

**Sedimentology of Arctic Fjords  
Experiment: Data Report, Volume 3**

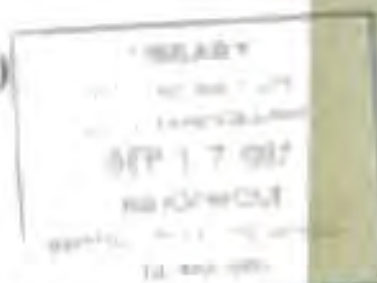
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July 1987

**Canadian Data Report of  
Hydrography and Ocean Sciences  
No. 54**



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## **Canadian Data Report Of Hydrography and Ocean Sciences**

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Data Reports are produced regionally but are numbered and indexed nationally. Requests for individual reports will be fulfilled by the issuing establishment listed on the front cover and title page. Out of stock reports will be supplied for a fee by commercial agents.

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En général, les rapports contiennent des données brutes ou analysées mais ne fournissent pas d'interprétations des données. Ces compilations sont préparées le plus souvent à l'appui de travaux reliés aux programmes et intérêts du service des Sciences et Levés océaniques (SLO) du ministère des Pêches et des Océans.

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Les établissements des Sciences et Levés océaniques dans les régions et à l'administration centrale ont cessé de publier leurs diverses séries de rapports depuis décembre 1981. Vous trouverez dans l'index des publications du volume 38 du *Journal canadien des sciences halieutiques et aquatiques*, la liste de ces publications ainsi que le dernier numéro paru dans chaque catégorie. La nouvelle série a commencé avec la publication du Rapport n° 1 en janvier 1982.

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Data Report, Volume 3**

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## ABSTRACT

Syvitski, J.P.M. and Praeg, D.B. (Compilers) 1987. Sedimentology of Arctic Fjords Experiment: Data Report, Volume 3. Can. Data Rep. Hydrogr. Ocean Sci. 54: iv + 468 p.

This is the third data report in a series on SAFE, the Sedimentology of Arctic Fjords Experiment (Geological Survey of Canada Project #810042). Contributions from over 15 researchers are presented in 15 chapters, which include information on inter-fjord and coastal surveys, prodelta investigations, manned submersible observations, sedimentologic, geotechnical and geochemical examinations of cores, and airphoto interpretations.

## RESUMÉ

Syvitski, J.P.M. and Praeg, D.B. (Compilers) 1987. Sedimentology of Arctic Fjords Experiment: Data Report, Volume 3. Can. Data Rep. Hydrogr. Ocean Sci. 54: iv + 468 p.

Ce rapport est le troisième d'une série concernant le projet SAFE, consacré à l'étude Expérimentale de la Sédimentologie des Fjords Arctiques (Commission Géologique du Canada Projet 810042). Les contributions de plus de 15 chercheurs sont présentées dans les 15 chapitres du volume; elles incluent les résultats des reconnaissances des fjords internes et des littoraux, des investigations des prodeltas, observations par submersible habité, des examens sédimentologiques, géotechniques, et géochimiques des carottes, et des interprétations de photographies aériennes.

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## CHAPTER 1

### INTRODUCTION

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The Sedimentology of Arctic Fjords Experiment (SAFE) was initiated in 1981 by the Geological Survey of Canada as a multidisciplinary study of the past and present depositional processes affecting a series of fjords along the east coast of Baffin Island (Figure 1). Depositional processes in arctic fjords are unique, in that hinterland river discharges are usually short but intense, basin water stratification is affected by both sea ice and wind mixing, and tidewater glaciers are common. The SAFE fjords are characterized by comparatively rapid process rates, which result in detailed and interesting sedimentary records. They are therefore ideal natural sedimentologic laboratories. The key objectives of SAFE include: (1) to understand sandur development and the character of the resultant facies; (2) to understand the time-dependent influences of rivers, tides, waves, wind and deep-water renewal on fjord circulation; (3) to use the geologic record of submarine and raised-marine deposits to establish the late Quaternary history within and between fjords, and to relate past and modern sedimentation patterns. The organizational framework of SAFE addresses these objectives by co-ordinating the efforts of a multidisciplinary scientific group which includes biologists, geochemists, geographers, geophysicists, geotechnical engineers, physical and chemical oceanographers, sedimentologists and micropaleontologists.

This volume is the third in the SAFE data report series. Volume 1 [25] and volume 2 [4] dealt primarily with information collected during C.S.S. Hudson cruises 82-031 and 83-028, respectively. This volume presents data generated from a variety of sources, including additional information from cruises HU82-031 and HU83-028, samples and submersible observations from M/V PANDORA II cruise 85-062 [3], and samples and observations from land-based helicopter expeditions in 1979, 1981, 1983, 1985 and 1986.

Listed below are some scientific highlights for the various reporting years of SAFE, including the present one. Numbers in parentheses refer to the SAFE publication list attached.

#### 1983/84

1. Placement and retrieval of the NHRI photo package at Cambridge Fiord, where the seasonal formation of the fjord-head polynya was filmed.

2. Placement of sediment traps and oceanographic moorings by long-lining with a PCSP jet ranger helicopter [21].
3. Development of a placer model that can be used to predict the deposition of heavy minerals near uplifted prodelta cliffs subjected to aeolian and wave reworking [6, 74].
4. Documentation of two distinct biosedimentological zonation on the prodelta slopes of Maktak and Irtibilung that sharply abutt; these zones relate to interchannel and channel environments that are affected by gravity flow events [21].
5. Macrobenthos sediment reworking is maximized where sedimentation is lowest in the basinal environments of the SAFE fjords [8,32].
6. Holocene sedimentation rates of 30 to 50 cm per 1000 years in the deep fjord basins compared to Pleistocene rates of greater than 400 cm per 1000 years [47, 73].
7. On-board susceptibility measurements of core material provide a rapid and efficient method for evaluating lithologic variations [65, 84].
8. An empirical relationship was found between dates determined from  $C^{14}$  on total organic matter and shell material: the latter dates are consistently younger [47, 73].
9. A bioenvironmental model has been developed, based on modern calcareous foraminifera assemblages located in SAFE fjords, to predict paleocirculation and sedimentological effects that may have occurred throughout the Quaternary [58, 88].
10. SAFE fjords with extensive sills contain the greatest accumulations of sediment and are believed to filter 90 % of the fine-grained sediment transferred from landmass to the shelf, compared to 40 % for fjords without sills [52].
11. Vertical velocities up to  $37 \text{ cm s}^{-1}$  have been calculated from the ascent rates of discrete scattering structures within the plume of a submarine spring (see 1) [14, 36, 54].
12. A seismostratigraphic model was formulated which describes one complete albeit complex glacial infilling cycle [52].
13. Bulk geotechnical properties vary with facies and the geographic location within each fjord; sediments are of medium to high plasticity, many being structurally sensitive [55, 56].

#### 1984/85

14. Six benthos associations were observed in the 10 SAFE fjords, and based on present-day environmental factors a biostratigraphic model was developed to follow the ecological changes accompanying a glacier's retreat [50].
15. The break between calcareous and araneaceous foraminifera in raised marine sequences may provide proxy information on water depth and fresh-water inflow levels [59].

16. Massive slides have occurred in Holocene sediments in five northern Baffin Island fjords, suggesting that one or a series of recent large earthquakes have occurred (centered around Scott Trough) [92].
17. Debris and grain flows are as important as turbidity currents for infilling arctic fjords [60].
18. A significant volume of shoreline gravel is rafted to sea by attached algae in some SAFE fjords [11].
19. Annual push moraines have been located and identified both onshore (paleo) and offshore (modern) adjacent to Baffin Inlandwater glaciers [7, 49].
20. Sedimentation rates are higher between 6500 and 9500 YBP compared to periods before and after [69, 71].
21. Sediment trap experiments indicate that sedimentation resulting from ice-rafting and aeolian processes ranges up to  $4 \text{ g m}^{-2} \text{ day}^{-1}$  during the freeze-up period [21].
22. SAFE fjords are each geochemically unique depending on local fluvial inputs, sediment pH/Eh conditions, and levels of organic matter; elemental distributions depend largely on lithology (which reflect the ratio of layered silicates to other detrital minerals derived from nearby provenances) and therefore processes affecting sedimentation [9, 33, 75].
23. Seiche events are important for the input of marine waters, with their associated nutrients/plankton, into the fjord-head environment [37, 97].
24. Modern ( $\text{Pb}^{210}$ ) sedimentation rates in Ilirbilung Fiord range from  $0.1$  to  $3 \text{ cm a}^{-1}$ .
25. A climate-sediment discharge model has been developed to predict total and daily bedload and suspended loads into Baffin Island fjords; the model agrees with the distribution of organic carbon content of seafloor sediments [50].
26. Fjord styles of subaqueous failures are excellent analogues for ancient fan sequences.
27. Seismostratigraphic and morphometric data support the role of the Coriolis force in shaping the sediment masses in the arctic [22].
28. A morphometric method was developed for estimating basin sediment thickness in fjords where seismic data does not exist—useful in estimating Quaternary denudation rates in remote areas.
29. Stewart Lakes were a marine fjord some 500 years ago but were cut off from the sea by Little Ice Age glacier advances—they are presently undergoing extremely high rates of sedimentation, possibly the highest in arctic Canada [53].
30. There has been a 36 times reduction in apparent erosion/sediment transport capacity for the Cambridge Fiord delta during the period 4700 YBP to present compared to the Hypsithermal period of deglaciation (6000 to 4700 YBP) [20, 93].
31. Based on an interval of absence of wave-storm ridges at the head of Cambridge Fiord, it is speculated that between 1700 and 3000 YBP Cambridge Fiord (and possibly other nearby fjords) had a permanent sea ice cover [20, 93].

1985/86

32. Frontal dynamics of "maritime" glaciers, whether subaerial or submarine, may be modeled so as to predict the formation of push moraines and ice-contact fans [49].
33. The magnetic susceptibility of Late Quaternary fjord and shelf sediment of eastern Baffin Island is directly influenced by a sediment source function and the particular style of progradation [46].
34. There is a small but significant influx of detrital carbonate into the fjords of Baffin Island @ 4 ka which may reflect increased iceberg rafting from NW Greenland and/or increased resuspension of carbonate-rich shelf sediments [69].
35. The upper portion of the water column (< 100 m) in the Baffin Island fjords is subject to important short-period variations (hrs-days) that appear wind-induced, with maximum amplitudes in the water structure found at the fjord-heads [97].
36. The very sudden increase in ice-rafting indicators at 6100 BP in Clark Fiord may indicate the return to the present-day pattern of sea-ice break up in the fjord and along the outer coast, allowing icebergs to enter the fjord [82].
37. Although each Baffin Island fjord has a unique microfaunal assemblage, key environmental factors have been found to explain the major variations; the unique shallow vs. deep water populations of arenaceous and calcareous foraminifera will allow down-core microfaunal trends to be used in the understanding of mass flow processes that dominate these fjords [59].
38. The sediment dynamics associated with a slowly retreating (partially-pinned) tidewater glacier at the head of Coronation Fiord have been described and modelled [94].
39. Important geophysical targets were ground-truthed by submersible sampling and observations, including details on frontal dump and medial moraines, till tongues, slope failure deposits and bedrock features [3, 90, 96].
40. Slope stability experiments on prodelta environments include the initiation and filming of turbidity current events [96].
41. The diversity and density of macrobenthos in the SAFE fjords can be related to water properties, bottom energy and seafloor type [96].
42. Six sandur deposits were stratigraphically mapped using facies analysis--- a dynamic facies model was subsequently formulated [93].
43. Sediment dynamics within nivation hollows was documented.
44. One of Canada's largest Tertiary-Quaternary deltas (Cape Aston) was recognized as having similarities to the Mackenzie delta and to Sable Island [93].

45. Data from helicopter-emplaced oceanographic moorings and weather stations indicate the presence of storm-induced seiches in fjords and 9 turbidity current events on the prodelta slopes of Ilitbilung Fjord, within in a five week period. Detailed analysis of the gravity flow events has revealed two types of events: (1) powerful single events may indicate delta front failure of coarse-grained sediment, and (2) weaker multi-events may indicate retrogressive slide failure of the prodelta muds [this volume, Ch. 6].
46. Many raised marine sections contained evidence of internal failure, possibly seismically induced [92].

### 1986/87

47. p-wave velocities measured on Baffin cores ranged from 1024 to 2493 m s<sup>-1</sup> [this volume, Ch. 10].
48. Aeolian transport in arctic fjord valleys occurs principally in winter; the final deposit is controlled by surface roughness, topography and vegetation cover and is reworked year round [77].
49. Studies of 21 Baffin glaciers show most having retreat rates between 3 and 50 m a<sup>-1</sup>, with only two tidewater ice front advances found ( $\approx 11$  m a<sup>-1</sup>) [this volume, Ch. 14].
50. A first-order box model was developed to estimate the sedimentation rates within Coronation Fjord: 100 mm a<sup>-1</sup> at 1 km from the ice front to 0.7 mm a<sup>-1</sup> at 30 km [96].
51. Whales and seals rework the seafloor of Baffin Island fjords, even to depths of 350 m [65].
52. Carbon is an excellent proxy (inverse) indicator of sedimentation rates in Baffin Island cores: a hypothesis that is consistent with the Neoglacial interval being a period of low denudation rates.
53. A land-sea map series has been initiated to relate the onshore Quaternary depositional setting to that found within the Baffin fjords [110].
54. The glacial rivers of Baffin Island are very turbid (up to 2 kg m<sup>-3</sup>) except where they are filtered by coastal lakes [this volume, Ch. 4].
55. Baffin Island fjord sediments are more enriched in <sup>15</sup>N than Mid-Atlantic coast shelf sediments, a difference that may reflect extensive fertilizer input to the ocean along the Mid-Atlantic seaboard [64, 66].
56. McBeth Fjord is dominated by hemipelagic deposition and has a smooth muddy prodelta, whereas Ilitbilung is dominated by mass-flow processes and has a variety of sediment failure and resedimentation features [80].

This open file is planned to be the last major SAFE data report. The publication of SAFE manuscripts will continue. Attached is the most up-to-date (April 1, 1987) SAFE reference list. We thank all the contributors of this report, and wish all SAFE participants success in their endeavors to write up and publish their manuscript contributions. We also thank the various national and international agencies and institutes who have supported SAFE logistics and personnel.

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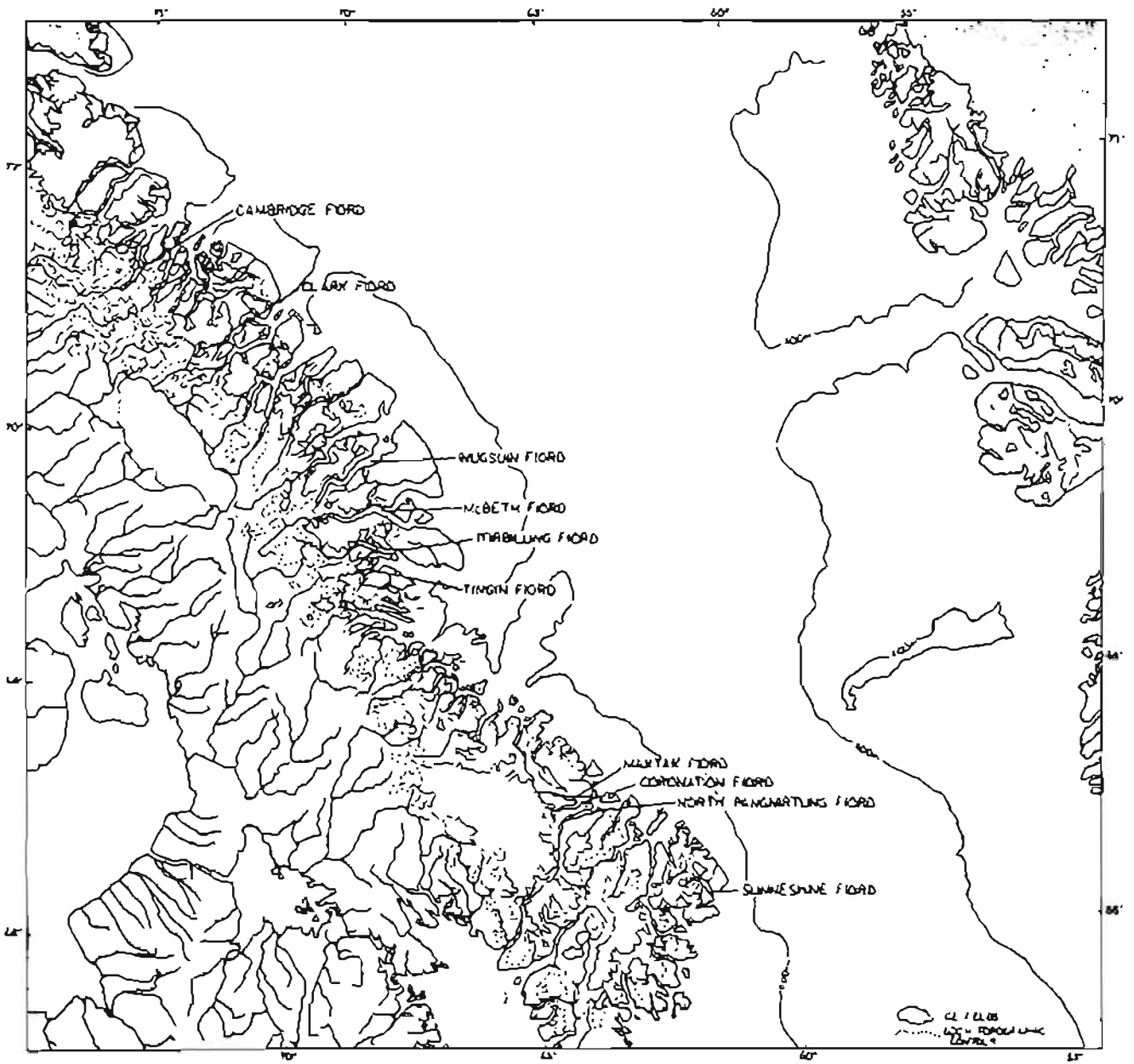


Figure 1



# LATE QUATERNARY GLACIAL AND RAISED MARINE STRATIGRAPHY OF NORTHERN BAFFIN ISLAND FIORDS

Jay A. Stravers

## INTRODUCTION

This report describes 84 onshore sample localities from glacial and isostatically raised marine sections of northernmost Baffin Island. The majority of sample sites occur along the shores and formerly submerged valleys of Cambridge Fiord, Buchan Gulf, Tay Sound, Paquet Bay, the Coutts Inlet system, and the foreland areas beyond the mouth of Coutts Inlet (see Figures 1 and 2). The primary objectives of the field and laboratory studies presented here are three fold. 1: To correlate the onshore glacial and marine stratigraphy to offshore seismostratigraphic records obtained for the Cambridge Fiord basin (Gilbert and MacLean, 1983) 2: To examine the raised marine stratigraphic sections in an attempt to determine the nature of the correlative offshore glacial marine units identified on the seismic records, 3: develop a radiocarbon chronology of glacial events that could be applied to the offshore basin sections that were too deep to be reached by piston core.

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## METHODS

A detailed glacial and surficial deposits map was produced from analysis of air photographs. Sample localities were chosen on the basis of their relationship to the regional glacial geology and their potential for providing dateable materials that could be used to develop a chronology of glacial events. Stratigraphic sections were described and measured in detail and most sample localities were documented on photographs. Radiocarbon assays were obtained from 15 samples submitted to the Geological Survey of Canada Radiocarbon Lab and to Beta Analytic Inc. Radiocarbon Lab.

Size frequency distributions were determined for 70 samples by Donald Clattenburg in the AGC sedimentology laboratory. The gravel fraction distribution was determined at 1/2 phi intervals by standard sieving. The sand fraction was analyzed at 1/5 phi intervals for its equivalent spherical sedimentation diameter using the A.G.C. settling tube. The mud fraction, when greater than 10% by weight, was analyzed on the Sedigraph 5000D at 1/5 phi intervals for the particles equivalent spherical sedimentation diameter.

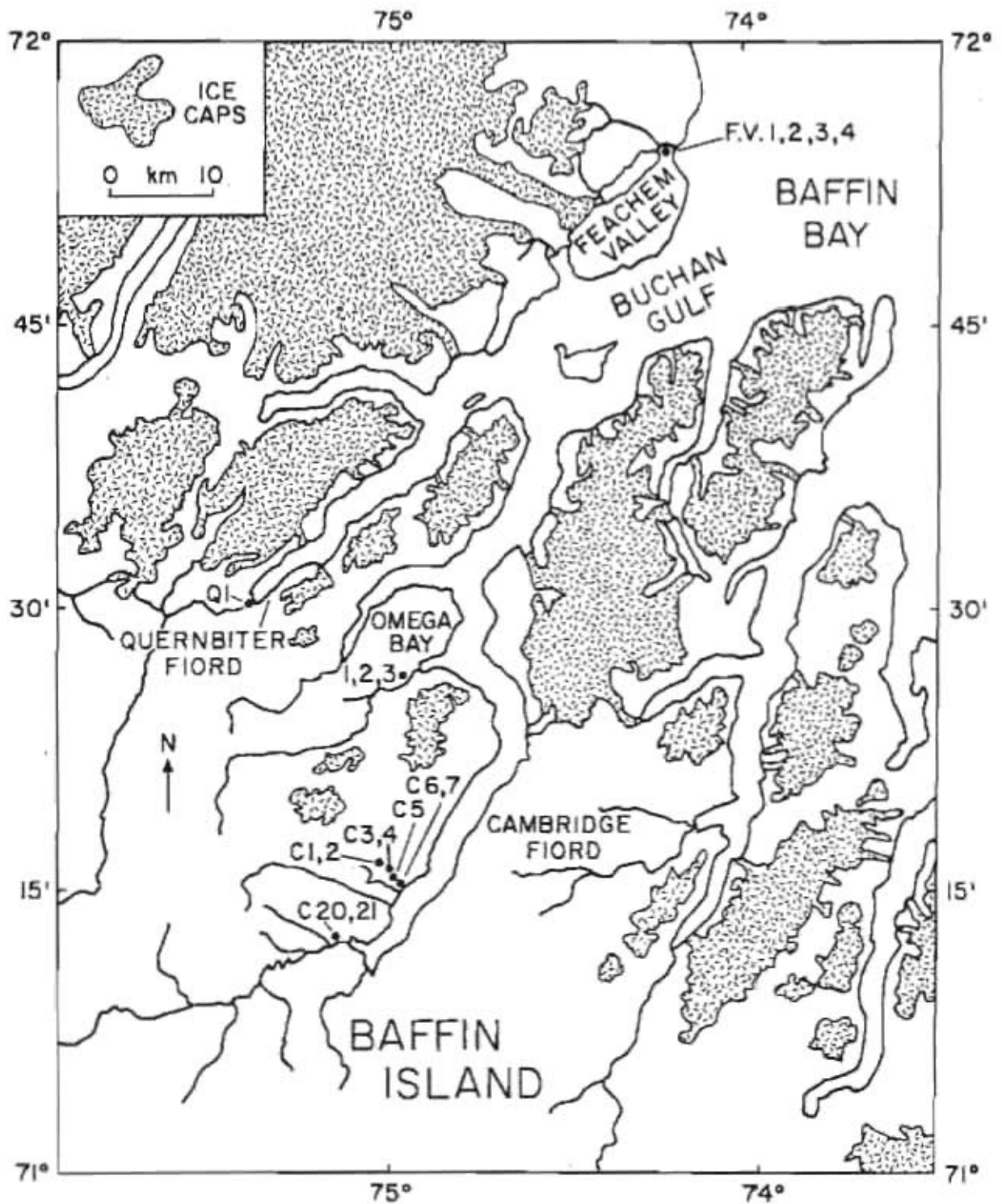


Figure 1 Map of sample localities within Cambridge Fiord and outer Buchan Gulf.

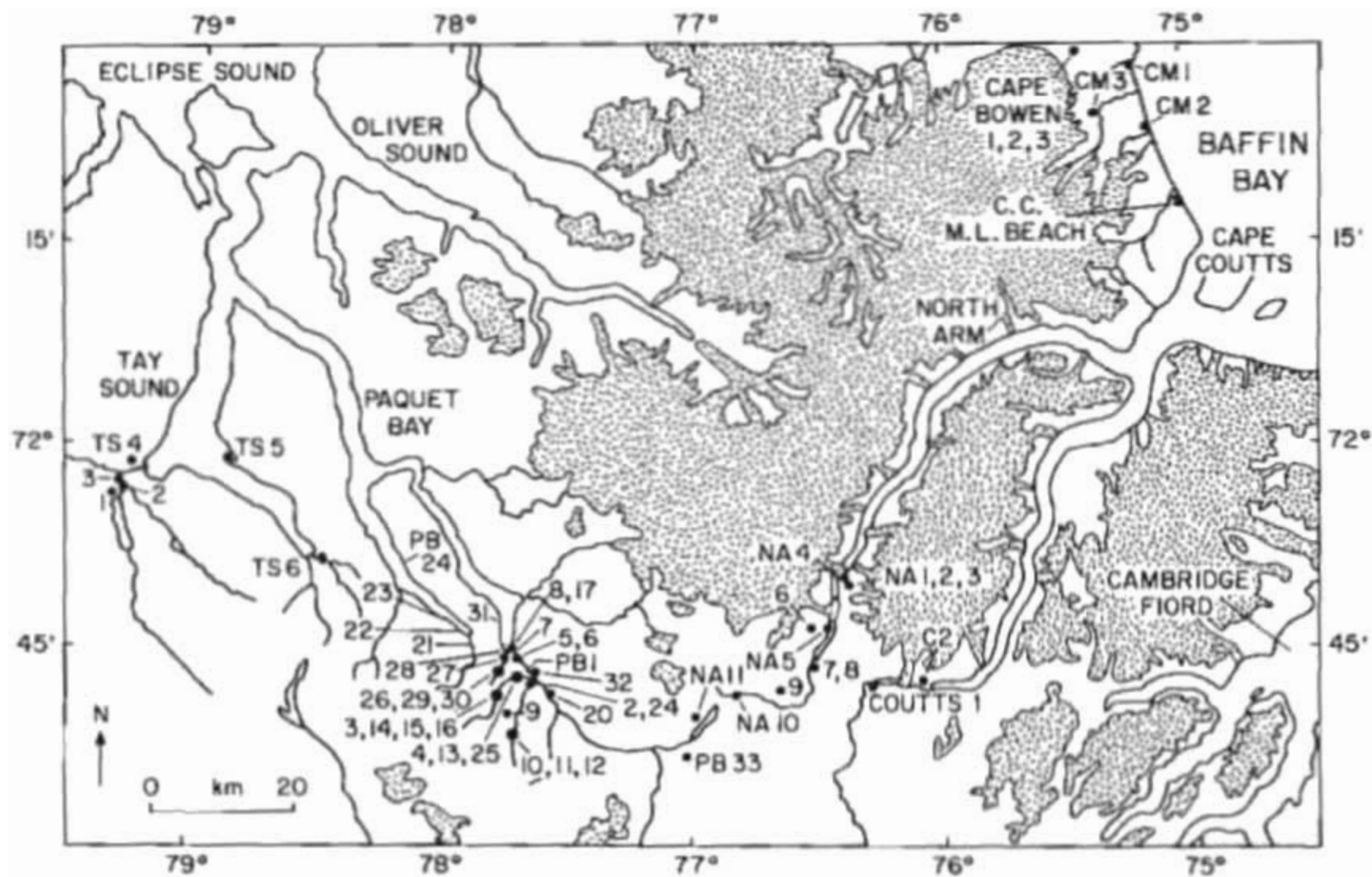


Figure 2 Map of Sample Localities from the Paquet Bay and Coutts Inlet area.

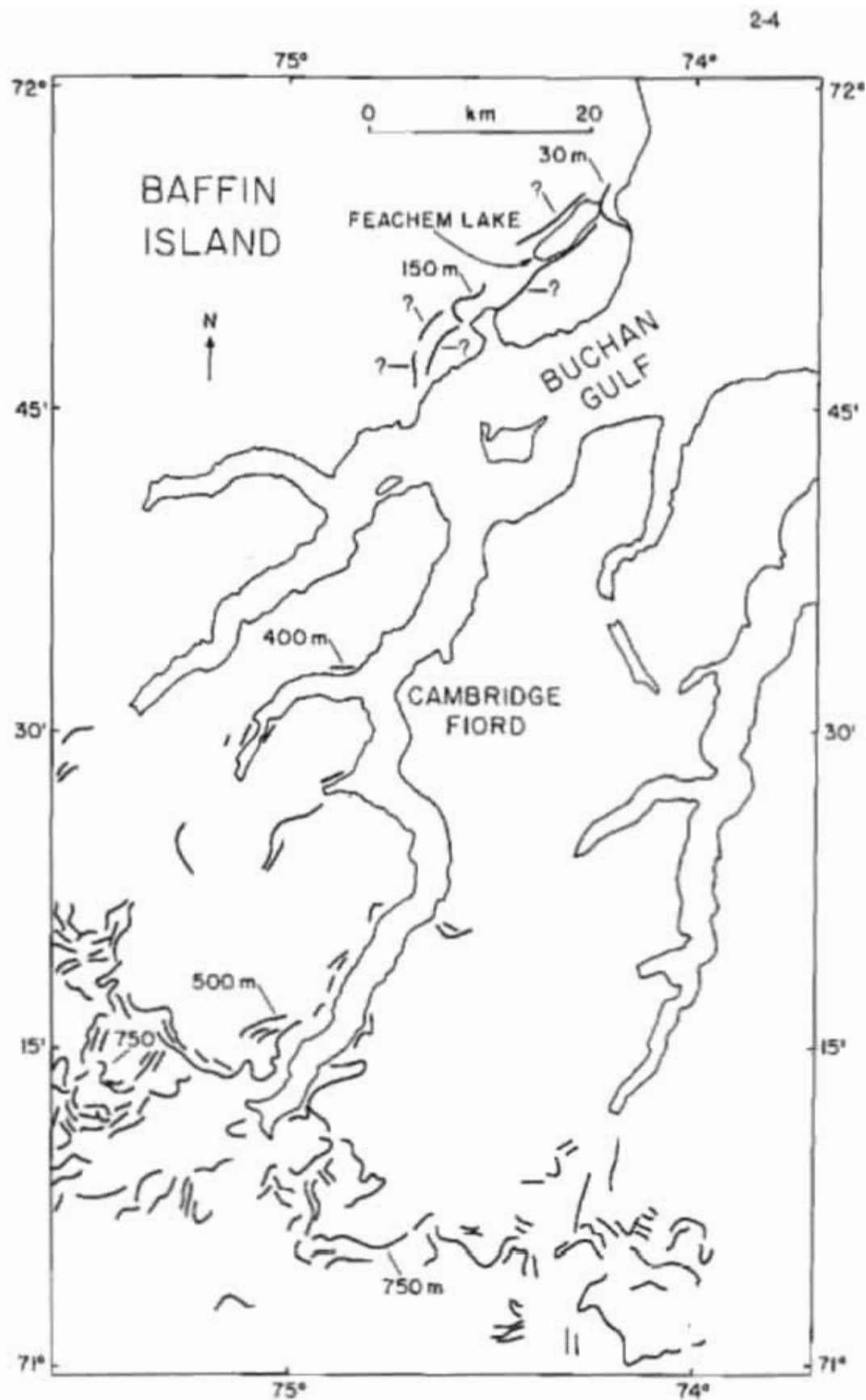


Figure 3 Map of "Cockburn" moraines and ice contact drift of inner Cambridge Fiord and moraines distal to the "Cockburn" moraine system which exhibit similar weathering characteristics (Cambridge moraines). Note that older more highly weathered moraines (pre-Holocene or pre-late Foxe) are not included on this map.

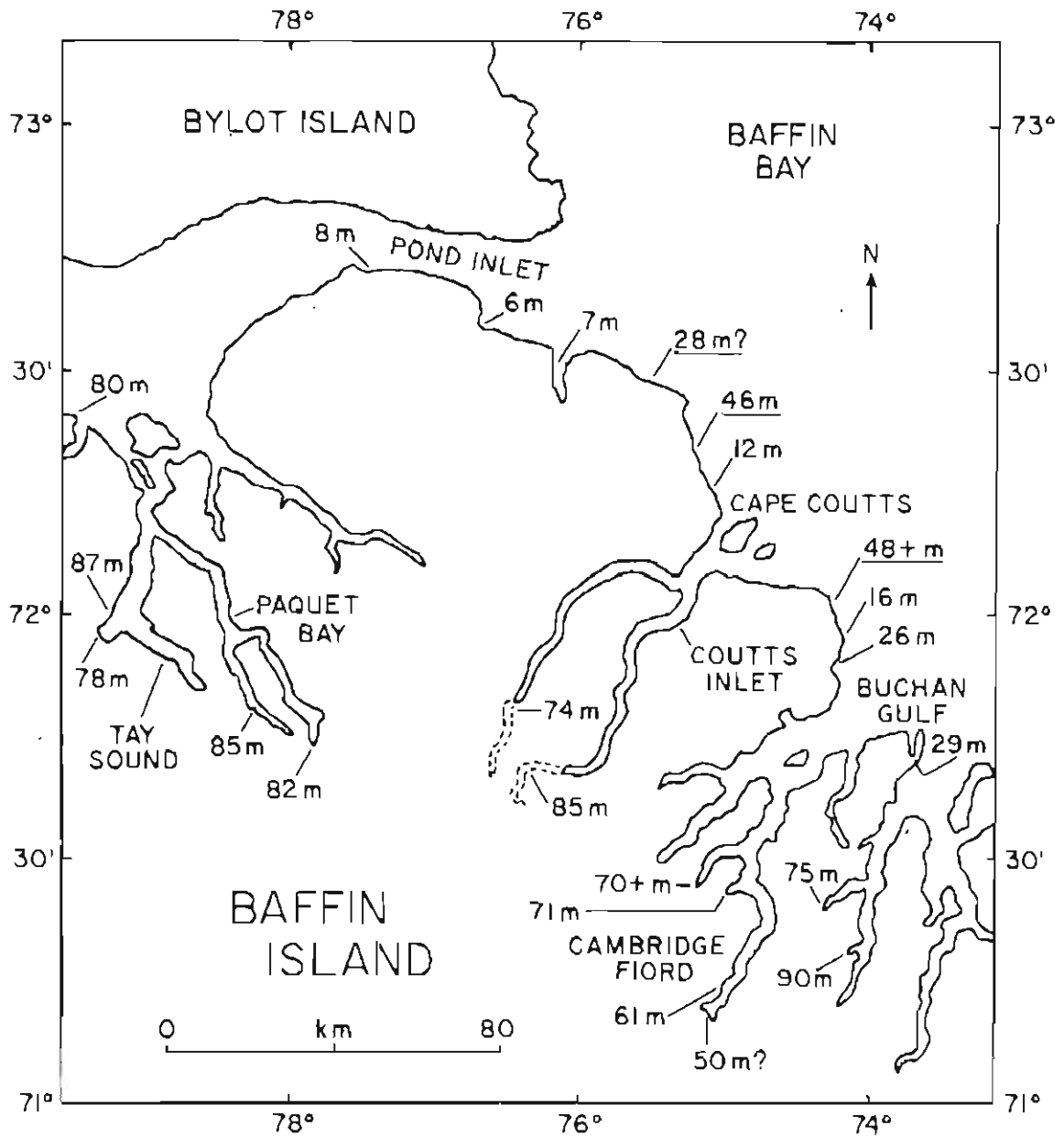


Figure 4 Map of the marine limits (in meters) of northern Baffin Island. The underlined values indicate the elevation of pre-Holocene or pre-late Foxe marine limits.

## RADIOCARBON SAMPLES

The radiocarbon determinations on marine mollusc shells were obtained from 2 laboratories which report radiocarbon age relative to different standards. Beta reports shell dates relative to the wood standard of Del  $^{13}C = -25\text{‰}$  PDB while GSC normalizes shell dates to  $0.0\text{‰}$  PDB. Therefore in order to insure intralab compatibility it is necessary to standardize all reported radiocarbon dates. This procedure is particularly necessary when dealing with a high resolution radiocarbon chronology for early Holocene glacial events. The method for recalculating the radiocarbon age of shells generally involves a normalization of the date to  $-25\text{‰}$  and the subtraction of a specific number of years for the reservoir effect of "old" seawater. Due to the uncertainty of the reservoir factor in Baffin Bay I have chosen to simply standardize the dates to  $0.0\text{‰}$  PDB rather than  $-25\text{‰}$ . This automatically provides a reservoir correction of 410 years which is probably a reasonable estimate in light of data presented by Mangerud (1972).

SAMPLE LOCALITY	RADIOCARBON LAB. ID. #	UNCORRECTED OR REPORTED DATE	STANDARDIZED DATE
Cambridge 6	Beta-20728	6040+100	5620+100
Cambridge 7	Beta-20729	4300+80	3890+80
Cambridge 20	Beta-16492	4000+70	3590+70
Omega Bay 1	Beta-20726	8260+150	7840+150
Omega Bay 2	Beta-20727	9010+120	8600+120
Feachem Valley 2	GSC-4357	8130+110	8130+110
Feachem Valley 4a	GSC-4366	7310+70	7310+70
Feachem Valley 4b	Beta-20730	6150+130	5730+130
North Arm 1	Beta-20724	6990+110	6580+110
North Arm 2	Beta-20725	7140+90	6730+90
Tay Sound 2	GSC-4317	6990+90	7010+90
Paquet Bay 8	GSC-4379	4850+70	4850+70
Paquet Bay 8	Beta-19588	5070+90	4660+90
Cape Coutts 10m	Beta-20731		5770+80
Cape Bowen 17Aug85	Beta-16487	26130+300 Hiatella arctica	Amino Acid 0.22+ free 0.036+ total

## GLACIAL AND RAISED MARINE DEPOSITS OF THE CAMBRIDGE FIORD SYSTEM

The samples were collected from isostatically raised marine sections along the shores of inner Cambridge Fiord (Figure 1), Omega Bay, Feachem Valley (informal), and the western coastal area of outer Buchan Gulf. Morainal sequences and ice contact deposits were sampled and described along the western valley wall of inner Cambridge Fiord as well.

## Moraine Systems of Cambridge Fiord

An important feature of the Cambridge Fiord glacial sequence is that disjunct moraine segments bearing identical weathering characteristics to the "Cockburn" (Andrews and Ives, 1978) moraines of inner Cambridge, can be traced along the middle and outer reaches of the fiord (Figure 3). I interpret the trend of these moraines (here referred to as the Cambridge moraines) as marking a shallow gradient outlet glacier which terminated within outer Buchan Gulf. Reconstructed ice surface elevations trend from 500m at the inner fiord to 450-400m near Omega Bay, 150m at Feachem Bay, and finally intersect the marine limit at about 30m in outer Feachem Valley. A clearly defined weathering break developed in morainal deposits can be mapped along inner Cambridge Fiord. The Cambridge moraines show little evidence of post depositional modification by weathering. They display fresh, stable surface morphologies, very limited soil development, and show no evidence for cryoturbation. In marked contrast, the glacial deposits above the weathering break show very degraded and indistinct morainal morphologies. They have been subjected to extensive cryoturbation and much of the apparent morainal form is due to solifluction.

The majority of the marine sections examined were found to be fossiliferous and thus were sampled for radiocarbon analysis. A tentative glacial reconstruction can be outlined from the dates reported here as well as those from the reconnaissance field studies conducted by Hodgson and Haselton (1974). The glacial and marine deposits within Cambridge Fiord and Omega Bay are related to the early to mid-Holocene retreat of an outlet glacier that occupied the fiord. The outermost morainal or glacimarine deposits of the Cambridge moraines have been identified at Feachem Valley (site F.V.2 along coast of Buchan Gulf), where they dammed Feachem Lake (informal). The outlet glacier must have terminated in the vicinity of outer Buchan Gulf because here, the moraines are observed to intersect and underlie marine deposits of the marine limit phase. These moraines pre-date  $8600 \pm 120$  (Beta-20727, Omega Bay 2) which marks the initial deglaciation of the Cambridge Fiord outlet glacier. The glacimarine facies of the Feachem Valley sequence (F.V.2) date from  $8130 \pm 110$  (GSC-4357) and they indicate glacial input to the Buchan Gulf system from a major readvance occurring just prior to  $7840 \pm 150$  (Beta-20726, Omega 1).

### Holocene Marine Limits and Pre-late Foxe Marine Deposits:

North of Feachem Valley, along the Baffin Bay coast, the Holocene marine limit is marked by prominent raised beaches that have been superimposed on, or eroded into older deltaic deposits. The elevation of the marine limit berm ridges declines northward apparently in a direction away from the axis of Buchan Gulf (Figure 4). The highest Holocene marine limits along the outer coast are observed at Feachem Valley (30m). Northward, they decline to 16m in the Cape Jameson area, 12m near the mouth of Coutts Inlet, and 6 to 8m along the northernmost coast of Baffin Island. The marine limit may be expected to be isochronous along the outer coast because it remained ice free for the entire late Foxe and early Holocene interval (excepting the Feachem Valley sites).

Therefore, the regional trend of the data suggest a significant ice load in Buchan Gulf.

#### SAMPLE SITES AND LOCALITY DESCRIPTIONS:

##### INNER CAMBRIDGE TRAVERSE SUMMARY: (for Cambridge Sites 1 - 7)

- Pre late Foxe moraines at 405m and 507m  
Lower moraine appears to have soliflucted over late Foxe or early Holocene moraines
- Prominent Kame terrace level 278m
- Prominent recessional moraine 219m
- 1st water washed feature 171m (ice marginal drainage)
- Prominent slope break suggesting wave action??? or water washing perhaps by ice marginal stream 122m
- Prominent wave washing limit 61m
- constructional features (genesis unknown) 46-51m, possibly a wave modified moraine
- Most prominent marine constructional feature 30-34m  
6330+140 (GSC-1094)
- Upper surface (slope break) of C6 and C7 outcrop 18-22m
- C7 fossiliferous sands 12m 3890+80 (Beta-20729)
- C6 fossiliferous marine stoney muds 8m  
5630+100 (Beta-20728)
- M.H.T. (mean high tide)

Cambridge 1 Moraines above the main kame terrace level in Cambridge  
Cambridge 2 fiord.

UTMG 18W VQ 4995E 79085N

Date 1Aug86

Elev. 405m and 507m

Sed. Sample: 1 - Till sample from C horizon of soil pit at  
C1 (405m).  
2 - Till sample from C horizon of soil pit  
at C2 (507m)

##### Comments:

Both sites are on moraine crests above the main kame terrace level. These sites appear to be the most stable of any of the higher moraine sites in this area however they do show clear evidence of solifluction with down slope mass movement having masked younger morainal deposits. Soil pits at both sites show thin A horizons over diffuse cambic B horizons of 6 and 8cm. Boulder armouring is common on almost all of the higher "moraines" and it appears that much of the moraine like forms of these deposits is due to solifluction rather than a glacial depositional process. The armouring is probably due to two factors including frost heave which brings the larger clasts to the surface and deflation which removes the interstitial fines. Because of these factors I would consider relative weathering to be unreliable at these sites.

Cambridge 3 Prominent kame terrace and moraine segment along inner Cambridge fiord.

UTMG 18W VQ

Date 1A86

Elev. 278m

Sed. Sample: 1 - Till sample from C horizon in soil pit on flat, stable, well drained surface of terrace.  
2 - Sample from the B horizon of the same soil pit.

Comments:

Soil pit shows well formed horizonation with a 7cm dark cambic B horizon. This kame terrace shows a very fresh, stable morphology of "Cockburn" or late Foxe age. There is no evidence of solifluction or cryoturbation as in the higher deposits. It may not however represent the late Foxe maximum ice extent because there is no clear weathering break associated with a specific ice marginal feature between this deposit and the moraine sites at C1 and C2. There are however higher deposits (to 500m) of similar morphology in the adjacent valley to the southwest. Here at site Cambridge 3 there is an irregular slope that may have been washed by ice marginal drainage but the slope is unstable and its true genesis is unknown.

Cambridge 4 Stream cut into stratified sands of the kame terrace.

UTMG 18W WQ 5002E 79075N

Date 1A86

Elev. 280m=surface of terrace

Sed. Samples: 1 - well sorted sands from 6m below the surface of the terrace  
2 - coarse poorly sorted layer interbedded with the sands.

Comments:

Stream cut exposes 8m of well sorted poorly stratified sands interbedded with coarse sands layers within the kame terrace. The deposition of the coarse beds have caused considerable deformation of the underlying sediments indicating the sands were water saturated at the time of deposition. In the adjacent valley to the SW there are similar kame terrace features that occur at higher elevations. These must relate to the same ice surface and thus should provide reasonable data on the ice surface gradient.

Cambridge 5 The prominent lateral moraine below the kame terrace.

UTMG 18W VQ 4999E 79065N

Date 1A86

Elev. 219m

Sed. Sample: 1 - sample from B soil horizon at 7-10cm depth below surface.

2 - sample from Cn soil horizon at 35cm depth below surface.

Comments:

Soil pit excavated in moraine crest shows a 2cm A over a 10cm thick cambic B horizon over Cn. The sample site is on a slight slope therefore the B horizon may be augmented. note; some B horizon was inadvertently mixed into the C horizon sample so it may not show a true C color. The interpretation is that this moraine represents a major stillstand during early Holocene retreat and general ice surface lowering.

Cambridge 6 Outcrop of fossiliferous stoney muds along stream above shoreline.

UTMG 18W WQ 5010E 79060N

Date 1A86

Elev. 8m

R.S.L. sub-littoral muds

M.L. 61m

Sed. Sample: 1 - sample of stoney mud

Shell Sample: 1 - whole valves and valve fragments of *Macoma calcaria*, *Mya truncata*, and *Hiatella arctica* excavated from stoney mud or collected from float on the outcrop.

Comments:

Stratigraphic section consists of 4m of stoney muds (cropping out above the stream bed) overlain by 6m of presumably deltaic sands. The muds may represent an ice-proximal sediment deposited during deglaciation. The surface above the outcrop slopes from 18m to 22m however it is an irregular surface that may be erosional in nature rather than indicating any specific sealevel feature. The most prominent marine constructional feature or terrace above this site lies at 30-34m.

Cambridge 7 Marine sands overlying the stoney muds of C6

UTMG 18W WQ 5010E 79060N

Date 1A86

Elev. 12m

R.S.L. 18-22m? see note

M.L. 61m

Sed. Sample: 1 - sample of fossiliferous sands

Shell Sample: 1 - valve fragments with a few whole valves of *Mya truncata* and one large whole valve of *clinocardium*. Collected from float on outcrop.

Comments:

Stratigraphic section consists of 4m of stoney muds (C6) overlain by 6m of deltaic sands which contain scattered large clasts. It is not clear whether the clasts are coming from eroded topset beds or are scattered throughout the sands. The surface above the outcrop slopes from 18m to 22m however it is an irregular steeply sloping surface that may be erosional in nature rather than indicating any specific sealevel feature. The most prominent marine constructional feature or terrace above this

site lies at 30-34m so it is difficult to tell if deposit relates to an 18-22m sealevel or a 30-34m level. If this sample is dated it could be compared to the 4000 date at 12m on the Keel river to reasonably determine which of the terrace levels it relates to.

Cambridge  
20 and 21 12m fossiliferous delta site dated at 3590 $\pm$ 70 Beta-16492  
UTMG 18W VQ 4920E 79002N  
Date 8A86  
Elev. Ca20 6m  
Ca21 9m  
Terrace Elev. 12  
R.S.L. 10-12m  
M.L.  
Sed. Samples: 1 - Ca20; fossiliferous muddy sands from delta foreset beds exposed along major river cut.  
2 - Ca20; well sorted sands from just below sample 1 of Ca20.  
Shell Samples: 1 - Ca20 Large in situ paired valves of *Mya psuedoarenaria* from delta foresets.  
2 - Ca21 in situ paired valves of *H. arctica*, *Mya truncata*, *Mytilus edulis*, and *Serripes groenlandicus* from foreset beds overlying Ca20.  
T.L. Samples: 1 - Ca20 shell M.S.; from main shell bearing muddy sands.  
2 - Ca20 w S.S.; from well sorted sands just below sample 1 of Ca 20.

Comments:

Outcrop consists of 10m of deltaic foreset and topset beds exposed along major river cut. Base of outcrop or stream level  $\approx$  2m aht. Note that only 3m of section separate cambridge 20 and 21 in the same outcrop yet they contain completely different faunas.

Omega Bay 1 Main stratigraphic section underlying the 50m terrace  
Omega Bay 2 UTMG 18W WQ 5015E 79266N  
Omega Bay 3 Date 1A86  
Elev. OB1 53m  
OB2 47m  
OB3 45m  
R.S.L. OB1 71m?=delta surface  
OB2 sub-littoral marine mud  
OB3 same as OB2  
Shell Samples: 1 - OB1; valve fragments of *Mya truncata* and *H. arctica* collected from float of delta foreset beds. (collected over 3m interval)  
2 - OB2; in situ paired valves of *Hiatella arctica* excavated from outcrop or collected from thin float veneer. From flat lying muds directly overlying diamict and underlying

foreset beds. (collected over 2m interval)  
3 - OB3; small collection made at essentially  
the same site as OB2 but containing sample  
of other species present.

Comments:

The total stratigraphic section exposed here is about 44m. The base of the section consists of 2-7m of nonfossiliferous compacted stoney mud which grades upward into 3-6m of fossiliferous conformable flat lying stone free muds containing an in situ *H. arctica* fauna. There is considerable relief (up to 8m) on the surface of the stoney muds which is however reduced to a few meters on the upper strata of the overlying muds. The conformable muds in turn grade upward into 21m of sandy foreset beds of a delta graded to a 71m sealevel. Foreset sequence consists of well sorted sands and muddy sands locally cut by erosional channels that are filled with basal gravels and less well sorted sands.

Quernbiter Site of single main raised deltaic surface in Quernbiter  
Q. 1 fiord.  
UTMG 18W VQ 4865E 79340N  
Date 8A86  
Elev.  
Terrace Elev. 19m  
R.S.L. 17-19m  
M.L. ?

Comments:

This surface represents the only recognizable deltaic surface in Quernbiter. It is incised slightly below what appears to be a major outwash deposit or possibly an extensive alluvial fill unrelated to glacial meltwaters. This fill unit covers most of the valley floor inland from this site. The delta sediment outcrops in 1986 consisted of large impressive rotational blocks of frozen deltaic foreset and topsets beds that were tilting out of the outcrop (mass wasting) down toward the stream bed.

Feachem Upper part of traverse where stream cut exposes morainal  
Valley 1 and outwash deposits.  
UTMG 18W WQ 5265E 79794N  
Date 10A86  
Elev. 34m=terrace surface R.S.L.? may be wave washed  
Sed. Samples: 1 - FV1 stoney mud sampled from cryoturbated  
surface of deposit.  
2 - FV1 outwash? collected from stream cut.

Comments:

This site is the prominent surface of a moraine and outwash complex that dams Feachem Lake. The morphology consists of a flat terrace like feature that shows cryoturbated surfaces in places where stoney muds cropout. The major stream cut exposes what appears to be a coarse outwash although there is no good undisturbed section to examine.

Feachem Stream cut outcrop of beach sands overlying stoney muds.  
 Valley 2 UTMG 18W WQ 5268E 79794N  
 F.V. 2 Date 10A86  
 Elev. 26m=beach strandline R.S.L.=25m  
 M.L. 25m?  
 Sed. Sample: 1 - stoney mud collected near base of stream  
 cut (20m elev), probably equivalent to FV1.  
 Shell Sample: 1 - whole valves and valve fragments of *Mya*  
*truncata* and *H. arctica*. collected from  
 float in lower stoney mud unit.

Comments:

The marine limit (early Holocene or late Foxe) in this area is difficult to determine because slope instability has destroyed much of the original land surface. It stands at least 25m and possibly higher. The base of the section exposed in the stream cut consists of 5.5m of fossiliferous stoney mud that contains pockets of moderately well sorted sands (these sands however may be slumped down from above). The surface of this unit is irregular (1m+ relief) and is overlain by 0.5m of lag gravels reworked from the underlying mud. This lag is in turn overlain by 3m of beach and eolian sands. Shell fragments of *Mya truncata* and *Hiatella arctica* in the beach deposit very likely represent reworked shells from the underlying mud. Limestones are common in the lower stoney mud where they may comprise 1% of clasts.

Feachem Fluvial deltaic sands cropping out above stream which runs  
 Valley 3 on top of the stoney mud unit.  
 F.V. 3 UTMG 18W WQ 5270E 79793N  
 Date 10A86  
 Elev. 22m=delta surface R.S.L.= approx. 22m  
 Shell Samples: 1 - whole valves and valve fragments of *Macoma*  
*calcareo* collected from float in the deltaic  
 sands. This sample will not be dated as  
 it probably represents reworked shells from  
 the underlying stoney mud.

Comments:

Section exposed in stream cut consists of 9m of fluvial deltaic sands overlying the fossiliferous stoney mud. The stoney mud outcrops only in the stream bed which broadens out at this site and runs on the surface of the stoney mud unit. The abundant shells found at the base of outcrop are from the muds not the sands.

Feachem  
 Valley 4  
 F.V. 4

Stream cut exposure of foreset beds and trough fill sands both containing in situ fauna.  
 UTMG 18W WQ 5272E 79792N  
 Date 10A86  
 Elev. 15 - 20m R.S.L. see note  
 Sed. Samples: 1 - upper organic rich trough fill sands from 19m in outcrop.  
 2 - lower foreset bed sands from 15m in outcrop.  
 Shell Samples: 1 - FV4a - organic rich trough sp.; Large in situ paired valves primarily of *Mytilus edulis* and *Macoma calcarea* with lesser *Mya truncata* and *H. arctica* collected from upper trough fill sands  
 2 - FV4b - lower foreset beds; Primarily paired valves of *Macoma calcarea*, *Hiatella arctica*, and *Mya truncata* collected in situ from the lower foreset bed unit.  
 T.L. Samples: 1 - FV4 O.R.T.B.; collected in film canister from freshly cleaned exposure of organic rich trough beds.  
 2 - FV4 l.f.b.; collected in film canister from freshly cleaned exposure of lower foreset bed sands

Comments:

This 9m section exposes two distinct sandy units. The base consists of 3-4m of sandy delta foreset beds with the in situ *Mya* and *Macoma* fauna. This unit is overlain by 5-6m of trough fill sands which contain the in situ *Mytilus* and *Macoma* fauna. Their growth positions are closely associated with organic rich beds and heavy mineral rich beds within the sequence. They commonly occur as aggregate clusters of paired valves concentrated along the organic or heavy mineral beds. The exact sealevel of these deposits is uncertain because neither the trough beds nor the foreset beds can be traced into topsets at this locality. Therefore the top of the section appears to have been eroded away during the offlap sequence. It seems likely however that the sample relates to a 22m sealevel as indicated by the fluvial beds within the deltaic sequence at site F.V. 3.

FEACHEM VALLEY LOWER TRAVERSE

18m and 16m: Prominent Beach Ridge (eroded into older materials, primarily the stoney mud unit).  
 10m Broad vegetated bench with discontinuous beach strands projecting through.  
 2m Discontinuous and irregular beach ridges.

Comments: (next page)

There is no precise indication of the height of the holocene marine limit in Feachem Valley however it may stand at 26m (FV2). In comparison to CJ1 (17m) there is a clear indication of Holocene shoreline deleveling with greater total uplift occurring within Buchan Gulf.

#### PRE-LATE FOXE DEPOSITS OF THE BAFFIN BAY COAST NORTH OF BUCHAN GULF

Note: the locations of the following Cape Jameson sites are not shown on figure 1.

Cape Jameson 1 Eroded outwash deposits cropping out in gullies above the holocene marine limit.  
 UTMG 18W WQ 5287E 79827N  
 Date 10A86  
 Elev. 40m=terrace surface  
 R.S.L. <40m? M.L.?  
 Sed. Sample: 1 - coarse sands from gulley outcrop

#### Comments:

The surface expression of these deposits suggests an eroded terrace surface. The sediments that outcrop in the gullies and stream cuts are primarily coarse gravels and appear to be outwash. If this interpretation is correct the deposit must postdate the deltaic sequences sampled at higher elevations further north (CM sites and CJ10). Thus the outwash deposits are clearly graded to a sealevel that stood below the deltaic sequences of Cape Mac. and Cape Jameson.

CJ1 Holocene Beach Traverse  
 M.L. poorly developed strandline 17m  
 Prominent strandline 11-13m  
 Prominent strandline 4m

#### Comments:

Along this section of the coast the holocene marine strandlines are fairly well developed. The uppermost strandline or what I presume to represent the marine limit is often obscured by colluvium or soliflucted debris from the outwash deposits above.

Cape Jameson 10 Delta outcrop near radiocarbon dated shell collection site of Hodgson and Haselton (1974).  
 UTMG 18W WQ 5285E 79905N  
 Date 10A86  
 Elev. 32-39m Terrace Level=48m  
 Sed. Sample: 1 -  
 Shell Sample: 1 - Valve fragments of *Mya truncata*, *H. arctica* and *Macoma calcareo* collected from float in stoney mud.

Comments:

This site consists of wave cut and stream cut exposures of a thick stoney mud section overlain by deltaic sands. Several outcrops were examined around the area in an attempt to locate Hodgson and Haselton's (1974) shell collection site. Of all the sites visited this locality was the only one found to contain fossils. Unfortunately the site is presently covered by an extensive snowbank which obscures much of the outcrop and probably many of the fossils. Samples were collected for amino acid analysis.

#### GLACIAL AND MARINE DEPOSITS OF TAY SOUND, PAQUET BAY, AND THE COUTTS INLET SYSTEM

The following sample sites are from the interconnected fiord and valley system between Tay Sound and Coutts Inlet. All sample locations are shown in Figure 2. These samples were collected from morainal and ice contact deposits, from terraced outwash deposits graded to the moraines, and from raised sections of marine deposits whose sedimentologic character were strongly influenced by the early Holocene glacial/deglacial sequence.

A general chronology of glacial events can be reconstructed from the available data. At 9500 BP. a system of outlet glaciers in Tay Sound and Milne Inlet flowed to the margins of Eclipse Sound to construct the Cape Hatt ice contact delta (Klassen, 1985). These outlet glaciers were fed by the Foxe Basin ice dispersal center or from a plateau ice cap lying to the south of Tay Sound. A sequence of moraines mapped within the Coutts Inlet system suggest that this ice mass also fed outlet glaciers in these fiords.

The distribution of morainal and glaci-marine deposits suggest that during deglaciation calving embayments migrated into inner Tay Sound and Paquet Bay and that the form of the ice sheet was then reduced to a series of lesser outlet glaciers descending to tidewater from the margins of the adjacent plateau. Only a few radiocarbon dates from many of the fossiliferous deposits in this area have yet been obtained, however they indicate that plateau ice influenced marine sedimentation from at least 8350±300 (I-724 in Hodgson and Haselton, 1974) through 7010±90 (GSC-4317, Tay Sound 2 of this report). Subsequent to this period of glaci-marine sedimentation, deglaciation appears to have proceeded rapidly because stratigraphic sections show an abrupt upward transition into marine silts devoid of dropstones or into fine grained (more normal marine) deltaic sediments. Thus it appears that rapid retreat of the outlet glaciers into the plateau valleys facilitated the storage of coarse sediments in the valley outwash trains.

The following list of samples are grouped by geographic area according to the drainage systems from which they were collected

TAY SOUND 1: Proximal escarpment of ice contact deltaic complex.

UTMG 17W NK 5581E 79830N

Date 18J86

Elev. 74m

R.S.L. 78m

Sed. Samples: 1 - coarse sands exposed in stream cut of ice contact delta.

Comments:

Location at the western elbow in Tay sound. Coarse grained ice contact delta examined along wave cut exposure at the northern end of "long lake" and in stream cut at sample site. Distribution of foreset dip directions and existence of probable ice contact escarpment at northern end of "long lake" suggests that an outlet glacier occupying the lake valley was the sediment source. No fossils found at this site.

TAY SOUND 2: Sublittoral stoney muds underlying deltaic sequence.

UTMG 17W NK 5597E 79841N

Date 18J86

Elev. 60m

R.S.L. unknown-probably >78m

Sed. Samples: 1 - fossiliferous stoney mud exposed along river cut.

Shell Samples: 1 - whole valves and valve fragments of *H. arctica* and *M. edulis* collected from outcrop and float across outcrop.

Comments:

Location is inland of western elbow of Tay Sound along western bank of river that flows out of "long lake". Stratigraphic section consists of approx. 4m of stoney muds overlain by about 14m of the ice contact delta sands of Tay Sound 2. Local terrace surface is at 78m but fossil sample cannot be directly related to this sealevel. Stoney mud outcrops at numerous sites extensively around the area of the Tay Sound elbow. Most of the clasts examined consisted of crystalline lithologies with a minor amount (<1%) of sedimentary clasts.

TAY SOUND 3: Outcrop of main deltaic sequence along river.

UTMG 17W NK 5591E 79847N

Date 18J86

Elev. 48m

R.S.L. 78m

Sed. Samples: 1 - sandy foreset beds from main Tay Sound delta complex.

Comments:

Location is along major river cut into the main ice contact deltaic complex in Tay Sound. Outcrop exposes foreset beds that can be traced upward into topset beds directly underlying the main terrace surface at 78m.

TAY SOUND 4: Fossiliferous foreset beds presumably of main delta  
 UTMG 17W NK 5608E 79876N  
 Date 18J86  
 Elev. 33m R.S.L. possibly 78m (see note)  
 Sed. Samples: 1 - muddy sand from fossiliferous foreset  
 beds.  
 2 - coarse sandy foreset beds.  
 3 - intermediate well sorted sands of foreset  
 beds.  
 Shell Sample: 1 - paired valves, whole single valves  
 and valve fragments primarily of *Mya truncata*  
 and *Macoma* sp. with lesser *H. arctica* and  
*Musculus* sp.

Comments:

Small tributary stream cut exposes interbedded sandy and muddy-sand foreset beds. Local observations at the site and airphoto analysis suggest that this exposure is cut into the main deltaic sequence and not into a subsequent delta formed at a lower sealevel. However, there does appear to be a 40m terrace surface or surface remnant above this site but I suspect that this is an erosional remnant formed by either fluvial erosion or wave action during sealevel regression. No topset foreset sequences were observed in the outcrop. Clasts from foreset beds include common sedimentary or meta sedimentary clasts - primarily black shales or slates however none of the sediments or clasts are calcareous. No topset beds preserved at this site because beach erosion during sealevel regression has either removed some of the delta sediments or reworked the delta face.

Discussion:

Tay Sound sealevel history appears to consist of a singular major delta forming event at the 78m sealevel. Local observations and airphoto examination suggest that there was no other delta construction phase post dating the main ice contact delta. This may be due to the elimination of coarse sediment supply from the fluvial system by the establishment of "long lake" during deglaciation. Most of the coarse sediment has been and is being deposited in the long lake delta. Therefore possible Holocene increases in discharge rates have not been recorded in the marine environment of western Tay Sound. The main delta phase was followed by sealevel regression that cut a series of beach shorelines into delta face from 60m down to present sealevel. From 78m to approx. 60m only discontinuous strandlines are preserved. From approx. 60m to present sealevel a well preserved series of nearly continuous beach strandlines are seen. These strandlines have very low relief and are heavily vegetated with few outcrops of underlying sediments. Therefore, they were not examined for fossils.

TAY S. MISC: Modern beach and tidal flat at river mouth.  
 UTMG 17W NK 5621E 79873N  
 Date 18J86  
 Elev. 0m

R.S.L. modern

Sed. Samples: 1 - sandy beach deposit near mean high tide.  
2 - tidal flat sediment at -1.5m below mean high tide.

TAY SOUND 5: Shaley "ice contact" delta or submarine outwash fan

UTMG 17W NK 5741E 79885N

Date 18J86

Elev.

R.S.L. 11m down to present sealevel

Shell Samples: 1 - Tay Sound 5 lower delta unit; 5-8maht, shells from lower deltaic unit. Primarily whole valves of *Mytilus edulis* with lesser *Mya* sp., *H. arctica*, and *Macoma* sp. Sample collected from across much of the outcrop.  
2 - Tay Sound 6 upper; 5-10maht, shells from the upper beach unit collected from several levels within the deposit. Species distribution similar to underlying delta so they may represent a reworking of shells from lower unit.  
3 - Tay 5; 2maht; Whole valves and valve fragments primarily of *H. arctica* collected from the 2-3m level in the outcrop of the overlying beach unit.  
4 - Tay 5; 10maht; Whole valves and valve fragments primarily of *H. arctica* from the 9-11m level of the overlying beach unit. Collected from outcrop and float on the surface of the uppermost part of the deposit.

Comments:

This landform is a prominent ice contact delta (no obvious stream sediment source) that is composed almost exclusively of black shale (or slate) fragments up to 10-15cm across in a sandy matrix. There are a few scattered rounded crystalline clasts. A wave cut escarpment facing NW exposes delta foreset type beds dipping towards the SE. The upper surface of the deposit has been reworked into beach deposits that show a series of strandlines extending from the top of the deposit down to present sealevel. This deposit consists only of shale fragments, the fines having been washed out by wave action. The sediment composition of this delta must represent the local bedrock of the floor of Tay Sound which was dredged or entrained from the sea bed by an outlet glacier flowing in the Tay Sound trough.

TAY SOUND 6: Sublittoral muds and stoney muds outcropping from beneath the outwash deltas of innermost Tay Sound.

UTMG 17W NK 5869E 79757N

Date 18J86

Elev. 2m (base of stream cut) to 12m (erosional terrace level) = approx. 10m section.

R.S.L. ? (sub-littoral deposits)

Sed. Samples: 1 - lower unit-dark stoney mud with boulder, cobble, and pebble clasts (crops out at base of stream cut).  
 2 - lower unit-sample of 6cm thick sand bed within stoney mud.  
 3 - lower unit-massive muddy sands (upper part of the lower unit) containing the abundant *Mya* fauna.  
 4 - upper unit-light colored laminated well sorted silts with minor pebble or cobble clasts. Contains the juvenile *Mytilus* fauna.

Shell Samples: 1 - Tay Sound 6 lower; 5maht, Whole single and paired valves of *Mya* sp. and *Serripes groenlandicus* from upper part of stoney mud unit.  
 2 - Tay Sound 6 upper; 8maht, Whole single and paired valves (mostly juvenile) of *Mytilus edulis* from upper unit of well sorted silts.  
 3 - Tay Sound 6 both; Combined collection of all species present.

#### Comments;

Two stratigraphic units of sublittoral muds are clearly indicated by the litho- and biostratigraphy at this site. The lower unit (6m thick) is poorly sorted and crudely stratified consisting primarily of massive stoney muds (clast size ranging up to 60cm) or stratified muds disrupted by dropstones interbedded with sand layers up to 15cm thick. This unit grades upward into 2-4m of light colored well sorted silts in laminar beds from about 3mm to 3cm in thickness. A very few dropstone clasts are also found in this unit. The two units are also clearly differentiated on the basis of their macrofossil content. The lower shell collection comes from the upper part of the lower stoney mud unit and a transition zone into the upper silt unit. The upper shell sample was collected from a very narrow zone in the laminated silts. The stratigraphy probably records an ice margin retreat phase from ice contact to ice proximal (lower unit) to ice distal or ice free (upper unit).

#### PAQUET BAY SAMPLES

P.B.1: Low fluvial terrace near junction of the main river flowing into Paquet Bay and its first tributary stream valley.  
 UTMG 18W VQ 4066E 79608N  
 Date 19J86  
 Elev. 12m  
 Terrace Elev. 15m  
 Sed. Samples: 1 - coarse stratified fluvial sands and gravels  
 Organics: 1 - Organics buried by channel fill deposits.

## Comments:

4m section exposed along abandoned river channel. Terrace surface about 5-6m above main river level at this site. Organics are probably vegetation that covered an abandoned channel that was later reactivated possibly by a spring flood transporting sediment that buried the organics. Radiocarbon date could indicate an approximate age of active fluvial sedimentation at this surface. Sediment texture varies from well sorted fine sands to sands with up to 60% well rounded gravel content. Clast size varies from pebble up to approx 20cm.

P.B. 2: Stoney mud overlain by flat bedded sands (delta bottomsets) outcropping along main river channel just downstream from second tributary stream junction.  
 UTMG 18W VQ 4078E 79594N  
 Date 19J86  
 Elev. 38m  
 Terrace Elev. 44m  
 Sed. Sample 1 - well sorted stratified sands of main delta bottomset beds.

## Comments:

Base of section consists of stratified stoney muds with planer flat lying or undulating beds from a few mm to 4cm thickness. Contains locally abundant dropstones of exclusively crystalline lithology with most common clast size from 6-10cm and largest up to 20cm. Clast size distribution appears to be very similar to the stream gravel dist. of previous terrace site. The local river bed gravels are primarily reworked dropstone clasts. Surface morphology of the stoney muds appears to be very irregular with several meters of relief. No specific site was observed at which the muds graded upwards into the bottomset beds so the transition may represent an unconformable surface. Similarly, the flat lying sands are overlain by about 2m of fluvial gravels. This section shows evidence for multiple unconformities.

P.B. 3 Outcrop of delta foresets and bottomsets along first tributary stream valley.  
 UTMG 18W VQ 4055E 79600N  
 Date 20J86  
 Elev. 41m  
 R.S.L. 49m for foresets but shells from bottomsets that cannot be traced to foresets.  
 Terrace Elev. 2 prominent levels  
                   51m=main delta surface  
                   45.5m=fluvial terrace downcut into main delta surface  
 Sed. Samples: 1 - sandy flat lying bottom set beds.  
                   2 - muddy sand flat lying bottomset beds.  
                   3 - coarse sandy foreset beds  
                   4 - gravely foreset beds



4 - single coarse sand layer (1cm thick)  
that represents the coarsest texture of any  
bed in this outcrop. sampled from 15.5m

Comments:

Approx. 21m of section are exposed along this river cut and the sample site is from the lower 3m which were cleared for detailed examination. Lower part of section consists of 2m of thick flat lying sand beds (up to 10-12cm) (sample 1) with minor interbedded muddy sand beds <1cm. Sharp contact with 1m of overlying sandy muds (sample 2) interbedded with sand laminae. Other samples include an in situ sample of sand/muddy sand couplets and a thin (2cm) coarse sand layer that represents the coarsest bed observed in the entire bottomset section. This sequence represents a transitional section between basal stoney muds and a prograding deltaic sequence.

P.B. 6            Near PB5 but higher in the section.  
UTMG    18W VQ 4059E 79618N  
Date    21J86 and 6A86  
Elev.   22m=bottomset samples  
         27m=elev. of foreset dip measurements  
Terrace Elev. 29.5m  
R.S.L.   ? bottomsets from which the shells were  
         taken are not necessarily conformable to the  
         overlying topsets  
Sed. Sample: 1 - sample from a 6cm thick muddy bed (22m)  
         which appears to be the finest grained bed  
         in the bottomset section.  
Shell Sample: 1 - whole valves and valve fragments of *Mya*  
         *truncata* and *Macoma* sp. collected from float  
         or in situ from muddy flat lying bottomset bed.

Comments:

Muddy beds are more prominent in the middle and upper part of the flat lying section where they increase both in number and in thickness (2mm to 15cm). Minor interbedded sand layers most of which are a few mm to a few cm thickness with a very few up to 10cm. Also at this section about 4m of delta foreset beds overly the flat lying sequence. At no place however could the foresets be traced with certainty into the bottomsets. Several foreset dips were measured at this site and toward the north along the stream cut. The sequence beginning at PB6 is 5 to 17 degrees toward 250, 10-055, 15-015, 15-005, and 5-020 at northern end of outcrop.

P.B. 7            Main river cut into a deformed sequence of glacial and  
         marine sediments 2km inland from river mouth.  
UTMG    18W VQ 4061E 79624N  
Date    21J86  
Elev.   7m  
R.S.L.   sub-littoral deposit (possibly dating near the  
         marine limit phase?)

- Sed. Sample: 1 - undisturbed stratified muds directly overlying deformed sequence.  
 2 - Overcompacted, crudely stratified till like diamict folded and thrust into a push moraine(?).
- Shell Sample: 1 - 4 paired valves of *Macoma calcaria* collected from rill wash in untectonized muds.

Comments:

The base of this 10m section consists of 2m of a compact, crudely stratified till (coarse stoney mud) that was thrust upward into and deformed about 7m of flat lying thin bedded (2mm-2cm) silts containing abundant dropstones. Numerous open folds and recumbant folds can be seen in the section as well as high angle reverse and thrust faults. The tectonized part of the section is separated from the overlying undisturbed silts by an angular unconformity however, toward the distal part of the tectonized sequence (northwest) progressively less deformed silts appear to grade conformably into the flat lying silts from which the shells were sampled. Therefore it seems likely that the shells would provide a close minimum age estimate for the tectonization. It is uncertain whether or not the undisturbed muds are equivalent to the stratified deposits of PB5 and 6 since they cannot be traced directly from outcrop to outcrop.

- P.B. 8 River cut exposure of delta foreset beds 1km from river mouth.  
 UTMG 18W VQ 4052E 79626N  
 Date 21J86 and 6A86  
 Elev. 21m  
 Terrace Elev. 28m (measured) 30m+ from map  
 R.S.L. 28m  
 Sed. Sample: 1 - ?  
 Shell Sample: 1 - whole single and paired valves of *Mya truncata* and *M. arenaria* with minor *Macoma* sp. collected from float or excavated from a single muddy foreset bed.

Comments:

This sample should provide an excellent date on the 28m sealevel. Several dip directions varying from 15 to 29 degrees almost due west were measured on this outcrop.

- P.B. 9 Isolated kame or moraine segment surrounded by fluvial deltaic surface of the "65m" terrace.  
 UTMG 18W VQ 4061E 79583N  
 Date 23J86  
 Elev. 72m  
 Sed. Sample: 1 - Sample of coarse sand in the C horizon from 40cm depth in soil pit dug on surface of moraine.

Comments:

Soil pit shows a 2cm A horizon overlying 14cm Cambic B and unmodified Cn. The B horizon thickness may be augmented since this site was probably at least briefly under marine water influence and thus accelerated weathering rates due to the mechanical action of salt crystallization. There is also a prominent "strandline" like feature cut into the south side of the moraine however, it is not possible to confirm that it is a wave cut rather than a fluvial feature.

P.B. 10      Ice proximal "side valley" outwash deposits from south flank of valley fill.  
 UTMG    18W VQ 4064E 79567N  
 Date    23J86  
 Elev.   95m  
 R.S.L. above the marine limit  
 Sed. Sample:    1 - Coarse outwash gravels sampled from stream cut into apex of outwash fan where the stream issues from a canyon cut into crystalline bedrock. Only crystalline lithologies are observed in the clasts here.

P.B. 11      Ground moraine site on bedrock surface above falls on south flank of Paquet valley.  
 UTMG    18W VQ 4052E 79554N  
 Date    23J86  
 Elev.   195m  
 Sed. Sample:    1 - Sample of coarse sandy till collected from Cn horizon at 35cm in soil pit.

Comments:

Soil pit reveals 1cm discontinuous A horizon, a 12cm Cambic B, and unmodified Cn. Scattered limestones are also observed on surface in vicinity of this sample site.

P.B. 12      Frost churned silty till deposit on lower slope of south valley side wall.  
 UTMG    18 VQ 4059E 79567N  
 Date    23J86  
 Elev.   105m  
 R.S.L. No evidence of marine submergence at this site.  
 Sed. Sample:    1 - Sample taken from surface of frost boil. Fine grained texture may represent efficient comminution of till matrix or may be due to concentration of fines by cryoturbation. No soils were observed at this site.

P.B. 13      Organic rich fluvial sediments from one of the main terraces in first tributary stream valley.  
 UTMG    18W VQ 4057E 79604N

Date 24J86  
 Elev. 25m  
 Terrace Elev. 26m  
 R.S.L. <20m  
 Sed. Sample: 1 - fluvial gravels underlying organic beds. Sampled from outcrop along stream cut.  
 2 - sample taken from 12cm thick sand layer from between two organic beds.  
 Organics: 1 - sample taken from lower organic rich bed (2cm thick).

Comments:

Stream cut exposes about 3m of fluvial gravels consisting of lower and upper gravel units separated by two organic rich layers in a 12cm sand bed. Sand unit may represent eolian sedimentation on flood plain of dry fluvial channel between two major episodes of fluvial sedimentation.

P.B. 14 Deep gully cut into the 50m delta.  
 UTMG 18W VQ 4054E 79597N  
 Date 24J86  
 Elev. 40m  
 R.S.L. approx. 50m  
 Sed. Samples: 1 - uppermost part of a sandy foreset bed just where it tips off the delta front.  
 2 - the gravely foreset bed that is the fluvial component of the sample 1 foreset bed.  
 3 - coarse sandy matrix of uppermost part of the fluvial section containing the coarsest gravels.

Comments:

2m section near the top of the outcrop was examined in detail. Here the delta foreset beds grade upward into fluvial topsets. The terrace surface above this site grades toward the moraine outcrop at PB15. Uppermost topset beds contain approx 50-70% >2mm gravels.

P.B. 15 Moraine segment outcropping within or partially buried by deltaic sequence of the 60+m terrace.  
 UTMG 18W VQ 4055E 79593N  
 Date 24J86  
 Elev. 58m  
 R.S.L. probably > about 60m  
 Terrace Elev. 61m  
 Sed. Sample: 1 - stoney silt from the moraine core.  
 2 - fossiliferous stratified silts (with dropstones) immediately distal (about 15m distance) to the moraine.  
 Shell Sample: 1 - primarily whole single valves and valve fragments of juvenile *H. arctica* with minor *Macoma* sp.

Comments:



of two prominent organic beds (up to 5cm thick) in fluvial channel fill sediments that underlie an erosional terrace cut 3.5m below the delta surface (51m) (PB16 of 5A86). The organics may date from the time when the fluvial channels were last active. A comparison with other shell dates that constrain relative sealevel should indicate the reliability of these organic dates.

P.B. 17      Organics from erosion channel breached through delta spur  
1km south of river mouth.  
UTMG    18W VQ 4052E 79629N  
Date    25J86  
Elev.  
Organics:      1 - sample from base of channel cut through  
the delta remnant.

Comments:

Probably represents vegetation growing in an abandoned fluvial channel. The channel appears to have been cut off after the main river channel was cut down below the level of the breach. The organic layer caps fluvial gravels and is in turn overlain by eolian sands.

P.B. 17      Foreset dip directions measured in outcrop below notch were  
16 to 21 degrees toward 300

P.B. 18      Sublittoral marine muds outcropping just inland from the  
southernmost tip of Paquet Bay-east arm.  
UTMG    18W VQ 4041E 79624N  
Date:    25J86  
Elev.    14m      R.S.L. ?-sublittoral deposit  
Sed. Samples: 1 - lower massive black mud unit.  
2 - middle fossiliferous stratified silts.  
3 - upper finely laminated sands.  
Shell Samples: 1 - 8 small paired valves of *H. arctica*  
and juvenile *Mya truncata* excavated from the  
lower mud unit.  
2 - whole valves, some paired, and valve  
fragments of *H. arctica*, *Mya truncata*,  
*Clinocardium ciliatum?*, and *Serripes groenland-*  
*icus* from the middle stratified silts.  
3 - small collection from the stream bed  
includes above species + *Macoma* sp. and  
*Mytilus edulis*. NOT FOR DATING.

Comments:

Good exposure along stream cut near shore of Paquet Bay shows three different marine units. The lower most is 2-3m of massive muddy fine sands outcropping just above the stream bed. The middle unit consists of transitional stratified silts with some fine sands. (comparison of dates from these two units could give good info on offshore sedimentation rates). The uppermost unit exposed in this outcrop consists of finely

laminated sands. Muds contain very few drop stones however of the observed stones approx. 50% are sedimentary clasts. These sediments may record a relatively deep offshore prograding deltaic sequence in which upper laminated sands represent deltaic bottomset beds.

P.B. 18a      outcrop of marine muds above PB18  
 UTMG    18W VQ 4037E 79623N  
 Date    31J86  
 Elev.    14m  
 R.S.L. sub-littoral muds

Comments:

This is the next good outcrop upstream from PB18 and two stratigraphic units are exposed here. The lower unit is a stoney mud (with approx. 5% by volume of clasts) that grades upward into a well sorted silt with very few dropstones.

P.B. 18b      Next outcrop following up gully.  
 UTMG    18W VQ 4036E 79623N  
 Date    31J86  
 Elev.    36m  
 R.S.L. sub-littoral muds

Comments:

Stoney muds with 5% clasts of which most are crystalline but with 1% sedimentary or metasedimentary rocks (shales, slates, and quartzites).

P.B. 20      Stoney mud outcrop along main river 8km upstream from mouth.  
 UTMG    18W VQ 4095E 79578N  
 Date    27J86  
 Elev.    44m  
 Sed. Sample:    1 - sample of diamict from north bank of river.

P.B.21      Ice contact delta system at head of west arm of Paquet Bay.  
 UTMG    18W UQ 3993E 79642N  
 Date    27J86  
 Elev.    65m  
 R.S.L. 68-75m  
 Sed. Sample:    1 - coarse grained fluvial topset gravels  
                     2 - coarse sand and gravelly foreset beds

Comments:

Ice proximal/ice contact deltaic complex that links east and west Paquet Bays. Delta surface of 68m in west Paquet Bay grades 5.5km through connecting valley to morainal and ice contact escarpment at 90m in East Paquet Bay. This complex has been preserved intact since deposition except for entrenchment of underfit stream. It represents a moraine/out-wash system that grades to the marine limit phase. Gravel % (>2mm) varies from 50 to 70% in outcrop with clast sizes up to 50cm. Clasts are exclusively crystalline.

- P.B. 22 Wave cut exposure of terminal moraine cored by fossiliferous marine stoney muds (near head of west Paquet Bay).  
 UTMG 18W UQ 3984E 79657N  
 Date 27J86  
 Elev. 2-15m  
 R.S.L. sub-littoral muds possibly marine limit phase.  
 Sed. Sample: 1 - lower massive stoney silts  
 2 - upper laminated silts with sand stringers.  
 Shell Sample: 1 - whole valves and valve fragments of *Macoma calcarea* and *H. arctica* with a few partial valves of *Mytilus edulis* and *Chlamys islandica* collected from float from the upper part of the section.

Comments:

Scattered dropstone clasts (5-10% by volume) occur throughout the lower massive silt unit (6m thick). Most clast are of pebble size (1-2cm) however some ranging up to 20cm were also observed. Clasts are primarily crystalline (granites and gneisses) but with about 5-7% sedimentary lithologies. Shells collected from float and appear to be coming from the upper part of the exposure (about 12m section in wave cut exposure) or the laminated silts. Approx 8m of stratified silts are exposed here however it was not possible to tell whether those silts immediately post date the moraine or if they were tectonized during the formation of the moraine.

- P.B. 23 Wave cut exposure of morainal/submarine outwash sequence in Paquet Bay west arm.  
 UTMG 18W UQ 3963E 79676N  
 Date 27J86  
 Elev. 2-11m R.S.L. >11m  
 Sed. Samples: 1 - coarse stratified sands and gravels from the base of the submarine outwash facies.  
 2 - sorted sands from the upper part of the submarine outwash facies.  
 Shell Samples: 1 - Paired valves and whole single valves of *H. arctica*, *Mya truncata*, and juvenile *Mytilus edulis* from the sandy stratified facies.  
 2 - whole large valves and valve fragments of *H. arctica*, *Mya truncata* and *Mytilus edulis* from the muddy facies of the moraine core.

Comments:

Multiple facies sequence of moraine core grading into submarine outwash sands and gravels outcropping along wave cut exposure on the western shore of Paquet Bay west arm. Core of moraine (proximal or ice contact facies) appears to consist of massive muds and stoney muds that grade laterally (toward the SE) into the gravelly submarine outwash (distal or water washed facies). Base of outwash section consists of a poorly sorted,

poorly to well stratified coarse gravel grading upward into well sorted but poorly bedded sands near the top of the section. Muddy core may represent thrust moraine or "frontal dump" sedimentation however this cannot be determined from the poor exposure of the mud at this site. Outwash represents coarse facies deposited by meltwater plume at ice margin. The trend of the moraines along this arm of Paquet Bay suggests that initial deglaciation of Paquet Bay had occurred and that these moraines were deposited by tidewater valley glaciers flowing in from the southwest.

P.B. 24      Stream cut exposure of coarse outwash/deltaic sequence  
 along second tributary stream near junction with river.  
 UTMG    18W VQ 4077E 79589N  
 Date    29J86  
 Elev.   30m=base of section  
 R.S.L. ?  
 Sed. Samples: 1 -

Comments:

This section is just around the corner from PB2 yet there is a distinct influence of coarse grained outwash sedimentation from the side valley system at this sight. Section consists of 6m of fine well sorted interbedded or interlaminated sands and silts of delta foreset beds which are overlain by 1-2.5m of coarse gravels of the outwash fan. Foreset dips measured between 25 and 27 degrees towards the N-NW whereas the sand beds at PB2 are flat lying. This may indicate that there is an unconformity between the delta sands and the outwash gravels. During the time of progradation of the side valley fan there may have been considerable erosion of the emerging deltaic deposits. It is difficult to say where sealevel was at the time the fan was constructed since no indisputable fan/deltaic facies have been identified.

P.B. 25      Multi terrace delta exposure along first tributary stream.  
 UTMG    18W VQ 4061E 79609N  
 Date    30J86  
 Elev.   samples from 28m, 29m, 32m, and 33m  
 Terrace Elev.   40m and 33m  
 R.S.L.        complex fluctuations between 40m and 33m.  
 Sed. Samples: 1 - coarse gravels from the base of the  
                   channel fill in the foresets (29m).  
                   2 - well sorted foreset sands (28m).  
                   3 - muddy sand foreset bed (29m).  
                   4 - fluvial sands (32m); from lateral extension  
                   of 33m terrace gravels into (below) the 40m  
                   terrace.  
                   5 - fluvial gravels (33m); similar relationship  
                   as sample 4.

Comments:

Stream cut exposure of approx 24m of a complex deltaic sequence. Lower 16m consists of sands and muddy sands in foreset beds with 7 measured

dip directions of 24 to 31 degrees toward N25W. There is also a prominent erosional channel cut into the foreset beds and back filled with gravels and stratified sands. These foresets are overlain (apparently conformably but...?) by 2m of topset beds that underlie the 35m terrace level and extend laterally (horizontal) into the outcrop of the extended section below the 41m terrace level. Here the topsets are buried by a complex 6m sequence of interbedded topset gravels and shallow but unmistakable sandy foresets. The section is interpreted as evidence for a series of sealevel events which include an initial stage of delta progradation at the 35m sealevel (lower terrace level). This relies on the assumption that the topset foreset sequence of the 35m terrace is conformable. Secondly, complex sealevel fluctuations must have occurred between 35m and 41m in order to facilitate deposition of interbedded foresets and topsets. Lastly, it appears that sealevel should have fallen back to the 35m level to allow for the fluvial erosion to cut the terrace escarpment between the 41m and 35m terraces. Therefore, the fluvial beds (topsets?) of the 35m terrace may not be conformable to the underlying foresets.

P.B. 26      Poor outcrop of deltaic sediments near the elevation of the prominent kame terrace.  
 UTMG    18W VQ 4034E 79615N  
 Date    site visited on    J86 and 3A86  
 Elev.    72m  
 R.S.L.    75m? irregular terrace surface showing little deltaic morphology.  
 Sed. Sample:    1 -  
 Shell Sample:    1 - 3 fragments of *Mya truncata* excavated from delta? sands.

Comments:

This deposit appears to be a delta remnant that lies within a series of morainal or ice contact deposits. It is not clear however if the local irregular topography can be attributed to glacial depositional forms or to subsequent fluvial and or marine erosion.

P.B. 27      Stony muds and well sorted silts outcropping along west flank of Paquet Bay east arm.  
 UTMG    18W VQ 4034E 79631N  
 Date    31J86  
 Elev.    30m  
 R.S.L.    sub-littoral muds  
 Sed. Samples:    1 -  
 Shell Samples:    1 - primarily valve fragments of *Hiatella arctica* collected from the transition zone between the lower stoney muds and upper well sorted silts.

Comments:

The stratigraphy of most of the outcrops along the west flank of Paquet Bay (east arm) appears to be very similar. There is a lower dark stoney

mud typically containing about 5% clasts by volume which grades upward into light colored, stratified, well sorted silts. It is difficult to correlate from one outcrop to the next but my feeling is that there are more than one stoney mud beds across the entire area.

- P.B. 28      Morainal stoney mud deposit outcropping near western shore of Paquet Bay east arm.  
 UTMG    18W VQ 4034E 79634N  
 Date    31J86  
 Elev.   3-12m  
 R.S.L. sub-littoral muds  
 Sed. Samples: 1 - PB28 A; pebbly mud from base of section (4mht) near the shell collection site.  
                   2 - PB28 B; sample of one of the sand beds that occurs in the stoney mud. (this sample taken from 20cm below A)  
 Shell Samples: 1 - paired valves of a single species of *Yoldia?* or *Portlandia?* from base of outcrop in muds containing scattered dropstones.

Comments:

Extensive wave and stream cut outcrop exposes stratified muds and sands. A lower mud containing scattered dropstones occurs at the base of the section. There is noticeable topographic relief (4-5m) on the upper surface of this lower unit however it does appear to grade upward into conformable flat lying stratified silts. The morphology of the outcrop suggests a moraine like form. The sediments of the lower part of the section are quite deformed with numerous examples of high angle reverse and thrust faults along with extensive tight folding. They may represent soft sediment deformation associated with glacial tectonism. The interpretation is that the lower section represents ice marginal deposition and processes with a retreating ice source for the sedimentation of the the upper stratified silts.

- P.B. 29      Low relief "outcrop" of fossiliferous silts.  
 UTMG    18W VQ 4040E 79617N  
 Date    3A86  
 Elev.   43m  
 R.S.L. sub-littoral silts  
 Sed. Sample: none collected because nothing is "in place".  
 Shell Sample: 1 - Valve fragments and whole valves of *Mya truncata*, *Hiatella arctica*, and *Macoma calcarea* collected from surface float.

Comments:

No true outcrop of the silts at this site, it is simply a 10m<sup>2</sup> area that is free of vegetation where the silts are eroding out on the surface. Many shells found in the float however none were excavated from the deposit. There are a few cobble and boulder clasts also weathering out of this deposit. My impression of the site is that it is the upper silt unit rather than the lower stoney mud unit however the fauna is comparable

to the lower unit of PB18. Also this is the highest fossiliferous silt outcrop identified in this area. Whether or not that means it is from the highest part of the marine mud section is speculative.

- P.B. 30 Marine limit delta and associated moraine on western margin of Paquet Bay fill sequence.  
 UTMG 18W VQ 4029E 79624N  
 Date 3A86  
 Elev. 75m  
 R.S.L. 78-82m  
 M.L. Approx. 82m  
 Sed. Samples: 1 - Well sorted sands from delta foreset bed.  
 2 - Muddy sands from delta foreset bed.  
 3 - Till matrix collected from the moraine core.  
 Shell Samples: 1 - Whole valves and valve fragments of juvenile *Macoma calcaria* and *Mya truncata* collected from upper float above the snowbank.  
 2 - Mainly whole valves of *Macoma calcaria*, *Mya truncata*, and *H. arctica* collected from sheet wash deposits below the snowbank. Collection site is washed by organic rich meltwater from the snowbank.  
 3 - A few shell fragments collected from the till that outcrops in the core of the moraine segment.  
 Organics: 1 - Organic layer on overlying the delta sediments and buried by 70cm of organic rich eolian sands.

Comments:

Stream and perennial snowbank cut exposes a morainal segment with overlapping deltaic sediments at this site. This is the highest marine delta yet identified and it appears to represent the marine limit. Foreset beds dip to the northwest between 15 to 25 degrees. The snowbank partially obscures the outcrop and shells collected from sheet wash deposits below the snowbank are bathed in its meltwater. The snowbank contains much wind blown organic debris therefore contamination of the lower shell sample by organic rich meltwater is a possibility. Moraine segment at this site is mostly seen in outcrop and has only a very slight surface expression. Furthermore, it is not clear whether the delta sediments are genetically related to the moraine or subsequently buried it. The surrounding topography shows an irregular delta surface nested between several subdued moraine segments that project above it in slight positive relief (1-2m). Moraines which outcrop at elevations below this delta (marine limit?) appear to be wave washed whereas above that surface, though they are relatively subdued, show no clear evidence for wave erosion. Till consists of a compact stoney mud with mostly crystalline clasts ranging up to 50cm in diameter. Boulders comprise about 50% by volume of the till. About 10-20% of the pebble and cobble clasts are shaley fragments.

- P.B. 31 Northern most outcrop of marine muds along west shore of Paquet Bay east arm.  
 UTMG 18W VQ 4031E 79672N  
 Date 7A86  
 Elev. 2-7m  
 R.S.L. sub-littoral marine stoney muds  
 Sed. Sample: 1 -  
 Shell Sample: 1 - whole valves, valve fragments and some paired valves primarily of *H. arctica* with a few specimens of *Mytilus edulis* and *Macoma* sp. collected from float on stoney mud.

Comments:

Lithologically this deposit would appear to correlate to the stoney muds of inner Paquet Bay however I am not sure if those muds contain *Mytilus edulis*. Therefore they may represent slightly younger, warmer water sediments(?).

- P.B. 32 Prominent marine limit delta terrace on east side of river.  
 UTMG 18W VQ 4074E 79605N  
 Date 8A86  
 Elev. 75m  
 Terrace Level 78-80m  
 M.L. Presumably 78-80m  
 Sed. Sample: 1 - coarse grained ice proximal deltaic sediments from gully exposure.

Comments:

This terrace has a relatively flat surface that extends for some 14km along the east valley wall. Several of the gully cuts in this terrace were examined near the site and each exposes deltaic foreset beds. Also site PB30 which appears to be the marine limit delta in Paquet Bay, hand levels out to the same surface as this terrace. It does however seem unusual that such an extensive terrace would have an essentially flat surface profile.

- P.B. 33 Late glacial moraine and outwash deposits approaching drainage divide between Paquet Valley and North Arm valley.  
 UTMG 18W VQ 4286E 79487N  
 Date 8A86  
 Elev. 175m  
 Sed. Sample: 1 - Till from 30cm depth (Cn horizon) in soil pit excavated in moraine crest.  
 2 - Outwash immediately distal to moraine of sample 1. sampled along stream cut adjacent to moraine.

Comments:

Moraine shows a poorly formed, indistinct Cambic B horizon 7-8cm thick. Cn horizon shows blonde colors while B shows subtle reddish orange colors.

North Arm 1 48m delta in parallel valley to North Arm of Coutts Inlet.  
 UTMG 18W VQ 4520E 79703N  
 Date 7A86  
 Elev. 45m  
 R.S.L. 46-48m  
 M.L. 70-74m  
 Sed. Samples: 1 - fossiliferous delta foreset sands  
 Shell Samples: 1 - whole small valves of *Macoma* sp. collected from float from sandy delta foreset beds.

Comments:

This sample represents a significant period of Holocene deltaic sedimentation in North Arm. The next highest prominent marine terrace in this valley is the marine limit terrace of NA3. There are only two major deltaic systems preserved in this valley (this site and the marine limit delta) and these may represent periods of sea level stability or increased sediment supply. Since the deposition of the 48m delta there has been a great deal of post glacial fluvial recycling and erosion of previously extensive deltaic deposits. Therefore the raised delta surfaces exist in scattered remnants and much of the floor of this valley is underlain by sandy post glacial alluvium reworked from the deltaic sediments.

North Arm 2 Stoney muddy sand underlying delta sands of NA1  
 UTMG 18W VQ 4520E 79703N  
 Date 7A86  
 Elev. 42m  
 R.S.L. sub-littoral sandy muds  
 Sed. Sample: 1 - stoney muddy sands from beneath delta sands of NA1  
 Shell Sample: 1 - whole valves and valve fragments of *H. arctica* and *Mya truncata* collected from float on stoney muddy sand underlying delta sands of NA1.

Comments:

This unit is interpreted as a sequence of deltaic bottomset beds related to the foreset beds of NA1.

North Arm 3 Marine limit "kame delta"  
 UTMG 18W VQ 4428E 79708N  
 Date 7A86  
 Elev. 68m  
 R.S.L. 70-74m = Terrace Level  
 M.L. 70-74m  
 Sed. Sample: 1 - fluvial top set coarse gravels

Comments:

This deposit probably represents the marine limit in this section of North Arm. The sediments in gully exposures appear to be foreset sands and topset gravels however no marine shells were found. The presence of numerous perched boulders on bedrock surfaces immediately above this delta level indicate that marine inundation did not extend above 74m. The ice proximal if not ice contact nature of this delta is indicated by the coarse nature of the sediments. The >2mm fraction of the coarse gravels comprises an estimated 50% in the fresh outcrops.

North Arm 4 Outwash fan from drainage of late Holocene ice dammed lakes  
in upper North Arm  
UTMG 18W VQ 4515E 79723N  
Date 7A86  
Elev. 2m to 0m  
Sed. Sample: 1 - coarse sand matrix of alluvial fan

Comments:

Surface cover of boulders on the deposit is commonly 90-95% with 5-10% coarse sandy matrix which was sampled. Most of the fines appear to have been washed completely out of the deposit. The size distribution of surface boulders was measured at the site and estimated over the extent of the deposit from photographs.

North Arm 5 Most extensive raised delta surface of inner North Arm.

North Arm 7 UTMG 18W VQ 4462E 79590N

North Arm 8 UTMG 18W VQ 4462E 79582N

Date 7A86

Elev. NA7; 60m

NA8; 67m

Terrace Level Approx. 70m

R.S.L. Approx. 65-70m

M.L. Approx. 100-110m

Sed. Sample: 1 - NA7; coarse delta sands probably from foreset beds.

2 - NA8; coarse gravels from topset beds at helicopter landing site.

Comments:

This delta surface represents a major period of coarse grained deltaic sedimentation within the North Arm system. The deltaic surface for these three sites is contiguous indicating that the delta system extended much further seaward during the time of its formation and has since been extensively gutted. The volume of holocene sediment recycled in this area of the fiord is considerable.

North Arm Uppermost delta surface in North Arm valley

M.L. delta UTMG 18W VQ 4447E 79547N

Date 7A86

Elev. 6m below delta surface

Terrace Level Approx. 100

R.S.L. Approx. 100m

M.L. Approx. 100m

Sed. Sample 1 -

Comments:

This appears to be the marine limit delta in the North Arm valley. Its elevation is around 110m as measured from the altimeter (99m with 3.5hrs from last sealevel fix) and the fact that its surface is slightly above the uppermost lake level measured at 94m (1hr from sealevel fix). Map elevation estimate would put it slightly higher at around 120m. There was no prominent break between terrace levels seen from NA8 to this level. However that observation was made from the helicopter and the surfaces are not continuous but have been disconnected by fluvial erosion. It is possible that the entire delta surface prograded from

the marine limit to NAB and NAS during a falling sealevel (approx. 30m). Alternatively, the slope may represent subsequent isostatic tilting of a formerly horizontal water plane however, this seems like an unusually steep tilt for such a short distance.

N.A. 9 late Foxe/early Holocene ice contact drift filling tributary valley floor above North Arm.  
 UTMG 18W VQ 4408E 79580N  
 Date 7A86  
 Elev. 325m  
 Sed. Sample: 1 - coarse grained ice contact/ice stagnation drift.

N.A. 10 early Holocene outwash and recent alluvium sampled from near drainage divide on valley floor above North Arm.  
 UTMG 18W VQ 4361E 79565N  
 Date 7A86  
 Elev. 180m  
 Sed. Samples: 1 - Late glacial coarse grained outwash gravels on valley floor 9m above current stream level.  
 2 - Recent alluvium just below sample 1 and just downstream from active side valley alluvial fan.

N.A. 11 Major late Foxe/early Holocene moraine on valley side wall above North Arm.  
 UTMG 18W VQ 4295E 79532N  
 Date 7A86  
 Elev. 395m  
 Sed. Sample: 1 - sample of till from the 22cm level (Cn horizon) of soil pit excavated into moraine crest.

Comments:

Prominent moraine crest shows fresh morphology which I assume to be typical of the late Foxe/early Holocene deposits in this valley system. This sight shows a very weakly developed cambic B horizon of 6cm. The usefulness of soil colors properties of these last three sites is difficult to judge because they are all coarse grained iron rich materials.

Coutts I. 1 Main ice proximal delta surface of inner Coutts Inlet.  
 UTMG 18W VQ 4550E 79570N  
 Date 8A86  
 Elev.  
 Terrace Elev. 85m  
 R.S.L. 80-85m

Comments:

This terrace is a coarse grained ice contact delta that whose surface consists of several large remnants isolated above a surrounding alluvial plane. The delta surface appears to represent the marine limit phase. The alluvial fill consists of a single graded surface much lower than the delta remnants but apparently containing pitted kettle holes of an

ice melt out nature. The alluvial fill is slightly incised by the present river whose flood plane consists of modern alluvium that is graded to the present ice dammed lake level.

Coutts I. 2 Raised delta surface underlain by stoney muds.  
 UTMG 18W VQ 4612E 79563N  
 Date 8A86  
 Elev. 45m?  
 Terrace Elev. 55m?  
 R.S.L. sub-littoral muds underlying 55m delta.  
 M.L. 80-85m?  
 Sed. Sample: 1 - stoney muds sampled along gully

Comments:

Non fossiliferous stoney mud underlies deltaic sediments of the upper most terrace and the outermost raised marine sequence preserved in Coutts Inlet. It is not clear whether this surface is graded to that of C11 or represents a subsequent sealevel.

Cape Bowen 1 Moraine dammed lake on forelands north side of Macculloch glacier.  
 UTMG 18X VR 4830E 80457N  
 Date 9A86  
 Elev. 44m  
 Sed. Sample: 1 - Stoney mud from stream cut in moraine at NE. end of lake.

Cape Bowen 2 and 3 Outwash surface just distal and graded to moraine of CBl  
 UTMG 18X VR 4840E 80467N  
 Date 9A86  
 Elev. 37m-CB2 43m-CB3  
 Terrace Elev. 39m  
 R.S.L. ? M.L. ?  
 Sed. Sample: 1 - CB2 sample of coarse sands from outcrop along stream cut.  
 2 - CB2 fine sands from same outcrop  
 3 - CB3 sample of sandy till from 25cm depth in soil pit in moraine segment that projects through delta surface.

Comments:

This outwash sediment accumulated between two moraine sets during a recessional phase (sites 2,3 are distal to the moraine of site 1). The stream cut exposes several tens of meters (laterally) of trough cross stratified sands and fine gravels. The entire system must relate to a pre-late Foxe glaciation because shells in the marine diamict exposed along the coast just outside this moraine system date from 25,660±310 (Beta-16487 considered to be a minimum date). A few scattered lime-stones were identified in the moraine and outwash deposits here.

Cape Bowen 17Aug85 Coastal bluff exposure of massive glacial marine stoney mud outcropping 3km east of Cape Bowen.  
 UTMG 18X VR 4838E 80487N  
 Date 17 August 1985

Elev. 7m Terrace Elevation  
 R.S.L. ? Sub-littoral deposit  
 Sed. Sample: 1 - bulk sample of pebbly mud matrix  
 Shell Sample: 1 - whole valves and valve fragments of  
*Hiatella arctica* and *Macoma calcareo* excavated  
 from outcrop or collected from float overlying  
 fossiliferous part of section.  
 Radiocarbon: 25660±300 Beta-16487  
 Amino Acid: Free 0.22± Total 0.036± *H. arctica*

Comments:

This unit represents the last major glacial depositional period of the Cape Bowen forelands. The radiocarbon date is clearly a minimum date and the deposit probably correlates to the Kogalu member of the Clyde Foreland Formation (Miller et.al., 1977, Miller, 1985) and the Eclipse glaciation of Bylot Island (Klassen, 1985). Foreign erratics including striated carbonates compose a minor (2% or less) but significant component of the coarse fraction. This unit appears to outcrop along much of the coastal section between Cape Bowen and Cape Macculloch.

Cape Macculloch 1 Eroded deltaic complex outcropping along the coast 2km south of Cape Macculloch.  
 UTMG 18X VR 4935E 80417N  
 Date 9A86  
 Elev. Terrace Elev. upper surface=52m  
 R.S.L. 45m+ M.L. ?  
 Sed. Sample: 1 - delta sands from gully outcrop.  
 Shell Sample: 1 - CM1; valve fragments of numerous species including *Hiatella*, *Mya*, *Macoma*, *Serripes*, *Chlamys islandica*, and gastropods collected from lower float in muddy sand 5-10m above sealevel.  
 2 - CM1a; shell fragments from well sorted sands near top of section (41m) collected for A.A. analysis.  
 3 - CM1b; fragments and 1 whole valve of *H. arctica* from muddy basal part of section (3m). for A.A. analysis  
 T.L. Sample: 1 - C.M.1b; collected in film canister from freshly cleaned exposure of foreset sands overlying CM1b.

Comments:

Much of outcrop consists of slumped blocks of planer bedded sands so it is difficult to find foreset directions to measure. The surface of the deposit is so eroded that it shows no true terrace form therefore it is difficult to determine the precise sealevel of the deposit. This irregular surface is also covered with abundant larger clasts in colluvium so it appears that there may be no in situ topset beds remaining. It is not clear whether there are more than one stratigraphic unit in this raised section therefore samples 1a and 1b were collected for amino acid analysis. Scattered limestones were also observed within this deposit.

Cape Macculloch 2 Coastal delta exposure 10 km south of Cape Macculloch  
 UTMG 18X VR 4955E 80333N  
 Date 9A86  
 Elev. Approx. 10m

Terrace Elev. 46m                      R.S.L. 46m?      M.L.?  
 Sed. Sample: 1 - delta sands  
                   2 - coarse gravelly beds  
 Shell Sample: 1 - whole valves and valve fragments primarily  
                   of *H. arctica*, *Macoma calcarea*, and *Mya*  
                   *truncata* collected from float

Comments:

Wave cut coastal exposure of deltaic complex similar to Cape Mac. 1 (possibly the same delta) however this locality is much less eroded than CM1. A number of foreset beds appear to be in place as well as topset gravels however there is limited expression of a true delta surface at this site. Scattered limestones also present here.

Cape                      Prominent moraine and adjacent deltaic surface 8km inland  
 Macculloch            (west) of CM2.  
 CM 3                    UTMG 18X VR 4881E 80352N  
                           Date 9A86  
                           Elev. Moraine=60m, Delta surface=33m  
 Sed. Samples: 1 - sample from Cn horizon at 35cm depth  
   from soil pit excavated in moraine crest.  
   2 - delta sands from stream cut in terrace  
   that appears to grade to the moraine.

Comments:

Major moraine system that stands in relief to surrounding deltaic terrace surface. Soil pit exposes multiple B horizon with strong cambic B 8cm thick with a diffuse cambic B extending to 16cm thickness below 2cm A horizon.

Cape Coutts            Holocene beach strandline sequence.  
                           UTMG 18X VR 4991E 80225N  
                           Date 9A86  
                           Elev. 9m  
                           Beach Elev.=10m            Holocene M.L.=12m  
 Sed. Sample: 1 - beach sands collected from stream cut of  
   holocene raised beaches  
   2 - heavy mineral concentrate in eolian  
   section of raised beach sequence.  
 Organics:            1 - organic matter (stalks of fucus) from  
   beach strata within outcrop

Comments:

Organics should probably date the 10m sealevel. This locality shows a complete 12m sequence of beach ridges which probably represent the entire holocene raised section on this foreland. The fresh morphology of the beach sequence stands in stark contrast to the older (infinite radiocarbon dates) eroded glacial marine and deltaic sediments into which they are cut. Therefore it is very easy to recognize the extent of the holocene marine transgression along most of the outer coast of this area.

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## GRAIN SIZE ANALYSIS:

The grain size analyses presented below are in the order in which they appear in the report and are thus grouped by geographic area.

## SAMPLE ABBREVIATIONS AND TABLE OF CONTENTS:

The first sample number listed for each grain size analysis is the abbreviation taken from the field sample list above. Those abbreviations are as follows;

ABBREV.	LOCALITY	PAGE #
CA	Cambridge Fiord	2-46 - 2-47
FB	Feachem Bay	2-47
FV	Feachem Valley	2-47 - 2-48
TS	Tay Sound	2-48 - 2-49
PB	Paquet Bay	2-50 - 2-55
NA	North Arm of Coutts Inlet	2-55 - 2-56
CI	Coutts Inlet	2-56
CB	Cape Bowen	2-56 - 2-57
CM	Cape Macculloch	2-57
CC	Cape Coutts	2-57

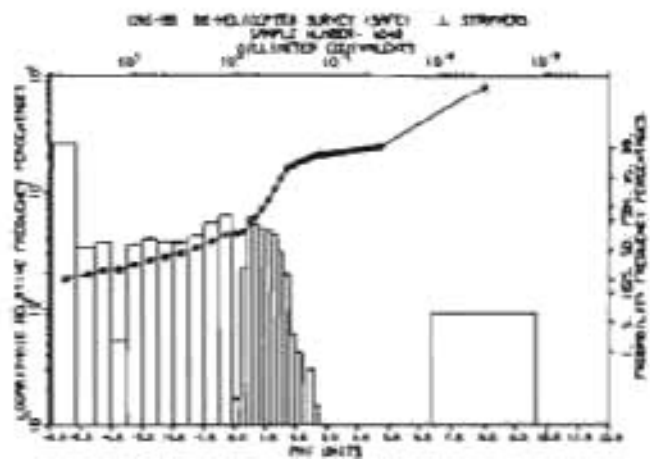
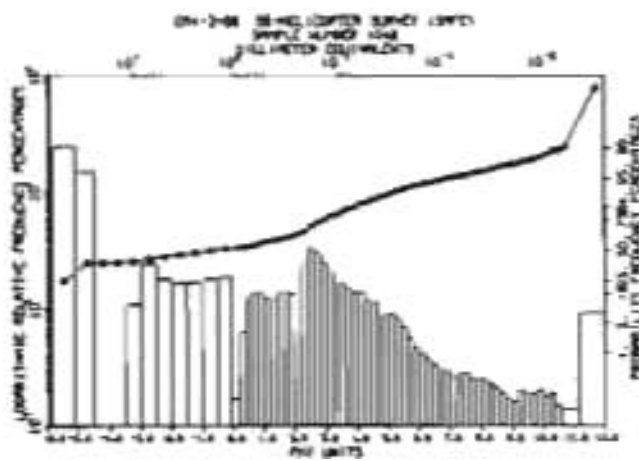
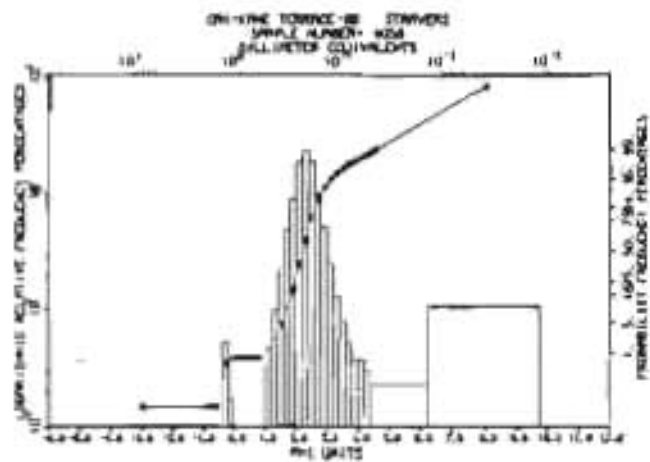
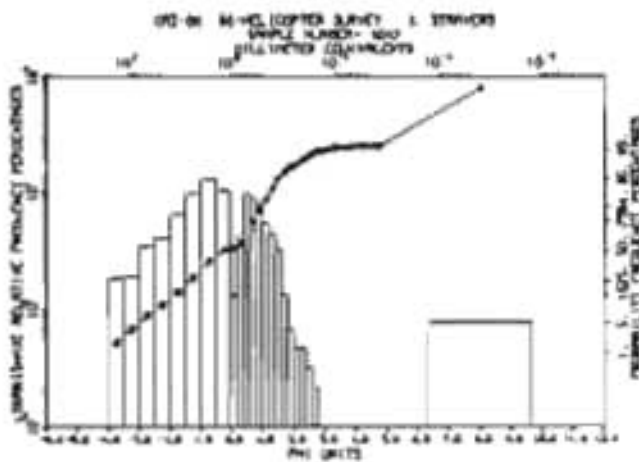
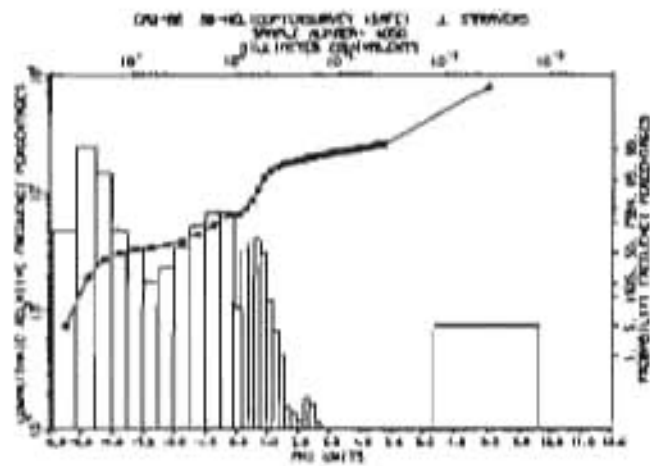
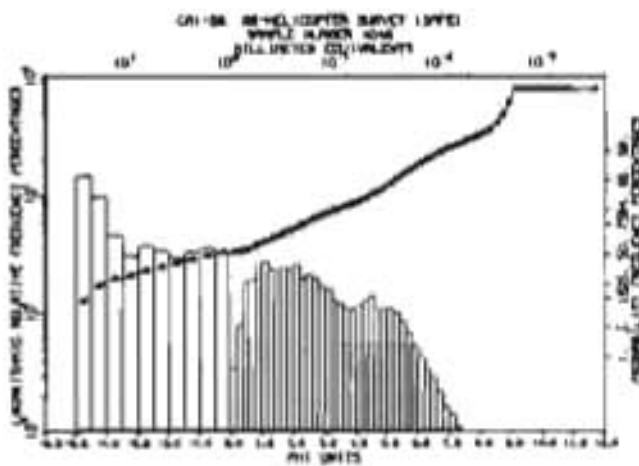
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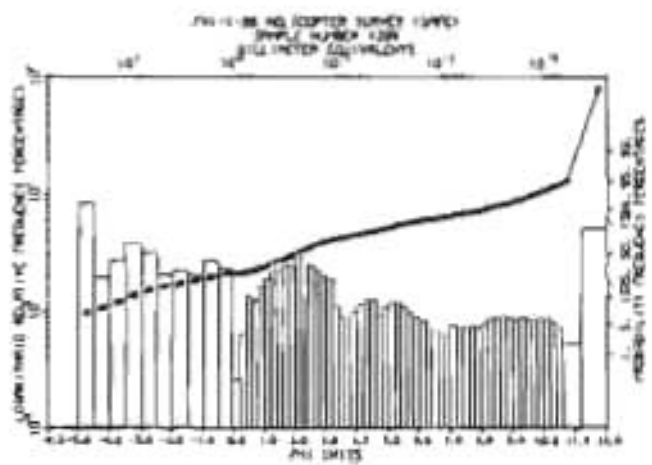
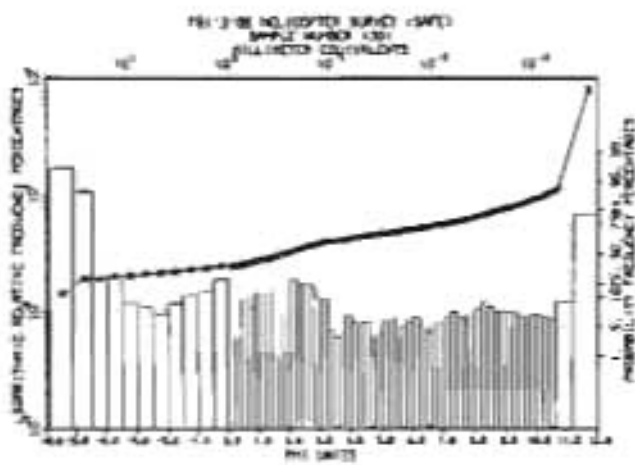
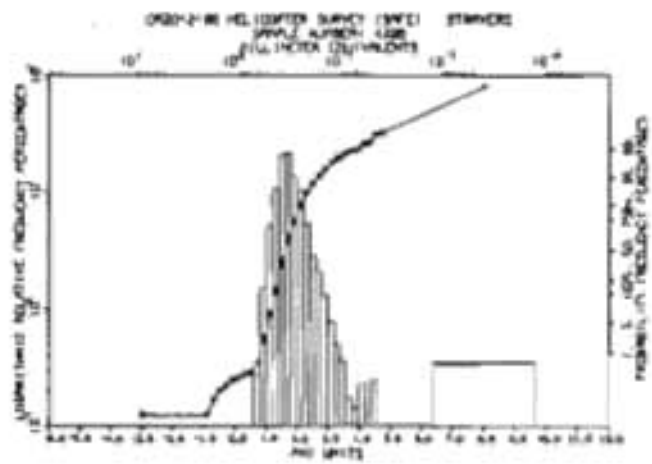
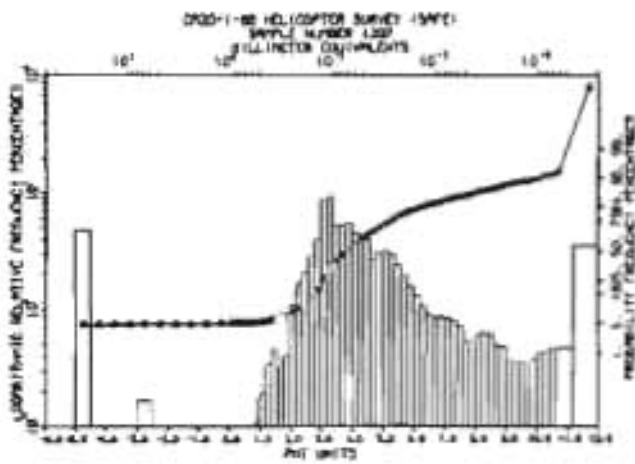
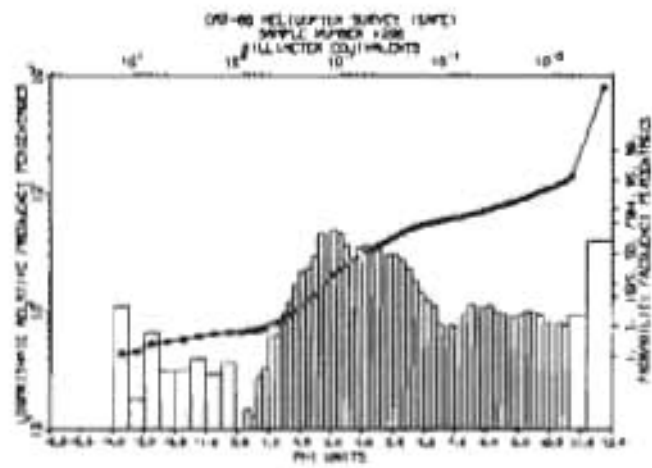
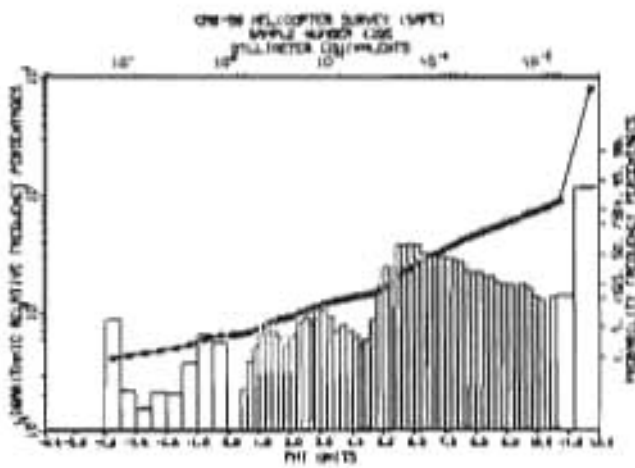
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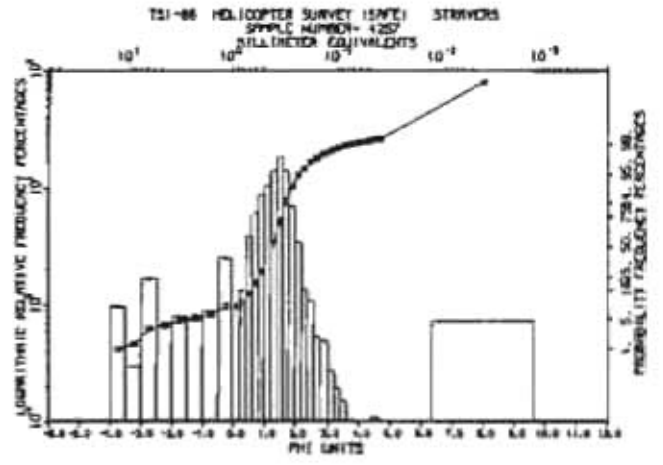
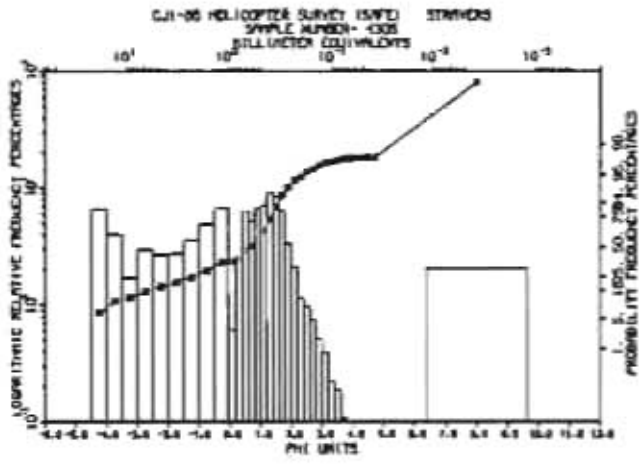
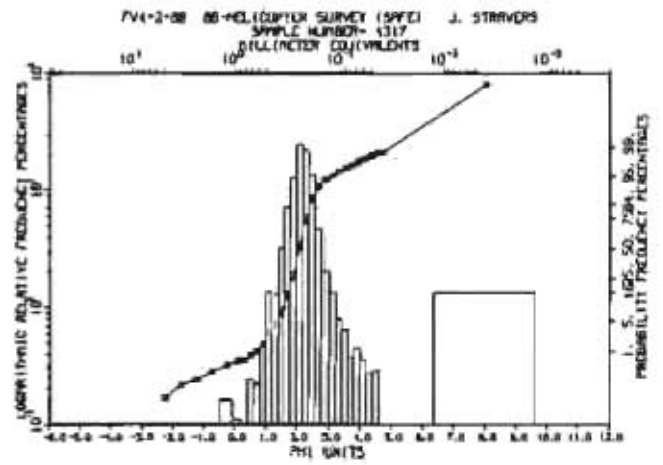
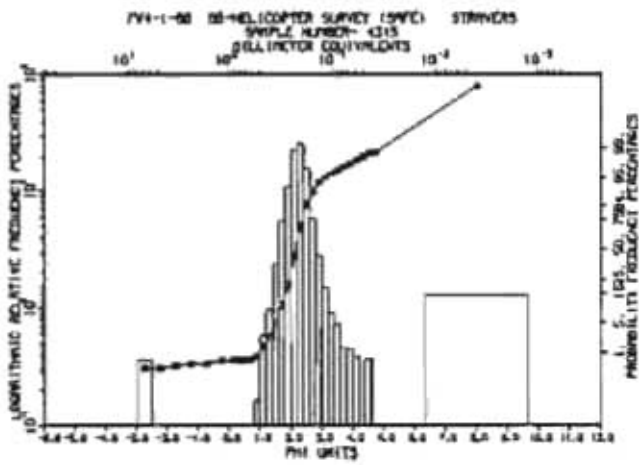
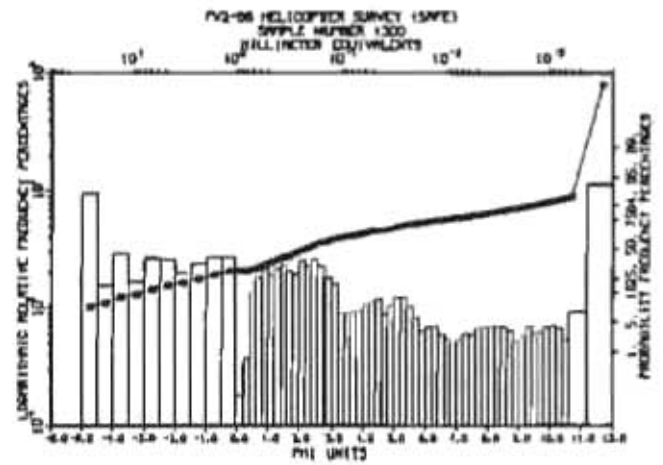
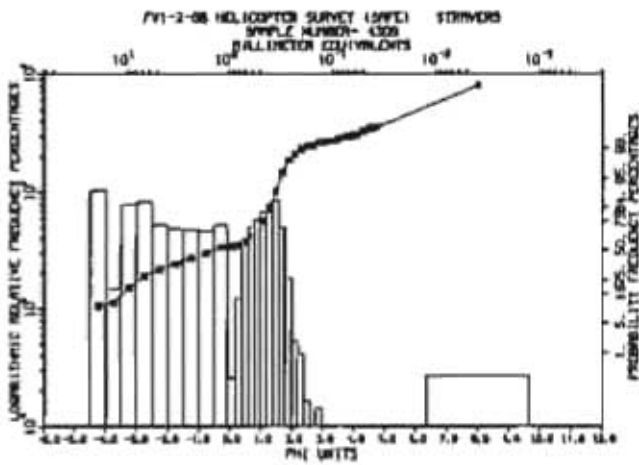
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CA2-86	4050	66.06	32.98	0.96	—	—	-2.46	2.45	0.85	3.84
CA3-86	4047	27.31	71.91	0.78	—	—	-0.17	1.53	0.73	8.12
CA4-KT-86	4056	0.02	98.03	1.95	—	—	2.38	0.77	3.87	31.95
CA4-2-86	4048	48.56	36.10	15.34	11.77	3.57	-0.57	4.49	0.43	2.16
CA5-86	4049	52.44	46.44	1.12	—	—	-1.80	2.87	0.14	2.48
CA6-86	4295	2.02	13.77	84.21	49.72	34.49	6.83	3.16	-0.60	3.64
CA7-86	4296	2.99	42.85	54.16	37.18	16.98	4.80	3.01	0.31	3.50
CA20-1-86	4297	4.91	46.82	48.27	38.55	9.72	4.27	3.00	-0.44	5.91
CA20-2-86	4298	0.00	99.02	0.98	—	—	1.80	0.62	4.02	36.59
FB1-2-86	4301	35.75	27.76	36.49	15.92	20.57	1.87	5.79	0.16	1.71
FV1-1-86	4299	26.59	39.08	34.33	17.91	16.42	2.44	4.73	0.24	2.16
FV1-2-86	4309	42.36	57.17	0.47	—	—	-0.67	2.14	-0.17	2.33
FV2-86	4300	25.12	38.10	36.79	16.29	20.50	2.88	5.10	0.27	2.07
FV4-1-86	4315	0.47	97.13	2.40	—	—	2.33	0.86	3.00	30.06
FV4-2-86	4317	0.15	97.55	2.30	—	—	2.26	0.84	3.96	29.93
CJ1-86	4305	24.22	73.53	2.25	—	—	0.19	2.24	0.11	4.83
TS1-86	4257	5.07	93.97	0.96	—	—	1.19	1.20	-0.32	13.81
TS2-86	4258	0.92	15.61	83.47	40.51	42.96	7.24	3.20	-0.55	2.85
TS4A-86	4259	0.44	55.83	43.73	34.92	8.81	4.31	2.34	1.43	5.50
TS6A-86	4260	5.81	17.74	76.45	57.61	18.84	5.51	3.40	-0.62	4.12
TS6*B-86	4261	0.72	17.07	82.21	64.50	17.71	5.84	2.51	0.55	3.76
TS6C-86	4262	2.37	16.14	81.49	63.20	18.29	5.84	2.83	-0.26	5.10
TS6D-86	4263	0.05	53.96	45.99	36.30	9.69	4.72	2.14	1.86	6.05
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PB3-4-86	4267	34.09	65.54	0.37	—	—	-0.35	1.81	-0.29	3.11
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PB10-86	4275	65.45	33.64	0.91	—	—	-2.09	2.38	0.87	3.98
PB11-86	4276	44.30	43.68	12.02	11.15	0.87	-0.06	3.34	0.34	2.19
PB14-1-86	4277	3.69	93.53	2.78	—	—	1.77	1.35	1.06	11.19
PB14-2-86	4278	75.59	21.50	2.91	—	—	-2.43	2.73	1.80	6.64
PB15-1-86	4279	27.60	25.81	46.60	15.35	31.25	3.86	5.34	0.13	1.50
PB15-2-86	4280	9.89	11.36	78.76	51.12	27.64	5.75	4.02	-0.79	3.39
PB18-1-86	4281	4.46	12.41	83.13	69.84	13.29	5.35	3.00	-1.09	6.82
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PB18-3-86	4283	0.00	36.84	63.16	55.43	7.73	4.80	1.78	2.12	7.59
PB21-86	4284	37.62	60.87	1.52	—	—	-0.65	2.02	0.46	5.31
PB23-1-86	4306	28.80	68.95	2.25	—	—	-0.08	2.12	0.52	5.11
PB23-2-86	4307	0.59	56.35	43.06	38.06	5.01	4.13	1.79	1.70	9.07
PB25-1-86	4285	32.94	65.98	1.08	—	—	-0.01	2.30	-0.26	2.85
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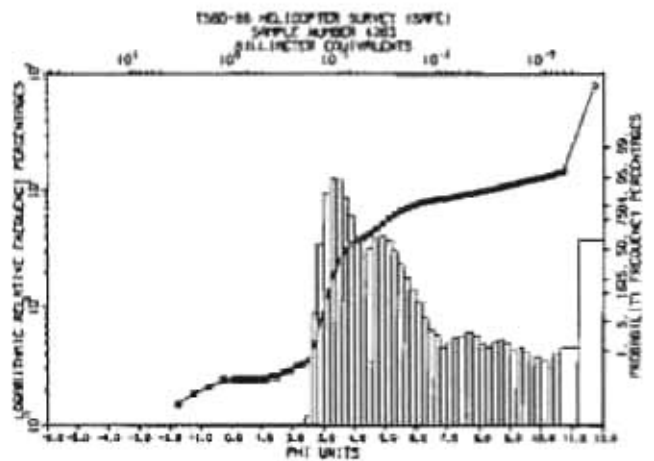
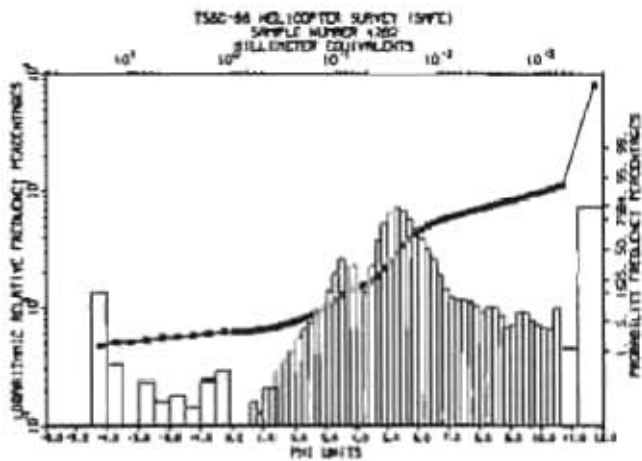
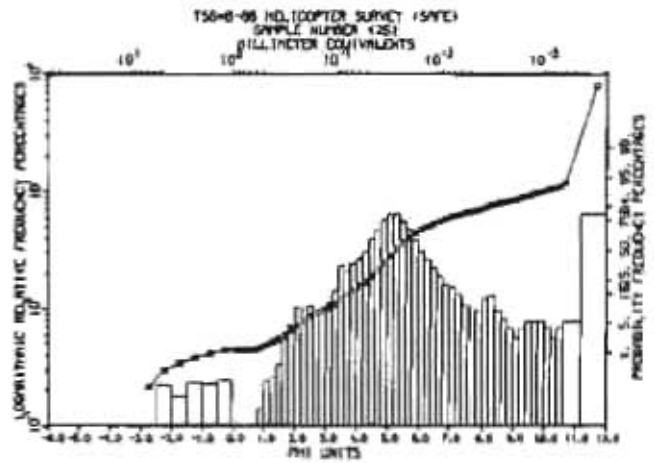
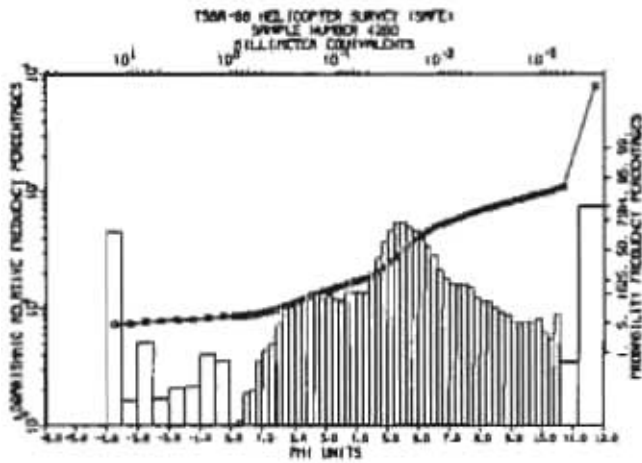
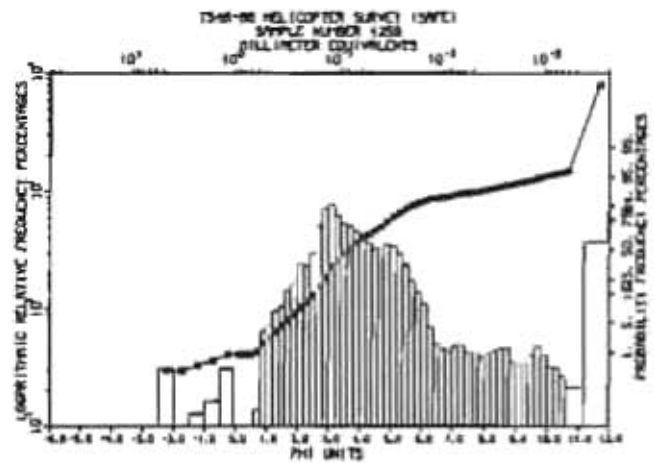
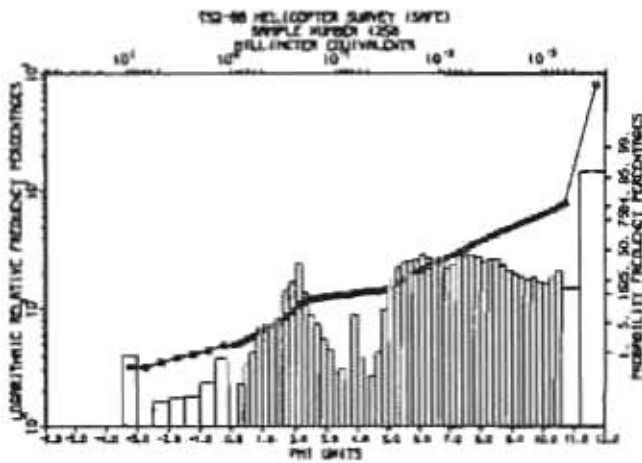
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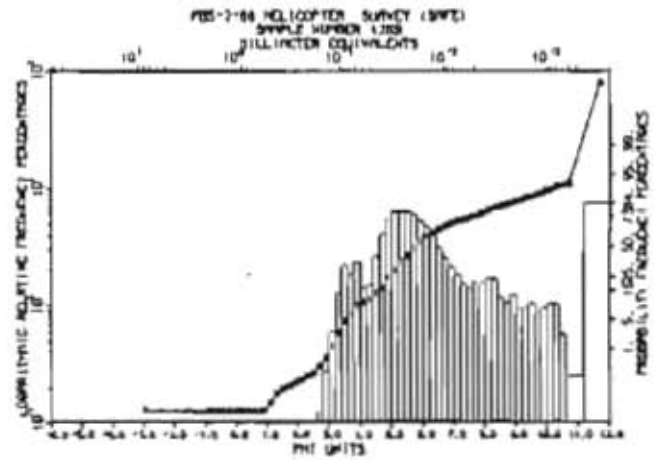
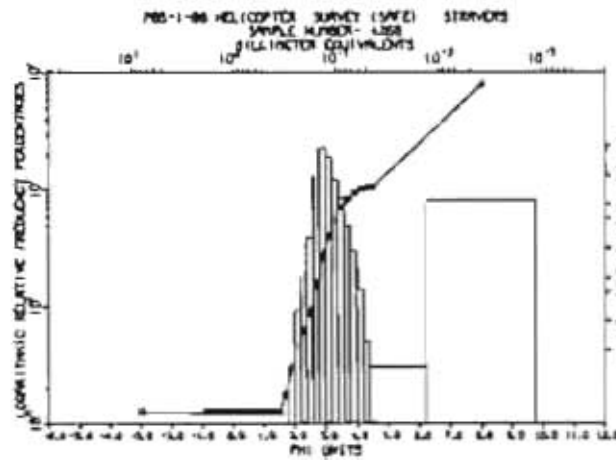
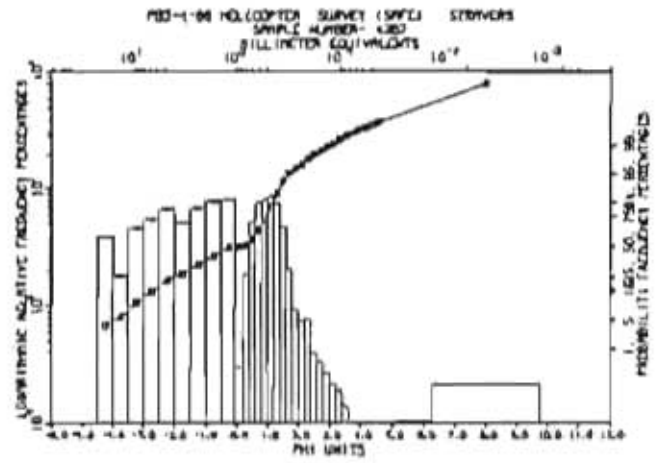
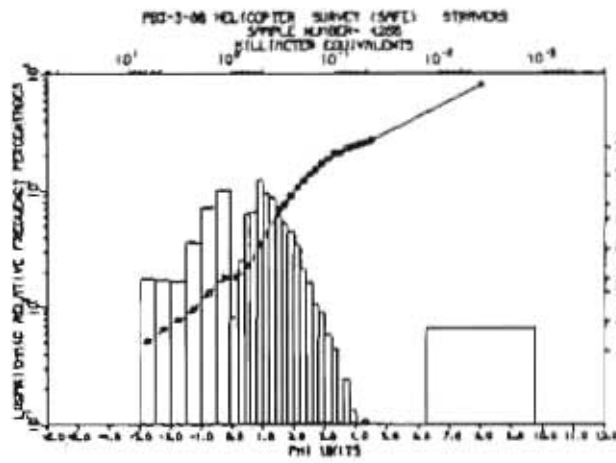
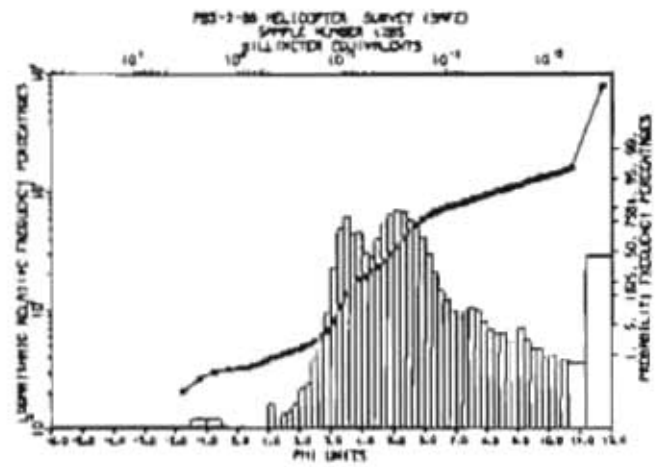
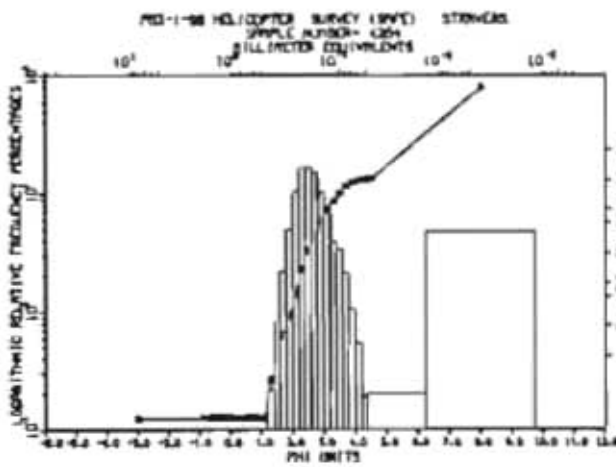
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		GRAVEL %	SAND %	MUD %	SILT %	CLAY %				
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PB25-4-86	4288	3.14	98.55	0.31	—	—	0.81	0.85	-0.31	12.13
PB25-5-86	4289	56.66	43.00	0.33	—	—	-1.54	2.12	0.09	2.15
PB28-1-86	4290	0.97	17.40	81.63	52.36	29.27	6.40	2.93	0.33	2.73
PB30-1-86	4291	0.00	92.74	7.26	—	—	2.84	1.20	3.16	14.03
PB30-2-86	4292	0.08	12.57	87.37	66.42	20.95	6.21	2.37	0.89	3.11
PB30-3-86	4293	25.72	44.92	29.36	19.84	9.52	2.13	4.09	0.47	2.66
PB32-86	4294	57.70	39.64	2.67	—	—	-2.01	3.12	0.68	3.42
PB33-1	4053	36.26	56.27	7.46	5.47	1.99	0.07	2.96	0.60	3.71
PB33-2	4054	32.34	63.90	3.76	—	—	0.26	2.34	0.94	4.97
NA-2-86	4303	11.83	32.72	55.45	37.65	17.81	4.32	4.02	-0.27	3.15
NA9-86	4051	52.08	40.20	7.72	7.31	0.41	-0.73	2.86	0.70	3.04
NA11-86	4052	68.32	26.76	4.92	4.82	0.10	-2.33	3.33	0.78	2.39
CI1-86	4055	59.40	40.08	0.52	—	—	-2.11	2.64	0.28	2.28
CI-2-86	4302	8.97	17.49	73.54	42.80	30.73	5.75	4.16	-0.52	2.75
CB1-86	4304	14.94	33.90	51.16	20.71	30.45	4.75	4.84	0.05	1.83
CB2-1-86	4310	25.03	72.02	2.95	—	—	0.68	2.04	0.49	3.86
CB3-86	4311	30.87	53.45	15.68	13.46	2.22	0.88	3.42	0.04	2.53
CM2-1-86	4312	0.00	66.21	33.79	27.16	6.62	3.94	2.06	2.17	7.85
CM3-1-86	4314	36.80	54.82	8.38	7.38	1.01	0.31	2.92	0.23	2.57
CM3-2-86	4308	0.34	95.87	3.79	—	—	2.41	1.10	2.88	17.21
CC1-86	4313	0.00	99.04	0.96	—	—	1.82	0.50	3.23	32.63
CC2-86	4316	0.00	99.37	0.63	—	—	1.88	0.49	8.44	104.85

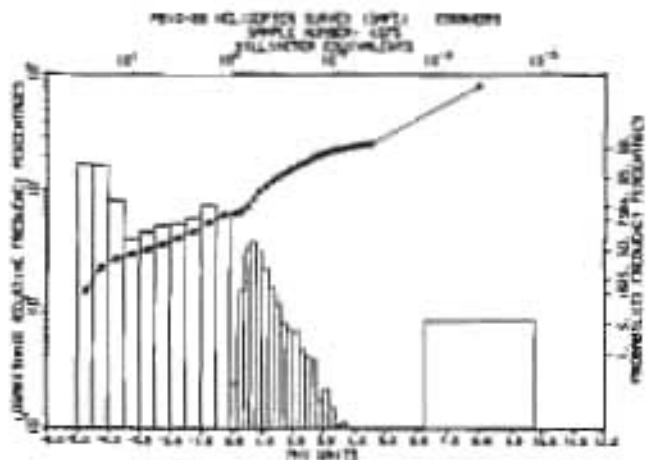
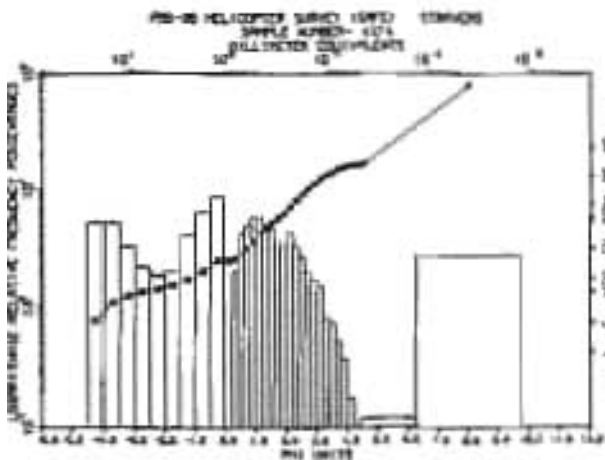
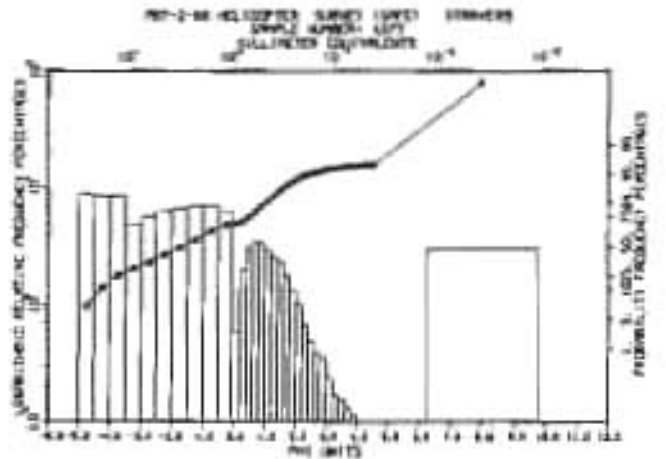
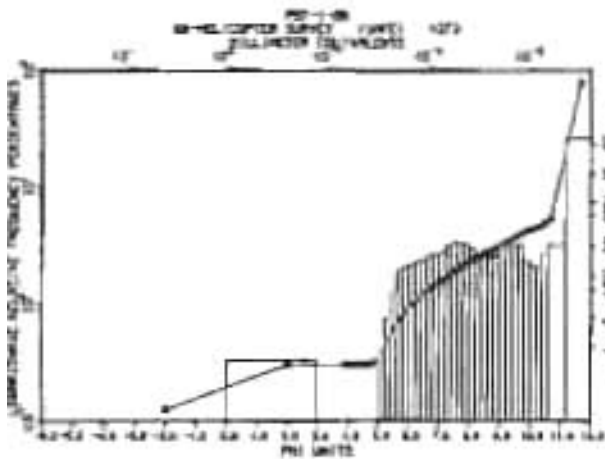
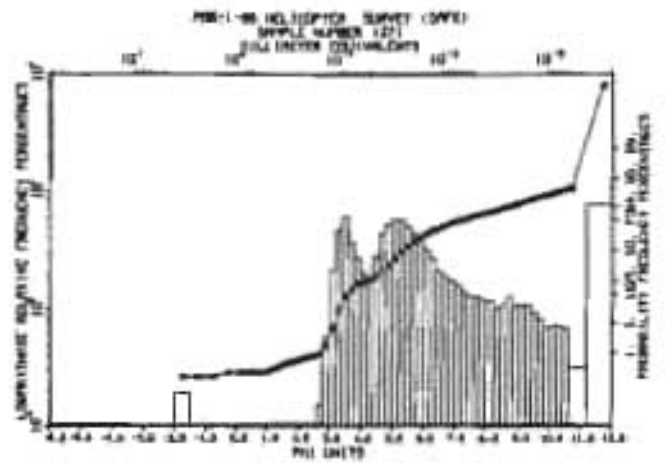
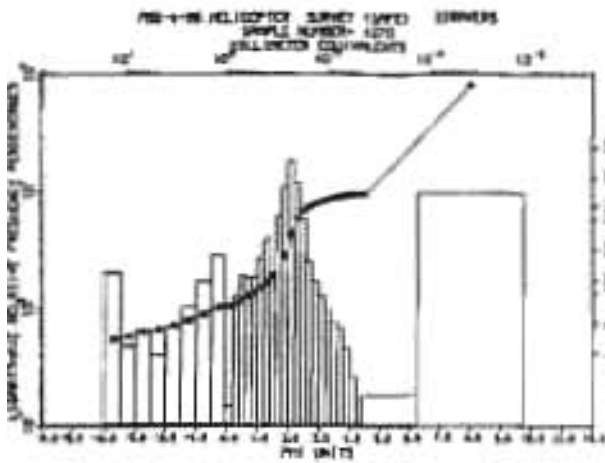


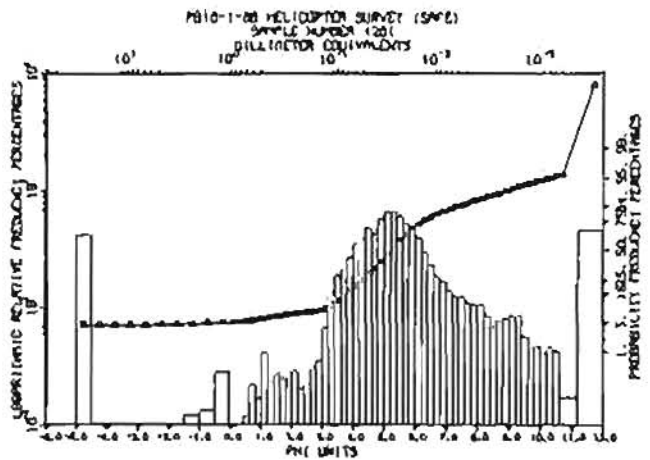
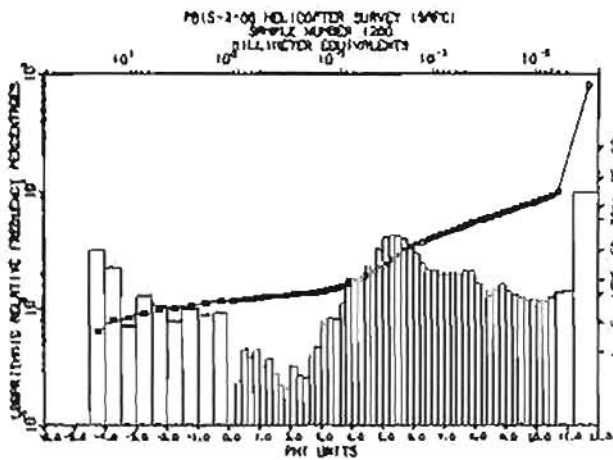
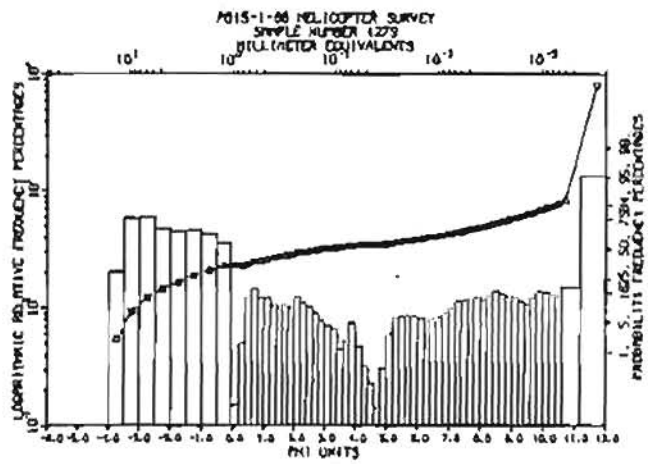
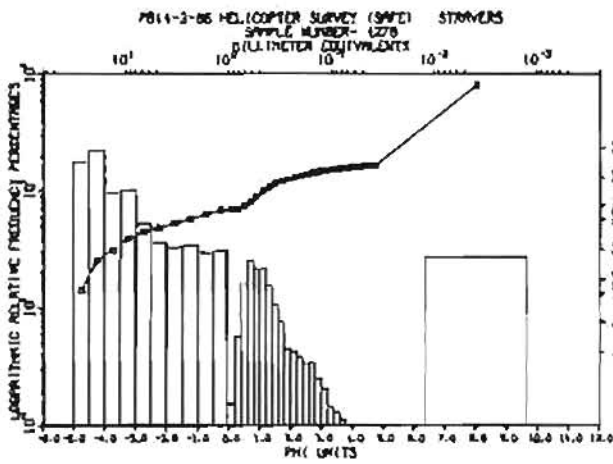
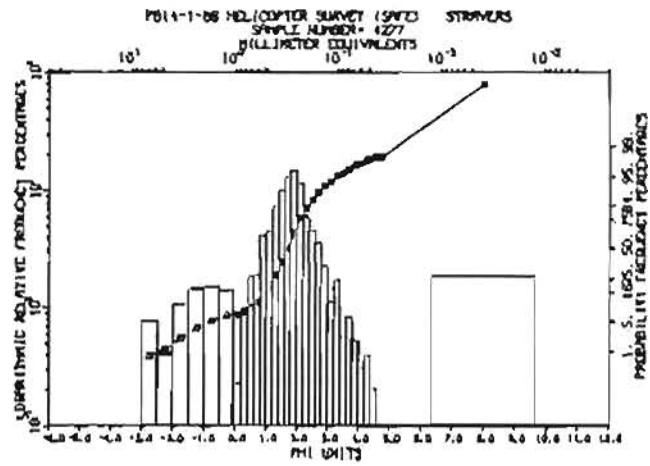
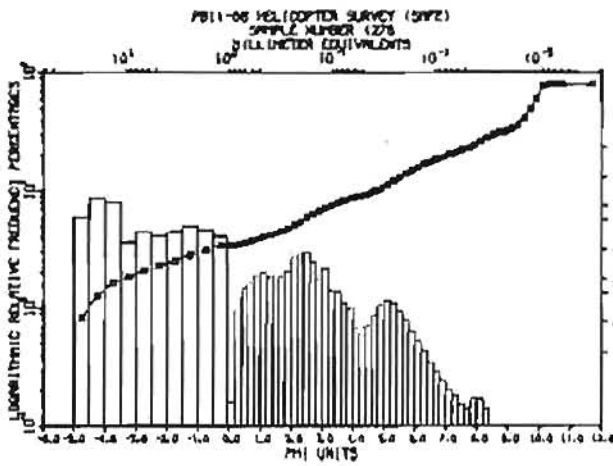


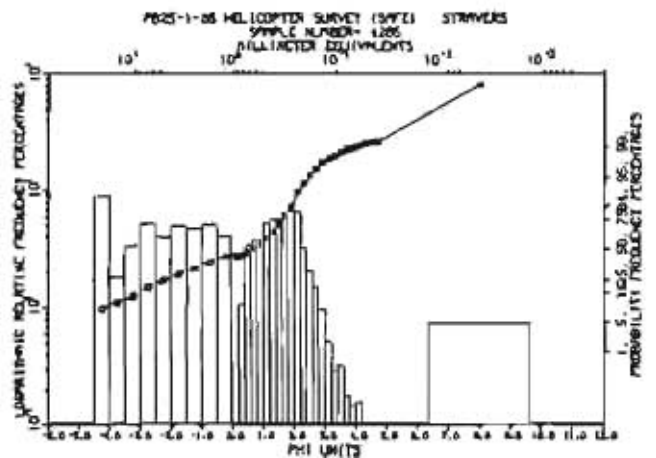
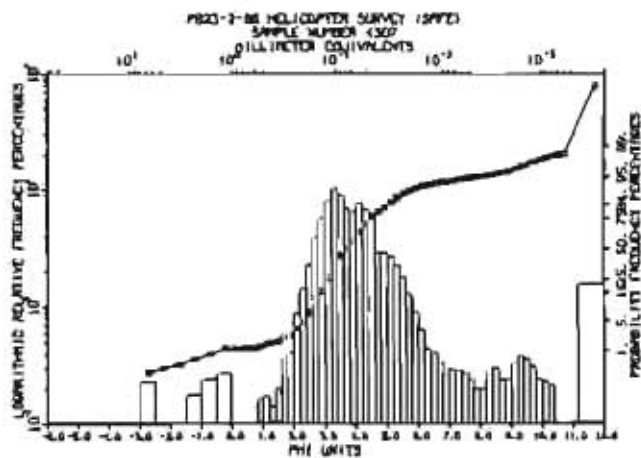
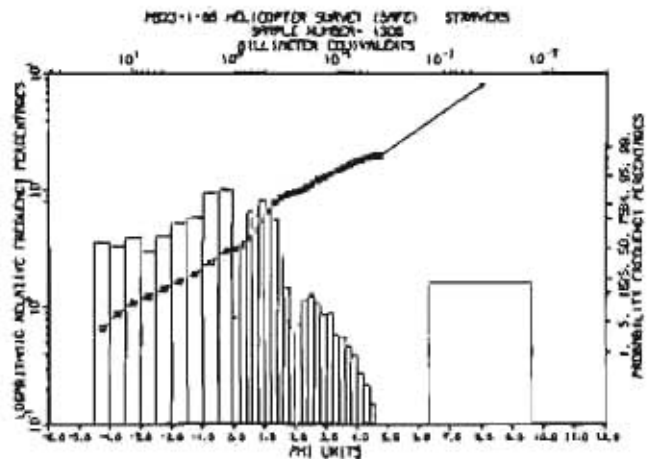
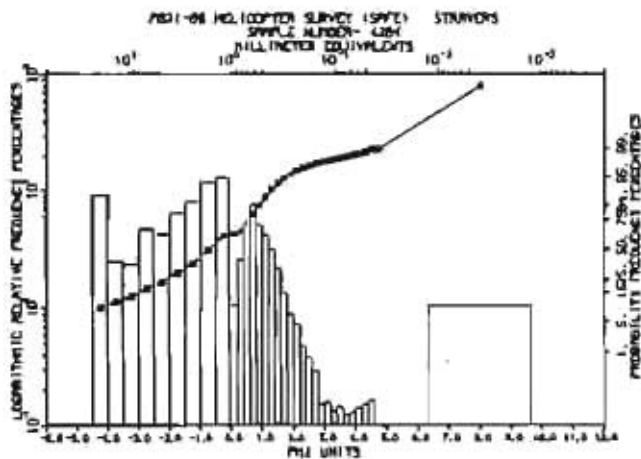
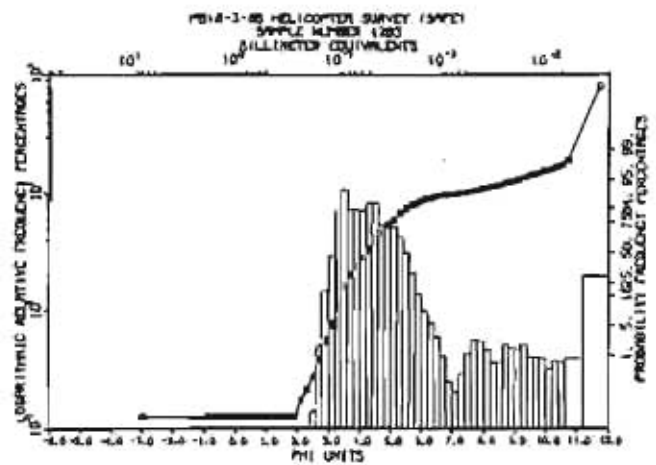
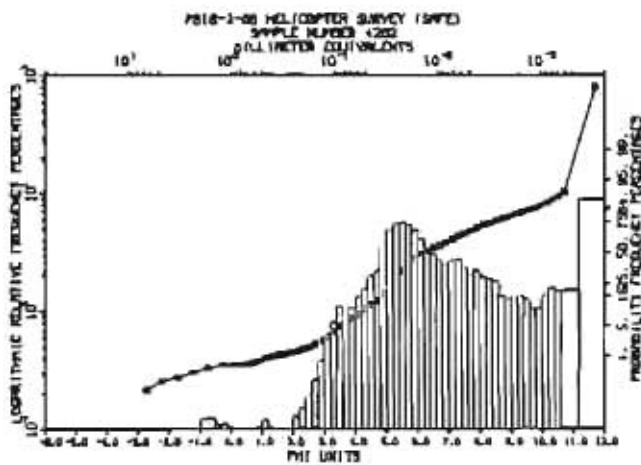


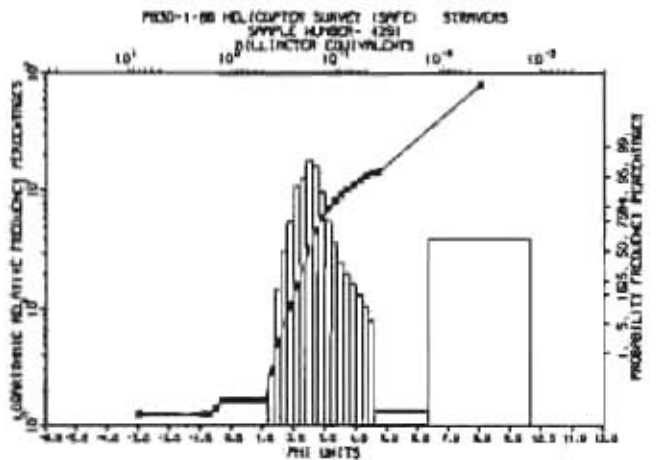
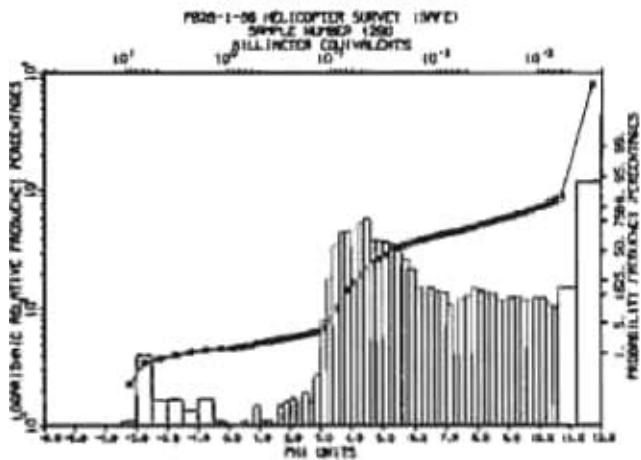
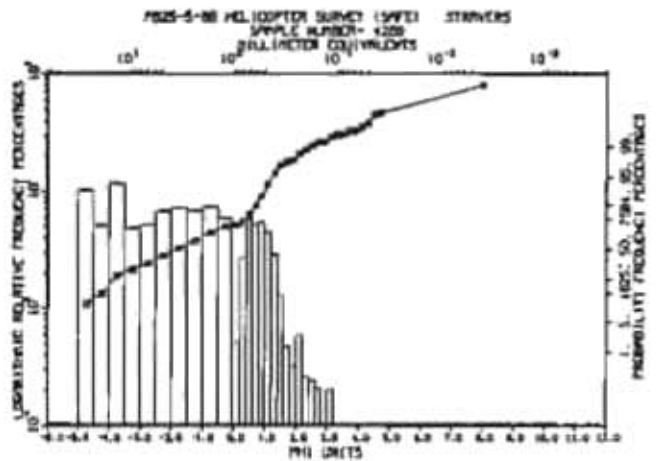
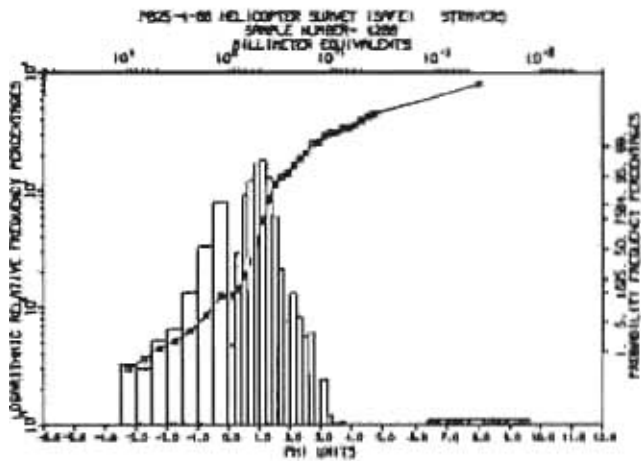
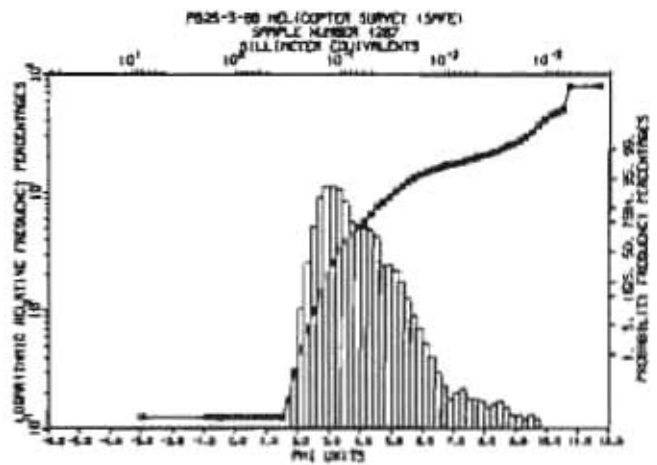
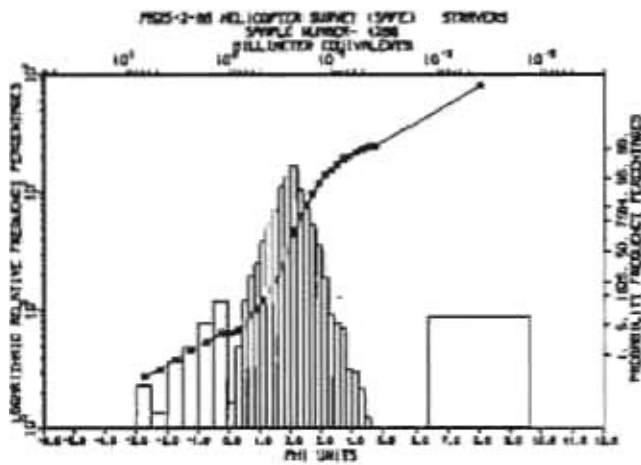


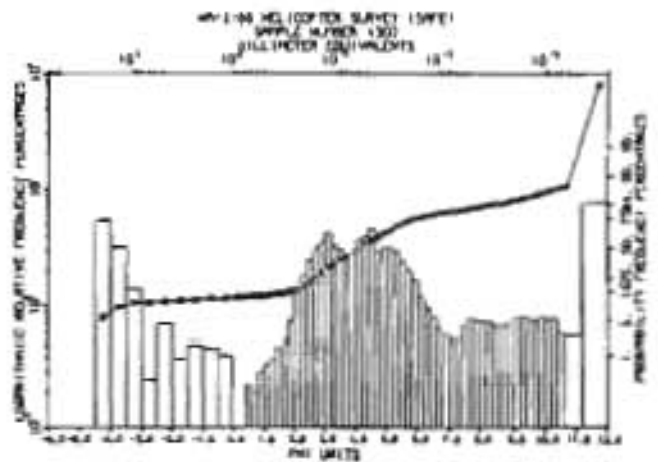
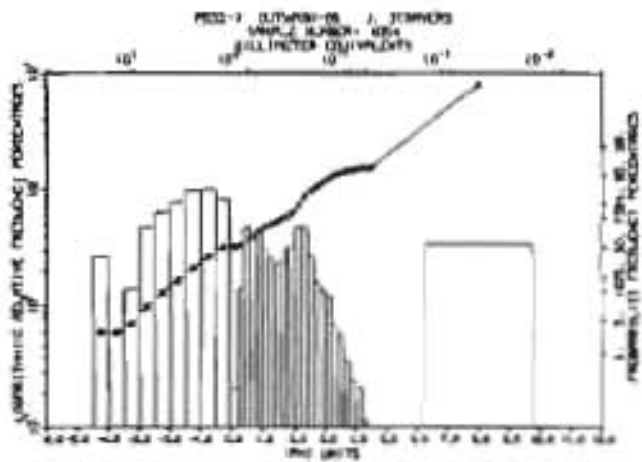
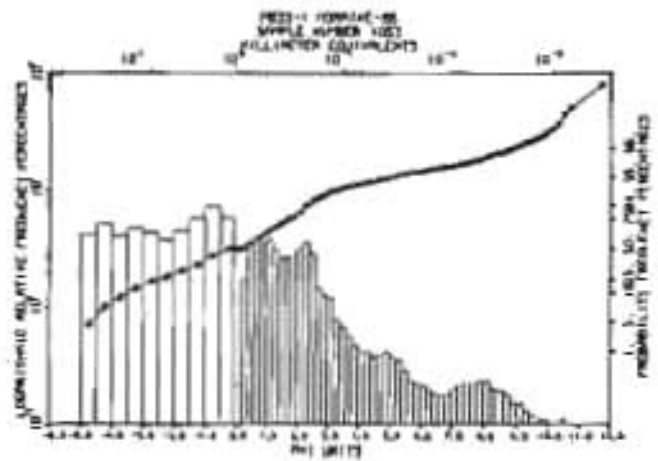
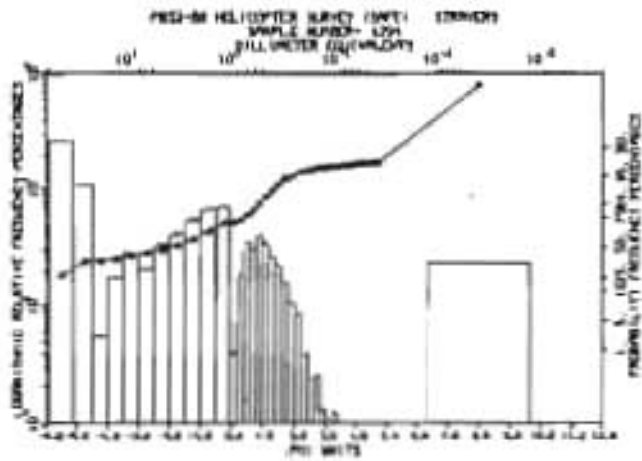
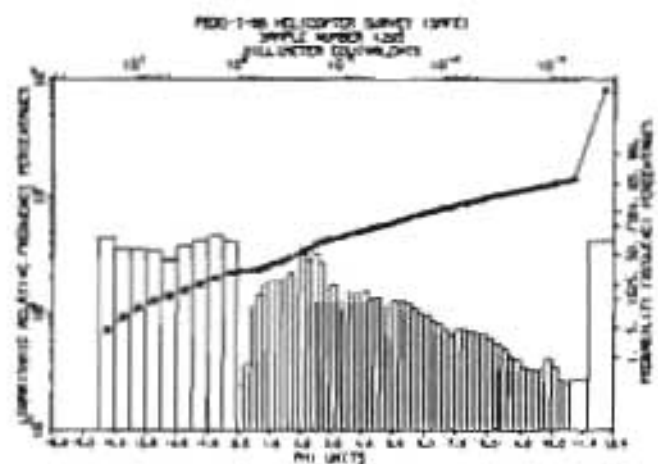
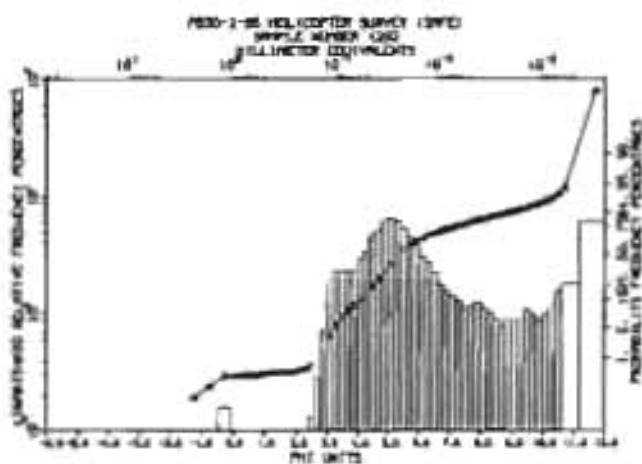


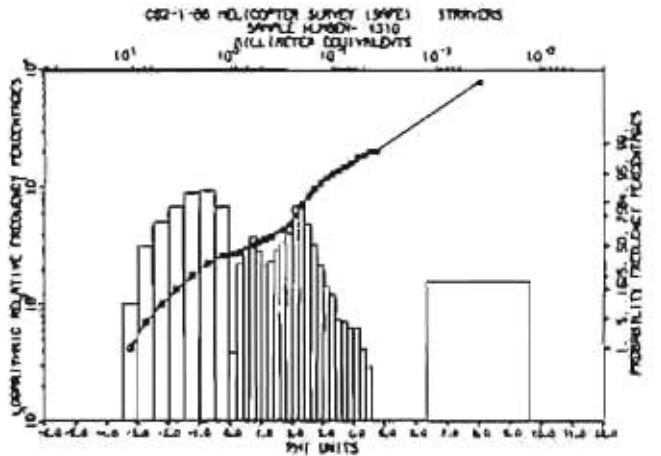
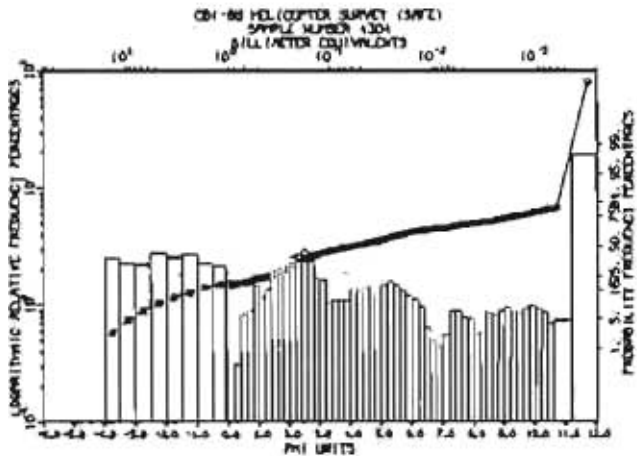
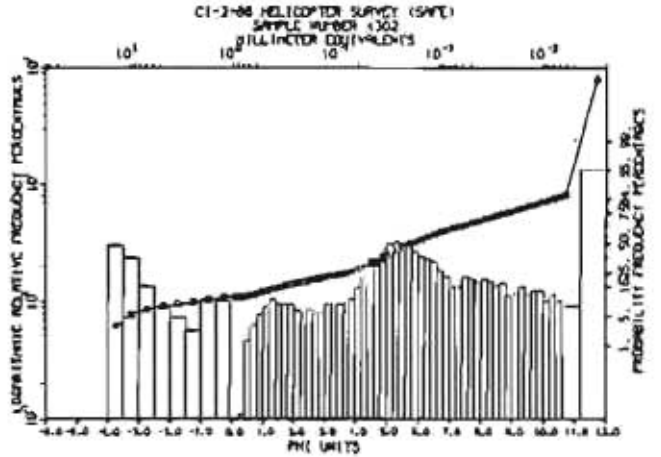
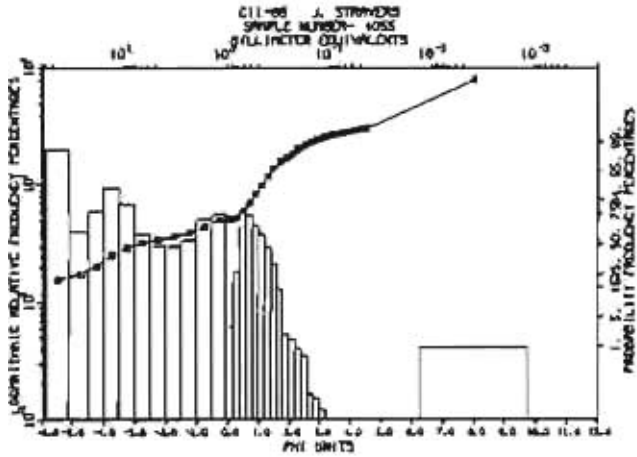
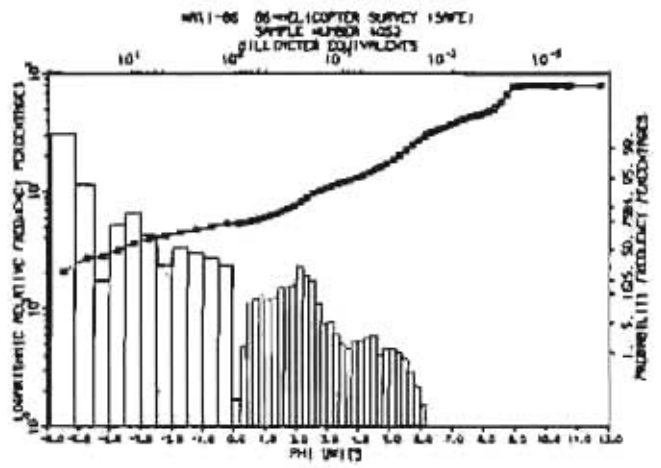
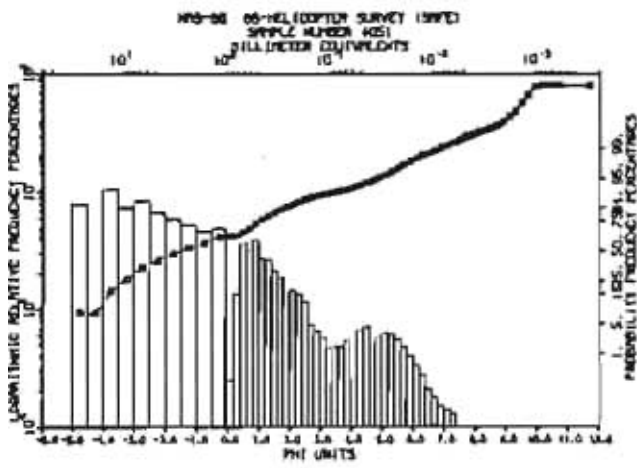


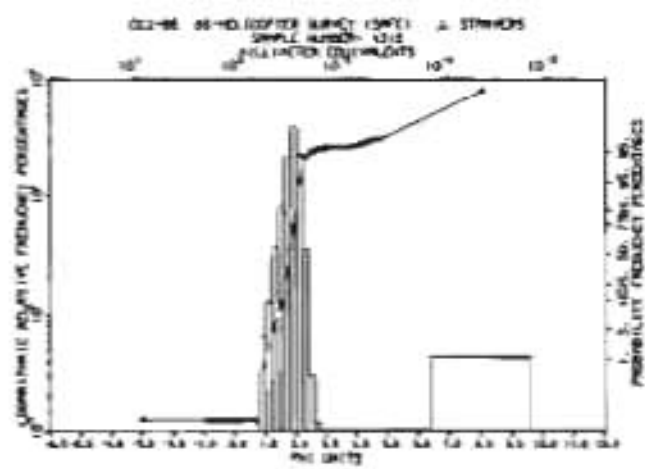
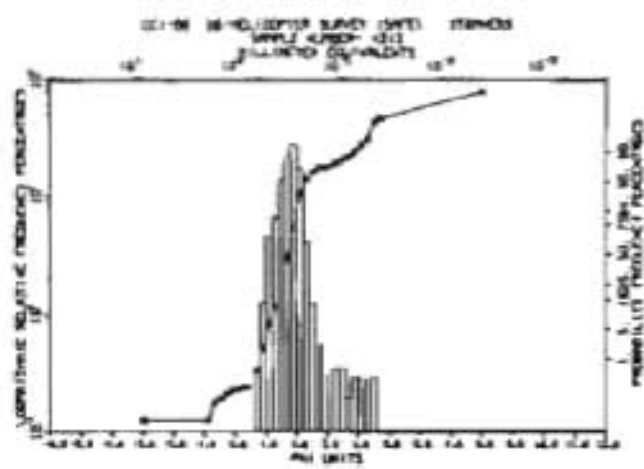
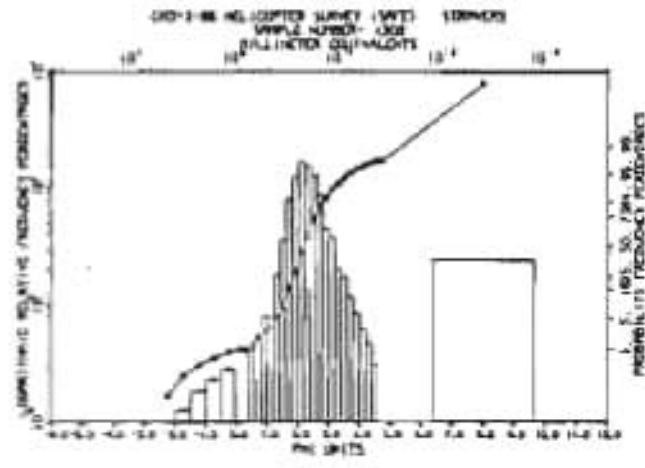
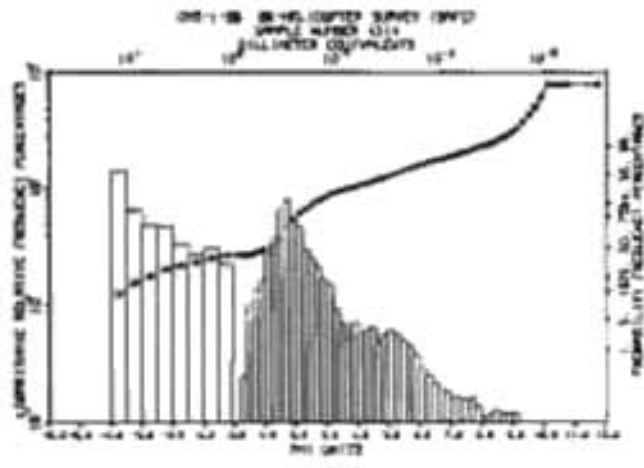
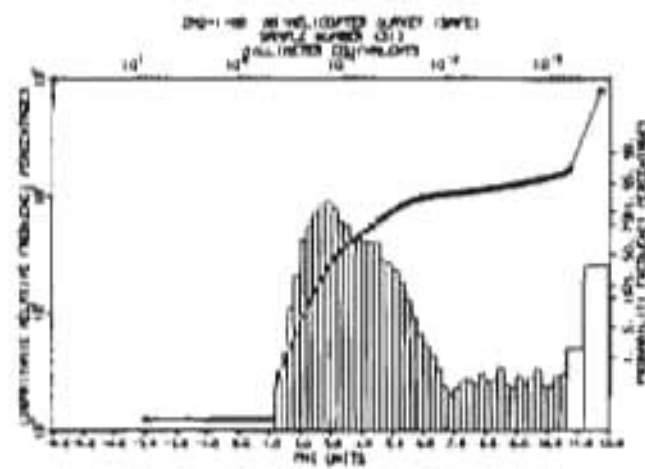
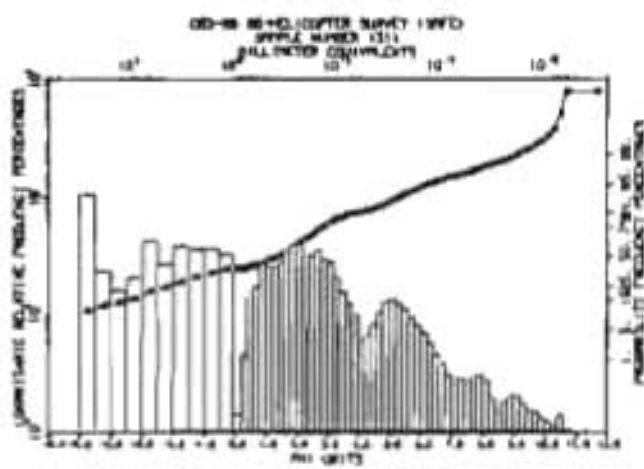














## CHAPTER 3

COASTAL MORPHOLOGY AND SEDIMENTATION  
EASTERN BAFFIN AND BYLOT ISLANDS, NWT.

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## INTRODUCTION

This report presents a summary of coastal geological information collected in 1985 from selected sites along eastern Bylot and Baffin Islands, NWT. It is the third in a series of data reports which has summarized beach survey and sediment information from this region. The first report outlined the field data collected, prior to and during 1979, as part of the Eastern Arctic Marine Environment Study (EAMES) program (McLaren et al. 1981); the second report listed and briefly described the sediment texture of samples collected in 1983 in conjunction with the Sedimentology of Arctic Fiords Experiment (SAFE) (Syvitski et al., 1984).

The purpose of this report is to document the beach sites surveyed in 1985 (Fig. 1, Table 1), and to provide a more complete listing of all beach surveys completed in the region since 1979 (Appendix 1). The report also documents the sediment samples collected in 1985 (Fig. 1-6, Tables 1,2) including the results of grain size analyses (Appendix 2), and photographs of epoxy resin peels made from sediment cores (Fig. 7, Appendix 3). General comments about shoreline changes and coastal sediment composition observed in 1985 are presented along with a more detailed description of shoreline morphology and sediment structure at two coastal environments: (1) a sand barrier beach, and (2) a shore fringed by perennial snowbanks.

## METHODOLOGY

The 1985 land-based beach survey and sediment sampling program was conducted using a Polar Continental Shelf Project (PCSP) sponsored Bell 206B helicopter which operated out of the communities of Pond Inlet and Clyde River, Baffin Island, NWT. (Fig. 1).

Beach Surveys Between 1979 and 1985 beach sites were established, ie. monumented and surveyed, along Bylot and Baffin Islands (Appendix 1) to provide information on the across shore morphology and sediment character of representative coastal types. In 1985 our attention was focused on the beaches fringing the coastal forelands of eastern Baffin Island and the sandur shores of eastern Bylot Island ( Fig. 1, Table 1). Measurements were completed using conventional survey techniques with either a level, transit and stadia rod or range poles

and abney level. Each survey line was aligned perpendicular to the coastline and extended seaward to hip wader water depth, from a benchmark located on the emerged shore, or from the backbarrier lagoon or stream channel (Fig. 2). In addition aerial video surveys were completed along the northeastern Baffin coastline, including the inner fiords (Fig. 1) where previous video coverage was poor or not completed during the EAMES Project (Sempels, 1982, McLaren and Barrie, 1985).

Sediment Sampling Sediment was collected from specific geomorphological features or representative across shore zones as (1) grab samples, from surface or subsurface cut sections, using a trowel or plastic vial, and (2) hand push-cores using variable lengths of plastic core liner (Table 2). The longest core collected in 1985 was 0.6m. Frozen ground restricted the penetration of cores and the digging of sections.

To obtain a better visual record of the detailed sedimentary structures, grain size characteristics and distribution of heavy minerals, epoxy resin peels were made from each of the push cores. The peels were prepared using a mixture of 2/3 Cold Cure epoxy resin and 1/3 hardener which was poured directly on one half of the split core. The mixture penetrated the core in proportion to the sediment porosity and hardened within 24 hours. The epoxy permeated sediment, once solid, was loosened from the core liner and remaining sediment, then rinsed with water to remove all loose sediment. Photographs of the peels were then taken (Fig.7, Appendix 3).

The grain size frequency distribution of all samples, including subsamples from the split cores were analysed using a combination of techniques at the sediment laboratory of the Atlantic Geoscience Centre. The gravel fraction was separated from the fines using a standard 2mm sieve while the sand fraction was separated from the muds using a 53um wet sieve. Where the sand fraction exceeded 10% of the total sample weight it was analysed for its equivalent spherical sedimentation diameter, at 0.2 phi intervals, using a settling tube. Similarly, where the mud fraction exceeded 10% of the total sample weight it was analysed over the range of 63um to 0.5um using a Sedigraph 5000D. A more detailed description of the laboratory procedures used at the AGC sediment laboratory are documented by Asprey et. al. (in prep.) The results of the gravel, sand and mud analyses were overlapped using the computer program MERGE and the percentage size fractions, moment statistics (Appendix 2) and frequency distribution plots (Appendix 3) were generated with the computer program READY (Hackett et al., 1986). The grain size distributions in Appendix 2 are plotted as a histogram on a logarithmic frequency scale and a curve on a cumulative frequency scale.

TABLE 1. Survey information for beach sites monitored in 1985 along Bylot and Baffin Islands, NWT. The site locations are given in Figure 1, and cross sectional diagrams for Middle Bay and three sites on Baffin Island are illustrated in Figure 2.

LATITUDE AND LONGITUDE	PLACE NAME	PROFILE NO.	DATE (DD/MO/YR)	TIME OF WL (EDT)	DISTANCE BM1 TO BM2 (m)	BM1 TYPE# HT (cm)	BM2 TYPE# HT (cm)	OTHER MARKERS	SEDIMENT SAMPLE NO.
<b>BYLOT ISLAND, NWT</b>									
73°39.5' 78°04'	C. LIVERPOOL	1	15/08/85	12:08	33.8	IRON 54	IRON 47	--	---
73°35.3' 77°44'	C. FANSHAW	4	15/08/85	15:10	17.6	IRON 60	ROCK -	--	---
73°33.5' 77°26'	C. FANSHAW	1	15/08/85	16:30	35.8	IRON 46	CAIRN*	--	---
73°21' 78°59'	BATHURST BAY	2	11/08/85	17:30	23.9	CAIRN -	IRON 57	--	---
73°9.5' 78°36'	'MIDDLE BAY'	2	11/08/85	14:21	21.9	IRON 43	- -	PIN	3888-3912 3954-3957,3959
72°59' 78°20'	'SOUTH BAY'	2	13/08/85	11:49	-	IRON 71	- -	--	---
<b>BAFFIN ISLAND, NWT.</b>									
72°16.5' 74°57'	CAPE COLTTS	1	18/08/85	15:56	32.6	IRON 47	IRON 52	--	3543-3552 3872-3877
71°30' 71°35'	CAPE ADAIR	1	07/08/85	17:24	62.6	WOOD 28	WOOD -	--	3952,3960
70°01' 67°21'	CAPE ASTON	1	04/08/85	11:54	57.0	- -	WOOD 25	WOOD	3846-3866 3553-3558 3934

TABLE 2 - 1985 SEDIMENT SAMPLE LOCATIONS FROM EASTERN BAFFIN AND BYLOT ISLANDS, NWT

Sample locations are indicated in Figures 1 to 6. Grain size analyses are attached as Appendix 2.

Photographs of epoxy resin peels of the cores are attached as Appendix 3 and Figure 7.

GEOGRAPHIC AREA	SED LAB #'s	DATE d/m/y	SITE LOCATION	FIG #	SAMPLE TYPE (depth)	SETTING
BAFFIN ISLAND						
CAMBRIDGE FIORD	3953	12/8/85	STOP 1	1	Grab	Organics from raised delta, Keel River (26m asl)
CAPE ADAIR	3952	7/8/85	PROFILE 1	2	Grab	Upper foreshore, beachcusp
"	3950	7/8/85	"	2	Grab	Foreshore, high tide level
"	3981	7/8/85	STOP 1	1	Grab	Raised beach (N of Profile 1)
CAPE ASTON	3846-51	4/8/85	PROFILE 1	2	Core 1-1 (55 cm)	Backshore, deflation zone
"	3852-56	4/8/85	"	2	Core 1-2 (50 cm)	Backshore, dune
"	3857-61	4/8/85	"	2	Core 1-3 (57 cm)	Backshore, dune
"	3862-66	4/8/85	"	2	Core 1-4 (55 cm)	Top beach berm
"	3553-58	4/8/85	"	2	Core 1-5 (54 cm)	Lower foreshore, ridge top
"	3934	4/8/85	"	2	Grab	Infill sediment, 1983 Pit 2
"	3940	4/8/85	STOP 1	4	Grab	Raised sequence - lower
"	3941	4/8/85	"	4	Grab	Raised delta 6m below surf. - bottom H.M.
"	3942	4/8/85	"	4	Grab	Raised beach 1-5
"	3962	7/8/85	STOP 3	4	Grab	Raised beach, pit 2, cemented veins
"	3936-39	4/8/85	STOP 4	4	Section 1 (34 cm)	Backshore, dune, pit 3
"	3867-71	7/8/85	STOP 4	4	Core (54 cm)	Backshore, dune, adjacent Section 1
CLYDE INLET	3922,23,27-29	2/8/85	STOP 1	5	Section 1 (25 cm)	Nivation hollow 3, pit C
"	3925	6/8/85	STOP 2	5	Grab	Beach sand
"	3926	6/8/85	"	5	Grab	Glaciomarine mud
"	3924	6/8/85	"	5	Grab	Flow till
"	3920	6/8/85	"	5	Grab	Aeolian sands over flow till
COUTTS INLET	3543-3546	18/8/85	PROFILE 1	2	Core 1-1 (19 cm)	Foreshore slope
"	3872-3877	18/8/85	"	2	Core 1-2 (45 cm)	Top beach face slope
"	3547-3552	18/8/85	"	2	Core 1-3 (25 cm)	Backshore slope
MCBETH FIORD	3566-70	11/9/83	-	6	Core 1 (64 cm)	Delta (from 1983 survey)
"	3878-87	6/8/85	STOP 1	6	Core 2 (60 cm)	Tombolo
"	3918	6/8/85	STOP 1	6	Grab	Upper lagoon segment
"	3919	6/8/85	STOP 1	6	Grab	Lagoon beds - organics
"	39-20,21,31,32	6/8/85	STOP 2	6	Section 1 (117 cm)	RB/Delta complex
"	3917	6/8/85	STOP 4	6	Grab	Lagoon beds - oldest part of section
"	3933	6/8/85	STOP 5	6	Grab	Tidal mud 0.5m above high tide
"	3935	6/8/85	STOP 6	6	Grab	Under moraine boulders - top of section
BYLOT ISLAND						
'MIDDLE BAY'	3888-3889	11/8/85	PROFILE 2	2	Core 2-1 (58 cm)	Barrier beach (BB), dune
"	3893-3898	11/8/85	"	2	Core 2-2 (58 cm)	BB, upper foreshore, berm
"	3899-3904	11/8/85	"	2	Core 2-3 (57 cm)	BB, backshore, flood zone
"	3905-3912	11/8/85	"	2	Core 2-4 (54 cm)	BB, backshore, river edge
"	3954	11/8/85	"	2	Grab	Beach top, H.M. 20 cm above base of pit 1
"	3957	11/8/85	PROFILE 2	3	Grab	Beach, typical H.M. layer (8 cm depth)
"	3955	11/8/85	STOP 12	3	Grab	Frozen beach sediment at tidal inlet
"	3956	11/8/85	STOP 5	3	Grab	Raised beach
"	3959	11/8/85	STOP 3	3	Grab	Channel sands 1.5 km from ice front
'SOUTH BAY'	3958	11/8/85	STOP 1	1	Grab	Terrace fronting glacier, 0-1m depth
BATHURST BAY	3963	11/8/85	STOP 10	1	Grab	At central ice front

## SUMMARY

Beach Morphology The coastlines of eastern Bylot and Baffin Islands are characterised by a wide variety of shore types ranging from steep rock headlands and glacial ice with no beach to continuous, low wide sand or gravel beaches along the coastal forelands (Sempels, 1982, McLaren and Barrie, 1985).

Resurveys of selected beaches in 1985 (Table 1) indicated that most sites had experienced a net erosion particularly across the upper foreshore slope while the lower foreshore had experienced a sediment accumulation in the form of ridge and runnel features; and several of the barrier beaches had accreted across the backshore because of wave washover deposition (Fig.2).

Beach Sediment A distinctive characteristic of all beach samples collected in 1985 (Table 2), was their high degree of sorting by waves and wind. With the exception of the backbarrier samples which contained more mud, all of the outer coast beaches consisted of very well to well sorted, ie. 0.2-0.9 phi, fine to coarse sand (Appendix 2). At Capes Adair and Coutts the foreland beaches were composed of coarse sand with a mean size ranging from 0.46 to 1.66 phi (0.73- 0.32 mm, Appendix 2 ). At Cape Aston and 'Middle Bay' the present barriers consisted of a slightly finer sand with a mean size ranging from 1.34 to 2.07 phi (0.39- 0.24 mm).

As a contrast, the sediment sampled from the fiord head deltas, the raised delta terraces at Cape Aston, and the backshore nivation hollows near Clyde River was much more poorly sorted and contained greater proportions of mud (Appendix 2) . Similarly the samples collected from the glacial deposits in 'South Bay' and Bathurst Bay, Bylot Island (Fig. 1) consisted of a poorly sorted mixture of gravel, sand and mud.

## DISCUSSION OF SELECTED SHORE TYPES

### 1. Sand (Barrier) Beaches

In 1985 attention was focused on the continuous sand beaches of the outer forelands, eg. Capes Coutts, Aston and Adair, and the sandur shores of Bylot Island (Fig. 1,2). The beaches, in particular the sand barriers, exhibited an assymmetrical shape with a steeper sloping seaward face of  $2^{\circ}$  to  $2.7^{\circ}$  (Table 3) and a more gradual landward sloping backshore of less than  $1^{\circ}$ . The sand barriers vary in width from 100-185m and have a crest height of 0.8 to 2.3m above mean water level. For the sites surveyed in 1985 the crest height decreased inversely with tidal range. At Cape Adair the sand beach is more representative of non-barrier shores. It has a steeper foreshore slope, a higher crest and is narrower than the lower sand barriers.

TABLE 3. Morphological characteristics, as measured in August 1985, of selected sand beaches along eastern Bylot and Baffin Islands, NWT. The site locations are provided in figures 1 and the cross sectional diagrams are illustrated in Figure 2.

LOCATION	PROFILE NO.	BEACH WIDTH* (m)	BEACH DIMENSIONS		CREST# HEIGHT (m)	MEAN THAW DEPTHS (m)	
			SLOPE(tan $\alpha$ ) Backshore	SLOPE(tan $\alpha$ ) Foreshore		BACKSHORE	FORESHORE
'Middle Bay'	2	125	0.012	0.036	0.8	0.89	0.97
Cape Coutts	1	102	0.014	0.048	1.6	0.71	0.57
Cape Aston	1	185	0.006	0.041	2.3	0.76	0.53
Cape Adair	1	64	0.017	0.138	2.9	-	0.83

\* Distance from the intersection of mean water level with the backbarrier lagoon and the beach foreshore.

# Height above mean water level.

A preliminary analysis of the across shore morphology and sediment character of the central sand barrier at 'Middle Bay', Bylot Island (Fig. 2, 3) is presented as an example of this coastal type. For this discussion the barrier has been subdivided into lower and upper backshore, foreshore, and nearshore zones because of the different processes which dominate each one.

(a) Lower Backshore - The landward extent of the sand barriers is either marked by a steep stream cut bank where drainage channels flow parallel to shore, as at 'Middle Bay' barrier, or by a low lying surface that is alternately exposed and flooded during spring melt and higher tides as at Cape Aston. At 'Middle Bay' the lower backbarrier is marked by a flat terrace which has formed through backbarrier flooding. Sediment samples collected from this zone, ie. core 2-4 (Fig. 2,7, Table 2) are mud and organic rich and are more poorly sorted than the more seaward portions of the barrier. Core 2-4 and the base of core 2-3 (Fig. 2,7) consisted of alternate muddy and sandy units that exhibited a more irregular structure than the parallel bedding of the berm and washover deposits which covered the upper backshore, ie. upper part of core 2-3 and all of core 2-1 (Fig. 2,7). The abundance of heavy minerals was also much less beneath the lower than the upper backshore. In 1983 and 1985 the water table was encountered 40-50 cm below the beach surface and the mean depth of thaw was 89 cm.

(b) Upper Backshore - The upper portion of the back barrier is dominated by aeolian processes and wave washover during higher energy storm events. The dune crests are oriented oblique or transverse to the coast, they are low (<0.5m), and are best developed in late summer when the barrier sands are drier. Core 2-1 (Fig. 2,7) collected from the upper 0.6m of sediment near the beach crest consisted of well defined, parallel interlaminations of light and heavy sands. Preserved dune structures are less than a few centimetres thick and discontinuities in the bedding are marked by thick ( up to 4cm) concentrations of heavy minerals. The burial of sea ice in the sand can produce irregularities in the sediment structure, e.g. base of core 2-2 (Fig. 7), but their preservation potential is low because of the dominance of waves.

(c) Foreshore - Seasonal beach changes are primarily recorded across the foreshore zone where the morphology can vary from steep wave cut banks to a more gradual slope with ridge and runnel features. Core 2-2 (Fig. 2,7) was collected from a recently formed berm on the upper foreshore. The upper portion of the core consisted of very thin, parallel interlaminations of heavy and light sands while the lower part consisted of slightly coarser, seaward dipping, swash deposits with the heavy minerals well mixed with the lighter sands (Fig. 7).

(d) Nearshore - Little or no bathymetric and sediment information is available from 'Middle Bay' however there is no evidence of a nearshore bar similar to that observed off the sand barrier at Cape Aston. There, the bars appear to be composed of sand and gravel and are intermittently cut by sea ice scour or ice wallow pits.

Cores collected from the other sand beaches indicate a similar but less pronounced change in across shore sedimentation to that found at 'Middle Bay' barrier. A more detailed study of the cores is required to confirm these trends.

## 2. Shoreline Nivation Features

Perennial snowbanks, snow patches and associated nivation hollows are common features within the lee or shadow of moderate to steep sloping shores of many Arctic Islands. Snowbanks can extend hundred's of metres alongshore and ten's of metres in width. Where the snowbanks reach present sea level, they incorporate the seasonal icefoot and are marked by a near vertical seaward ice face, but where the snowbanks have receded landward they are outlined by a much thinner edge, largely due to seasonal ablation. Nivation processes do not dominate general coastal development as do waves and sea ice but they can be a locally important periglacial modifier of beach and backshore sedimentation.

The late arrival of our helicopter at the beginning of the 1985 season presented an opportunity to investigate a series of nivation hollows

and associated shoreline features and deposits. These were located just to the west of the Clyde River delta and the village of Clyde River along the north shore of Patricia Bay (Fig. 1, 5).

**Morphology** -The north shore of Patricia Bay is part of the Clyde Foreland which consists of unconsolidated or partially consolidated deposits varying in grain size from very coarse boulder gravel to clay (Feyling-Hanssen 1976). The shore moderately slopes to 25-30m elevation and is marked by several flights of nivation features. Only the nivation hollows (NH) closest to present sea level were examined in 1985.

A comparison of the area of snowbanks between 1960 (NAPL air photo A16213-34) and 1985 (field observations) suggested that all of the snowbanks had ablated by at least 50% and many of the smaller snowpatches ie. NH-5, had melted completely over the 25 year period. The snowbanks at NH-1 and NH-3, where most of observations were made, each had ablated into two parts (Fig. 5a, Table 4).

Table 4. Snowbank dimensions along Patricia Bay, Baffin Island, NWT. August 2, 1985. The locations of the snowbanks are provided in Figure 5.

Snowbank	Length (m)	Width (m)	Icefoot Width (m)
NH-1	500	25-50	5
NH-2	430	40-60	5-10
NH-3	400	15-30	N/A
NH-5	no data collected		

In cross-section (Fig. 5a, inset) the nivation hollows are characterised by a relatively steep back wall topped by a distinctive boulder lag deposit. This lag has developed primarily as a result of colluvial processes and surface run-off washing the fines downslope, although it may have originally formed by wave erosion prior to snowbank accumulation. At NH-2 the back boulder rim extended 2-4m above the 1985 surface of snow and ice, which in turn varied from a maximum thickness of 2m to only a few centimetres at the edges of the snowbank. Ice thickness was also a minimum adjacent to large boulders (heat sinks) that were exposed within the snowbank. The ground was frozen beneath the edge of the snowbank but became progressively more thawed with distance from the ice edge.

Sedimentology - Where snow and ice extended to present sea level little or no beach had formed (Fig. 5a). The ground was only partly thawed ( $< 0.1\text{m}$ ), and beach development was further restricted by water turbulence from waves reflecting off the steep face of the icefoot. The net result was a poorly defined beach covered only by a cobble-boulder lag interspersed with a thin veneer of rill-washed colluvium and beach sediment. Heavy minerals were only concentrated above the frozen substrate beneath the ice edge.

In contrast, where snow and ice had retreated landward rill and stream cut colluvial and beach deposits had accumulated (Fig. 5a). At NH-3, where the ice had receded the farthest, it was fringed by a low wave-cut hummocky terrace (Fig. 5a,b). This was outlined at the base by a cobble-boulder lag (interpreted as a former snowbank terminus) that was fronted and partly covered by well sorted modern beach deposits and rill-washed mixed sand and gravels. Alongshore was a tidal flat, scattered with numerous large boulders up to 3m in diameter .

In a section dug at the seaward edge of the low hummocky terrace (Fig.5b, arrow) a wind reworked pebble lag overlay a 15-20 cm thick bed of homogeneous sand. Thin mud and organic layers occurred within and at the base of this sand unit. Heavy minerals appeared as concentrated laminations near the base of the thick sand unit, and were also observed as truncated structures within the pebbly rill-washed beach sand that extended to the base of the section at 40 cm depth.

Samples 3922-23 and 3927-29 were collected from a second section dug closer to the margin of snowbank NH-3 (Table 2, Fig. 5). The vertical sequence observed included a 2 to 5 cm thick surface unit of dessicated mud and organic material, overlying 4 to 8 cm of poorly sorted sand containing distinctive thin mud and organic layers similar to those observed in the section dug at the edge of the terrace. Below this, a 2 cm thick light coloured, well sorted sand occurred, which pinched out in a landward direction; it overlay a very well sorted concentration of heavy minerals at a depth of 12 cm. Beneath the heavy mineral layer was a uniform coarse sand 5-20 cm thick that overlay an organic rich layer at the base of the section.

A preliminary sedimentological interpretation is proposed for these sections, which is also based on additional samples (3924-26 and 3930, Table 2) collected from specific geomorphic features in the area of NH-3 (Fig. 5a). The surface muds are seasonal ice-melt deposits. These overlie colluvial fan and wave reworked sand in which heavy minerals have been concentrated, similar to the sediments observed beneath the seaward edge of the icefoot at NH-1 and NH-2. The coarse sands at 15-20 cm depth resemble beach foreshore deposits and the increased mud at the base of the section is thought to be wave reworked colluvium.

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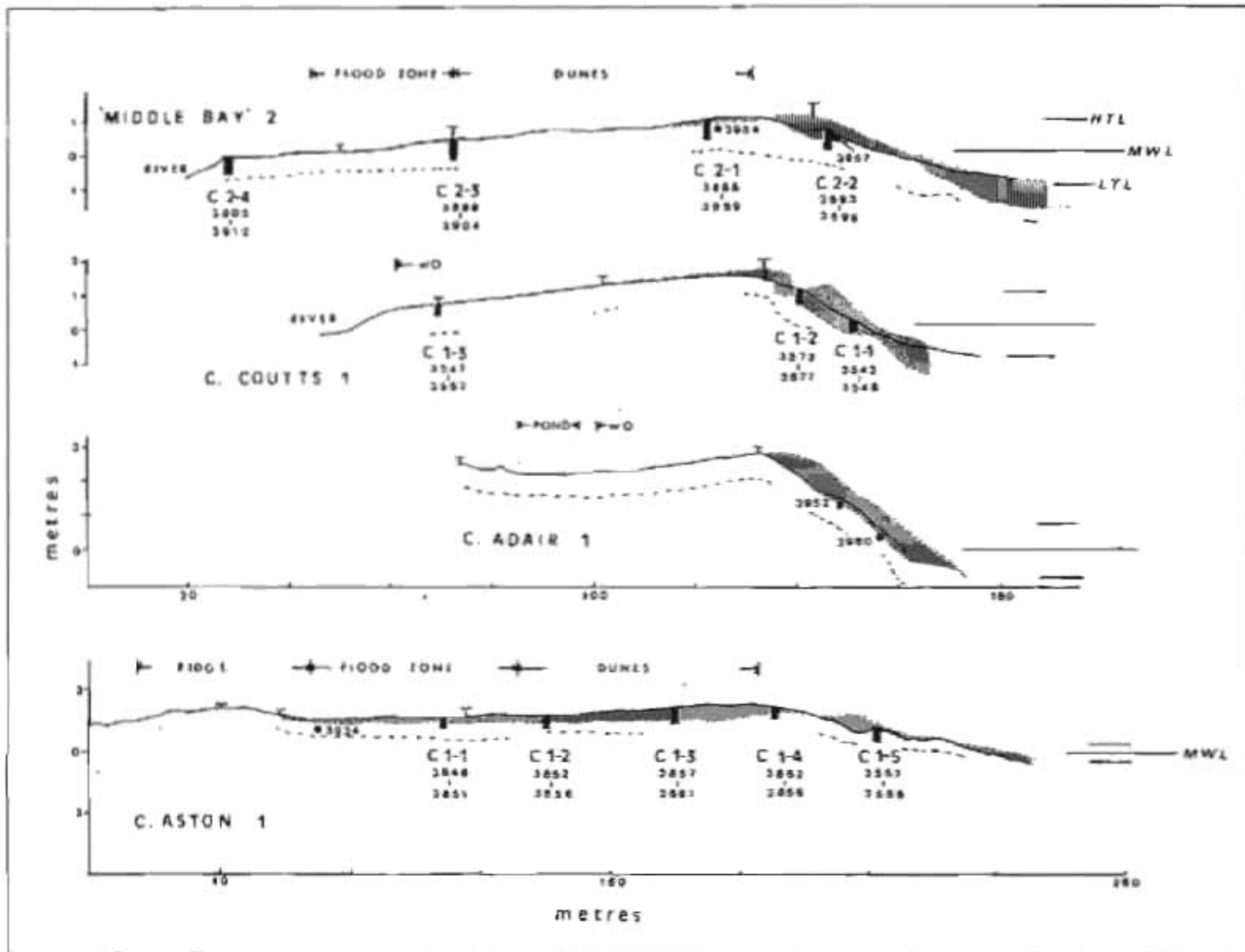


FIGURE 2. Examples of sand barrier beaches surveyed along the eastern coast of Bylot and Baffin Islands showing the location of grab and core samples collected in 1985. The stippled zone on each profile delimits the sweep zone or maximum zone of sediment mobility surveyed during the period 1979-1985. The dashed subsurface line marks the maximum thaw depth recorded at these beaches. Note the change in scale between the upper three profiles and the Cape Aston profile.

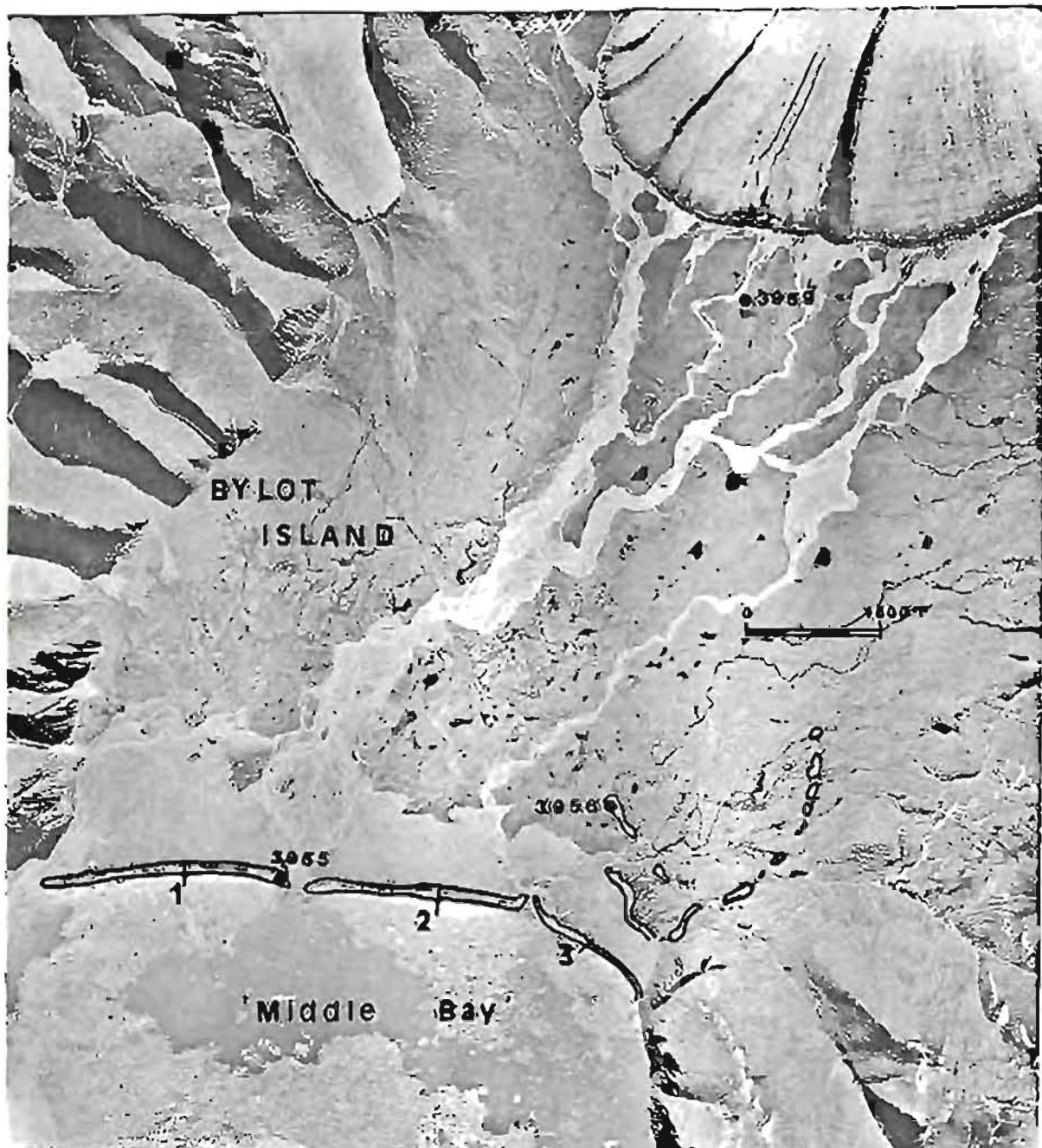


FIGURE 3. Aerial view (A16214-78, NAPL) of the glacier, outwash plain and barrier beach at 'Middle Bay' Bylot Island. Two sediment samples were collected from inland features and one from frozen sediment exposed along the banks of the central tidal inlet, however most of the samples and cores were collected from across the present barrier beach at profile 2. See Figure 2 for the cross-sectional view of the barrier and detailed location of the samples.

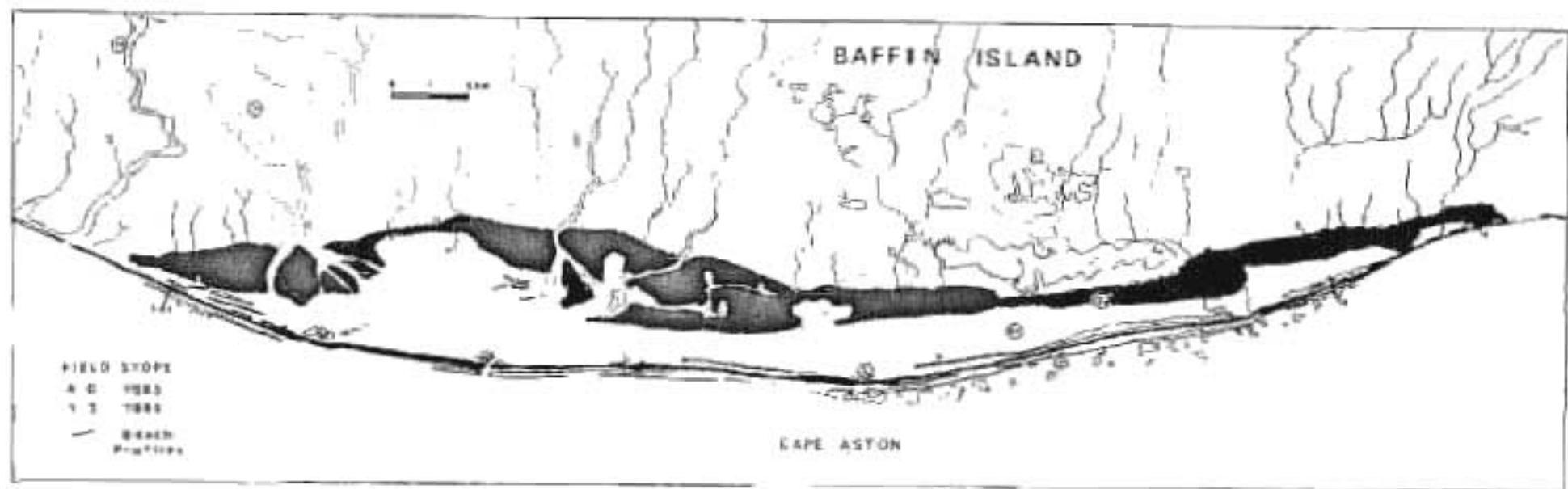


FIGURE 4. Map of the Cape Aston barrier beach system showing the sampling sites from 1983 and 1985. The present barrier (shaded in) is fringed by a discontinuous series of narrow nearshore bars and by narrow, low raised beach ridges that resemble the bars. Farther inland the shaded band is a zone of complex beach ridges and fluvial channel features developed within 10m of the present sea level. Between the raised and present beach is a wide flood zone which dries and becomes reworked by aeolian processes late in the summer e.g. September.

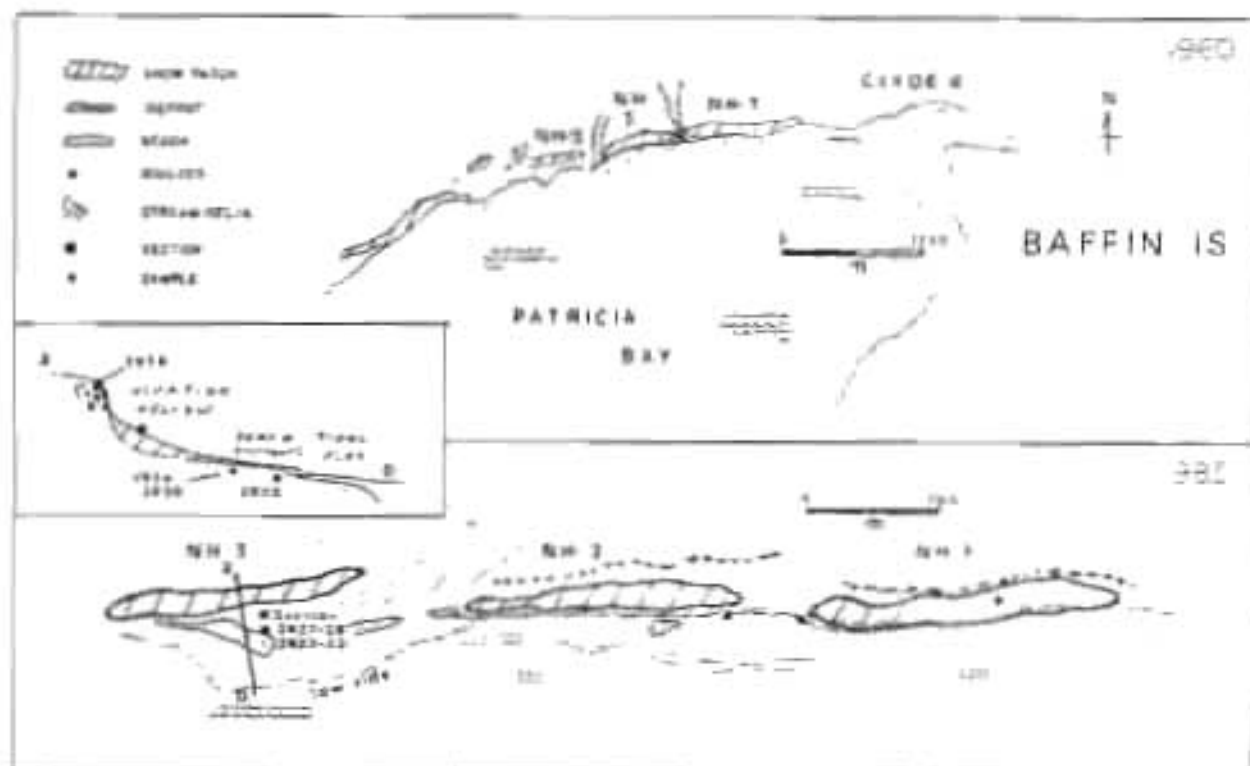


FIGURE 5a. Sketch of the nivation hollows along Patricia Bay, near Clyde River, Baffin Island in 1960 (from NAFL a/r photo A16213-34), and in 1985. The sediment sample sites from 1985 are shown as well as a generalized cross-sectional view of this type of coast.



5b. Ground view of the hummocky terrace exposed seaward of NH-1 in August 1985. Arrows indicate the location of the detailed sections and sediment samples completed in 1985.

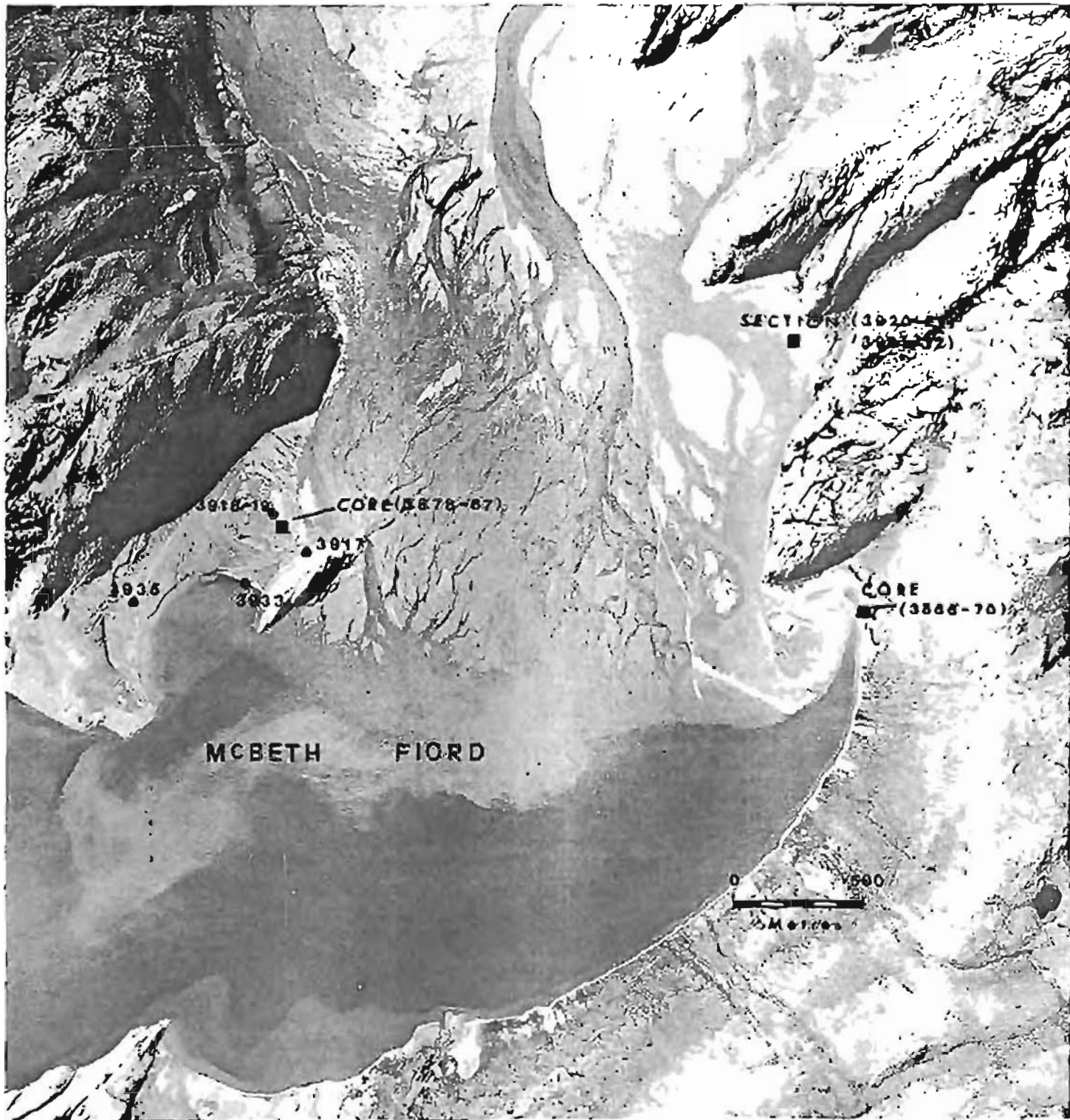


FIGURE 6. Aerial view (A17015-112, NAPL) of the delta at the head of MCBETH FIORD showing the 1985 sediment sample sites. The core shown at the right hand corner of the delta was collected in 1903 but the results of the sediment analyses (Appendix 2) were not available until after the previous data report was published (Syvitski et al. 1984).

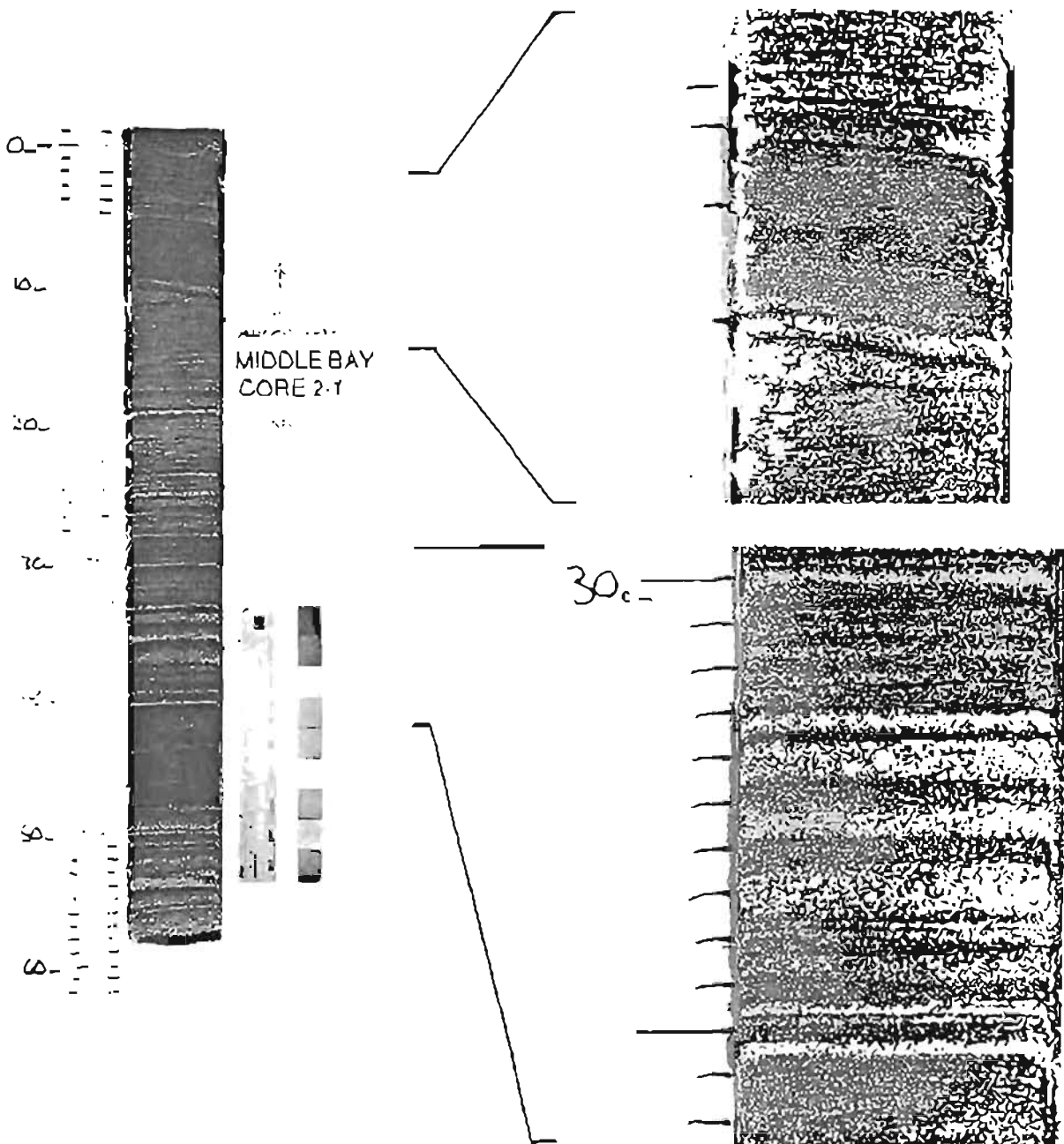
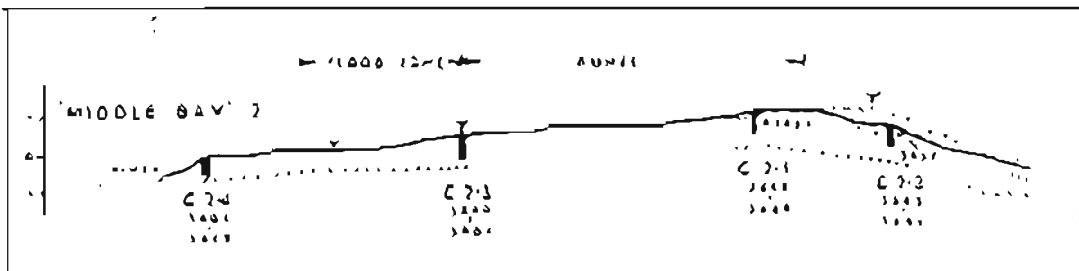


Figure 7. Photographs of the epoxy resin peel cores collected across the central sand barrier at 'Middle Bay', Uylot Island. The locations where the cores were collected are shown in Figure 3.

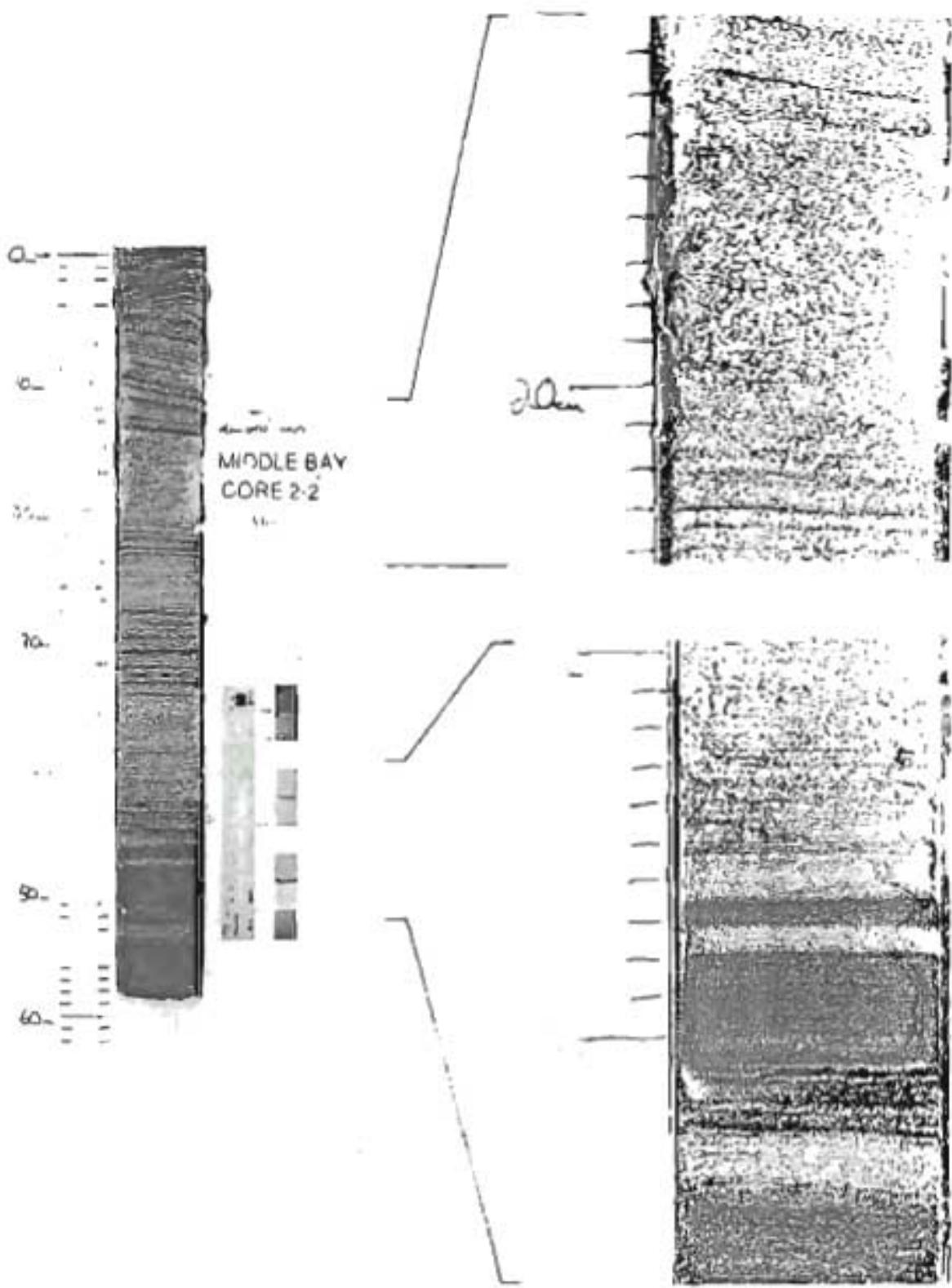


Figure 7 (continued)

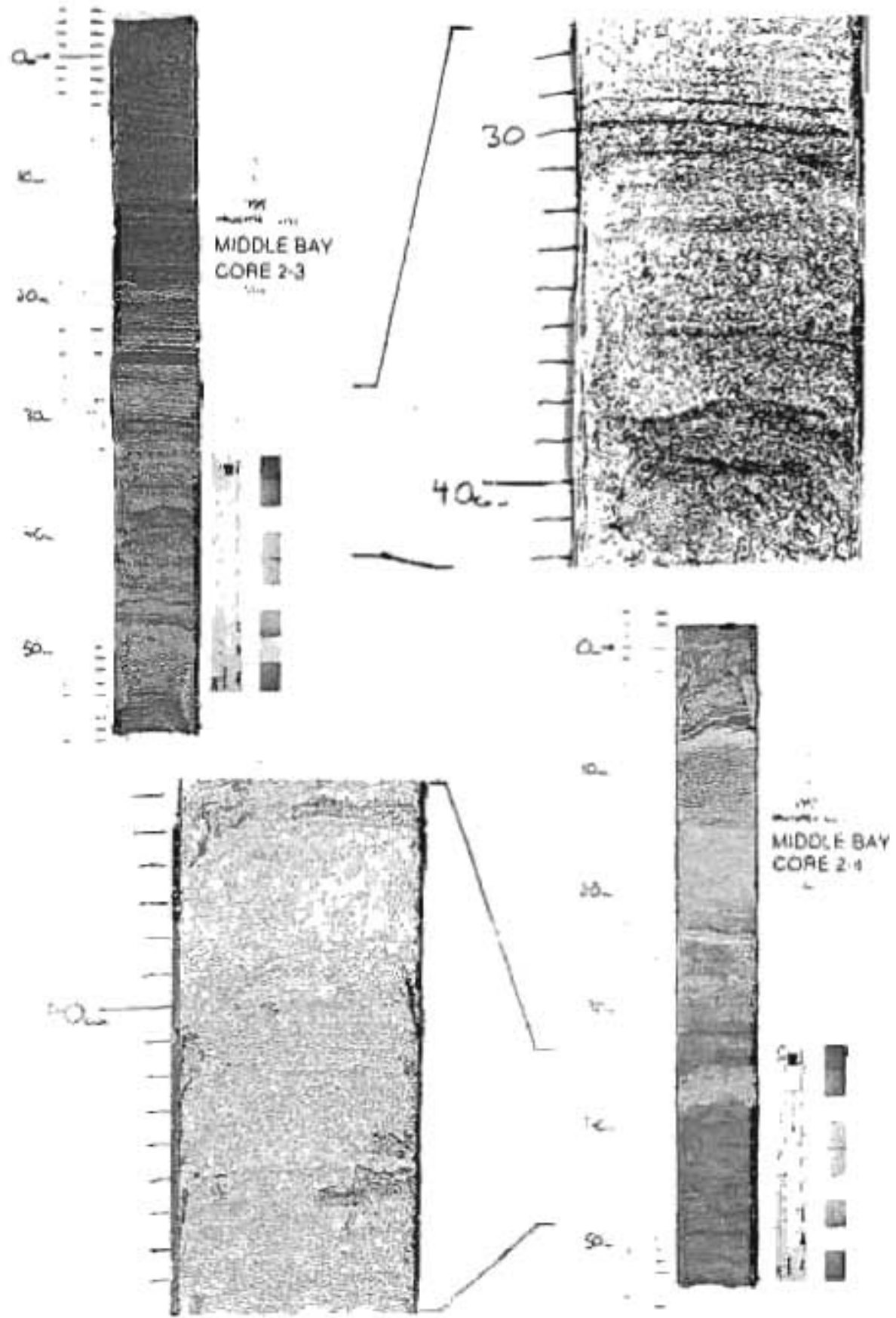


Figure 7 (continued)

## APPENDIX 1

BEACH SURVEY AND SEDIMENT SAMPLE INFORMATION FOR SITES MONITORED BETWEEN 1979 AND 1985 ALONG BYLOT AND  
BAFFLIN ISLANDS, N.S.L.T.

LATITUDE AND LONGITUDE	PLACE NAME	PROFILE NO.	DATE (DD/MO/YR)	TIME OF WL (EDT)	DISTANCE BM1 TO BM2 (m)	BM1 TYPE# HT (cm)	BM2 TYPE# HT (cm)	OTHER MARKERS	SEDIMENT SAMPLE NO.
-----									
BYLOT ISLAND, NWT									
73°40.3' 78°14'	C. LIVERPOOL	2	16/08/79	15:20	20.8	CAIRN -	CAIRN -	--	79338-79341
	LIVERPOOL	2	22/08/79	12:00	"	"	"	--	-----
	LIVERPOOL	2	29/07/81	15:15	17.0	IRON* 53	IRON* --	--	1217, 1218 1259
73°39.5' 78°04'	C. LIVERPOOL	1	14/08/79	16:10	34.6	CAIRN -	CAIRN -	--	79328-79329 79337
	LIVERPOOL	1	22/08/79	10:42	"	"	"	--	-----
	LIVERPOOL	1	03/09/79	10:30	"	"	"	--	-----
	LIVERPOOL	1	12/08/81	17:24	37.5	IRON*	IRON	--	1216
	LIVERPOOL	1	15/08/85	12:08	33.8	IRON 54	IRON 47	--	-----
73°35.3' 77°44'	C. FANSHAWE	4	13/08/79	14:50	-	-	ROCK -	--	79321-79323
	FANSHAWE	4	22/08/79	13:00	-	-	" -	--	79347-79348
	FANSHAWE	4	12/08/81	17:45	21.0	IRON* 58	ROCK -	--	1208, 1209
	FANSHAWE	4	15/08/85	15:10	17.6	IRON 60	ROCK -	--	-----
73°34.3' 77°35'	C. FANSHAWE	3	13/08/79	11:20	24.0	CAIRN -	CAIRN -	--	79318-79320
	FANSHAWE	3	26/08/79	10:00	-	" -	" -	--	79349-79350
	FANSHAWE	3	12/08/81	18:07	25.0	IRON* 55	IRON* 45	--	1207
73°33.5' 77°28'	C. FANSHAWE	2	17/08/79	22:30	20.1	CAIRN -	MAST	--	-----
	FANSHAWE	2	20/08/79	10:00	19.8	" -	" -	--	79343-79346
	FANSHAWE	2	25/08/79	20:30	20.9	" -	" -	--	-----
	FANSHAWE	2	03/09/79	11:50	20.1	" -	" -	--	-----
	FANSHAWE	2	12/08/81	18:25	-	IRON* 71	-	--	1210, 1211
73°33.5' 77°26'	C. FANSHAWE	1	15/08/79	20:00	36.1	CAIRN -	CAIRN -	--	79310-79312

## APPENDIX 1 CONTINUED...

73°33.5' 77°26'	C. FANSHALE	1	20/08/79	12:25	-	"	-	"	-	--	----
		1	03/09/79	13:00	-	"	-	"	-	--	----
		1	29/07/81	17:30	38.0	IRON*	46	WOOD*	41	--	1205, 1206
		1	13/08/81	18:20	-	"	-	WOOD	42	--	----
		1	15/08/85	16:30	35.8	"	46	CAIRN*	-	--	----
73°31.3' 77°16'	POSSESSION BAY	1	23/08/79	16:00	24.5	CAIRN	-	CAIRN	-	--	79351-79355
73°22.3' 77°03'	BATHURST BAY	3	31/07/81	12:30	59.0	IRON	49	CAIRN	-	--	1238, 1240
73°21' 76°59'	BATHURST BAY	2	12/08/79	10:45	23.4	CAIRN	-	CAIRN	-	--	79313-79316
		2	23/08/79	11:25	-	"	-	"	-	--	----
		2	03/09/79	14:10	-	"	-	"	-	--	----
		2	31/07/81	11:00	26.6	CAIRN	-	IRON*	56	--	1237
		2	14/08/81	19:35	-	"	-	"	55	--	----
		2	11/08/85	17:30	23.9	CAIRN	-	IRON	57	--	----
73°20.3' 76°58'	BATHURST BAY	1	15/08/79	16:00	31.6	CAIRN	-	CAIRN	-	--	79330-79333
		1	14/08/81	19:02	-	IRON	58	CAIRN	-	--	1219
73°16' 76°42'	'POCKET BAY'	1	08/08/79	12:20	-	CAIRN	-	-	-	--	79308-79309
		1	23/08/79	10:30	-	"	-	-	-	--	----
		1	12/08/81	18:50	5.0++	IRON	52	-	-	PIN	----
73°10.5' 76°37'	'MIDDLE BAY'	3	14/08/81	17:25	19.0	CAIRN	-	CAIRN	-	--	1201
73°9.5' 76°36'	'MIDDLE BAY'	2	31/07/81	15:55	71.0	IRON	46	WOOD	48	PIN	1195-1197
		2	17/09/83	14:38	22.6++	IRON	39	-	-	PIN	1370-1375
		2	11/08/85	14:21	21.9++	"	43	-	-	PIN	3888-3912 3954-3957, 3959
73°8.5' 76°34'	'MIDDLE BAY'	1	14/08/81	16:13	36.1	IRON	52	WOOD	40	PIN	1198-1200
72°59.5' 76°20'	'SOUTH BAY'	3	14/08/81	13:18	-	CAIRN	-	-	-	--	----
		3	17/09/83	10:12	10.9	"	-	CAIRN*	-	--	----
72°59' 76°20'	'SOUTH BAY'	2	14/08/81	12:40	-	IRON	68	-	-	--	1202-1204



**APPENDIX 2**

GRAIN SIZE DATA , 1985 SEDIMENT SAMPLES (SEE TABLE 2):

Tabulated size fraction percentages and moment statistics

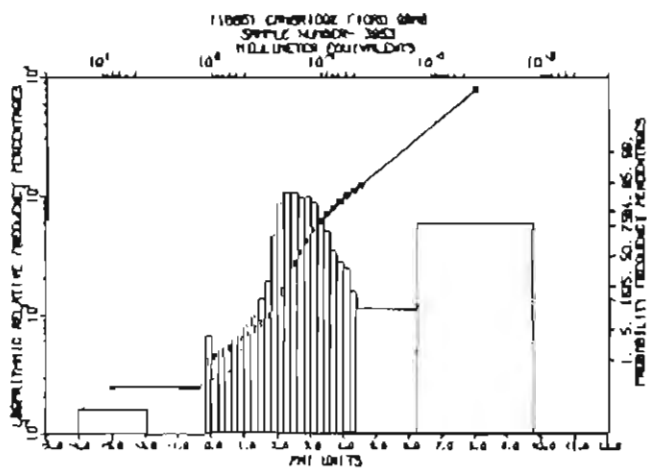
Frequency distribution plots

SAMPLE	LAB #	GRAVEL %	SAND %	MUD %	SILT %	CLAY %	MEAN Ø	SD Ø	SK	KURT
<b>BAFFIN ISLAND</b>										
<b>CAMBRIDGE FORD</b>										
Grab	3953	0.16	88.84	11.00	--	--	3.00	1.48	1.92	8.47
<b>CAPE ADAIR</b>										
Grab	3952	0.00	100.00	0.00	---	---	0.73	0.38	2.34	14.00
Grab	3960	0.00	100.00	0.00	---	---	1.50	0.38	-0.12	5.82
Grab	3961	0.93	98.87	0.20	---	---	0.46	0.58	-0.70	19.05
<b>CAPE EASTON</b>										
<b>Core 1-1</b>										
1-3 cm	3846	0.00	99.88	0.12	---	---	1.84	0.36	1.67	12.78
10-12 cm	3847	0.00	99.95	0.05	---	---	1.88	0.32	1.25	11.96
20-22 cm	3848	0.30	99.61	0.09	---	---	1.83	0.42	-4.10	54.04
31-32 cm	3849	2.40	97.29	0.31	---	---	1.81	0.88	-3.60	21.73
34-36 cm	3850	0.24	99.58	0.18	---	---	1.64	0.58	-0.98	14.17
45-48 cm	3851	0.00	99.85	0.15	---	---	1.31	0.36	2.76	24.47
<b>Core 1-2</b>										
9-12 cm	3852	0.00	99.99	0.01	---	---	1.71	0.27	1.14	11.49
21.5-24 cm	3853	0.00	99.87	0.13	---	---	1.96	0.29	1.65	12.96
33.5-37 cm	3854	0.00	99.67	0.33	---	---	1.88	0.55	0.99	6.17
37-38 cm	3855	0.00	99.87	0.13	---	---	1.37	0.46	0.81	8.16
40-42.5 cm	3856	0.00	99.87	0.13	---	---	1.75	0.32	0.80	10.95
<b>Core 1-3</b>										
3-5 cm	3857	0.00	99.96	0.04	---	---	1.82	0.27	1.69	15.26
22-24 cm	3858	0.00	99.97	0.03	---	---	1.84	0.23	1.51	15.29
26.5-28 cm	3859	0.00	99.99	0.02	---	---	1.75	0.28	0.71	9.75
39-41 cm	3860	0.00	99.94	0.06	---	---	1.56	0.33	1.18	9.90
53.5-55.5 cm	3861	0.00	99.91	0.09	---	---	1.94	0.33	0.50	9.16
<b>Core 1-4</b>										
5-7.5 cm	3862	0.00	99.94	0.06	---	---	1.88	0.25	2.20	16.73
10-12 cm	3863	0.00	100.00	0.00	---	---	1.92	0.23	1.00	7.79
23-24 cm	3864	0.00	100.00	0.00	---	---	1.84	0.27	0.68	6.56
40-43 cm	3865	0.00	100.00	0.00	---	---	1.75	0.27	-0.07	7.05
52.5-54.5 cm	3866	0.00	100.00	0.00	---	---	1.77	0.27	0.17	7.25
<b>Core 1-5</b>										
0-4 cm	3553	0.00	100.00	0.00	---	---	1.78	0.29	-0.08	5.25
7-8 cm	3554	0.00	100.00	0.00	---	---	1.72	0.24	1.72	13.73
14-17 cm	3555	0.00	100.00	0.00	---	---	1.86	0.30	1.15	10.59
25-29 cm	3556	0.00	100.00	0.00	---	---	1.75	0.24	0.47	7.27
45-47 cm	3557	0.00	99.98	0.02	---	---	1.69	0.32	0.40	7.58
52-54 cm	3558	0.00	100.00	0.00	---	---	1.81	0.26	0.33	9.89
Grab	3934	0.00	100.00	0.00	---	---	1.37	0.42	0.22	4.89
Grab	3940	0.00	77.49	22.51	20.66	1.85	3.58	1.24	3.31	18.75
Grab	3941	2.55	96.96	0.49	---	---	1.50	1.01	-2.05	10.90
Grab	3942	0.16	99.84	0.00	---	---	1.26	0.41	-1.43	23.43
Grab	3962	0.11	70.93	28.96	27.07	1.89	2.82	2.39	0.92	2.54
<b>Section 1</b>										
0-18 cm	3936	0.00	100.00	0.00	---	---	1.85	0.25	0.55	3.96
18-32 cm	3937	0.00	100.00	0.00	---	---	1.82	0.28	0.35	4.94
32-52 cm	3938	0.00	100.00	0.00	---	---	1.86	0.26	0.55	4.91
52-64 cm	3939	0.00	100.00	0.00	---	---	1.84	0.25	0.84	4.23
<b>Core</b>										
1-3 cm	3867	0.60	99.40	0.00	---	---	1.69	0.66	-2.98	18.55
10-12 cm	3868	0.00	99.93	0.07	---	---	2.14	0.25	0.52	15.87

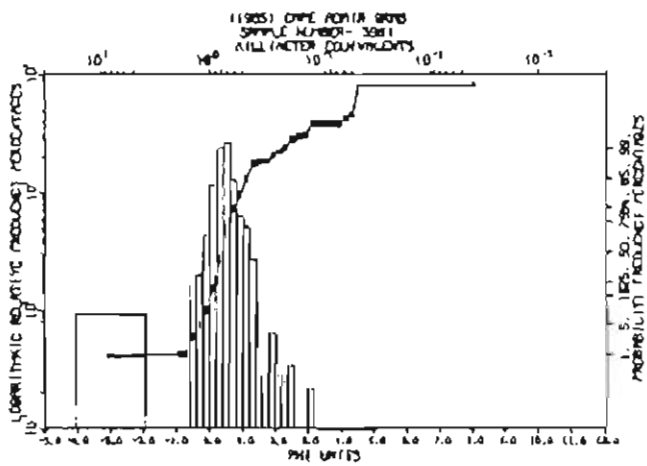
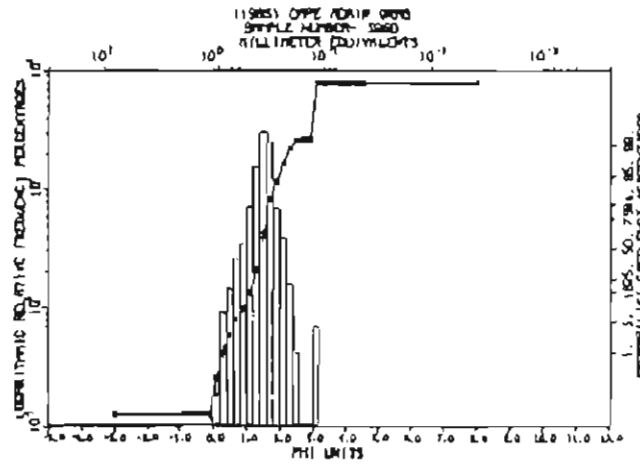
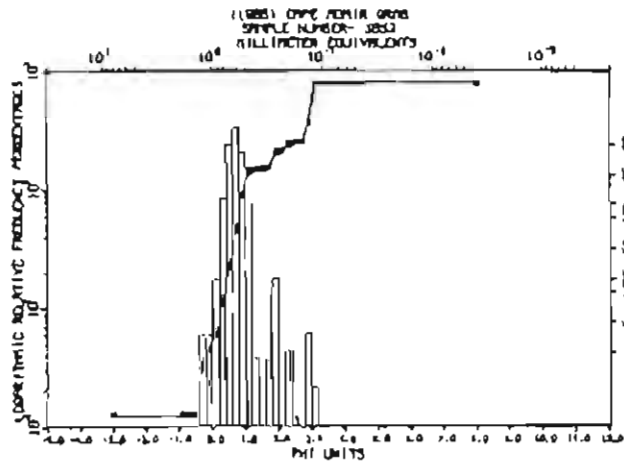
SAMPLE	LAB #	GRAVEL	SAND	MUD	SILT	CLAY	MEAN Ø	SD Ø	SK	KURT
		%	%	%	%	%				
18-20 cm	3869	0.00	99.89	0.11	---	---	2.07	0.30	0.30	11.34
30-32 cm	3870	0.00	99.94	0.06	---	---	2.16	0.23	1.20	12.68
45-48 cm	3871	0.00	99.97	0.03	---	---	1.90	0.35	-0.25	8.46
<b>CLYDE INLET</b>										
<b>Section 1</b>										
0-2 cm	3927	1.85	50.68	47.67	30.88	16.79	4.50	3.13	0.55	2.87
4-8 cm	3928	0.66	91.55	7.78	---	---	2.02	1.73	2.52	9.93
10-12 cm	3922	0.00	100.00	0.00	---	---	1.48	0.41	0.18	3.79
15-20 cm	3929	15.28	84.72	0.00	---	---	0.25	1.50	-1.29	3.60
24-25 cm	3923	6.63	88.98	4.39	---	---	1.28	1.82	1.07	9.14
<b>Grab</b>	3925	0.00	95.38	4.62	---	---	2.55	1.20	3.58	16.63
<b>Grab</b>	3926	0.11	2.50	97.39	32.33	65.06	8.93	2.43	-0.69	3.19
<b>Grab</b>	3924	8.64	90.71	0.65	---	---	1.08	1.50	-1.45	5.24
<b>Grab</b>	3930	0.00	98.50	1.50	---	---	2.24	0.63	0.75	3.82
<b>COUTTS INLET</b>										
<b>Core 1-1</b>										
4-7 cm	3545	0.00	99.86	0.14	---	---	1.00	0.56	2.92	14.52
8-10 cm	3543	0.00	99.93	0.07	---	---	1.66	0.33	1.68	12.44
12-17 cm	3544	0.00	99.96	0.04	---	---	1.44	0.36	1.44	10.16
17-22 cm	3546	0.00	99.94	0.06	---	---	1.49	0.42	2.01	12.19
<b>Core 1-2</b>										
0-3 cm	3872	0.00	100.00	0.00	---	---	1.10	0.53	0.05	4.59
3.5-5 cm	3873	0.00	100.00	0.00	---	---	1.70	0.33	0.48	7.17
12.5-15 cm	3874	0.00	100.00	0.00	---	---	1.54	0.35	0.60	6.78
21-23 cm	3875	0.00	100.00	0.00	---	---	1.44	0.33	0.80	9.82
29-32 cm	3876	0.00	99.97	0.03	---	---	1.38	0.35	1.24	11.54
38-41 cm	3877	0.00	100.00	0.00	---	---	1.26	0.36	0.89	10.34
<b>Core 1-3</b>										
0-4 cm	3547	5.30	94.62	0.08	---	---	0.84	1.14	-1.84	7.33
5-7 cm	3548	1.30	98.70	0.00	---	---	1.10	0.73	-2.21	14.72
13-16 cm	3549	0.00	100.00	0.00	---	---	0.94	0.39	1.69	11.44
16-18 cm	3550	0.30	99.63	0.07	---	---	1.29	0.46	-2.16	27.91
19-21 cm	3551	0.00	100.00	0.00	---	---	1.28	0.43	0.86	8.01
22-26 cm	3552	0.00	99.99	0.01	---	---	1.37	0.35	1.28	12.92
<b>MOBETH FORD</b>										
<b>Core 1</b>										
0-3 cm	3566	2.48	91.26	6.26	---	---	1.90	1.76	1.62	9.16
3-5 cm	3567	0.00	56.56	43.44	35.63	7.82	4.02	2.30	1.35	4.84
18-20 cm	3568	0.24	45.54	54.22	45.65	8.57	4.48	2.37	1.02	4.41
38-40 cm	3569	0.00	19.91	80.09	60.21	19.88	6.01	2.55	0.58	2.92
55-60 cm	3570	0.00	8.92	91.08	66.99	24.09	6.55	2.33	0.69	2.87
<b>Core 2</b>										
19-21 cm	3878	0.00	84.01	15.99	11.29	4.70	3.42	1.79	2.85	11.36
21-21.5 cm	3879	0.00	11.01	88.99	48.76	40.23	7.39	2.66	0.18	1.93
22-24 cm	3880	0.00	16.90	83.10	70.88	12.23	5.59	1.93	1.55	5.16
25-26 cm	3881	0.00	12.91	87.09	74.20	12.89	5.71	1.95	1.57	5.08
27-29 cm	3882	0.00	37.84	62.16	49.07	13.10	5.23	2.41	1.16	3.85
29.5-32 cm	3883	0.00	63.36	36.64	30.18	6.46	4.36	1.78	2.45	9.14
35-37 cm	3884	0.00	87.70	12.30	7.88	4.42	3.49	1.68	3.48	15.45
40-42 cm	3885	0.00	13.88	86.12	61.05	25.07	6.64	2.47	0.63	2.69
43-44.5 cm	3886	0.00	88.62	11.38	7.21	4.17	3.24	1.72	3.35	14.75
52-53 cm	3887	0.00	26.76	73.24	60.58	12.67	5.56	2.17	1.31	4.36
<b>Grab</b>	3918	0.00	4.29	95.71	49.46	46.25	7.85	2.66	-0.06	2.19
<b>Grab</b>	3919	0.06	87.68	12.26	---	---	3.18	1.45	2.32	8.65

SAMPLE	LAB #	GRAVEL %	SAND %	MUD %	SILT %	CLAY %	MEAN Ø	SD Ø	SK	KURT
<b>Section 1</b>										
37-47 cm	3920	0.86	99.14	0.00	---	---	1.12	0.66	-1.63	14.96
50 cm	3932	38.14	61.59	0.27	---	---	-0.34	1.23	0.47	4.60
70 cm	3921	6.07	83.50	10.43	---	---	1.93	2.12	0.08	4.25
115 cm	3931	1.04	59.96	39.00	36.26	2.74	3.88	1.64	0.19	9.30
Grab	3917	0.00	11.61	88.39	78.16	10.24	5.64	1.71	1.42	5.33
Grab	3933	0.02	6.86	93.12	46.61	46.51	7.87	2.70	-0.27	2.54
Grab	3935	0.07	8.78	91.15	42.66	48.49	7.77	2.96	-0.29	2.20
<b>BYLOT ISLAND</b>										
<b>MIDDLE BAY</b>										
<b>Core 2-1</b>										
8-10 cm	3888	0.00	100.00	0.00	---	---	1.88	0.32	0.08	8.24
10-12 cm	3889	0.00	100.00	0.00	---	---	1.72	0.38	-0.09	6.16
23.5-26 cm	3890	0.00	99.96	0.04	---	---	1.85	0.36	0.12	6.38
45-48 cm	3891	0.00	100.00	0.00	---	---	1.78	0.30	0.60	7.68
48-50.5 cm	3892	0.00	100.00	0.00	---	---	1.60	0.33	0.64	6.04
<b>Core 2-2</b>										
10-12 cm	3893	0.00	99.99	0.01	---	---	1.82	0.29	0.77	7.79
17-19 cm	3894	0.00	99.94	0.06	---	---	1.34	0.50	0.46	4.32
24-27 cm	3895	0.00	99.94	0.06	---	---	1.89	0.34	0.41	7.09
40-42 cm	3896	0.00	100.00	0.00	---	---	1.70	0.44	0.12	5.01
48-50 cm	3897	0.00	99.99	0.01	---	---	2.07	0.28	0.67	16.66
52-53 cm	3898	0.00	100.00	0.00	---	---	1.97	0.29	0.88	12.77
<b>Core 2-3</b>										
8-10.5 cm	3899	0.00	99.94	0.06	---	---	1.72	0.39	0.21	5.85
15-17.5 cm	3900	0.00	99.92	0.08	---	---	1.75	0.38	0.27	7.76
25.7-26.2 cm	3901	0.00	99.95	0.05	---	---	1.73	0.31	0.89	7.65
27.5-29.3 cm	3902	0.00	99.96	0.04	---	---	1.93	0.29	0.93	9.49
38.5-42 cm	3903	0.00	95.59	4.41	---	---	2.09	1.32	3.84	17.49
48.5-50.5 cm	3904	0.00	99.97	0.03	---	---	1.52	0.47	-0.11	5.65
<b>Core 2-4</b>										
4-6 cm	3905	0.00	86.07	13.93	8.10	5.83	2.76	2.24	2.42	7.96
10-12 cm	3906	0.00	98.90	1.10	---	---	1.90	0.76	5.61	46.99
16-18 cm	3907	0.00	81.46	18.54	8.21	10.33	3.17	2.78	1.94	5.42
26-28 cm	3908	0.00	94.22	5.78	2.66	3.12	2.21	1.64	3.99	19.17
29-31 cm	3909	0.00	91.41	8.59	3.71	4.88	2.56	1.92	3.25	12.95
36-38 cm	3910	0.00	99.27	0.73	---	---	1.79	0.66	5.65	54.44
45-46.5 cm	3911	0.00	97.17	2.83	---	---	2.23	1.04	4.69	26.45
49-51 cm	3912	0.00	99.50	0.50	---	---	1.87	0.56	6.43	72.48
Grab	3954	0.01	99.99	0.00	---	---	1.70	0.35	-0.62	8.59
Grab	3957	0.00	100.00	0.00	---	---	1.75	0.27	0.61	6.39
Grab	3955	0.04	99.53	0.43	---	---	1.71	0.46	0.42	12.83
Grab	3956	1.18	91.58	7.24	---	---	2.35	1.70	1.86	8.92
Grab	3959	0.00	95.38	4.62	---	---	2.40	1.26	3.47	15.74
<b>SOUTH BAY</b>										
Grab	3958	68.29	23.81	7.90	6.32	1.58	-1.39	3.36	1.16	3.61
<b>BATHURST BAY</b>										
Grab	3963	7.28	23.91	68.81	55.09	13.71	4.94	3.18	-0.72	3.87

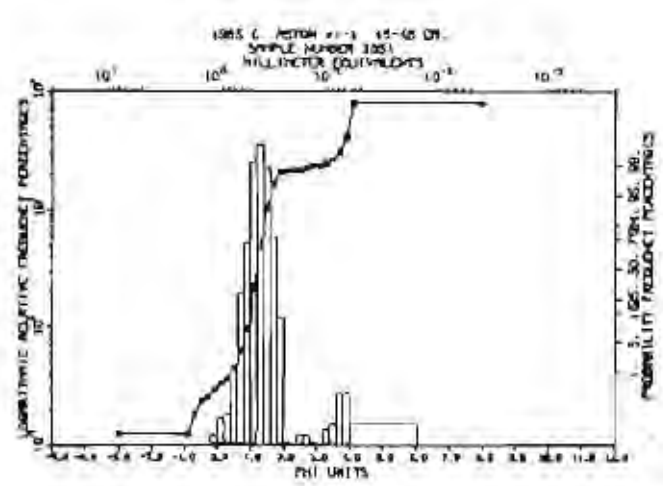
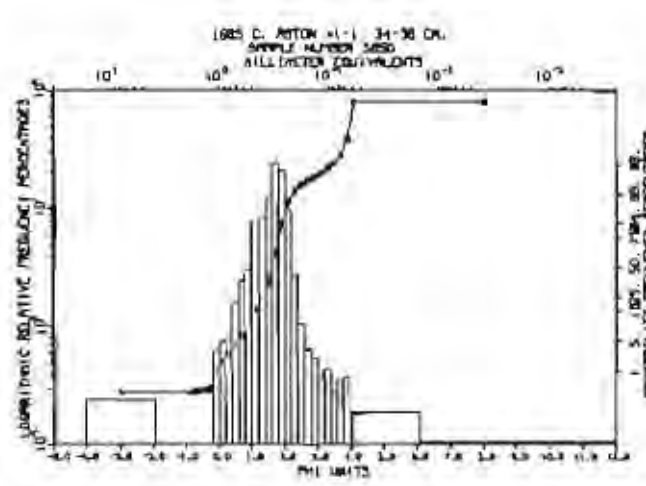
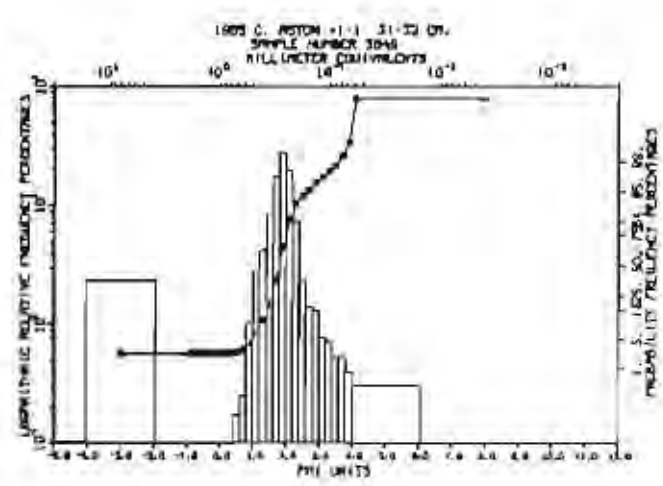
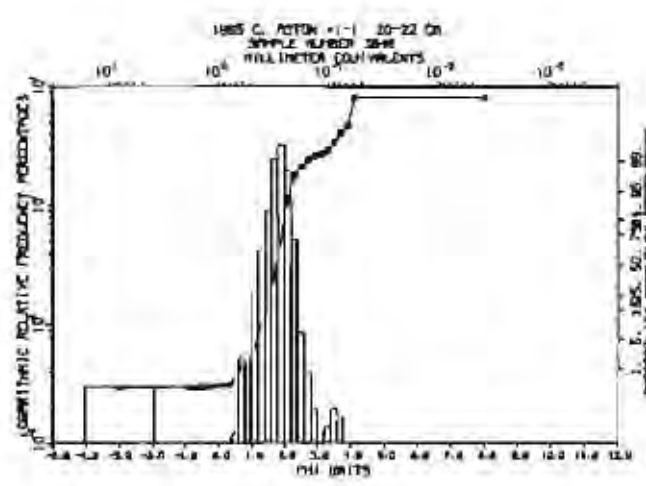
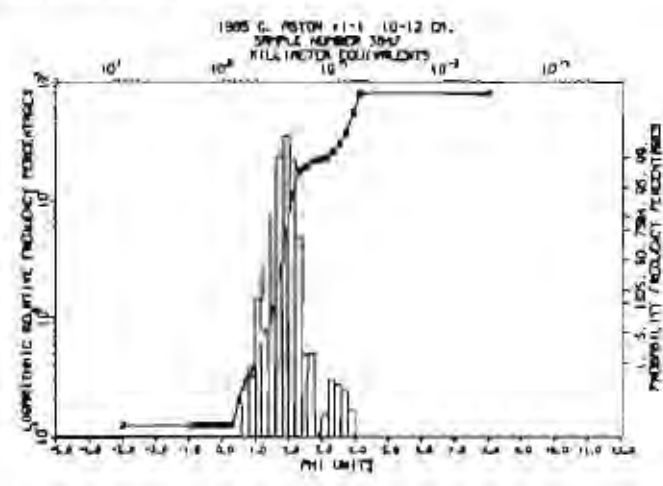
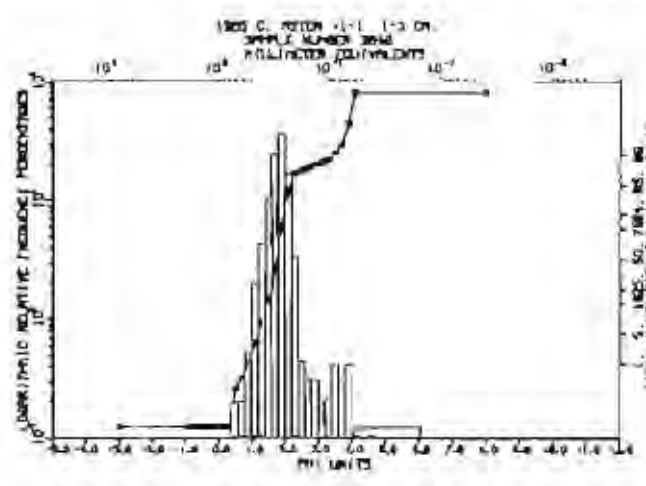
CAMBRIDGE FIORD GRAB



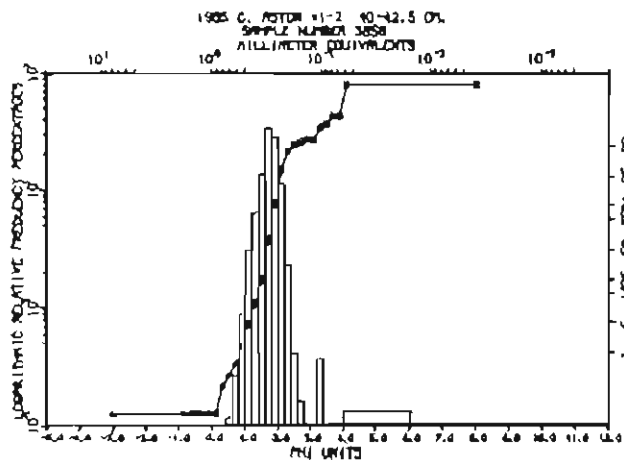
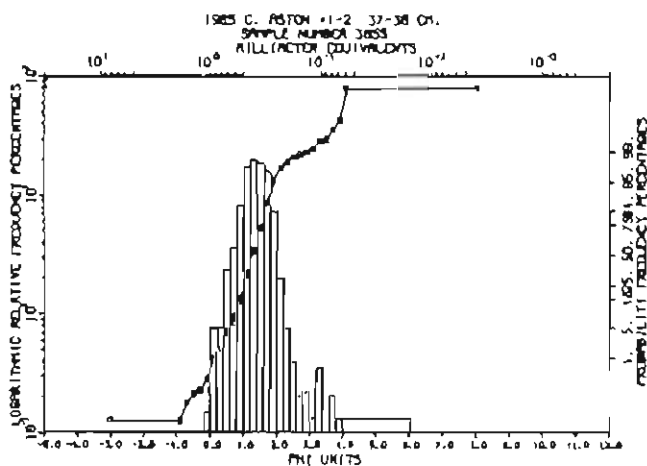
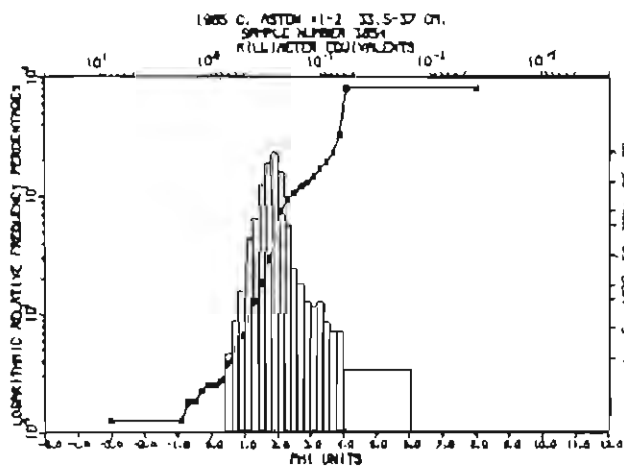
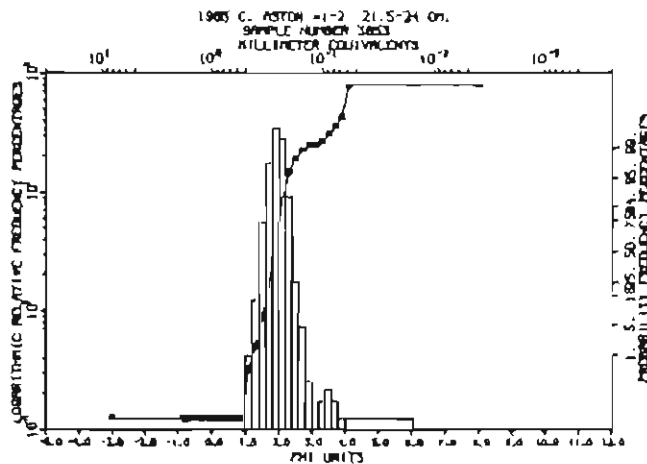
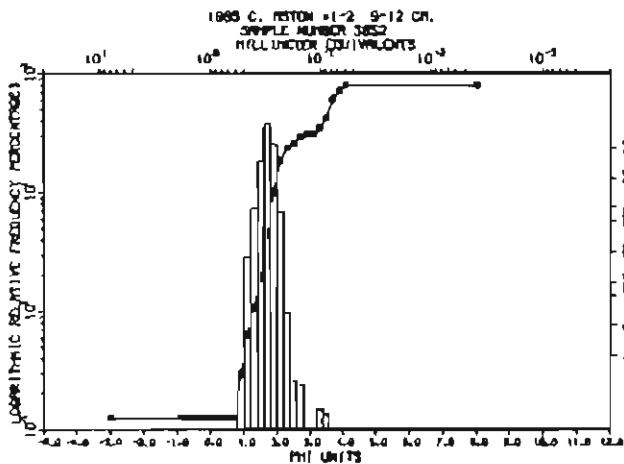
CAPE ADAIR GRABS



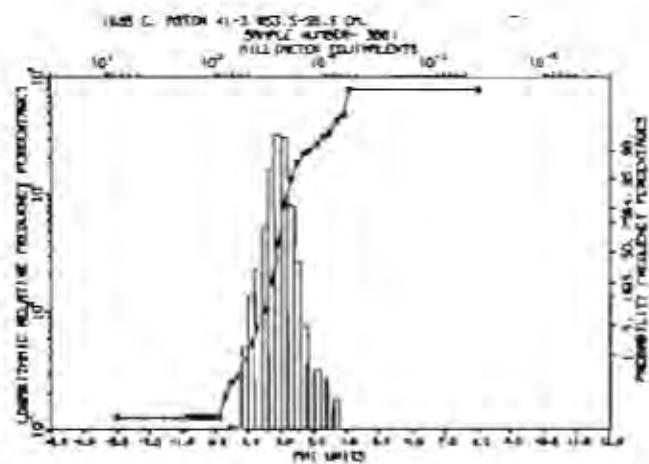
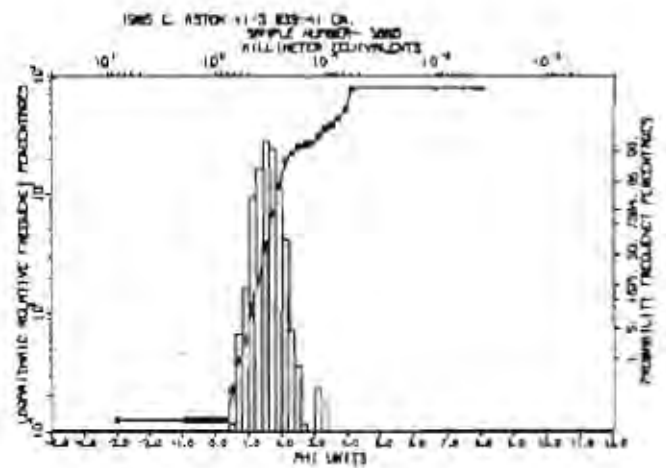
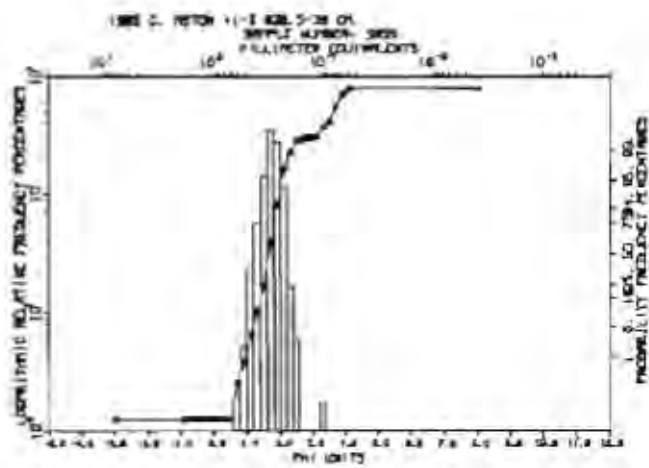
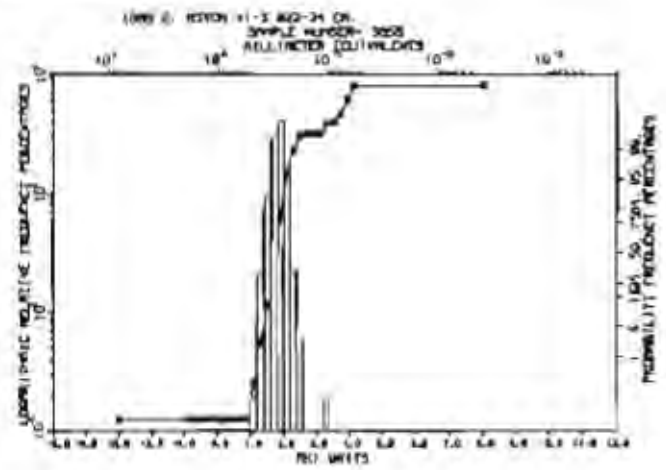
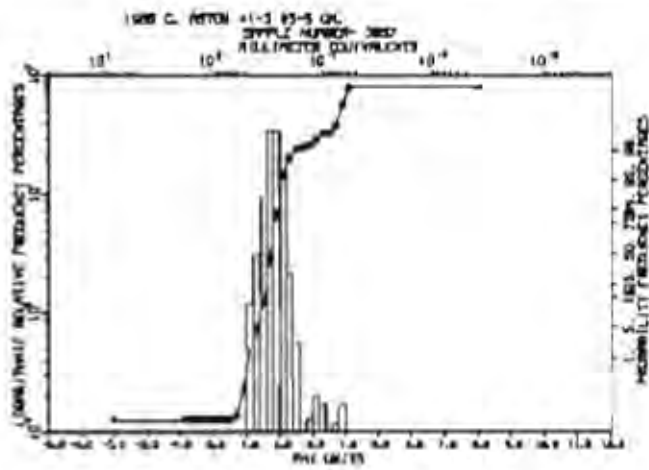
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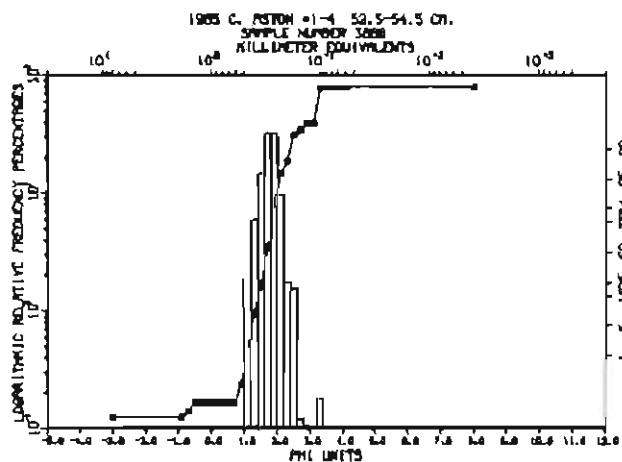
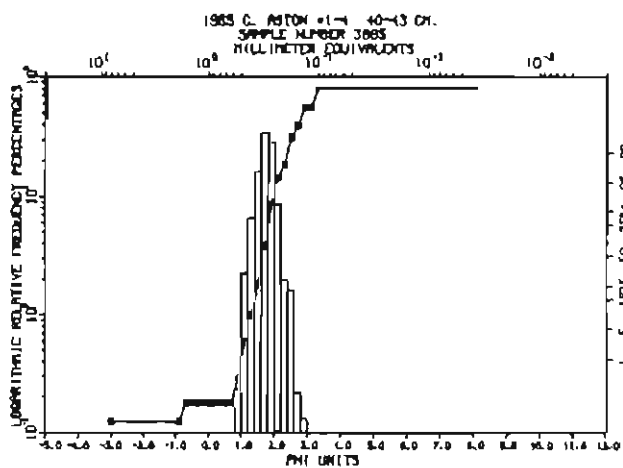
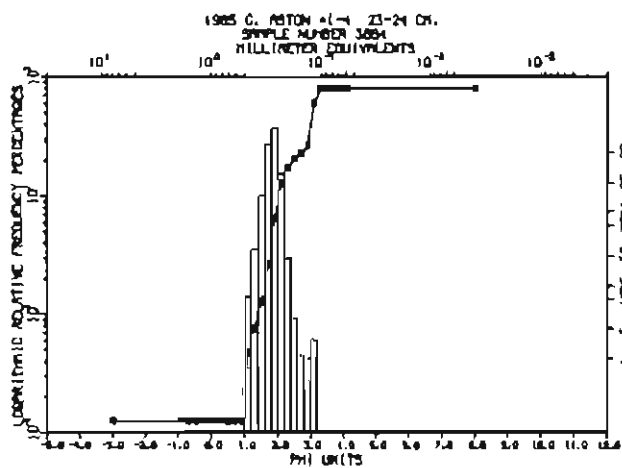
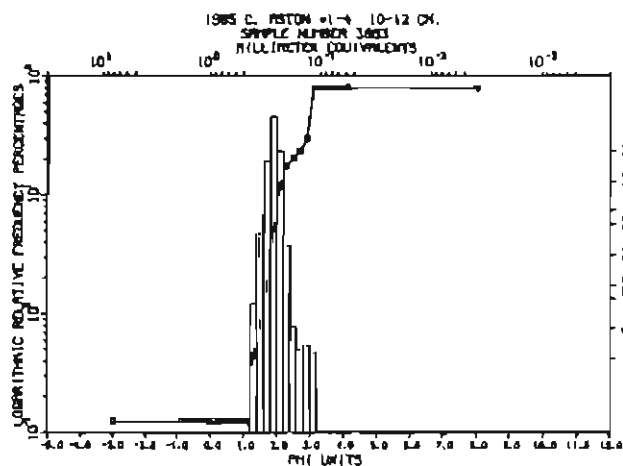
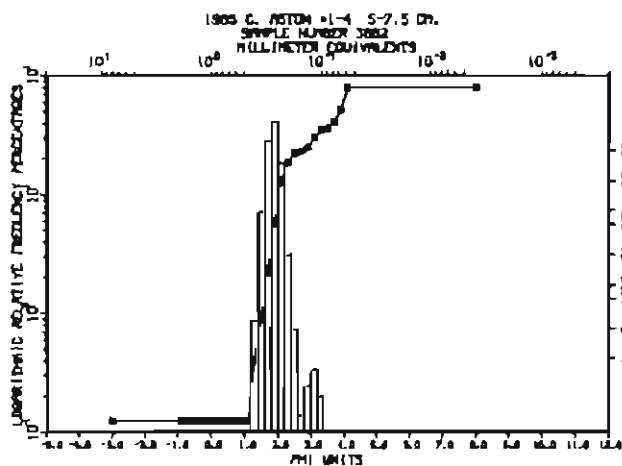
CAPE ASTON CORE 1-2



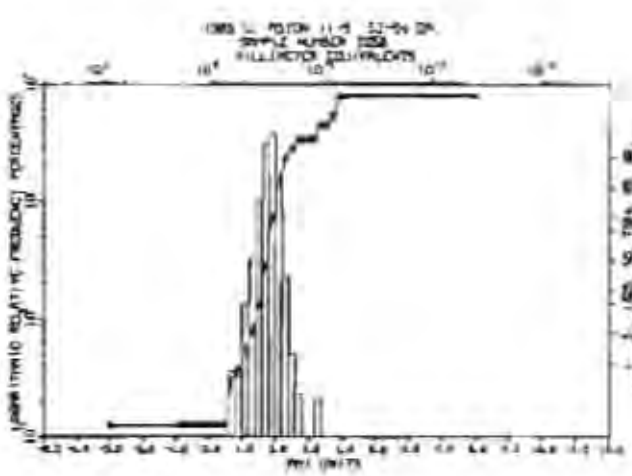
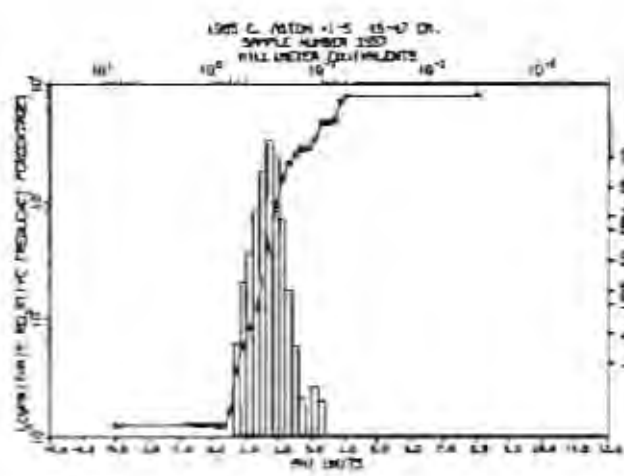
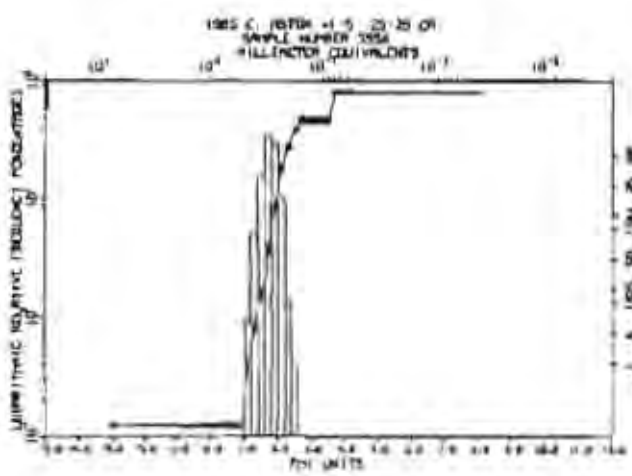
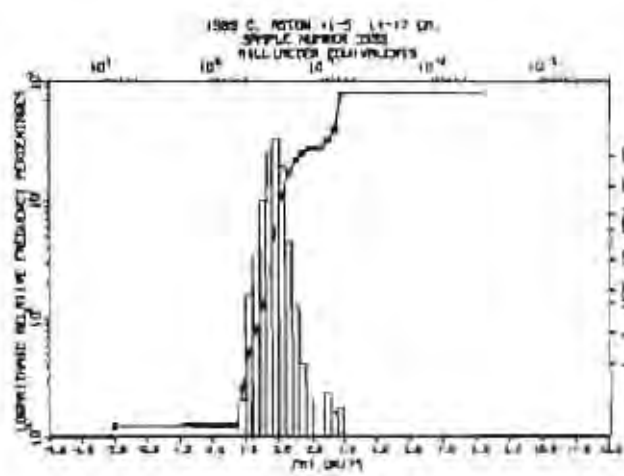
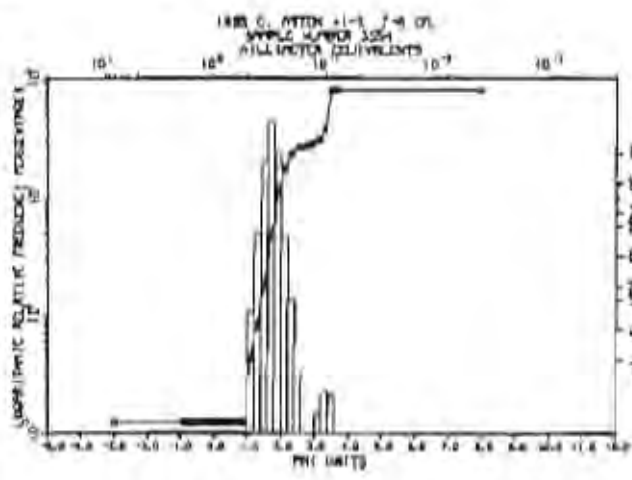
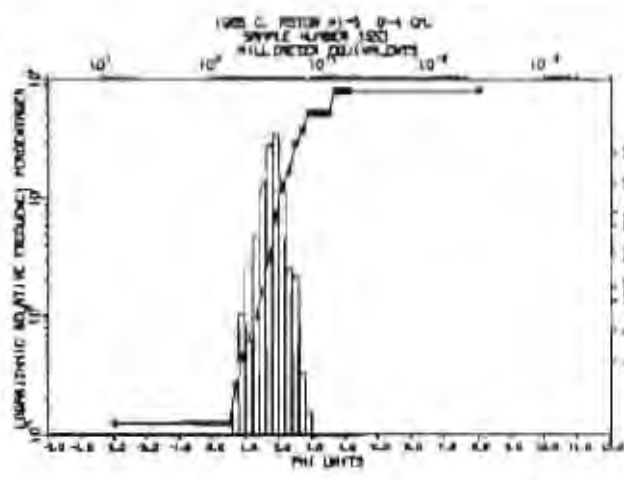
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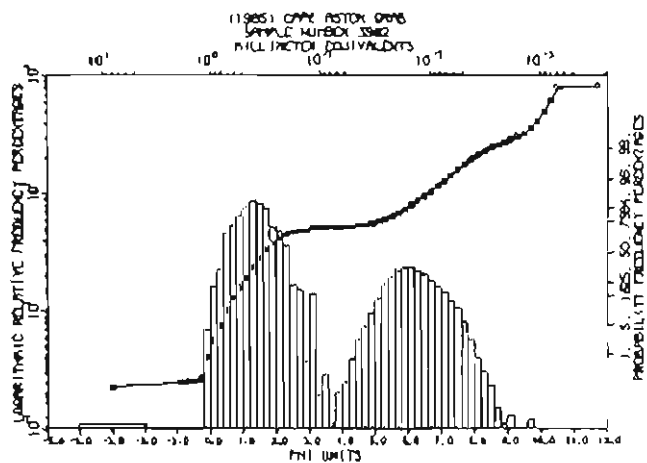
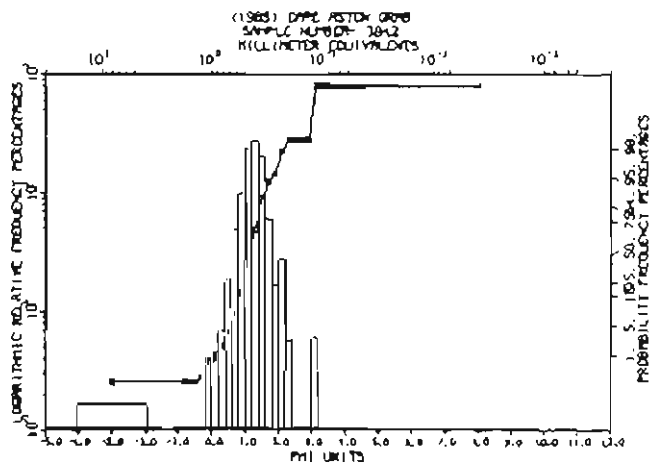
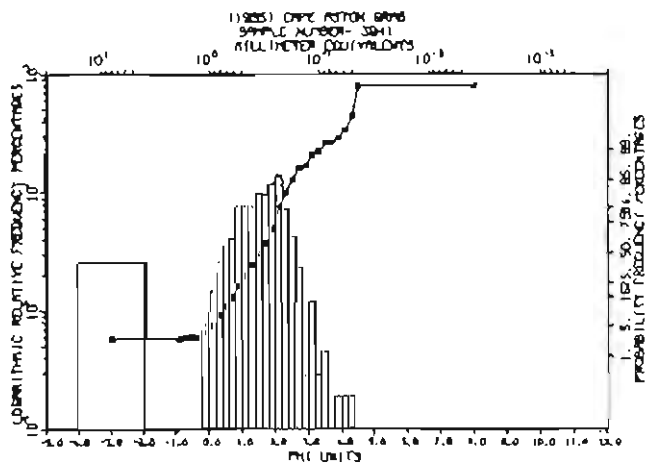
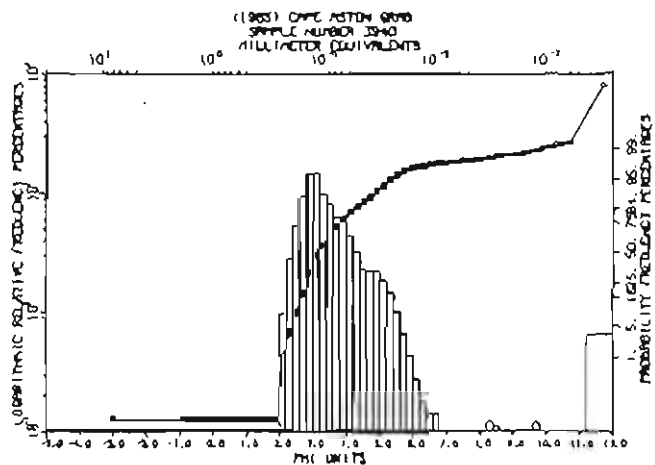
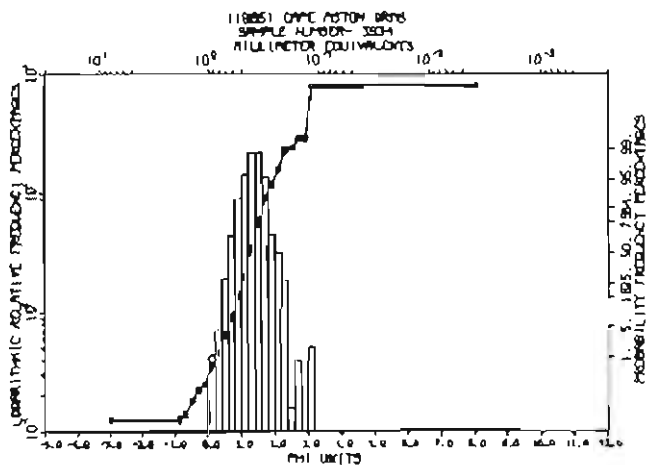
## CAPE ASTON CORE 1-4



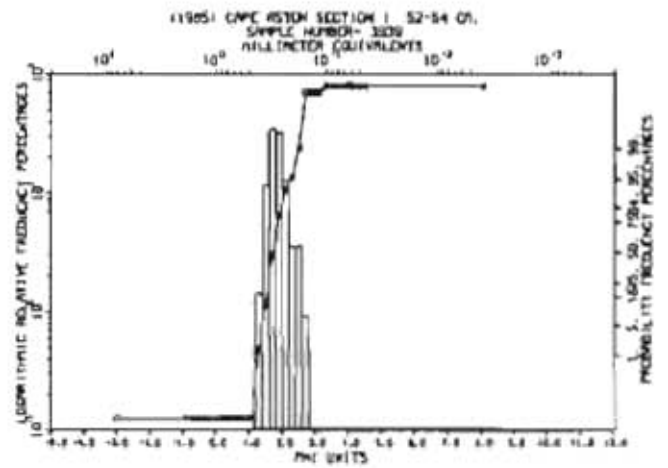
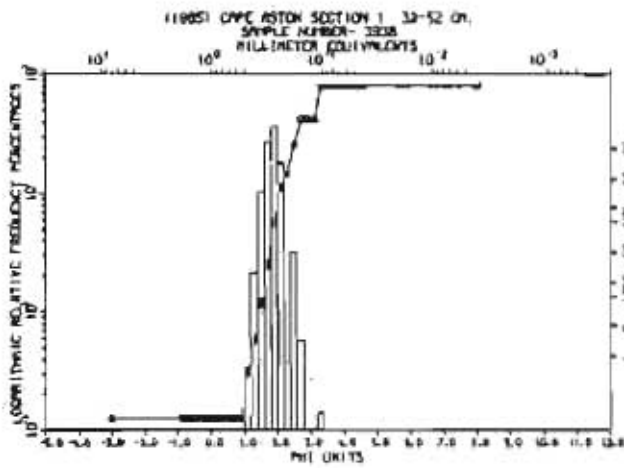
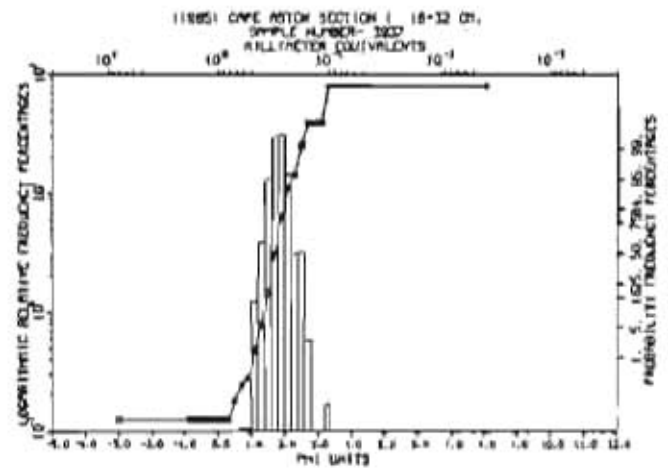
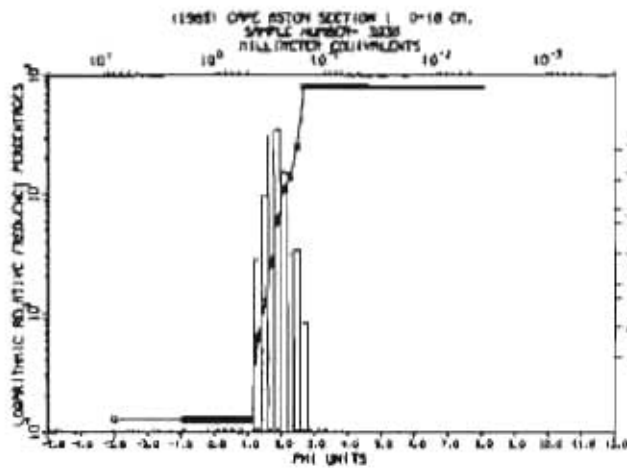
CAPE ASTON CORE 1-5



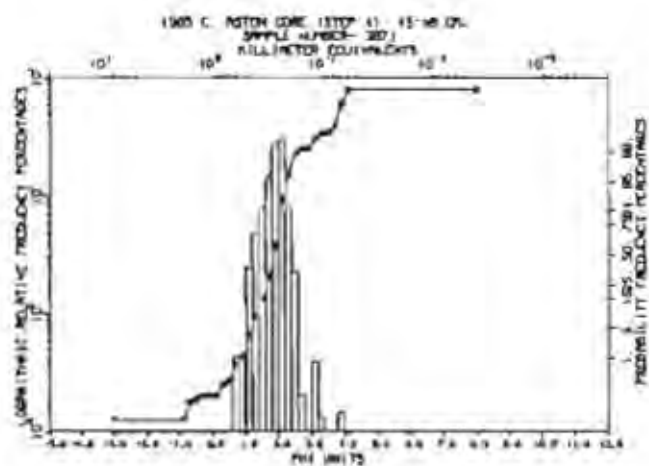
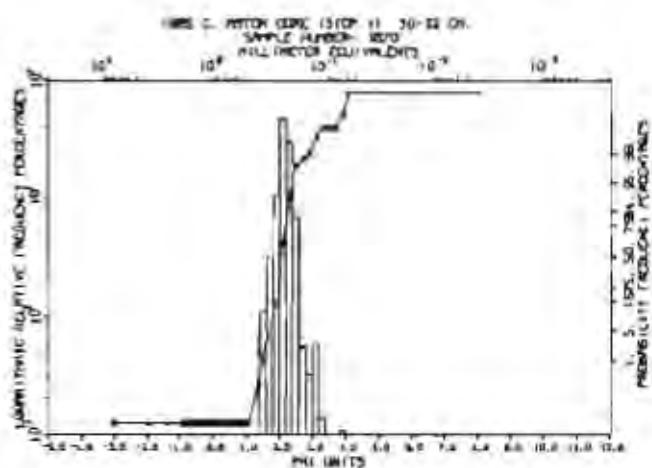
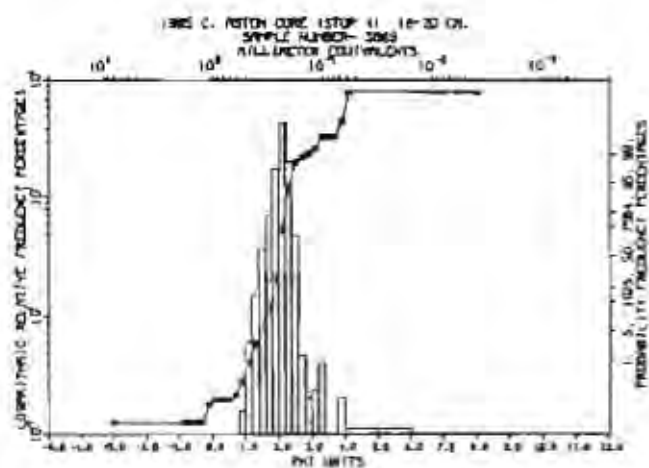
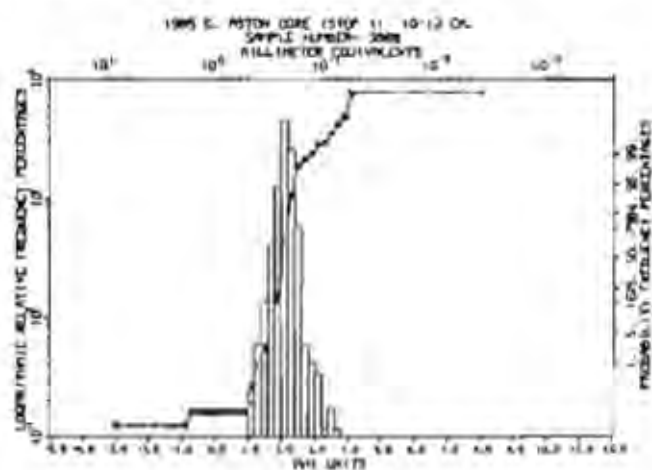
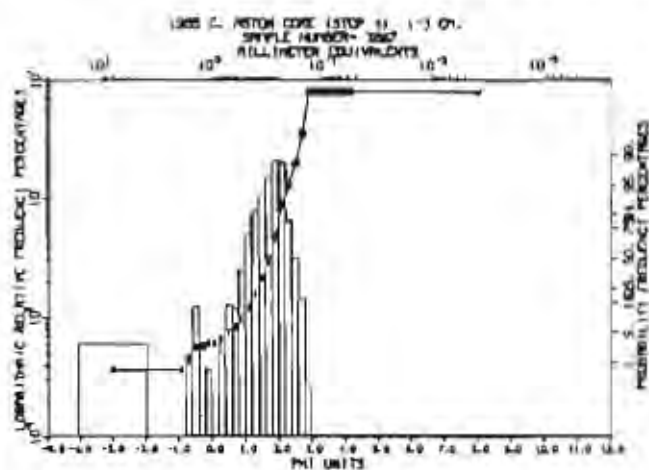
CAPE ASTON GRABS



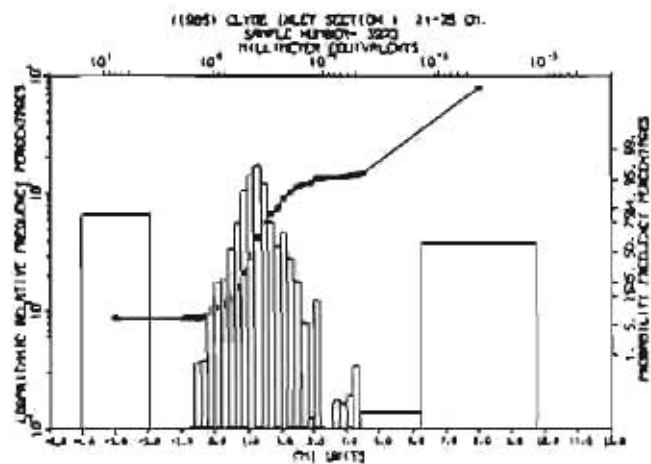
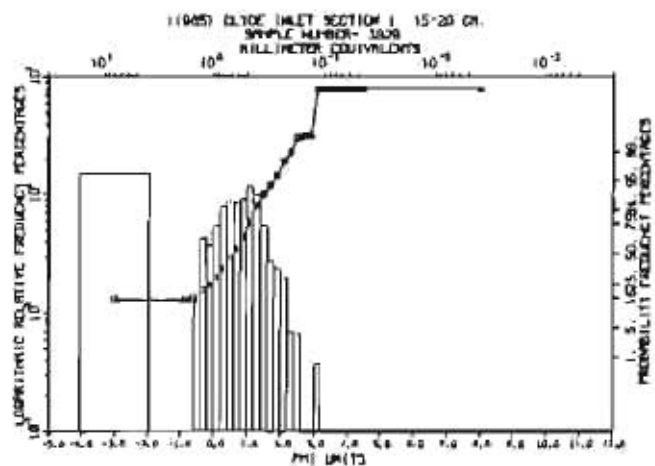
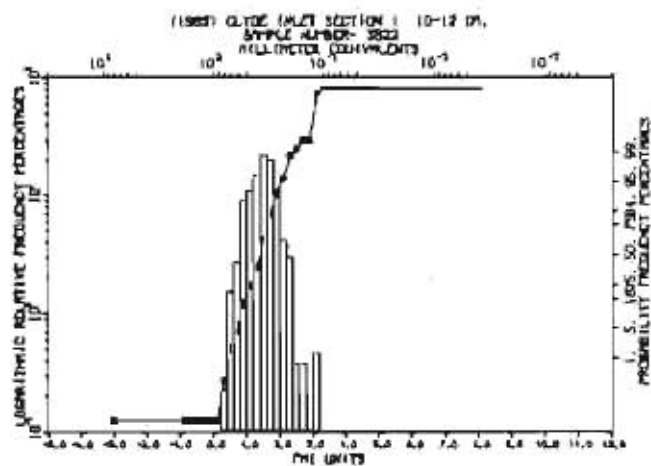
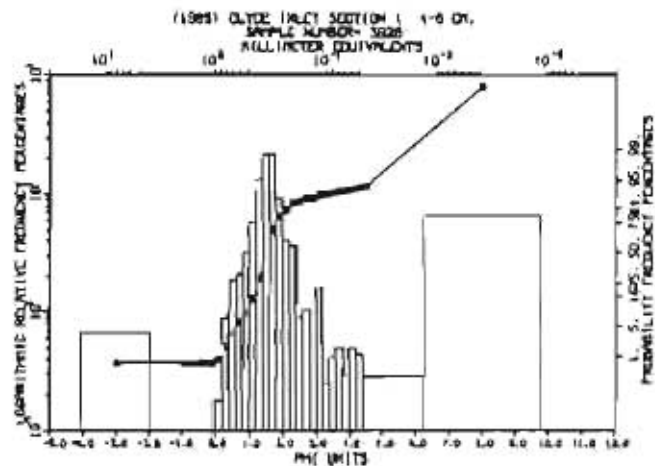
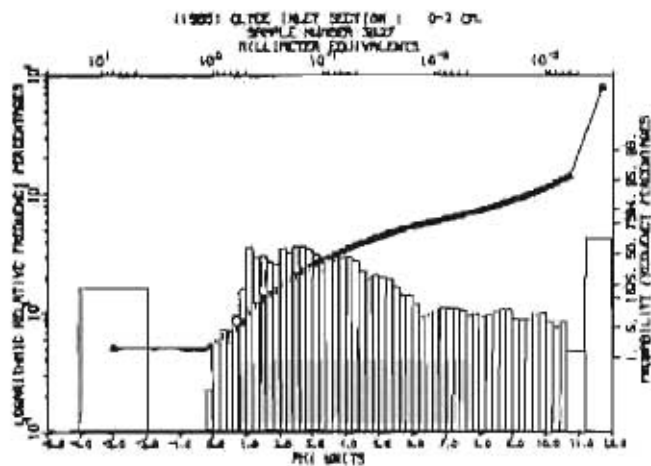
## CAPE ASTON SECTION 1



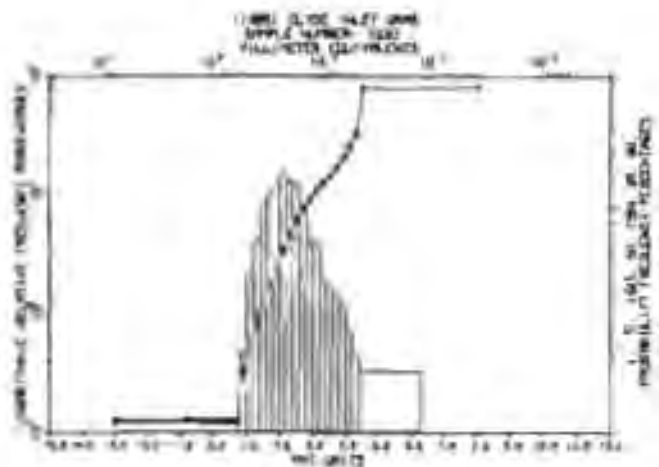
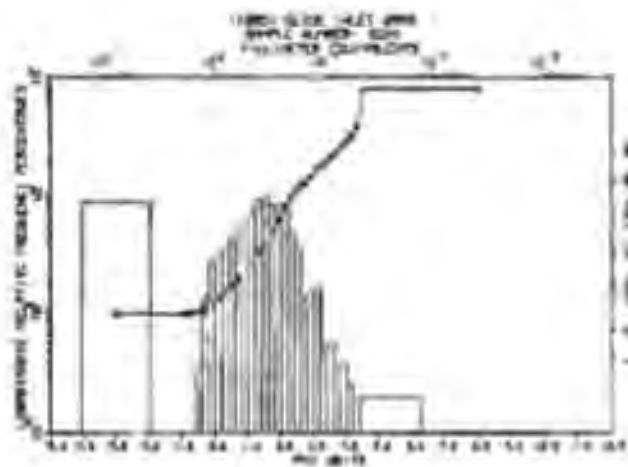
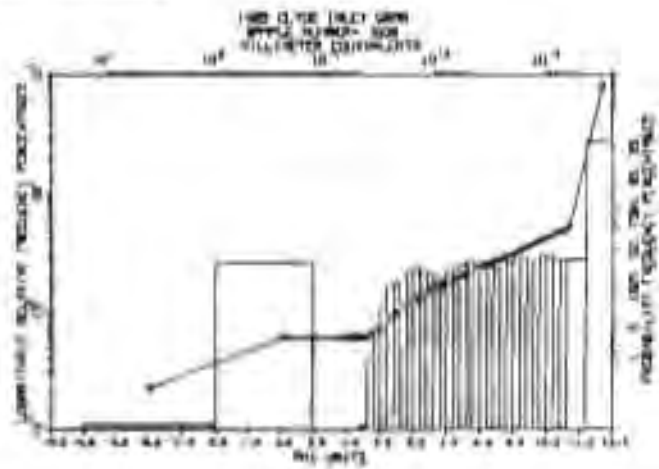
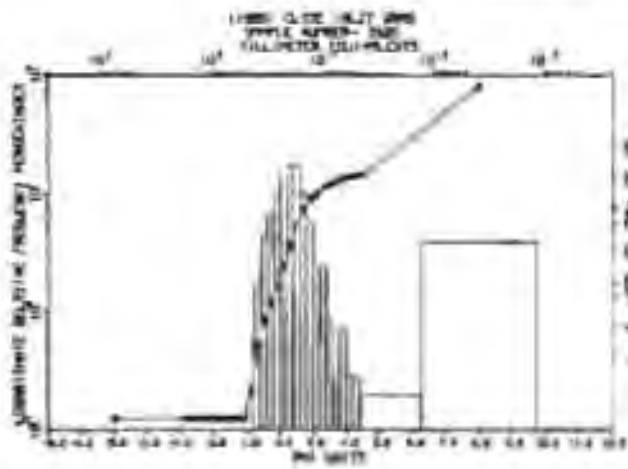
## CAPE ASTON CORE (STOP 4)



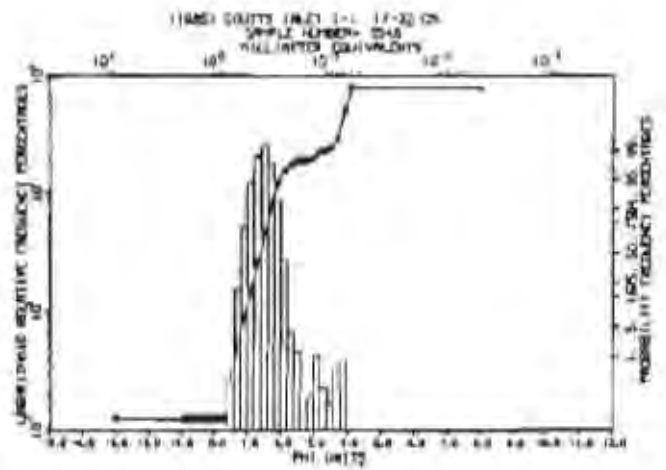
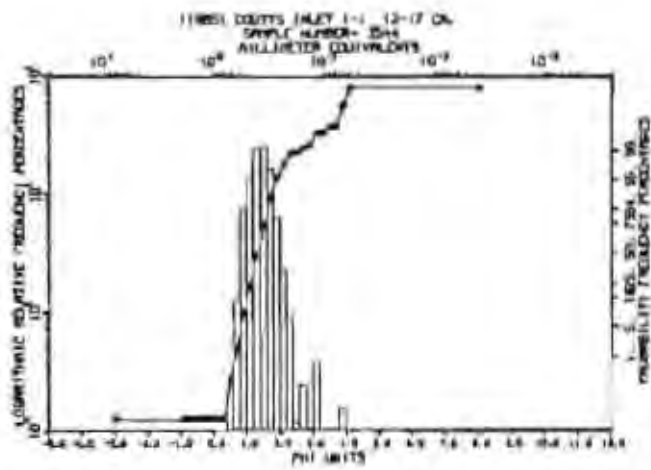
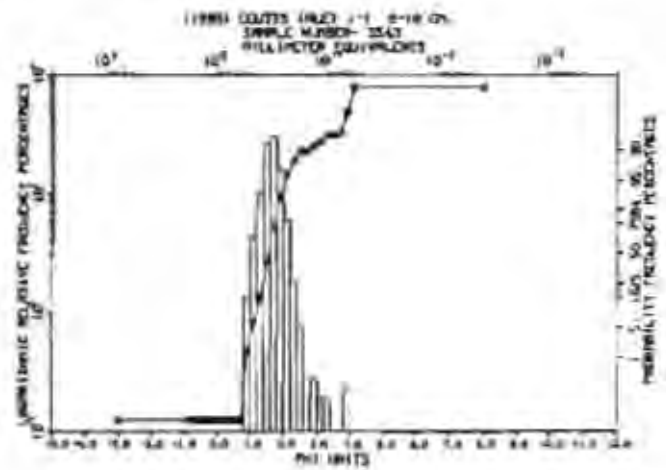
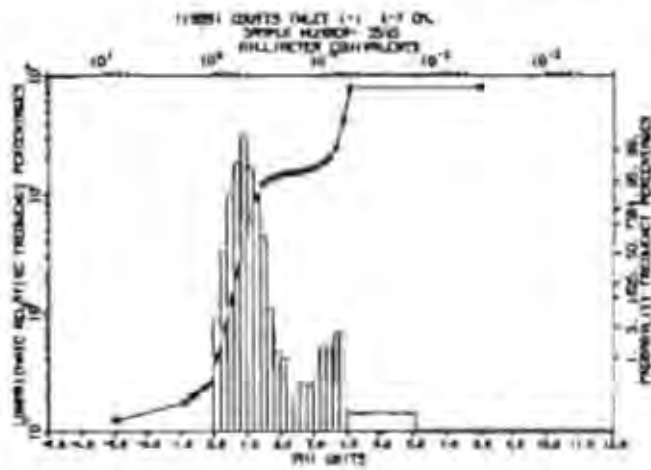
## CLYDE INLET SECTION 1



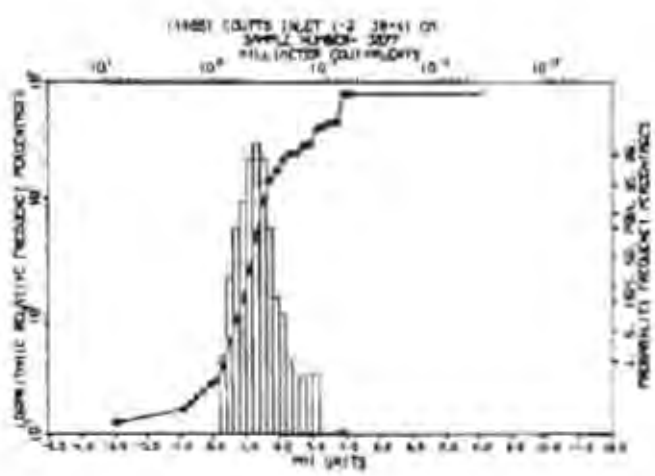
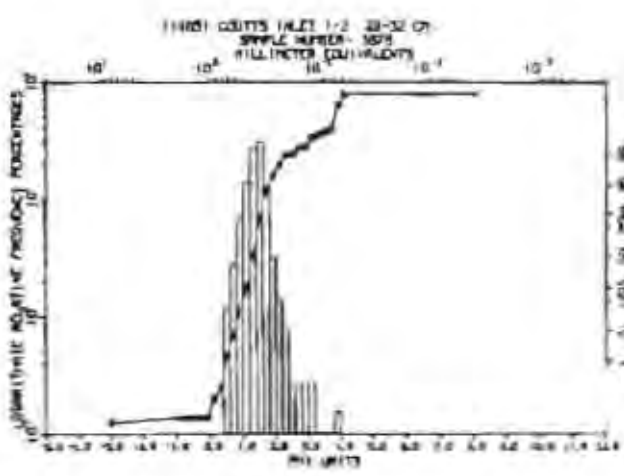
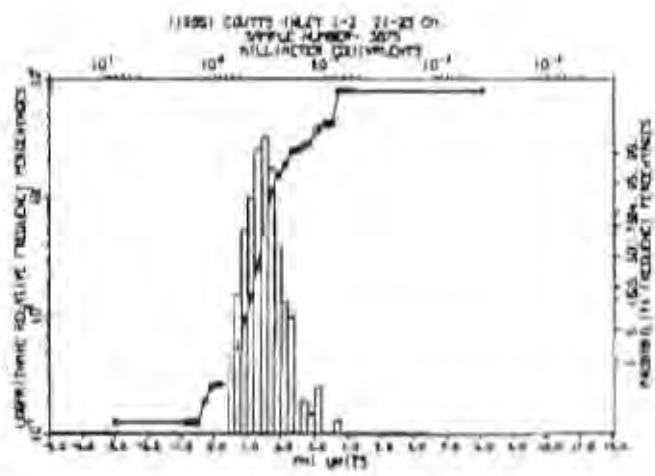
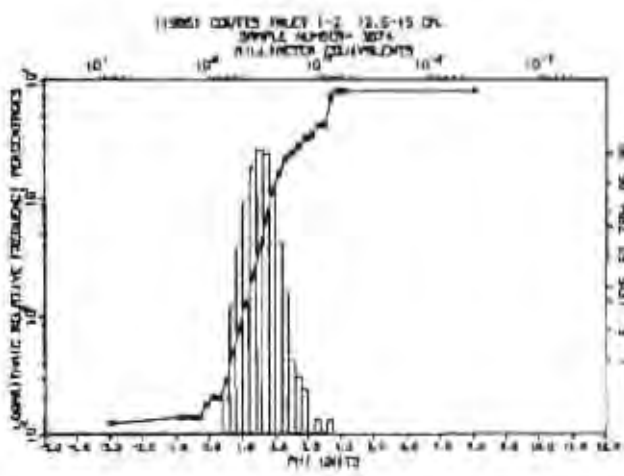
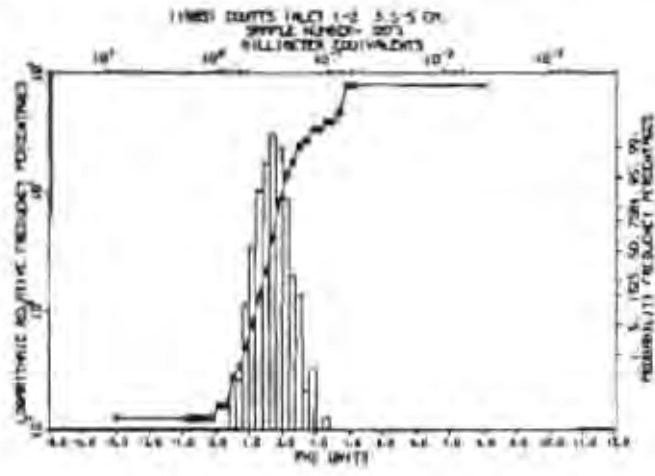
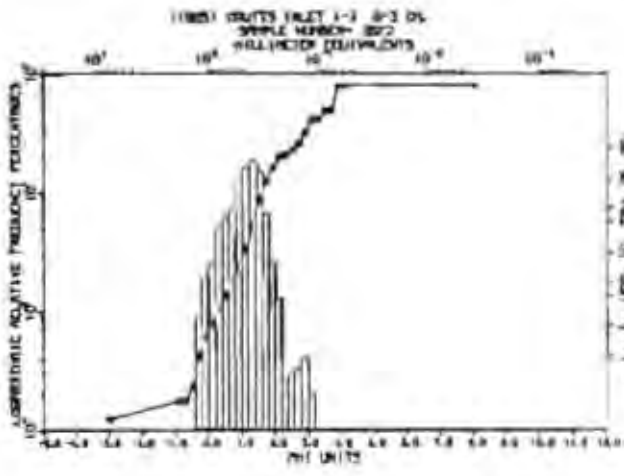
## CLYDE INLET GRABS



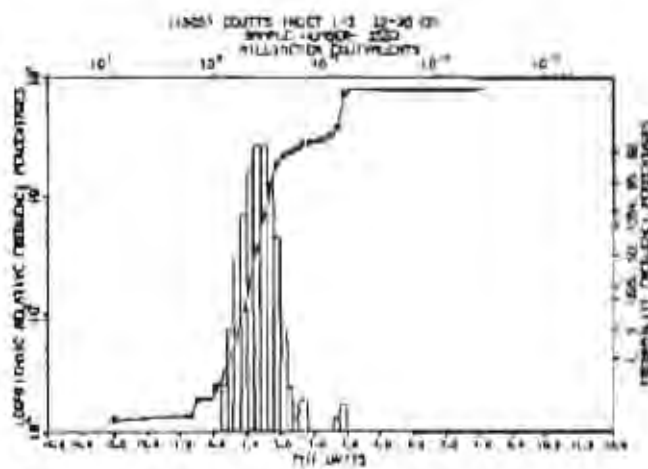
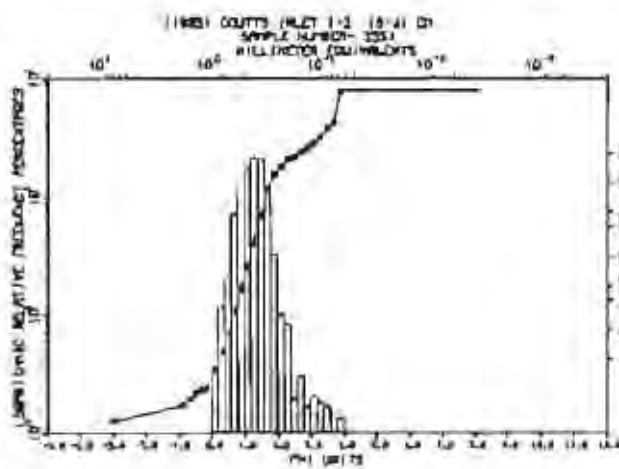
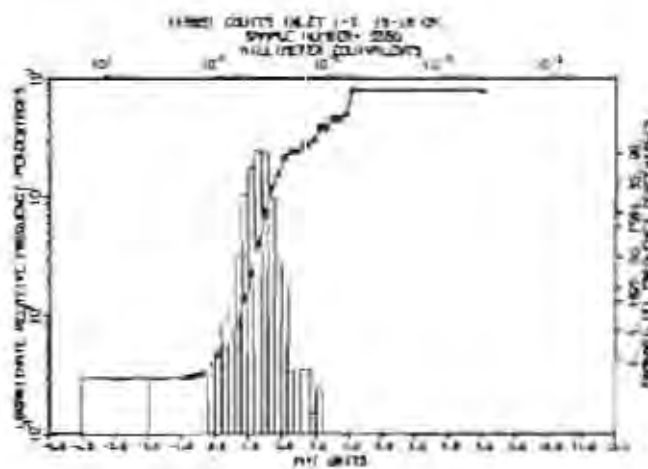
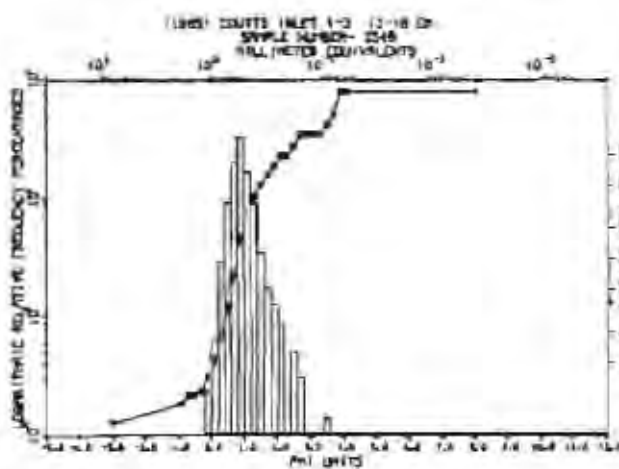
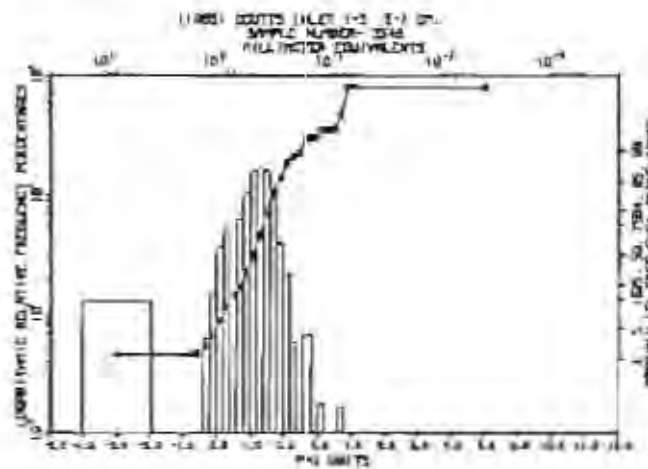
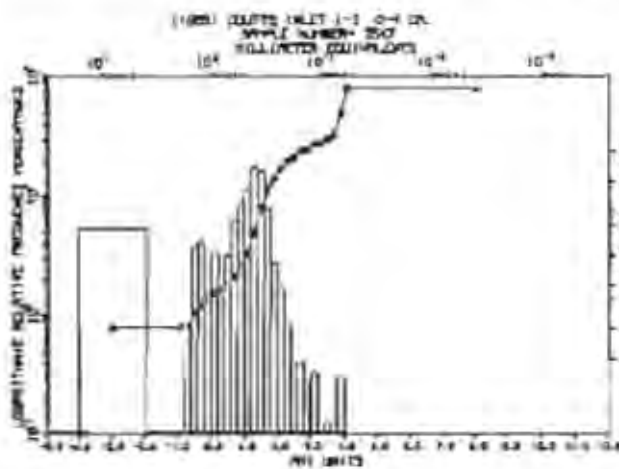
## COUTTS INLET CORE 1-1



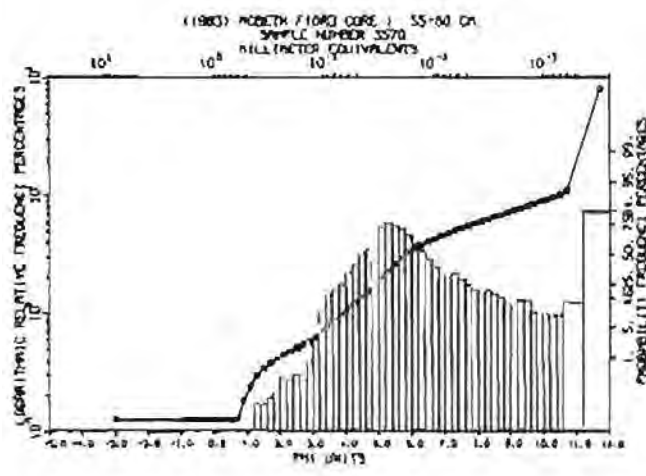
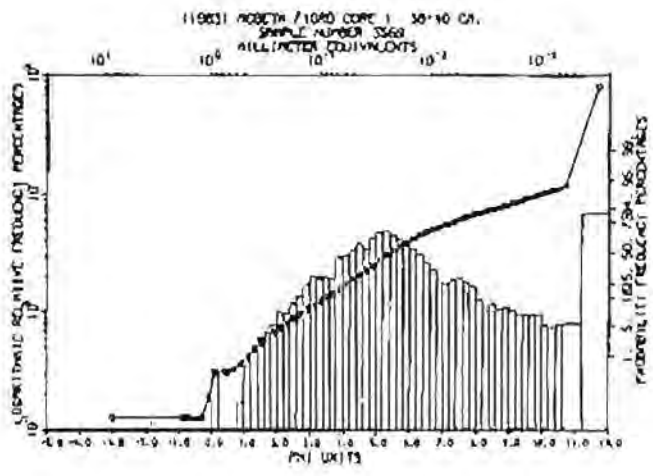
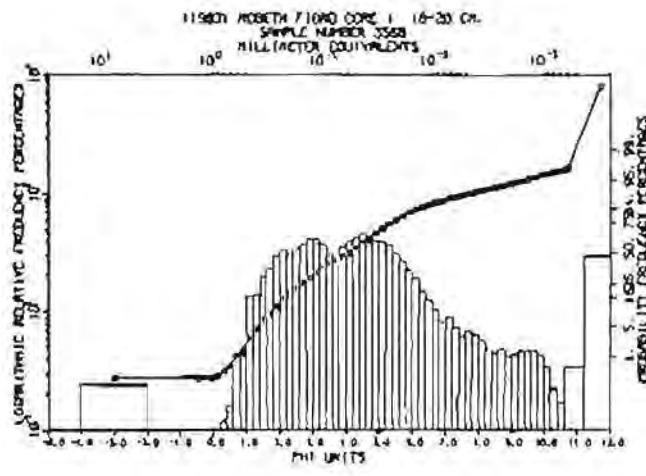
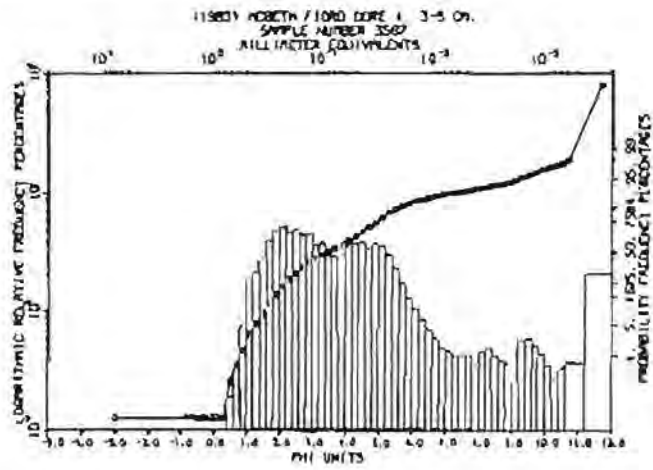
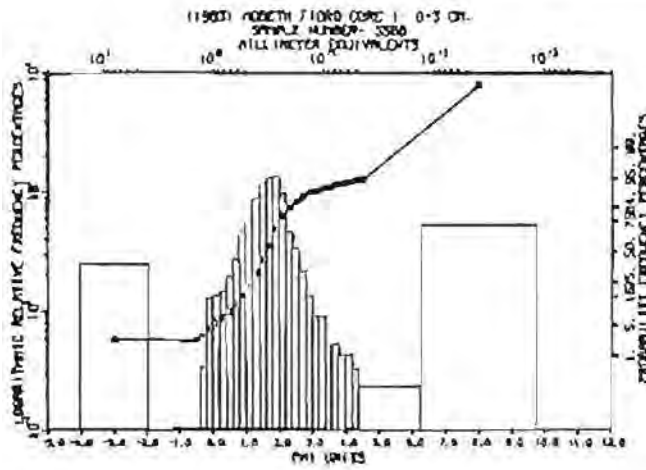
COUTTS INLET CORE 1-2



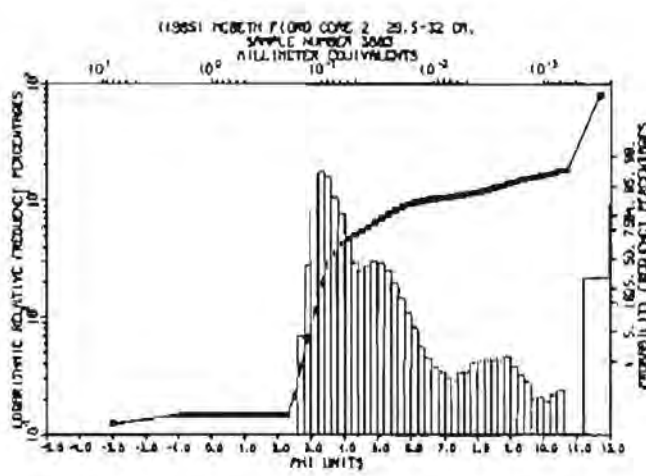
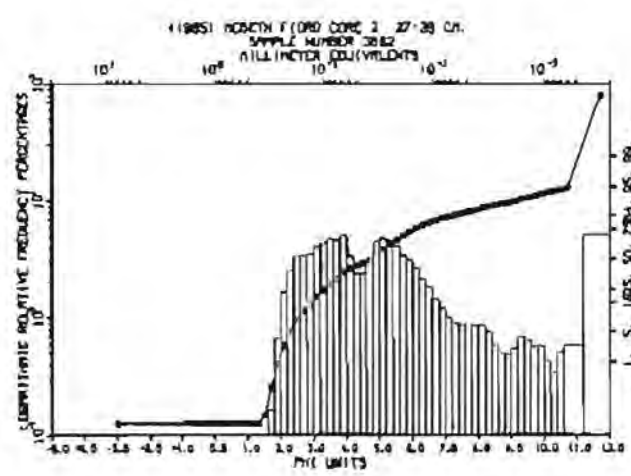
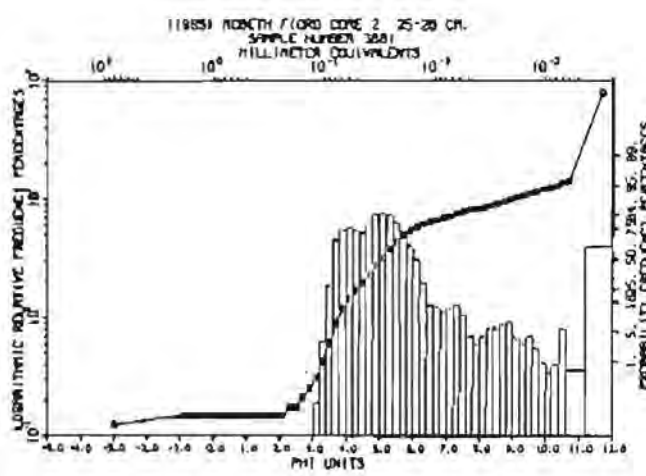
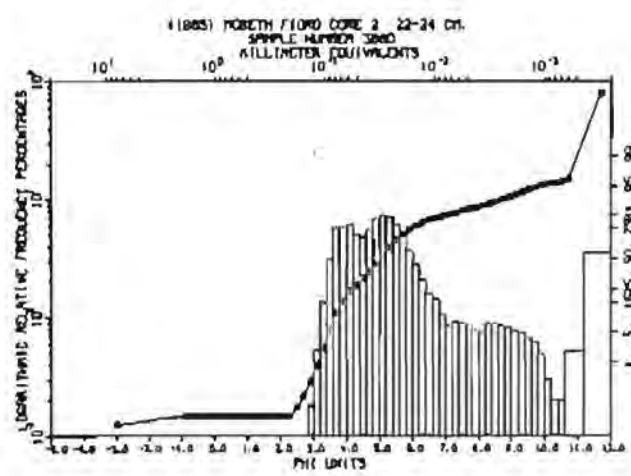
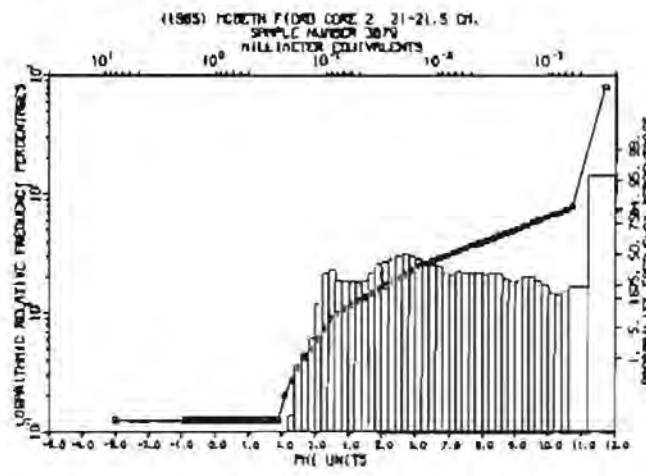
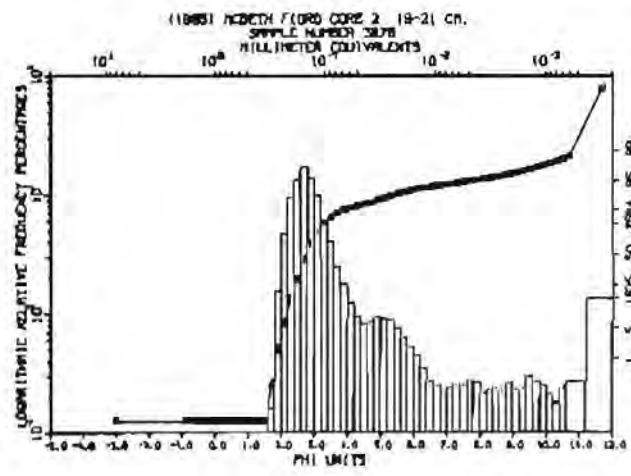
COUTTS INLET CORE 1-3



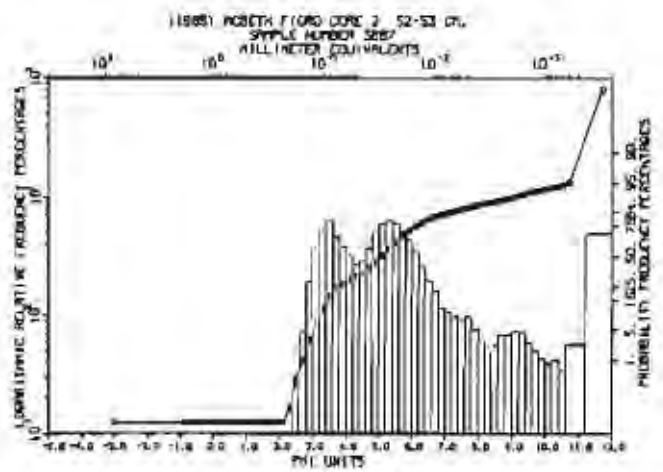
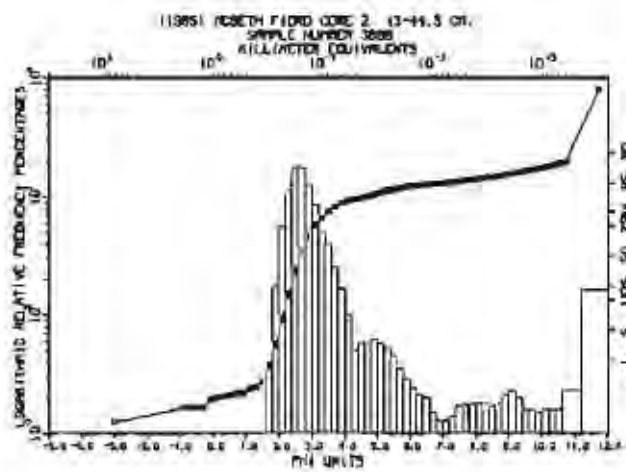
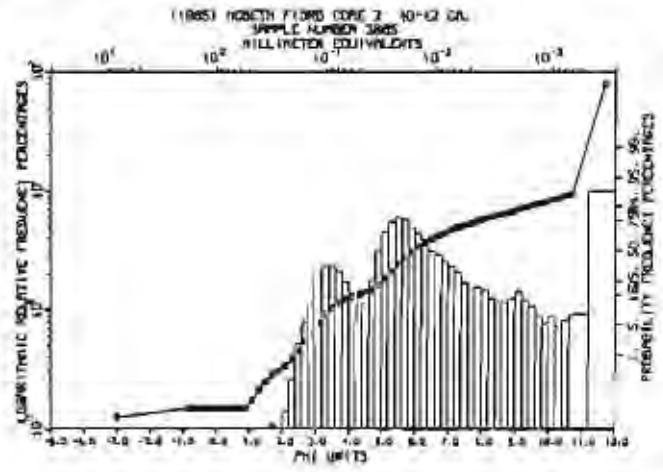
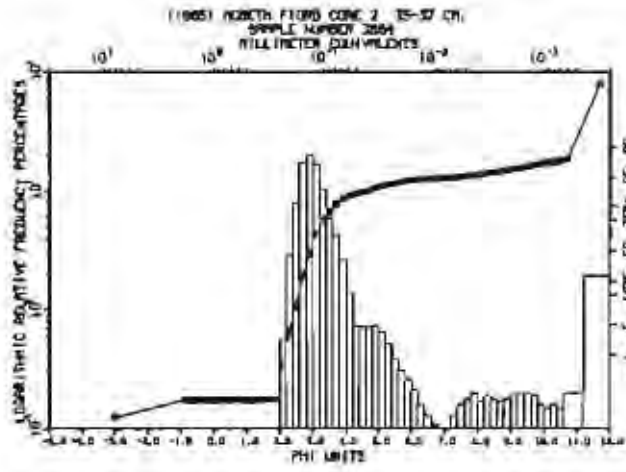
MCBETH FIORD CORE 1



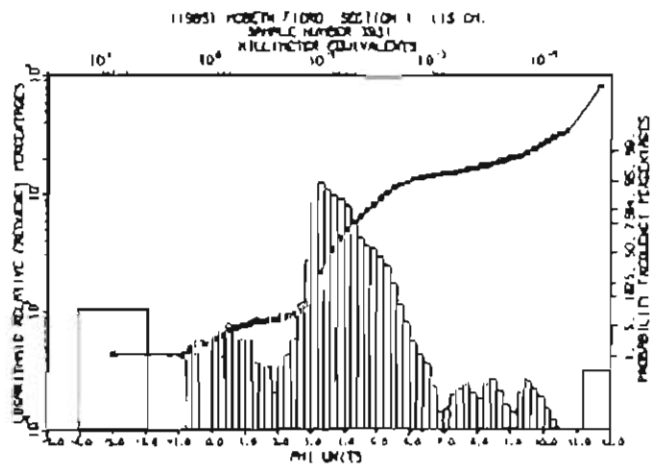
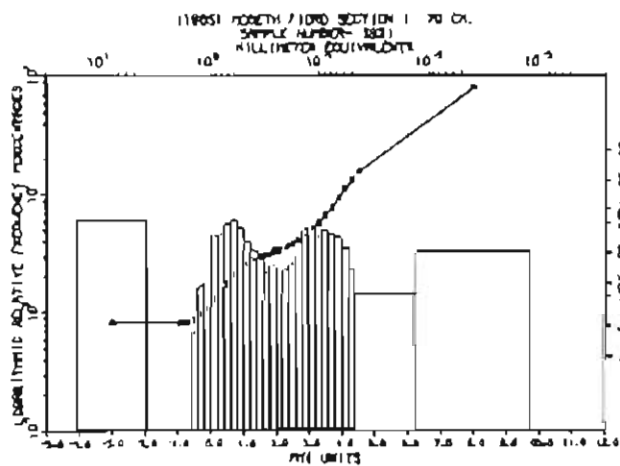
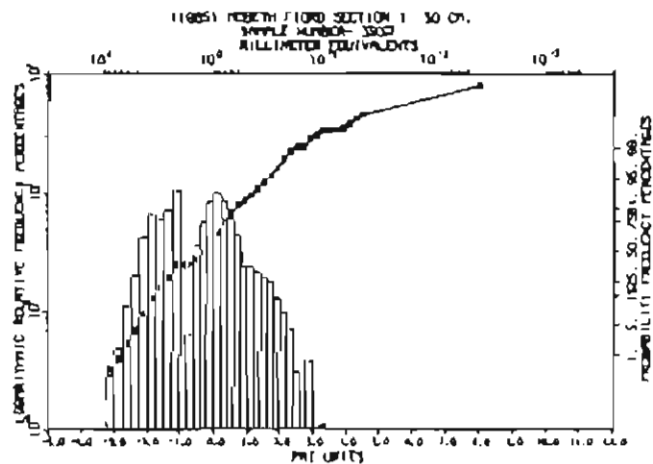
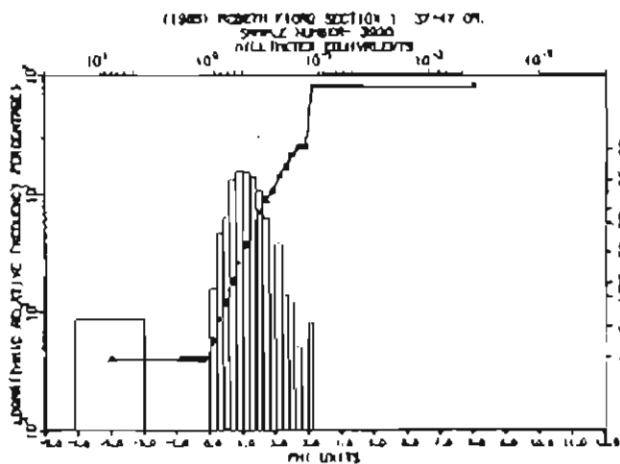
MCBETH FIORD CORE 2



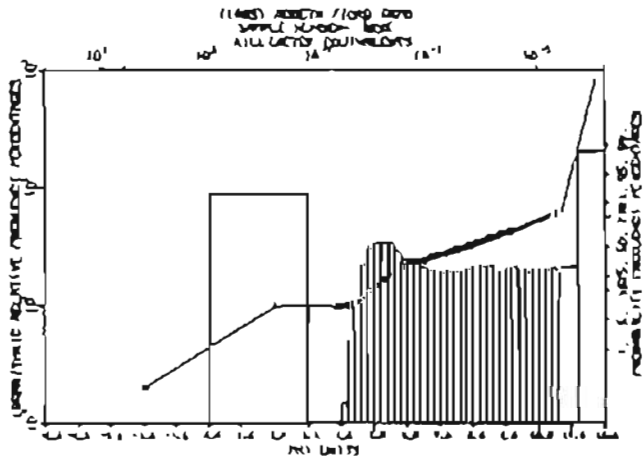
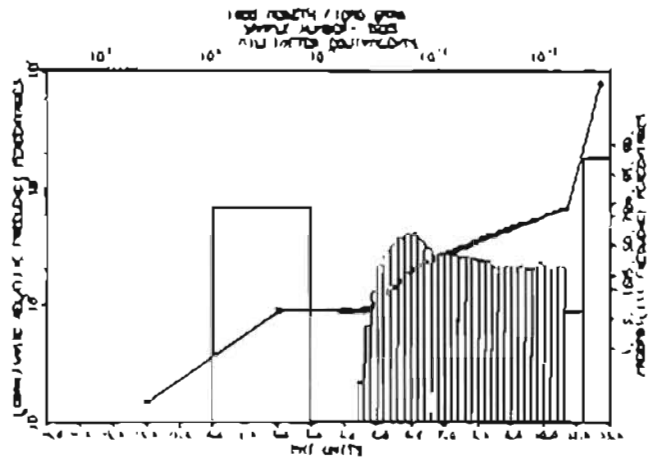
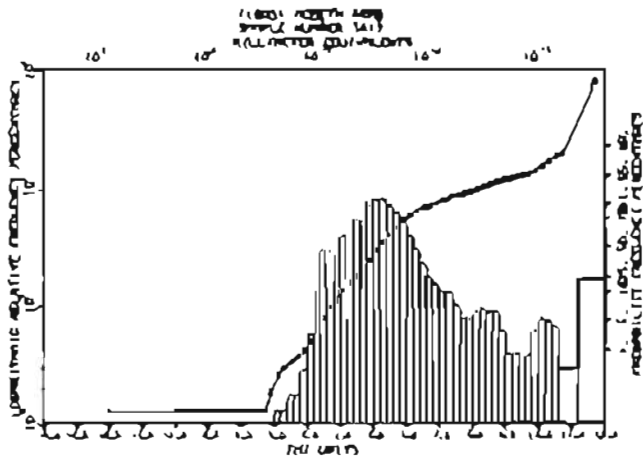
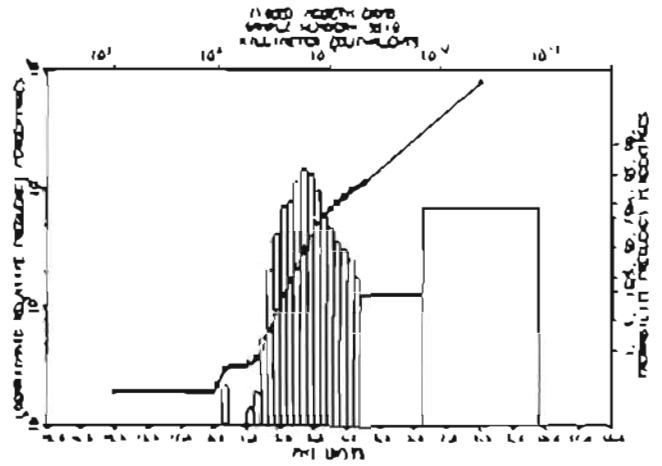
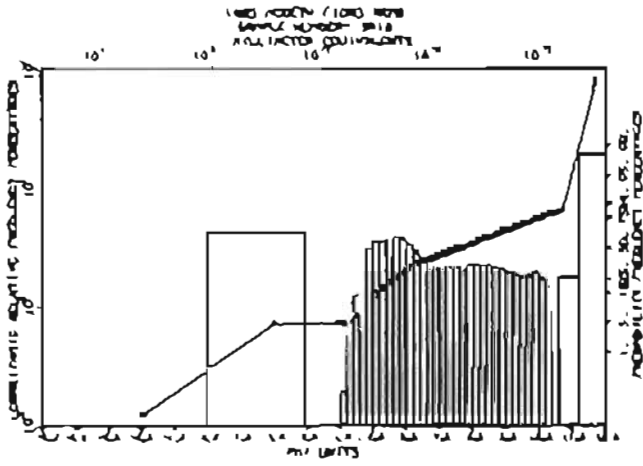
MCBETH FIORD CORE 2



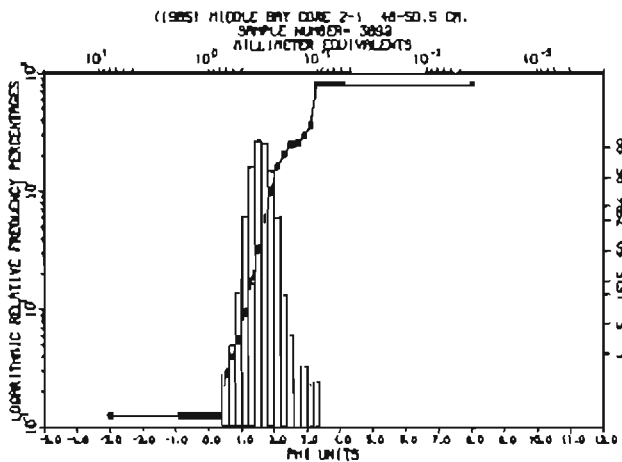
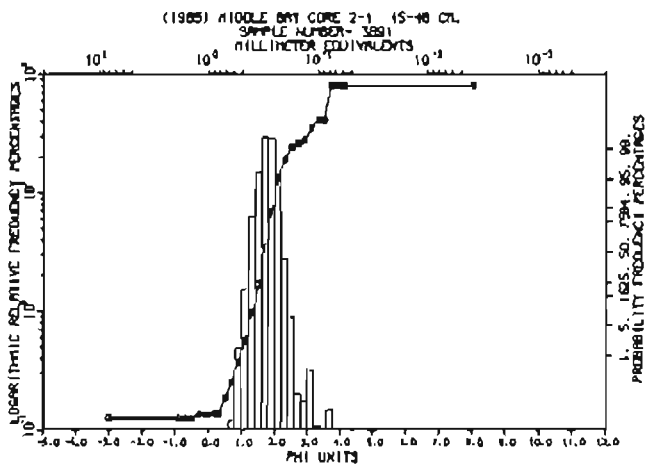
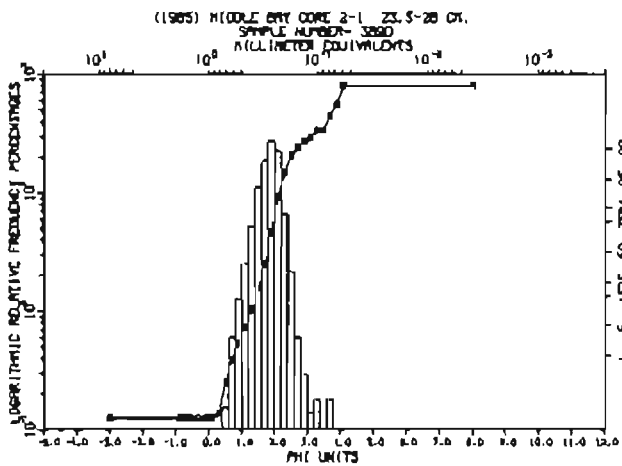
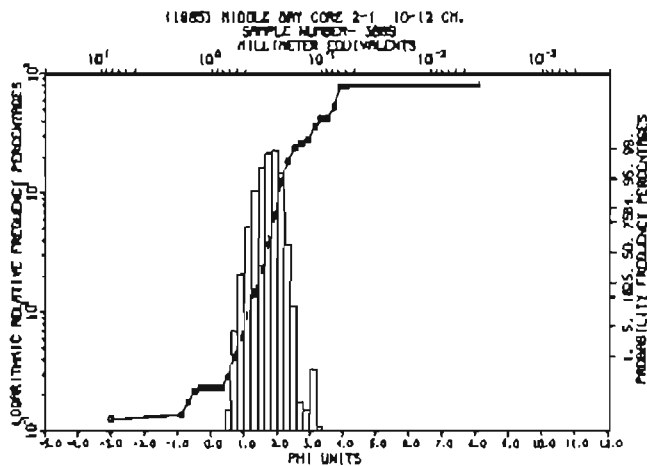
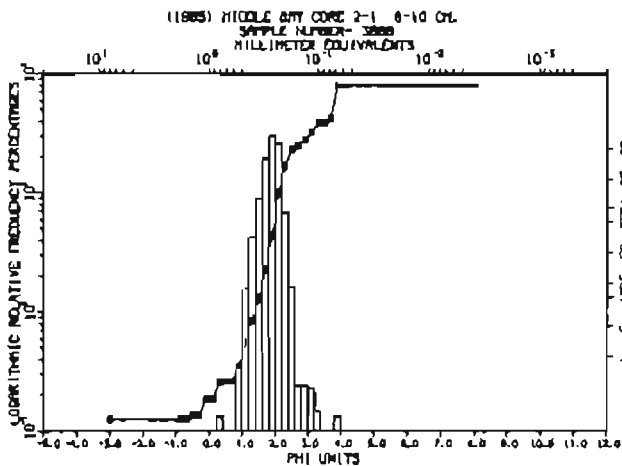
## MCBETH FIORD SECTION 1



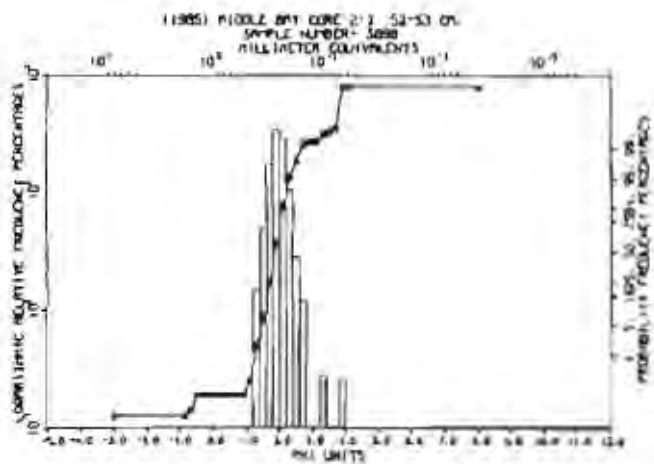
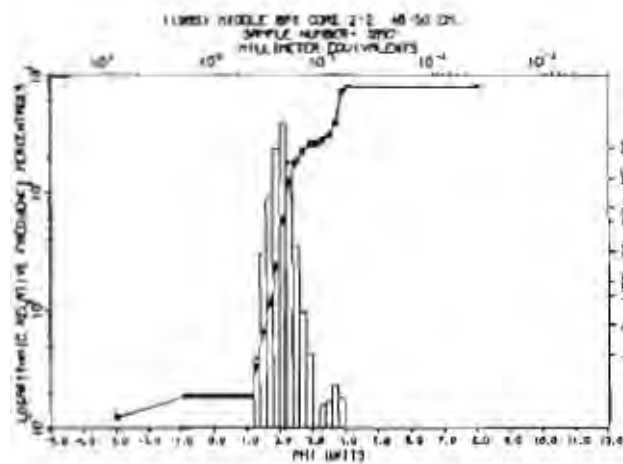
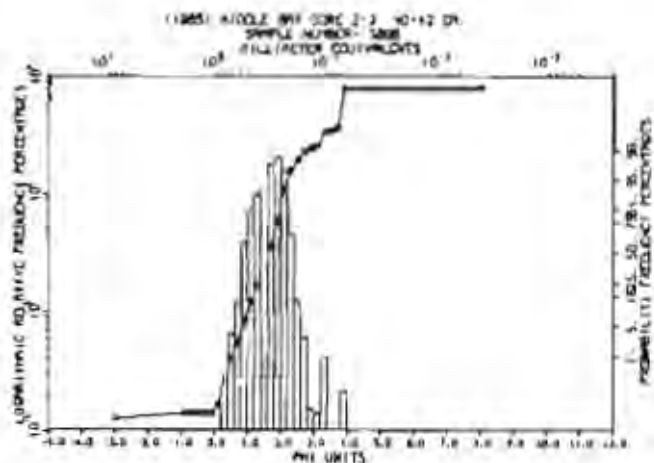
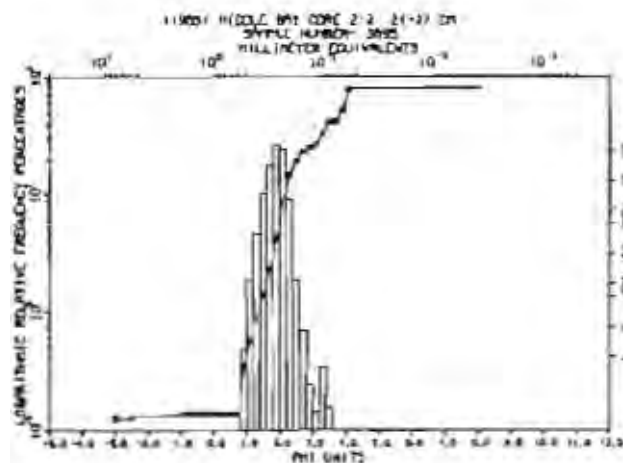
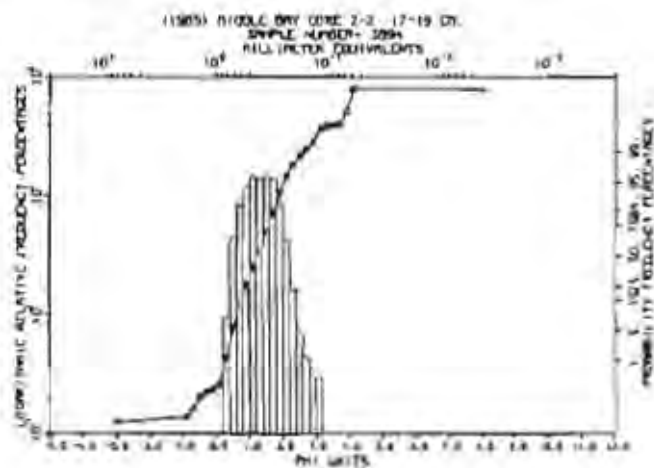
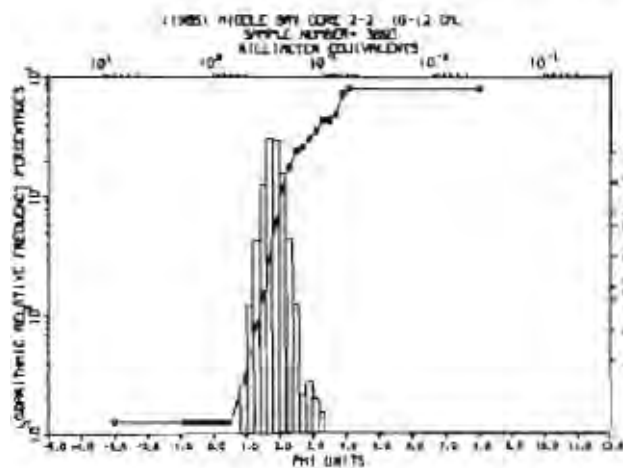
MCBETH FIORD ORABS



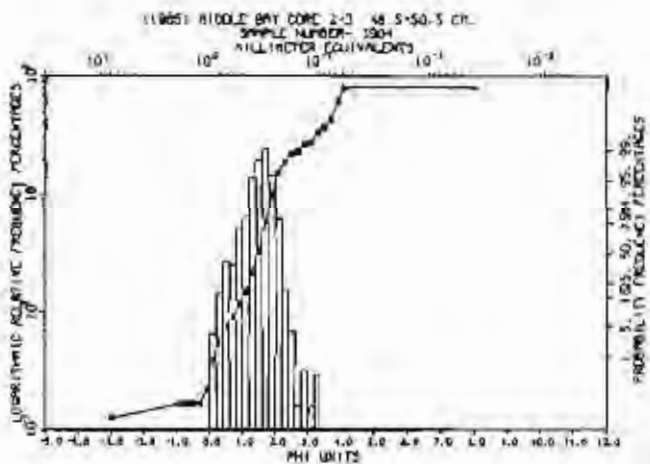
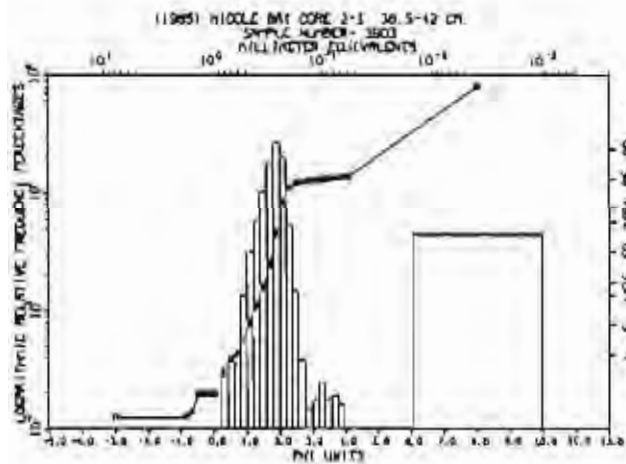
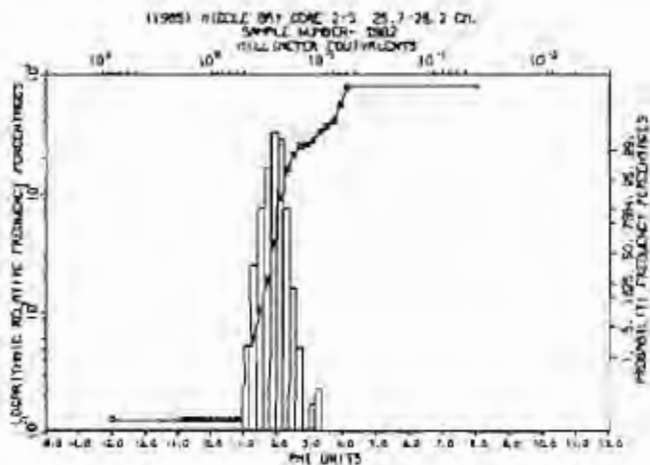
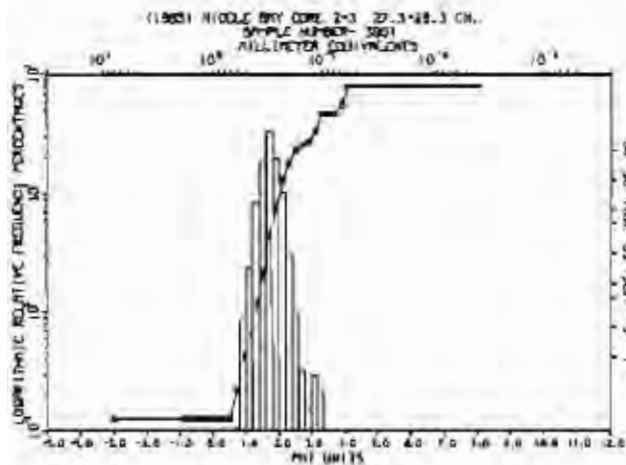
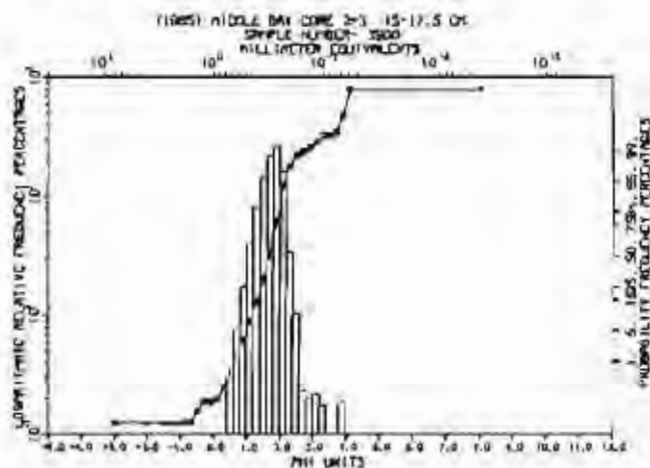
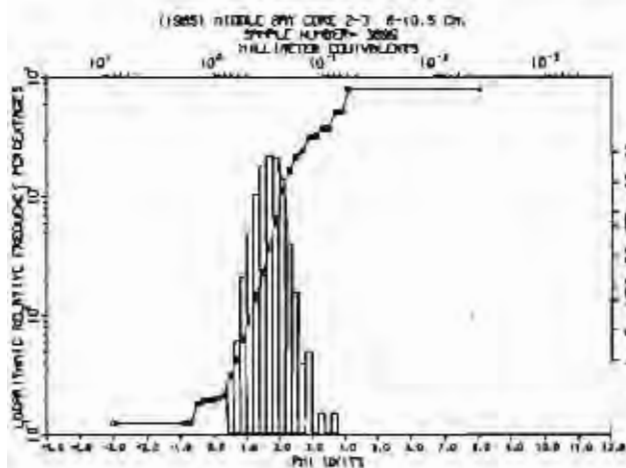
MIDDLE BAY CORE 2-1



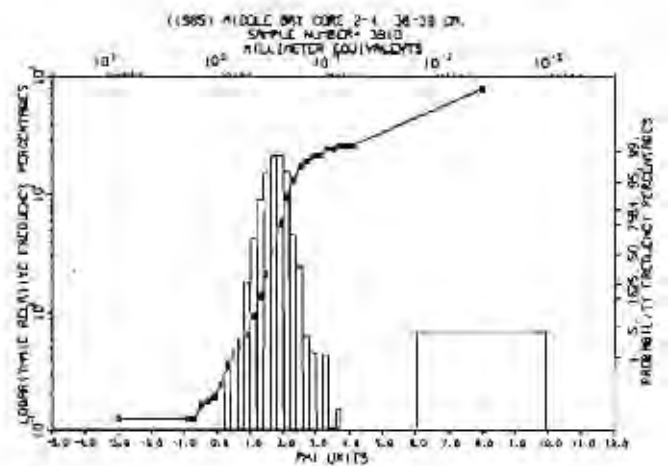
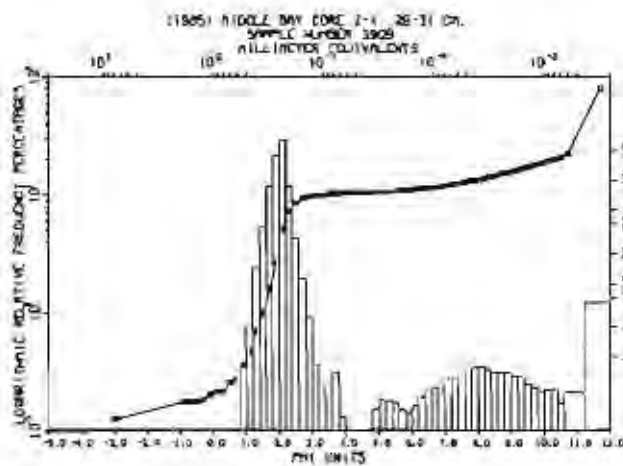
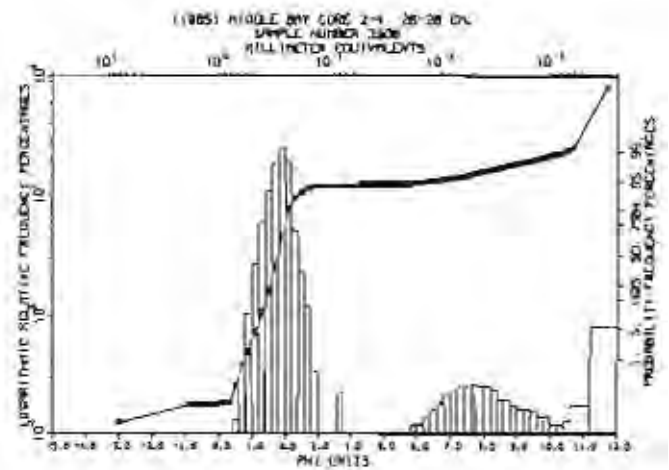
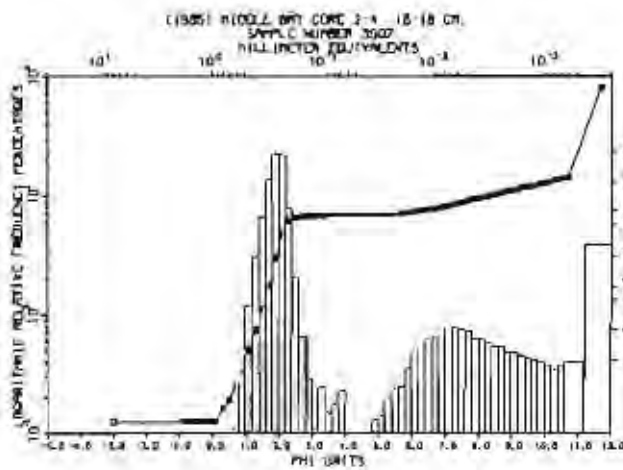
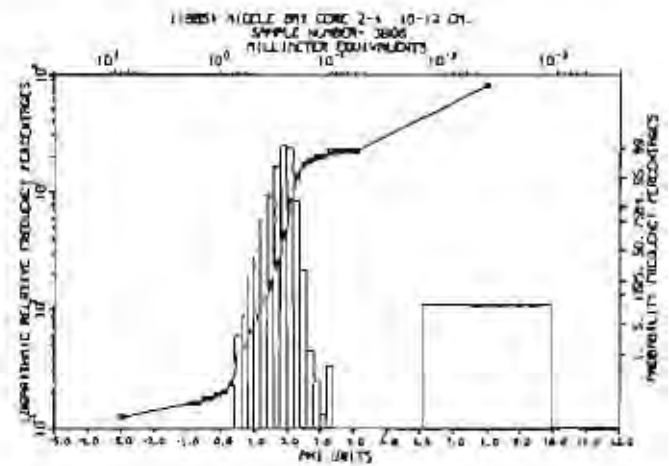
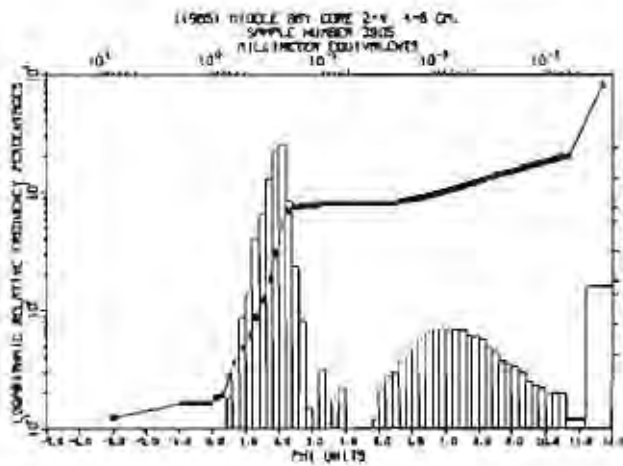
MIDDLE BAY CORE 2-2



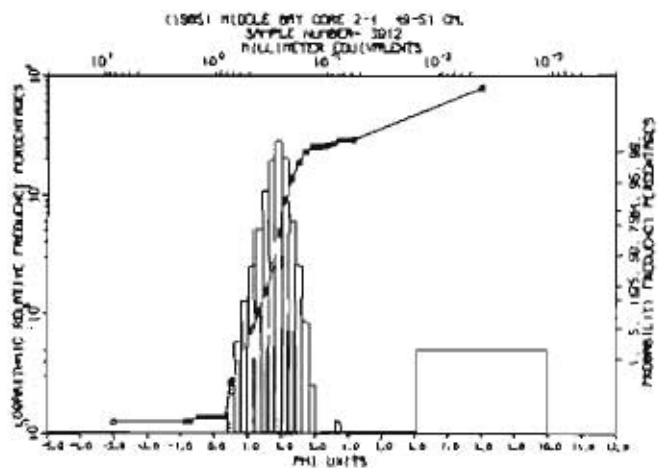
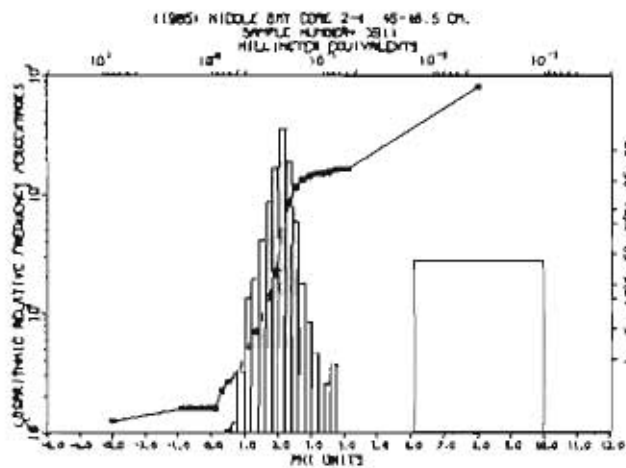
MIDDLE BAY CORE 2-3



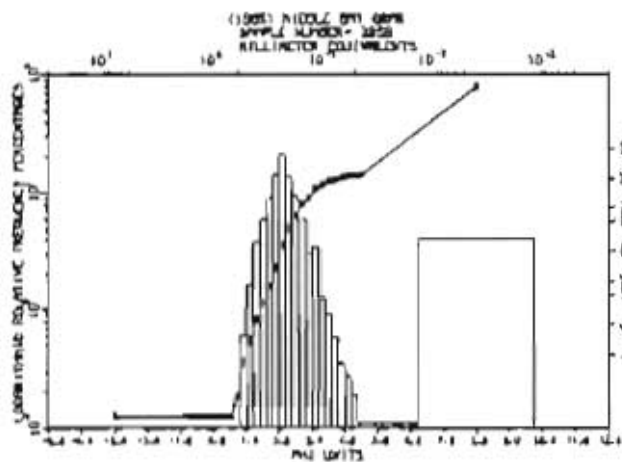
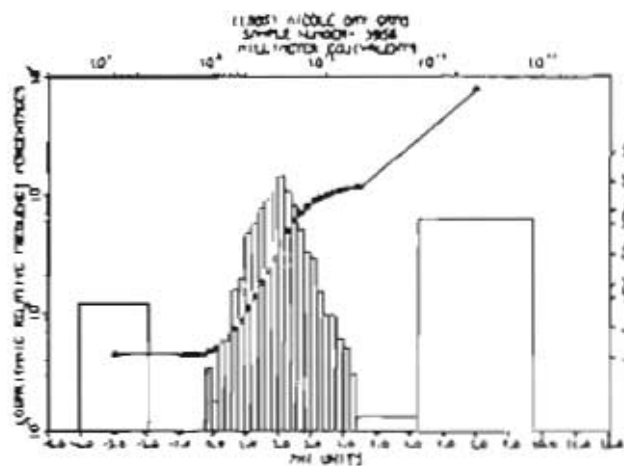
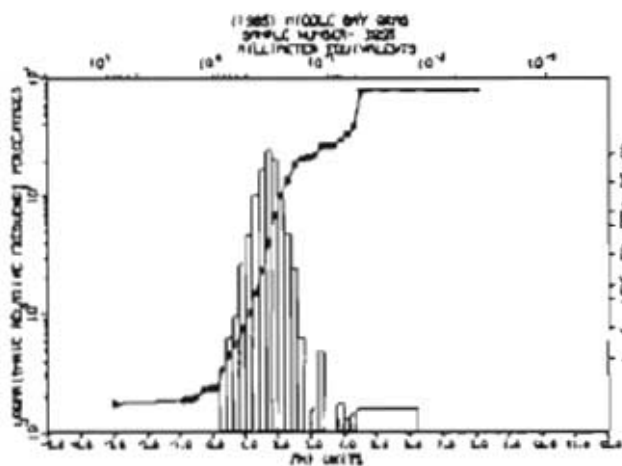
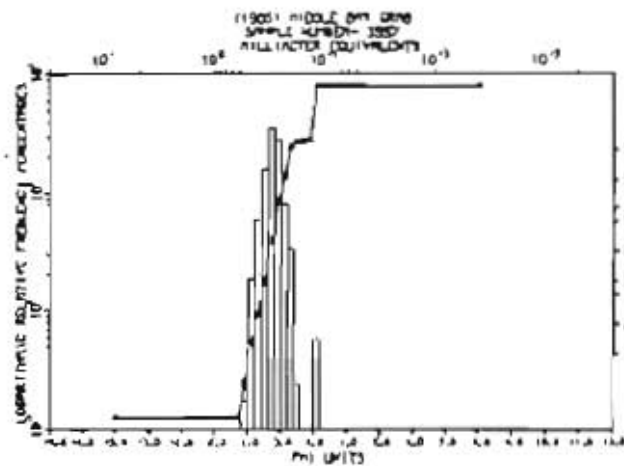
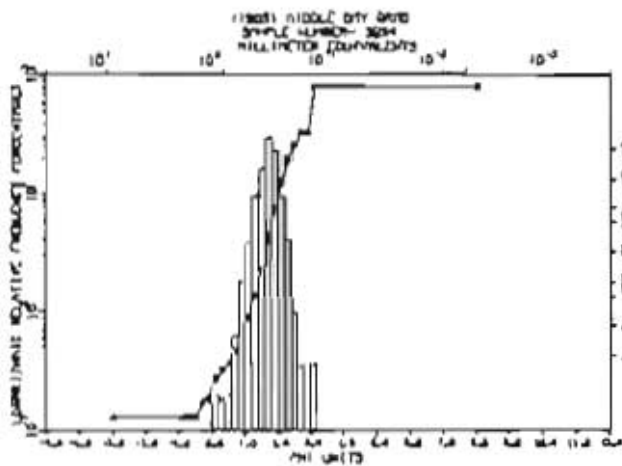
## MIDDLE BAY CORE 2-4



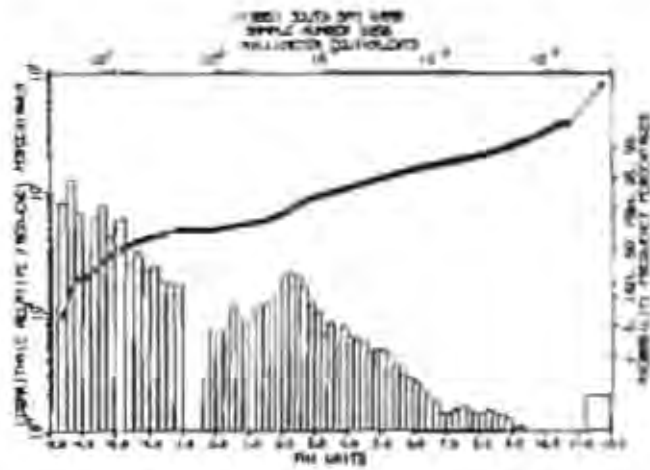
MIDDLE BAY CORE 2-4



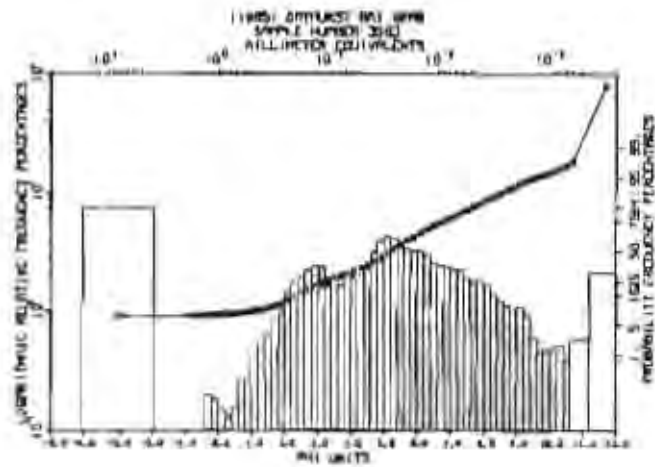
MIDDLE BAY GRABS



## SOUTH BAY GRAB



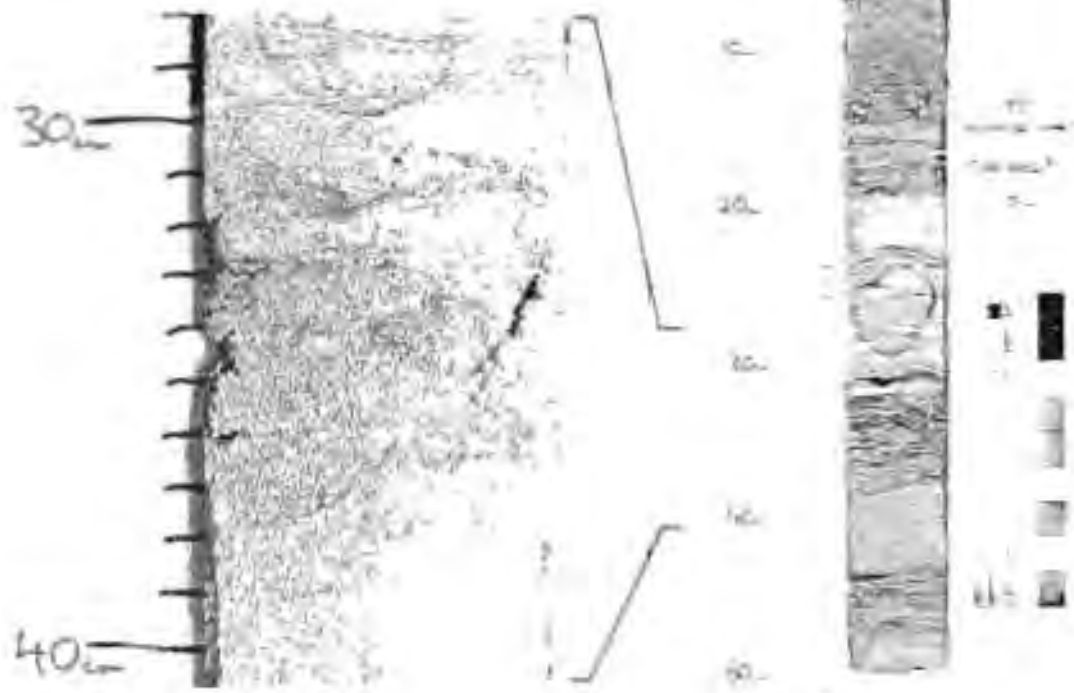
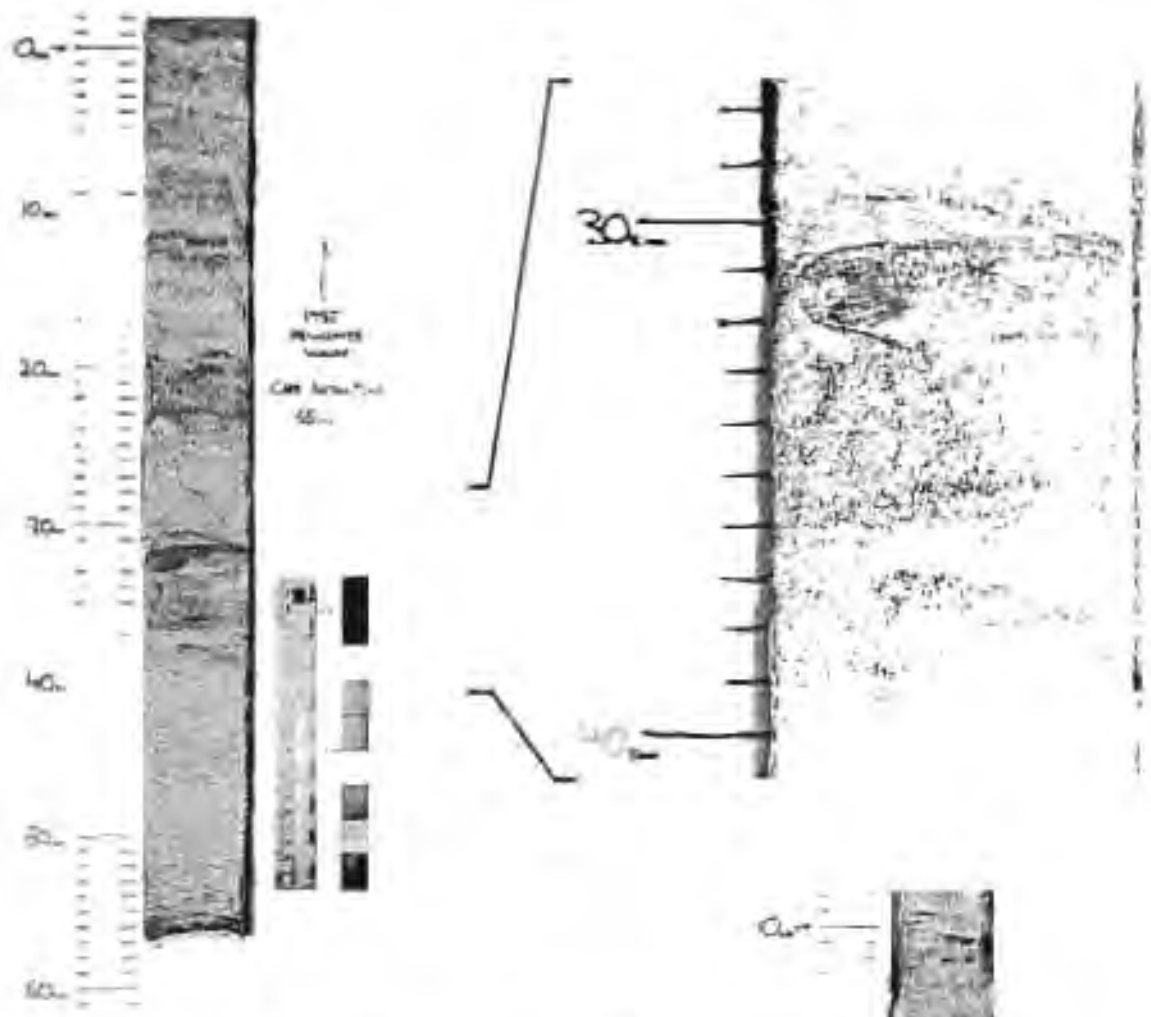
## BATHURST BAY GRAB



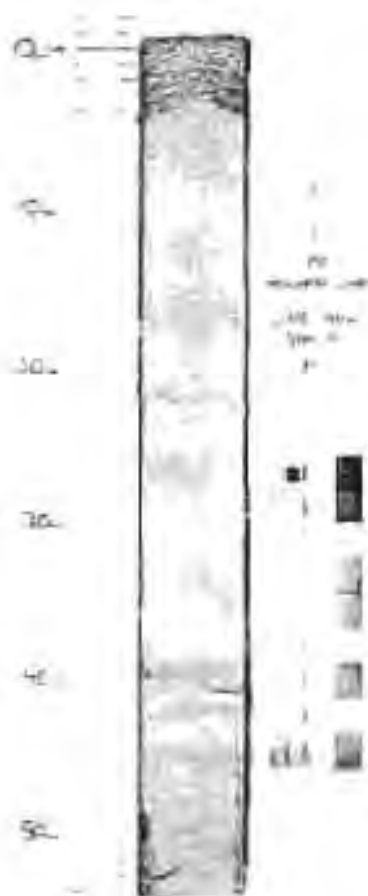
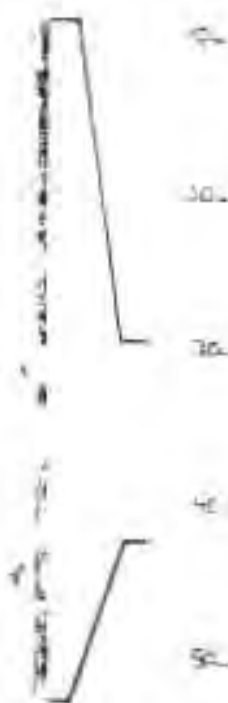
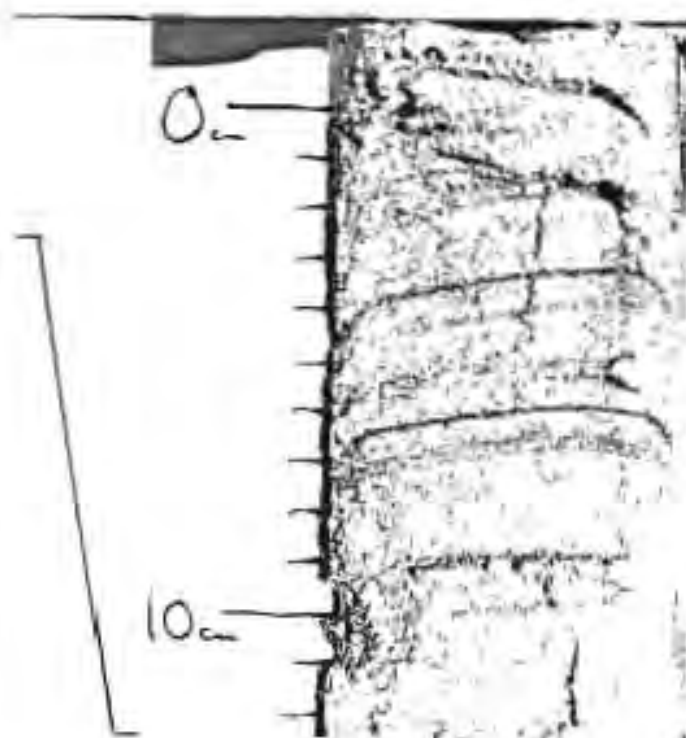
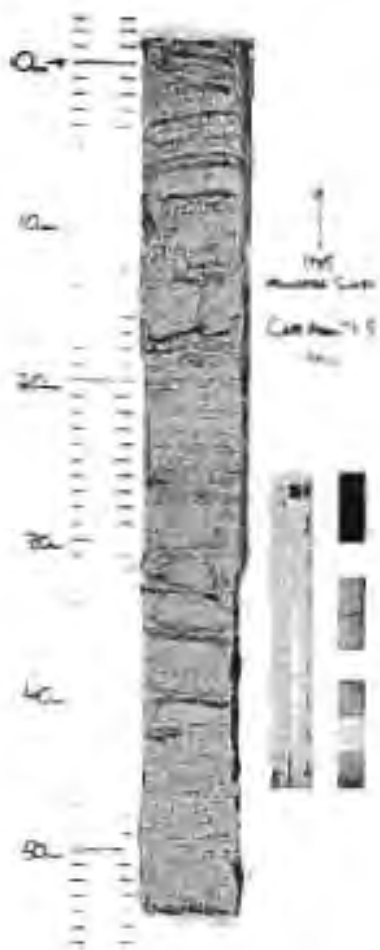
### APPENDIX 3

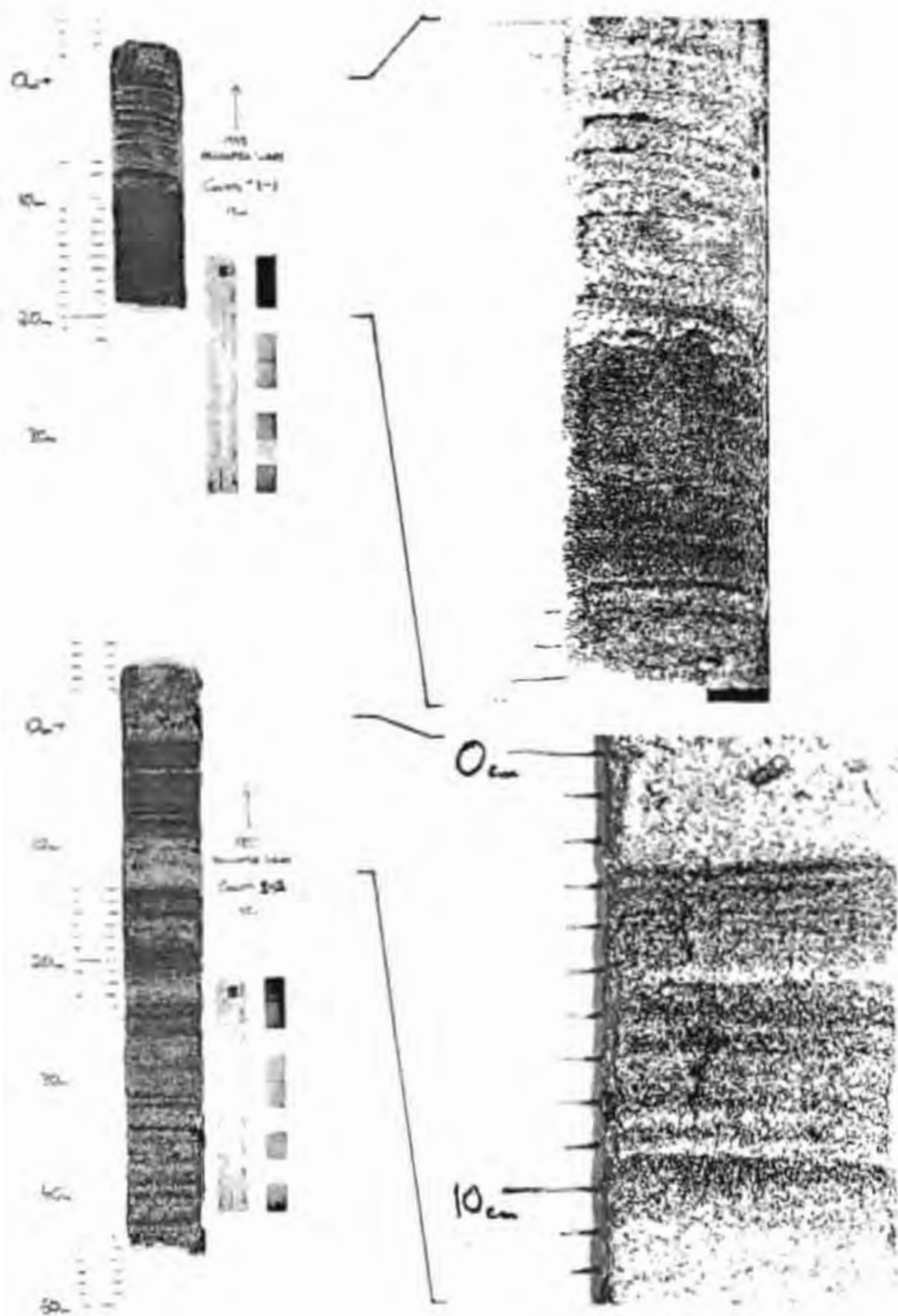
Photographs of the epoxy resin penetration peels obtained from cores collected at (1) Cape Aston beach, (2) Cape Coutts beach, and (3) McBeth Fiord head delta. Core locations are listed in Table 2, and indicated in Figures 2, 4 and 6.

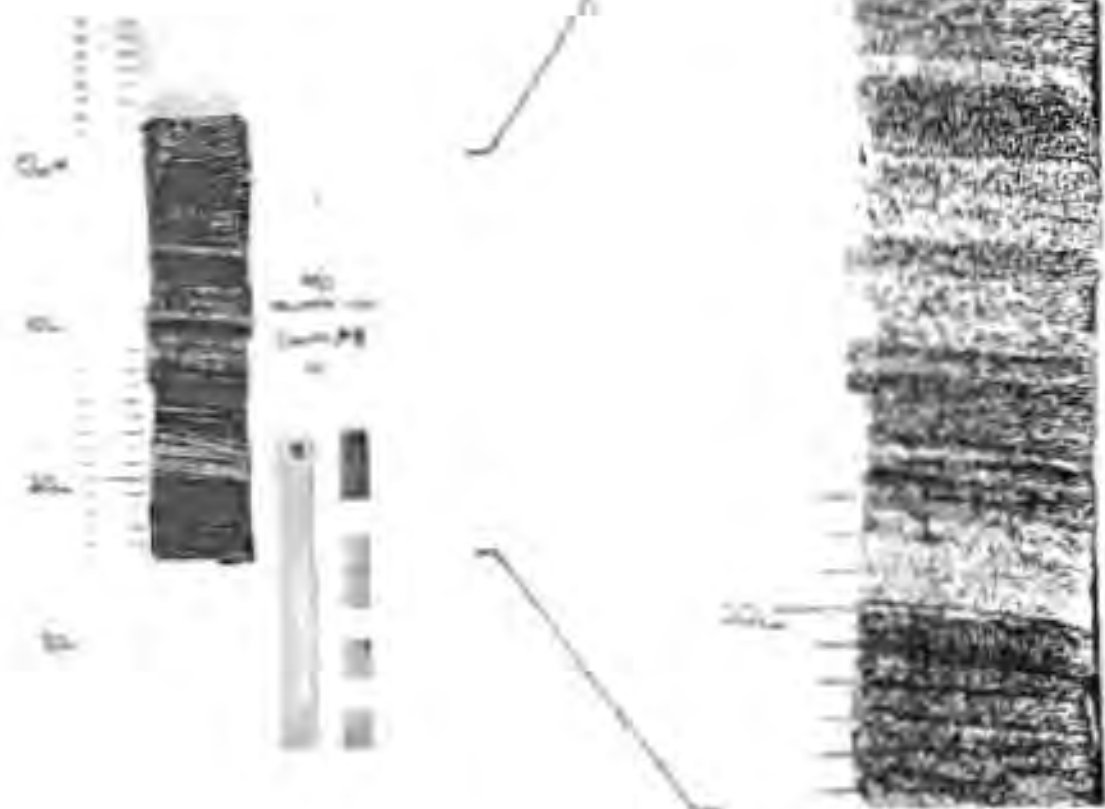
Note that (1) the 0 cm position indicated on the scale adjacent to the peels is the actual sediment surface, sediment above this line was added to minimize disturbance during transport, and (2) movement of epoxy down fractures in the sediment or along the core liner sometimes resulted in wavy ridges running across the peel surface, or in a disproportionate peel thickness at the core top or bottom.



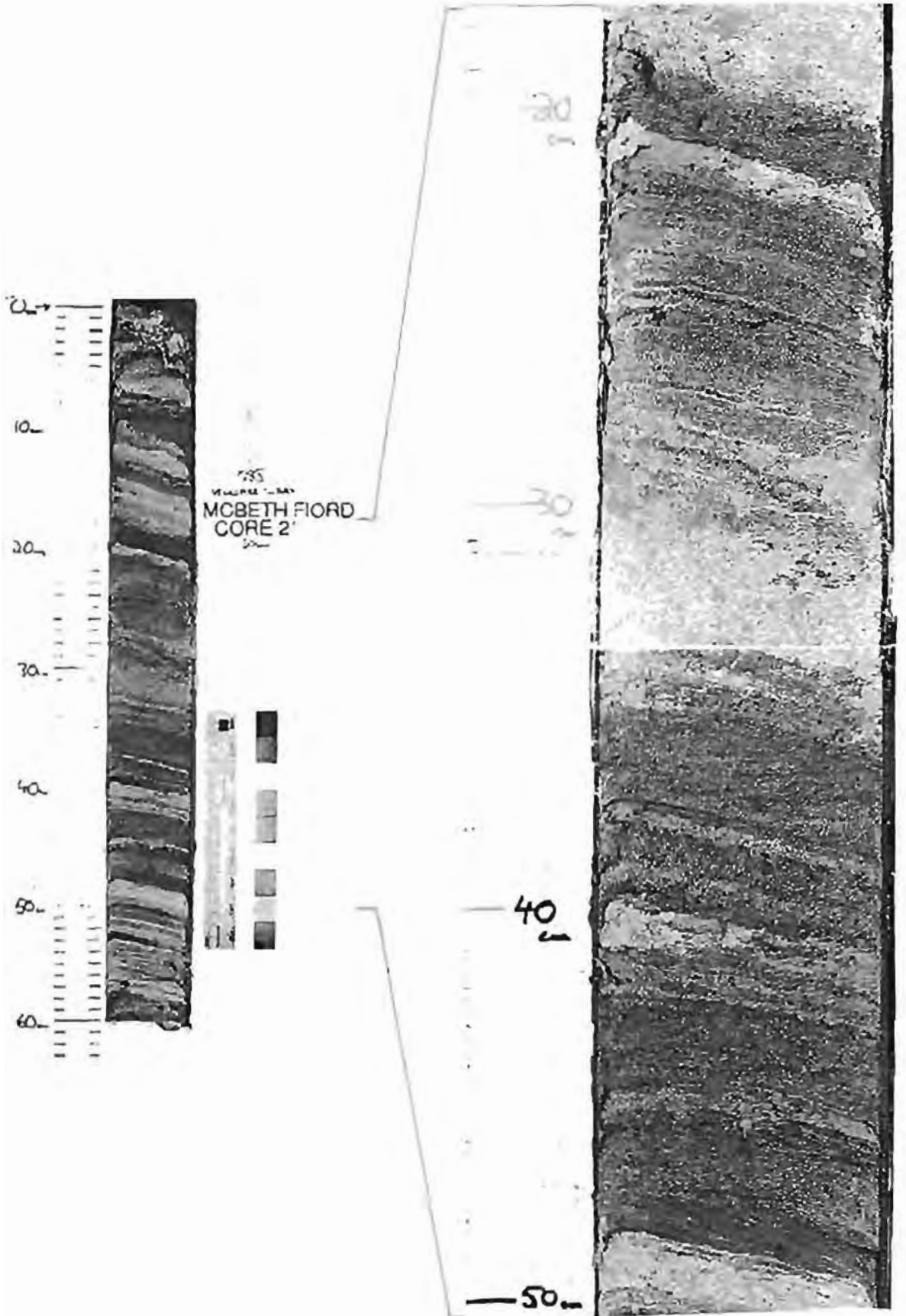














## CHAPTER 4

### SUSPENDED SEDIMENT LOADS ALONG THE COAST OF NE BAFFIN AND BYLOT ISLANDS

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#### **Project Objectives:**

- (1) To obtain a general pattern of the flux of sediment from land to sea and evaluate how that flux is affected by glacial and snow meltwater, erosion of raised marine sediments, lake filtration, and marine flocculation.
- (2) To obtain information on the size fractionation processes that occur during the efflux of sediment from land to sea.

#### **Methods:**

Sample locations are shown in Figures 1, 2 & 3, and listed in Table 1. Water samples were collected by hand-held 1-L Nalgene bottles from river banks or from platforms (PCSP helicopters, small boats) during BIO land-based expeditions in 1981, 1985 and 1986, and during BIO cruise 85-062. The samples were later filtered onto pre-weighed 47 mm diameter and 0.45  $\mu\text{m}$  nominal pore diameter Nucleopore<sup>®</sup> filters. Distilled water was washed through the final filtration stage to ensure no salts precipitated onto the filter. Filters were oven dried at 40°C for 15 hours. The filters were then reweighed ( $\pm 0.005$  mg) and the total suspended sediment concentration determined.

The 2800 series lab ID samples were analyzed on the Atlantic Geoscience Centre (AGC) computerized Coulter Counter model TAll<sup>®</sup> with two or three apertures (30  $\mu\text{m}$ , 200  $\mu\text{m}$ , 280  $\mu\text{m}$ ) and subsequently overlapped. Sample 85272 was analyzed by K. Kranck on the Atlantic Oceanographic Laboratory computerized Coulter Counter model TAll<sup>®</sup> with three apertures (200  $\mu\text{m}$ , 560 and 1200  $\mu\text{m}$ ) and subsequently overlapped. The filters were initially sonified in a sodium hexametaphosphate solution to provide a suitable electrolyte solution for particle analysis. The results are in terms of nominal equivalent spherical diameters and at 1/3  $\emptyset$  intervals.

The 3500 series lab ID samples were analyzed according to normal AGC soft sediment laboratory procedures. If the sand fraction was greater than 10 %, then that fraction was analyzed for its equivalent spherical sedimentation diameters using the computerized AGC settling tube. The mud fraction was analyzed on a computerized Sedigraph<sup>®</sup> 5000D for particle equivalent spherical sedimentation diameters at 1/5  $\emptyset$  intervals.

Moment statistics and frequency plots describing each size frequency distribution were calculated using the program READY (Hackett et al., 1986).

#### **Results:**

The suspended sediment concentrations and associated size information are listed in Table 1. Size frequency distribution plots are subsequently displayed, in the same order that the samples appear listed in Table 1. The frequency distributions are plotted in two ways, as histograms on a logarithmic frequency axis, and as cumulative curves on a probability frequency axis.

Future research will attempt to work out suspended load rating estimates from this data set. One initial observation is that SPM concentration values for these arctic glacier-fed rivers are comparable to temperate rivers having an annual discharge an order-of-magnitude larger. However, local effects are very important in explaining the variations in the concentration of suspended sediment. For example, the McBeth River, cut into raised deltaic/lagoonal sediment, had low values for SPM ( $10.6 \text{ g m}^{-3}$ ), but a local side-entry glacial outwash fan increased these loading values by an order-of-magnitude. It is noteworthy that the SPM levels observed along the front of the Coronation Glacier have over an order-of-magnitude variation (Fig. 3).

#### **Acknowledgements:**

Donald Clattenburg and Bill LeBlanc performed the textural analyses. Dan Praeg prepared the figures.

#### **Reference:**

Hackett, D.W., Syvitski, J.P.M., Prime, W. and Sherin, A.G.

1986: Sediment size analysis system user guide. Geological Survey of Canada, Open File Report #1240, 25 p.

Table 1.

Lab ID	System	Conc. (g m <sup>-3</sup> )	Mean (Ø)	St. D. (Ø)	Skew.	Kurt.	Sand (%)	Silt (%)	Clay (%)	Date
2809	Clyde R. -near the river mouth at the head of the fjord -69° 50.2' N 70° 30' W (Fig. 1)	2.7	7.6	1.7	-0.3	2.3	1.4	57.2	41.3	19:41 06/08/85
2822	McBeth R. -landward of Neoglacial outwash fan -69° 30.8' N 70° 10' W (Fig. 1)	10.6	7.0	1.5	0.4	2.3	0.2	73.9	25.9	17:50 06/08/85
2828	McBeth R. -seaward of Neoglacial outwash fan -69° 31.2' N 70° 04' W (Fig. 1)	136.4	7.6	1.7	-0.6	3.2	3.8	54.1	42.0	17:57 06/08/85
2813	Inugsuin R. -seaward of the lakes -69° 37.9' N 70° 02' W (Fig. 1)	1.3	6.8	1.7	0.5	2.1	0.3	73.7	26.0	10:51 06/08/85
2837	Itirbilung R. -river mouth -69° 15.1' N 69° 17' W (Fig. 1)	152.9	6.9	1.8	-0.1	2.2	5.5	63.7	30.8	18:32 05/08/85
2826	Pass R. -glacial stream in major mountain pass between Itirbilung and McBeth fjords -69° 23.1' N 68° 40' W (Fig. 1)	152.1	6.2	2.0	0.4	2.1	12.8	65.0	22.2	18:55 05/08/85
2835	Itirbilung G. -second glacier stream on north wall from head of the fjord -69° 19.2' N 69° 10' W (Fig. 1)	88.6	6.6	1.9	0.1	2.1	9.0	65.9	25.2	18:41 05/08/86
3559	Clyde Ck. -creek through Clyde Village by weather station -70° 28.9' N 68° 35' W (Fig. 1)	2204.0	5.7	3.0	0.7	2.3	41.8	34.6	23.6	09:50 05/08/85
2823	Clyde N. -creek between nivation hollows #2 and #3 near Clyde Village -70° 25.9' N 68° 41' W (Fig. 1)	23.2	7.3	1.7	0.2	1.8	0.2	64.0	35.8	10:20 05/08/86
85272	Clyde N. -at nivation hollow #2 from subice drainage -70° 25.9' N 68° 41' W (Fig. 1)	386.2	4.8	2.4	1.1	3.2	50.4	36.0	13.6	10:30 05/08/85
2808	N. Paquet Bay -at the river mouth of the south river -71° 49.2' N 77° 37' W (Fig. 1)	6.5	6.9	2.3	-0.1	1.6	11.7	48.2	40.0	18:49 10/08/85
2817	N. Paquet Bay -at the river mouth of the north river -71° 49.8' N 77° 38' W (Fig. 1)	1.1	7.1	1.9	0.2	1.8	1.6	64.6	33.8	18:48 10/08/85

Table 1. (cont.)

Lab ID	System	Conc. (g m <sup>-3</sup> )	Mean (Ø)	St. D. (Ø)	Skew.	Kurt.	Sand (%)	Silt (%)	Clay (%)	Date
2811	Keel R. -at the river mouth flowing into the head of Cambridge Fjord -71° 12.5' N 75° 08' W (Fig. 1)	0.8	7.5	1.7	-0.1	2.0	0.3	58.4	41.3	15:57 10/08/85
3561	Erik Harb. -sample #1 collected from mouth of river flowing into Erik Lakes -72° 22.7' N 76° 24' W (Fig. 2)	362.1	8.1	2.3	0.2	1.9	0.8	51.5	47.7	19:30 12/08/85
2838	Erik Harb. -sample #2 from the surface waters of the middle of the most landward of Erik Lakes T=2.5°C, S=0‰, 40 m above sea level -72° 24.7' N 76° 21' W (Fig. 2)	170.6	8.6	1.4	-1.5	6.4	1.7	24.0	74.2	19:35 12/08/85
3562	Erik Harb. -sample #3 from the surface waters of the ice-proximal side-entry moraine-dammed lake T=2.0°C, S=0‰, 40 m above sea level -72° 27.2' N 76° 16' W (Fig. 2)	276.1	10.6	1.7	-2.2	8.5	0.6	3.7	95.8	19:40 12/08/85
2829	Erik Harb. -sample #4 from the surface waters of the middle of the most seaward of Erik Lakes T=2.5°C, S=0‰, 19 m above sea level -72° 28.0' N 76° 11' W (Fig. 2)	136.4	8.2	1.8	-1.2	3.8	5.1	29.1	65.8	19:45 12/08/85
2804	Erik Harbour -sample #4 from the surface waters of Erik Harbour near the main tidewater glacier T=3.0°C, S=32‰, at sea level -72° 28.2' N 76° 07' W (Fig. 2)	8.8	8.1	1.5	-0.6	2.7	0.2	41.9	57.9	19:50 12/08/85
3564	Erik Harb. -at mouth of river draining the Erik Harbour Lakes and flowing into Erik Harbour: sample #9 (local ID) -72° 29.2' N 76° 07' W (Fig. 2)	1841.0	2.2	1.8	2.9	9.9	92.0	4.0	4.0	15/08/81
2810	Erik Harbour -sample #10 from surface waters of Erik Harbour seaward sample #9 -72° 29.3' N 76° 04' W (Fig. 2)	4.7	8.0	1.5	-0.6	2.7	0.2	44.1	55.7	15/08/81
2839	Erik Harb. -at mouth of side-entry river flowing into the harbour from along the NW wall: sample #11 (local ID) -72° 32.9' N 76° 10' W (Fig. 2)	125.9	8.6	1.6	-1.6	5.7	2.6	20.9	76.4	15/08/81
2815	Erik Harbour -sample #12 from the surface waters of Erik Harbour directly seaward of sample #11 -72° 32.8' N 76° 07' W (Fig. 2)	6.7	7.8	1.7	-0.5	2.4	0.5	47.6	51.8	15/08/81
2814	Erik Harbour -sample #13 surface water collected seaward of sample #12 -72° 33.7' N 76° 06' W (Fig. 2)	3.8	7.6	1.5	-0.2	2.3	0.5	57.3	42.2	15/08/81

**Table 1. (cont.)**

Lab ID	System	Conc. (g m <sup>-3</sup> )	Mean (Ø)	St. D. (Ø)	Skew.	Kurt.	Sand (%)	Silt (%)	Clay (%)	Date
2812	Erik Harbour	4.2	6.9	2.2	-0.1	1.6	9.0	50.6	40.4	15/08/81
-sample #14 surface waters collected seaward of sample #13 -72° 34.8' N 76° 03' W (Fig. 2)										
3563	Oliver Sound	482.9	9.8	2.2	-0.9	2.8	2.4	20.4	77.2	13/08/81
-at mouth of river draining main trunk glacier: sample #2 (local ID) -72° 07.7' N 76° 59' W (Fig. 2)										
2833	Oliver Sound	44.6	8.8	1.2	-1.5	6.4	1.0	21.6	77.4	13/08/81
-sample #1 surface waters collected seaward of sample #2 -72° 08.4' N 77° 01' W (Fig. 2)										
2807	Oliver Sound	1.2	6.0	2.2	0.4	1.8	22.6	53.4	24.0	13/08/81
-sample #3 surface waters collected seaward of sample #1 -72° 09.0' N 77° 03' W (Fig. 2)										
2824	Oliver Sound	3.4	7.7	1.5	-0.2	2.2	0.2	53.8	46.0	13/08/81
-sample #4 surface water collected seaward of sample #3 -72° 09.9' N 77° 08' W (Fig. 2)										
2818	Oliver Sound	4.7	7.7	1.4	-0.2	2.6	0.7	55.8	43.5	13/08/81
-sample #5 surface water collected seaward of sample #4 -72° 11.1' N 77° 14' W (Fig. 2)										
2819	Oliver Sound	??	6.4	1.4	0.7	3.0	0.3	84.9	14.8	13/08/81
-sample #6 surface water collected seaward of sample #5 -72° 11.5' N 77° 23' W (Fig. 2)										
2821	Oliver Sound	1.7	7.2	1.5	0.1	2.1	0.3	67.2	32.5	13/08/81
-sample #7 surface water collected seaward of sample #6 -72° 12.8' N 77° 38' W (Fig. 2)										
2820	Oliver Sound	2.2	7.3	1.6	0.2	2.0	0.2	65.1	34.7	13/08/81
-sample #8 surface water collected seaward of sample #7 -72° 15.8' N 77° 51' W (Fig. 2)										
2816	Cape Adair	6.0	7.4	2.4	-0.4	1.7	11.7	37.9	50.5	07/08/85
-at river mouth -71° 32.3' N 71° 52' W (Fig. 1)										
2806	Salmon R.	55.8	8.4	1.7	-0.8	2.6	0.5	33.9	65.6	12:55 09/08/85
-near river mouth -72° 40.5' N 78° 05' W (Fig. 2)										
2836	C. Liverpool	208.4	6.0	1.8	0.5	2.6	11.3	72.8	15.9	12:51 15/08/85
-sample #1 taken near icelfront of inland glacier, Bylot Island -73° 31.8' N 78° 22' W (Fig. 2)										

Table 1. (cont.)

Lab ID	System	Conc. (g m <sup>-3</sup> )	Mean ( $\bar{O}$ )	St. D. ( $\bar{O}$ )	Skew.	Kurt.	Sand (%)	Silt (%)	Clay (%)	Date
2825	C. Liverpool	155.4	6.6	2.2	0.0	1.9	14.4	54.8	30.8	13:30 15/08/85
-sample #2 taken near icefront of a second inland glacier, Bylot Island -73° 31.8' N 78° 26' W (Fig. 2)										
3565	C. Liverpool	314.0	9.6	2.1	-0.6	2.6	1.2	23.3	75.5	13:50 15/08/85
-sample taken at the mouth of the river entering the sea, Bylot Island -73° 39.1' N 78° 38' W (Fig. 2)										
2827	Guys Bight	70.4	8.0	1.9	-1.0	3.1	5.4	34.6	60.0	11:43 16/08/85
-at river mouth -72° 38.2' N 76° 41' W (Fig. 2)										
3560	S. Barrier	439.6	7.1	1.8	0.4	2.6	0.4	68.1	37.3	10:35 11/08/85
-at the ice front stream of the main trunk glacier on the South Barrier of Bylot Island -72° 58.4' N 76° 36' W (Fig. 2)										
2834	S. Barrier	183.2	7.5	1.4	-0.5	3.7	2.4	60.3	37.3	10:55 11/08/85
-at the ice front stream of a secondary glacier on the South Barrier of Bylot Island -72° 58.7' N 76° 38' W (Fig. 2)										
2805	Bathurst Bay	293.8	7.4	1.6	0.1	2.0	0.4	62.0	37.6	31/07/81
-at the ice front, Bylot Island -73° 19.3' N 77° 20' W (Fig. 2)										
2830	Bathurst Bay	195.3	7.0	1.8	-0.3	2.4	6.2	60.4	33.4	15:45 11/08/85
-at the ice front, Bylot Island -73° 18.8' N 77° 22' W (Fig. 2)										
2831	M. Barrier	10.5	7.4	1.6	-0.6	3.0	3.3	56.4	40.2	12:13 11/08/85
-at the ice margin of the main trunk glacier in the middle barrier of Bylot Island -73° 09.3' N 76° 50' W (Fig. 2)										
2832	C. MacCulloch	84.1	7.8	1.7	-0.7	3.1	3.0	45.5	51.5	10:10 10/08/85
-at the river mouth -72° 28.7' N 75° 12' W (Fig. 2)										
3558	Coronation F.	22.0	8.2	1.5	-0.9	4.2	2.3	40.0	57.7	11:30 07/09/85
-sample PA85-062 CO-W1 sampled from the surface (marine) waters off the tidewater glacier (see Fig. 3)										
3553	Coronation F.	12.9	8.1	1.9	-1.0	3.3	5.0	34.1	60.9	11:35 07/09/85
-sample PA85-062 CO-W2 sampled from the surface (marine) waters off the tidewater glacier (see Fig. 3)										
3547	Coronation F.	2.1	7.5	1.8	0.0	1.7	0.0	57.7	42.3	11:40 07/09/85
-sample PA85-062 CO-W3 sampled from the surface (marine) waters off the tidewater glacier (see Fig. 3)										
3554	Coronation F.	130.6	6.8	2.0	0.0	2.0	7.9	60.0	32.1	11:45 07/09/85
-sample PA85-062 CO-W4 sampled from the upwelling tan waters off the tidewater glacier (see Fig. 3)										

Table 1. (cont.)

Lab ID	System	Conc. (g m <sup>-3</sup> )	Mean (Ø)	St. D. (Ø)	Skew.	Kurt.	Sand (%)	Silt (%)	Clay (%)	Date
3548	Coronation F.	6.8	6.4	1.8	0.8	2.5	1.0	77.5	21.6	11:50 07/09/85
-sample PA85-062 CO-W5 sampled from the surface (marine) waters off the tidewater glacier (see Fig. 3)										
3549	Coronation F.	4.5	7.4	1.9	-0.2	1.8	2.2	54.6	43.2	11:55 07/09/85
-sample PA85-062 CO-W6 sampled from the surface (marine) waters off the tidewater glacier (see Fig. 3)										
3555	Coronation F.	28.2	8.7	1.4	-1.7	6.4	1.9	19.3	78.8	11:58 07/09/85
-sample PA85-062 CO-W7 sampled from the surface (marine) waters off the tidewater glacier (see Fig. 3)										
3556	Coronation F.	9.8	7.8	1.7	-1.0	3.7	5.2	42.1	52.7	12:00 07/09/85
-sample PA85-062 CO-W8 sampled from the surface (marine) waters off the tidewater glacier lagoon (see Fig. 3)										
3557	Coronation F.	7.3	7.6	2.0	-0.7	2.3	6.4	38.5	55.1	12:03 07/09/85
-sample 85-062 CO-W9 sampled from the surface (marine) waters off the tidewater glacier lagoon (see Fig. 3)										
3552	Itirbilung F.	0.72	7.2	1.8	0.3	1.8	0.1	66.4	33.4	13:12 14/09/85
-collected 10 m below the surface by Niskin water bottle with CTD and floc camera cast (PA85-062-22) -69° 19.4'N 68° 46.3' W (Fig. 1)										
3551	Itirbilung F.	0.65	6.7	1.8	0.7	2.3	0.5	75.3	24.2	13:12 14/09/85
-as in 3552 but at 120 m below the surface (PA85-062-22)										
3550	Itirbilung F.	1.31	7.4	1.8	-0.2	1.8	1.2	55.8	43.1	13:12 14/09/85
-as in 3552 but at 400 m below the surface (PA85-062-22)										



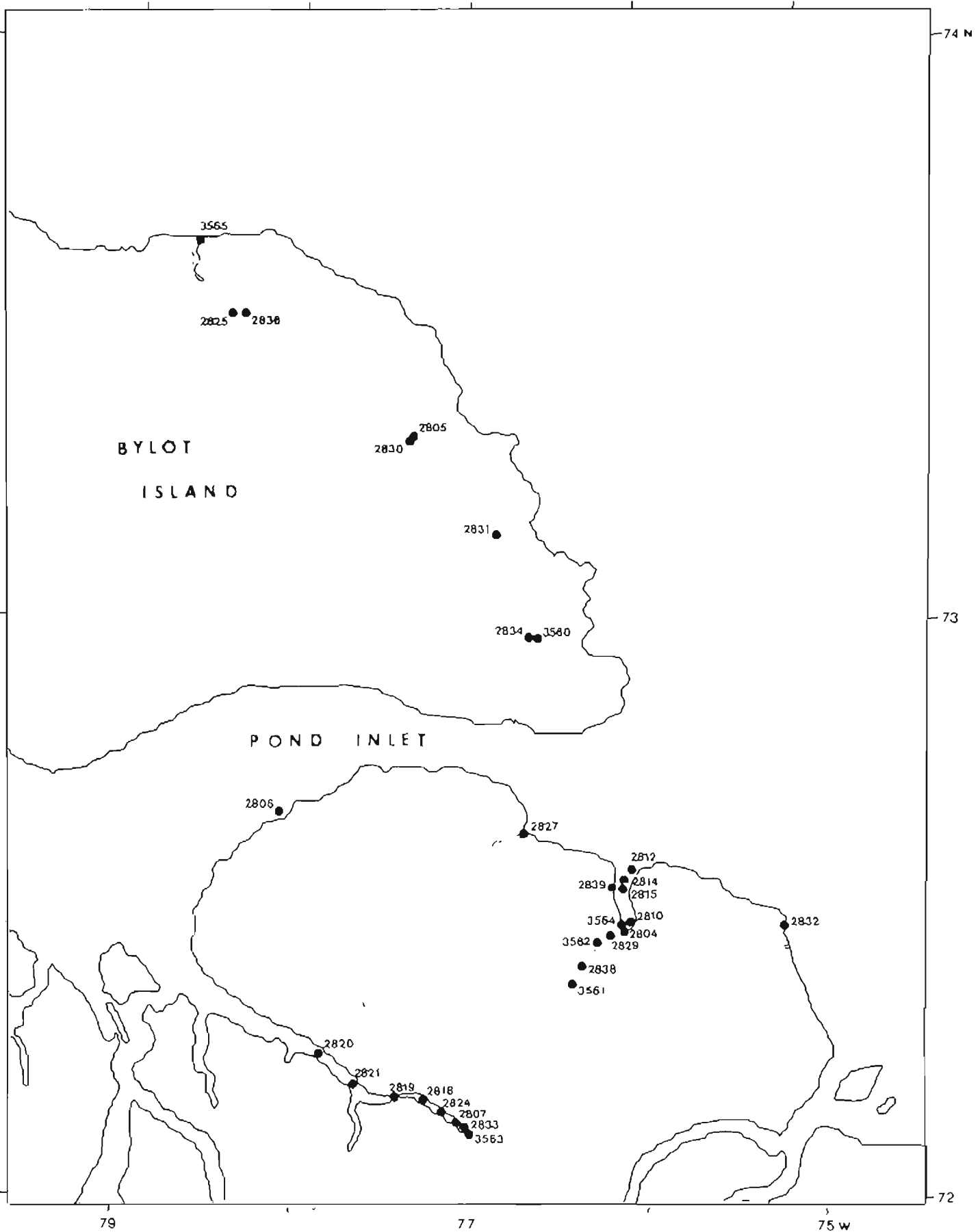


FIGURE 2 - Locations of water samples on northern Baffin and Bylot Islands (see Figure 1 for location). See Table 1.

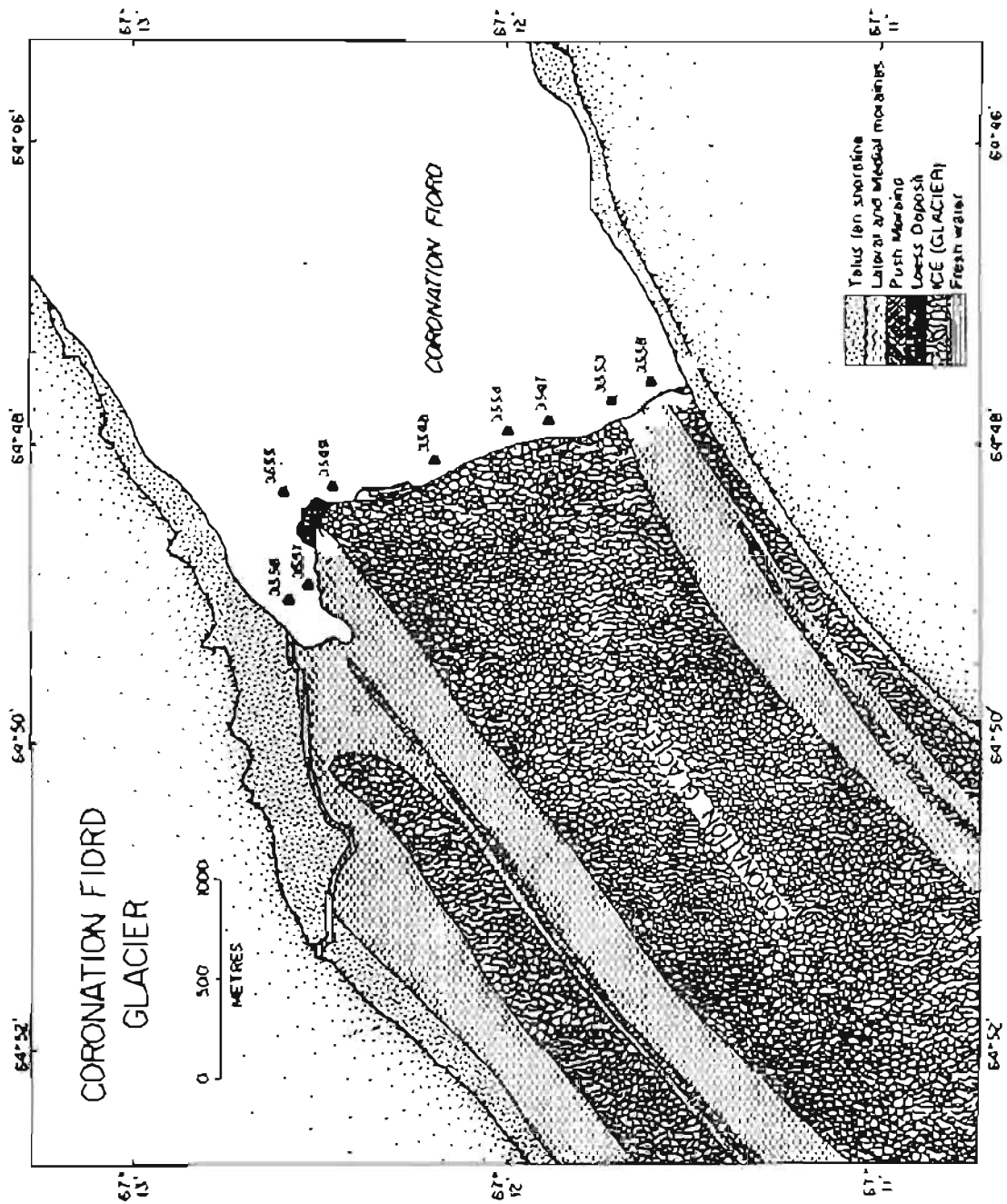
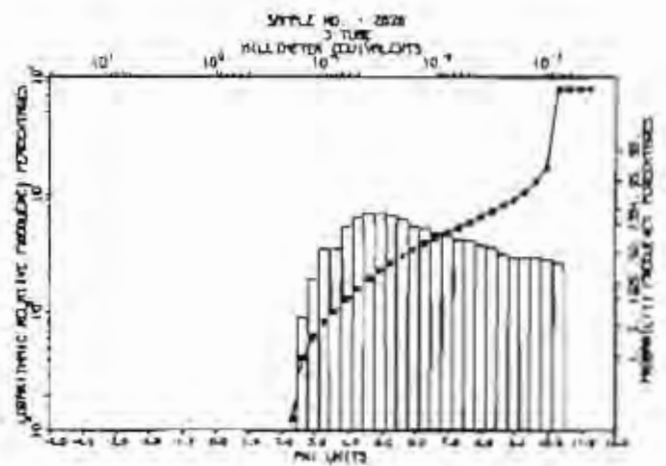
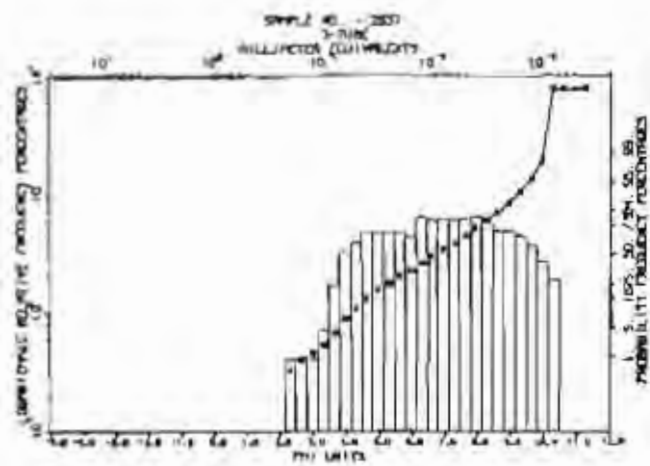
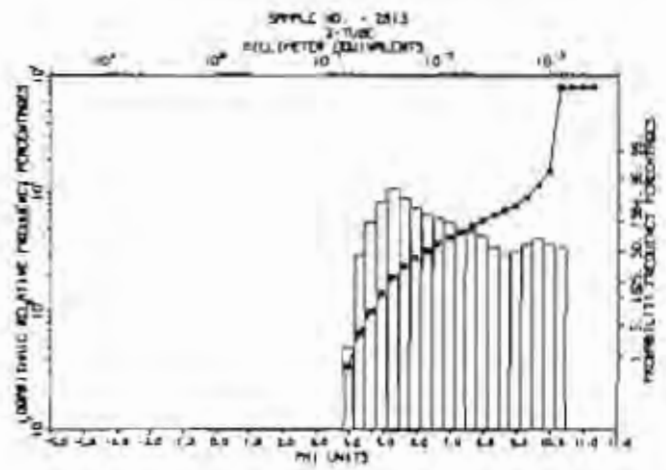
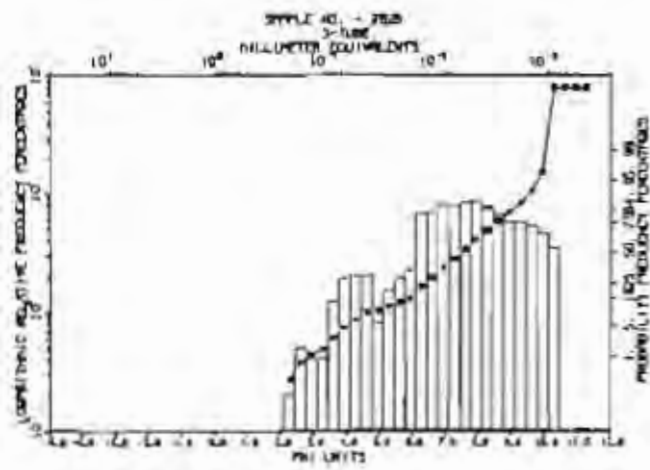
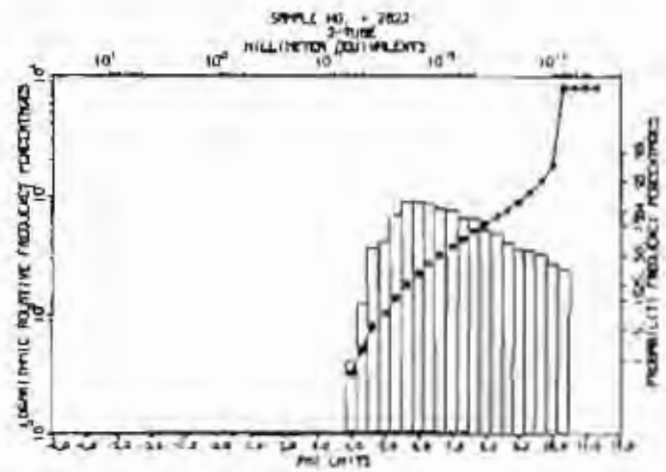
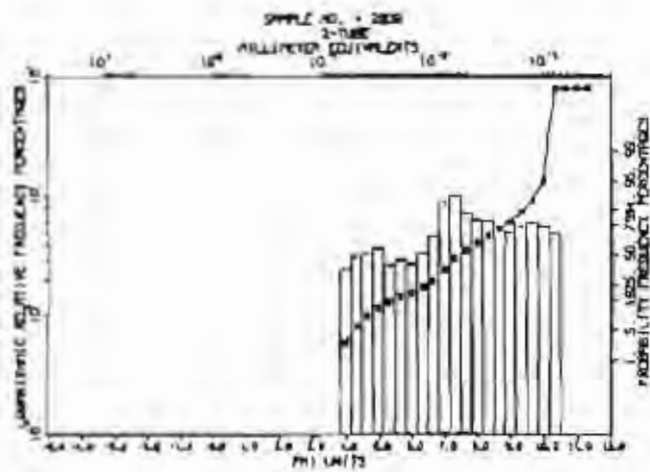
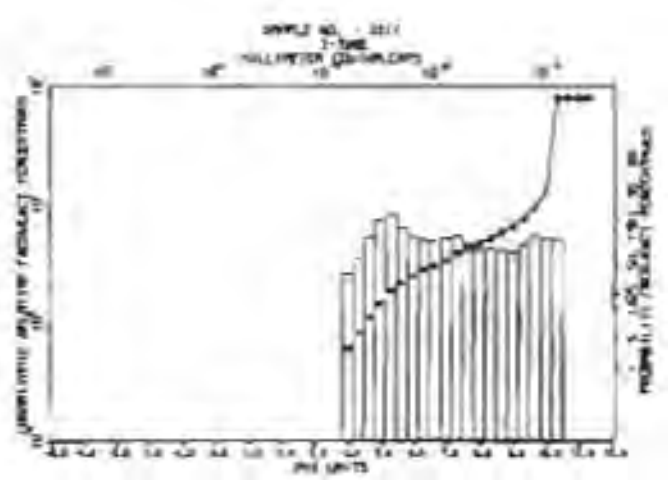
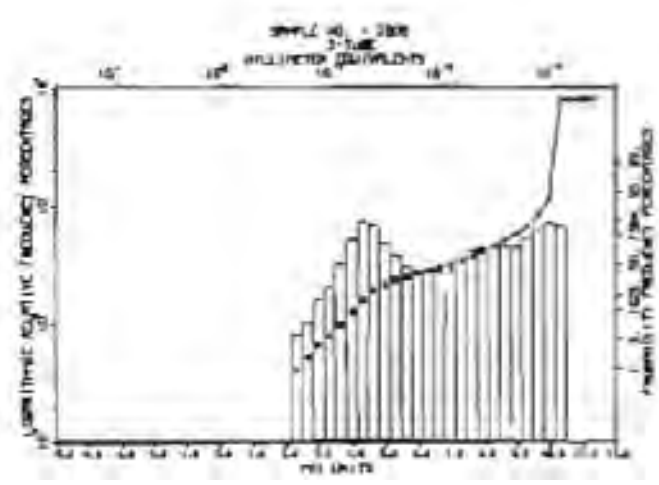
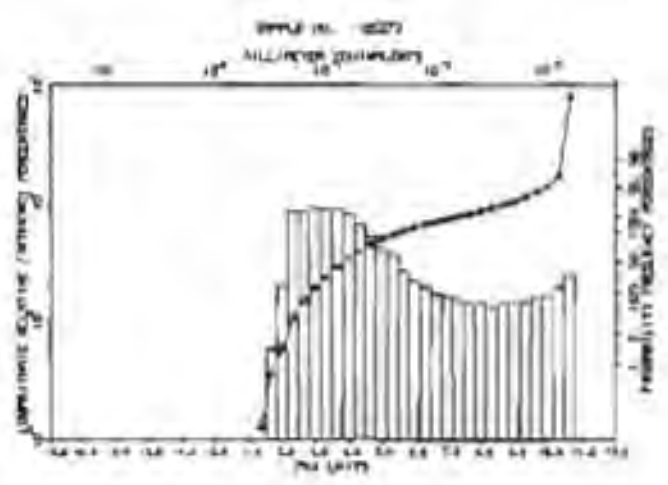
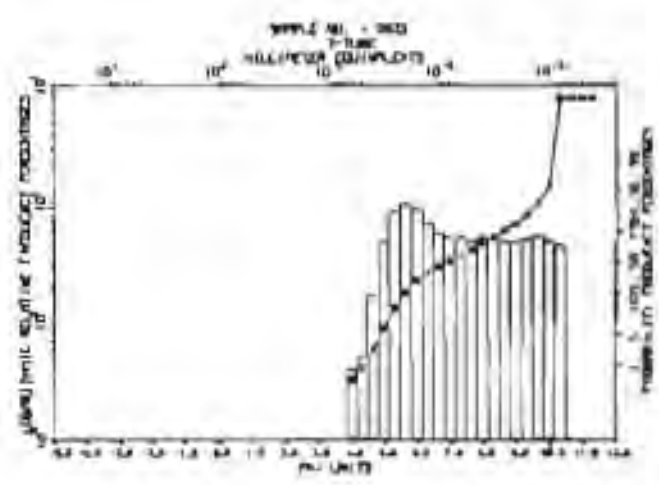
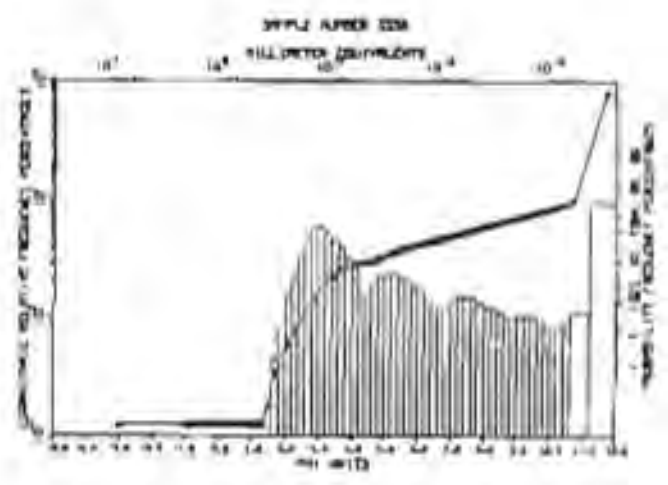
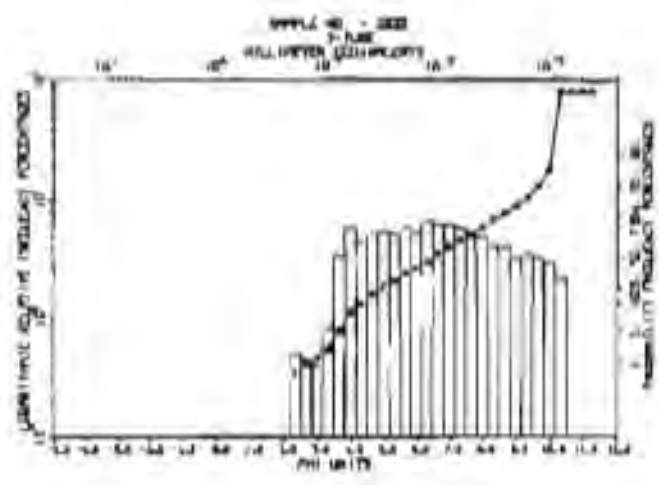
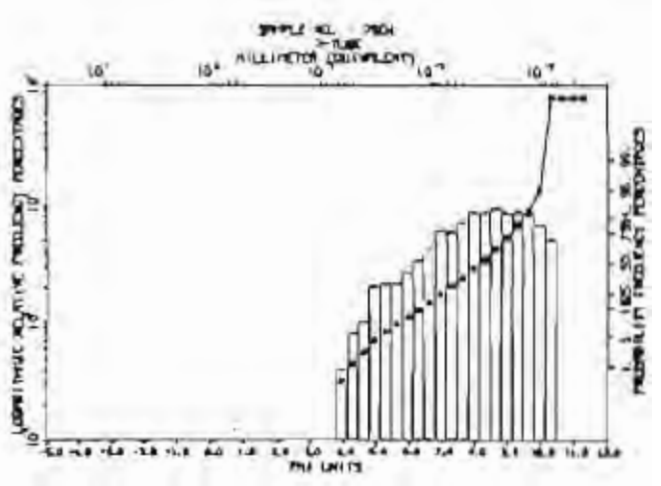
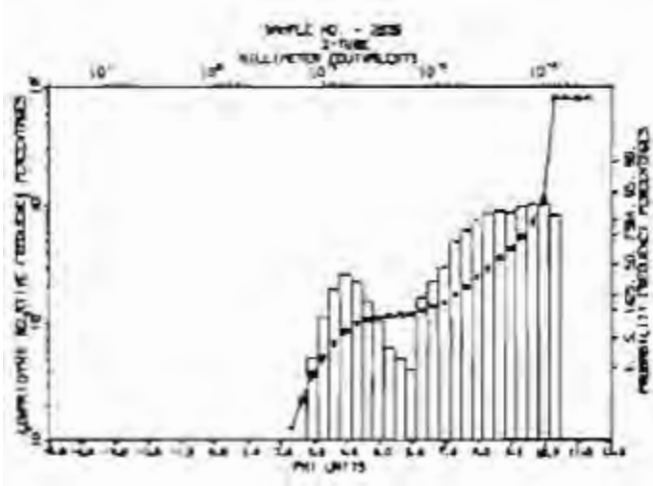
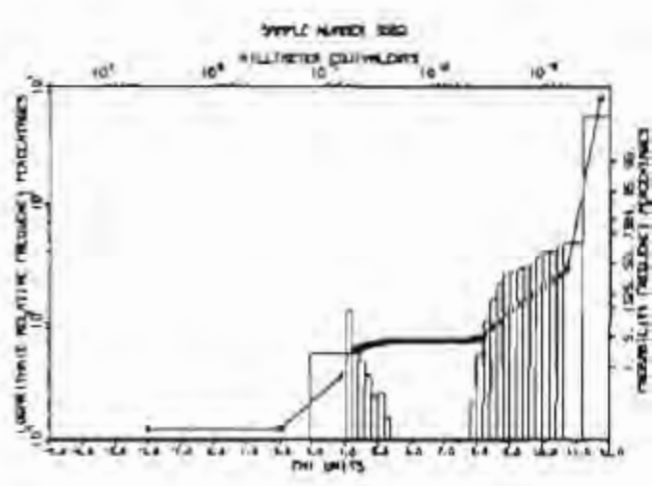
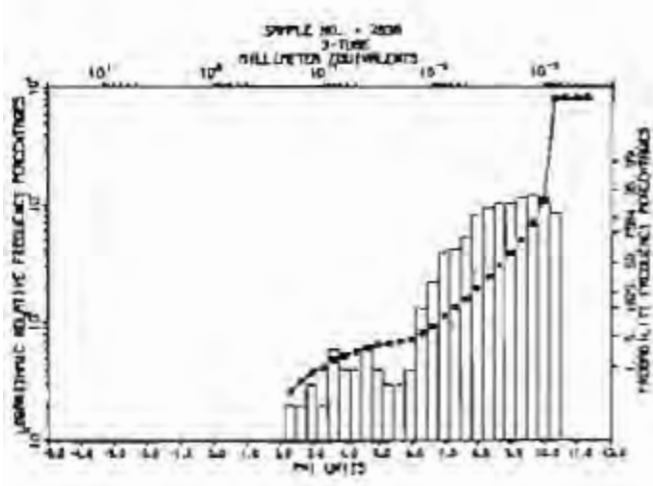
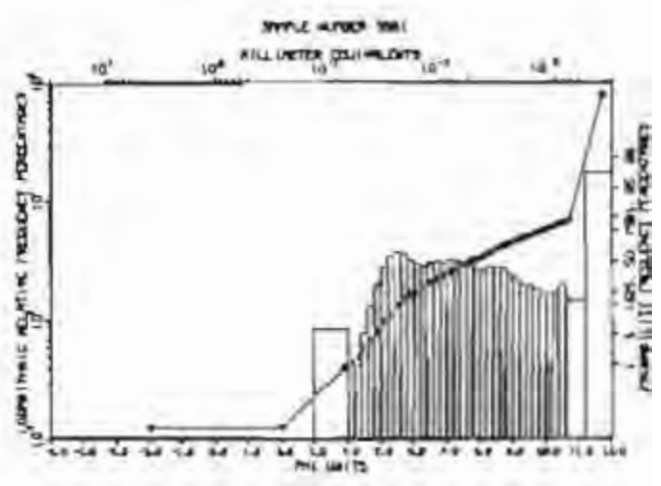
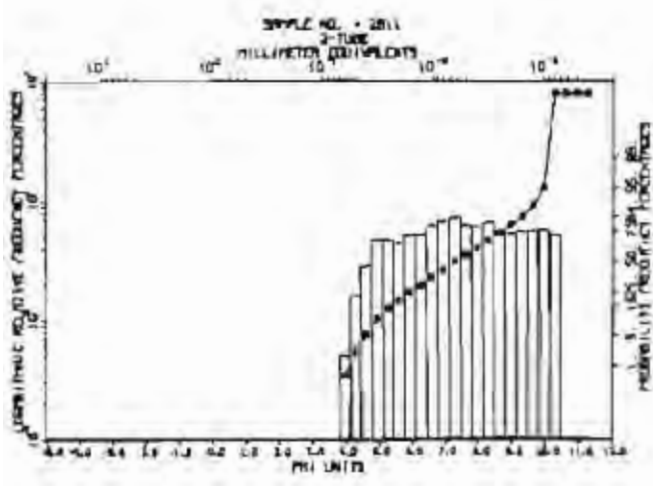
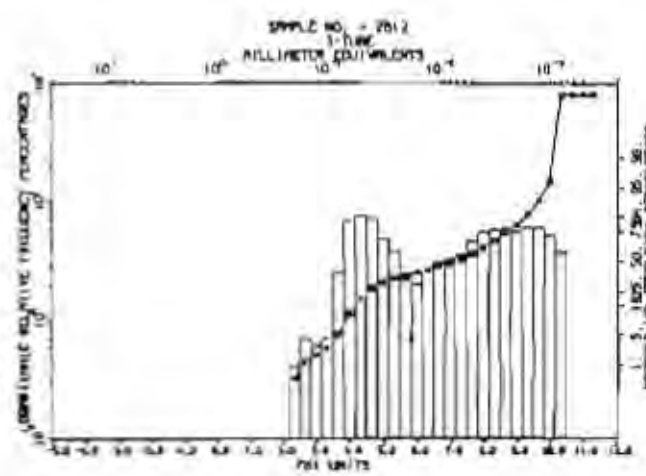
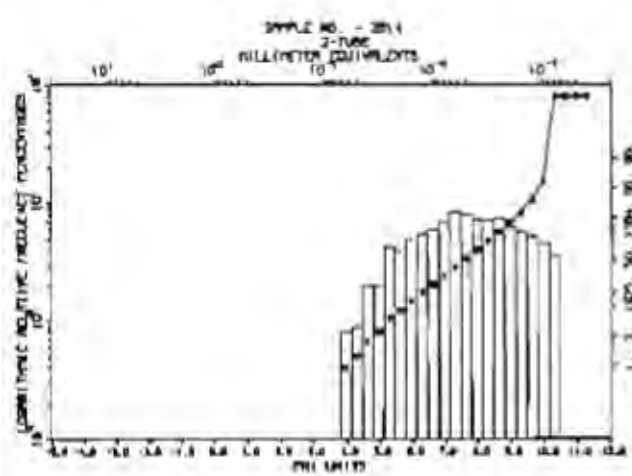
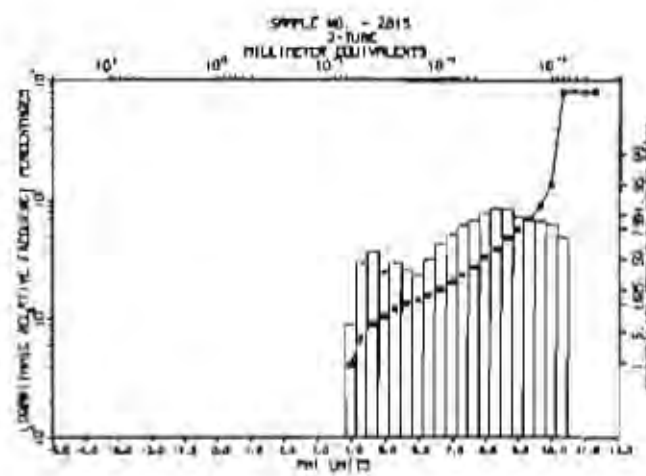
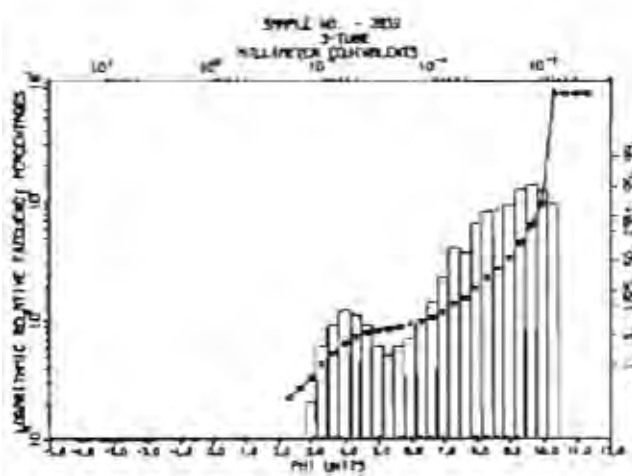
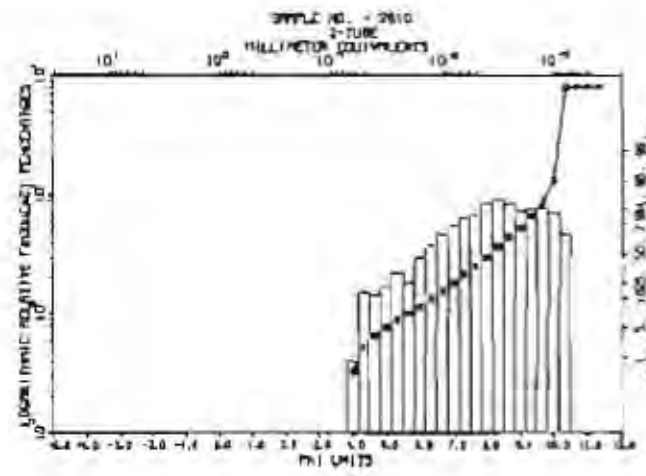
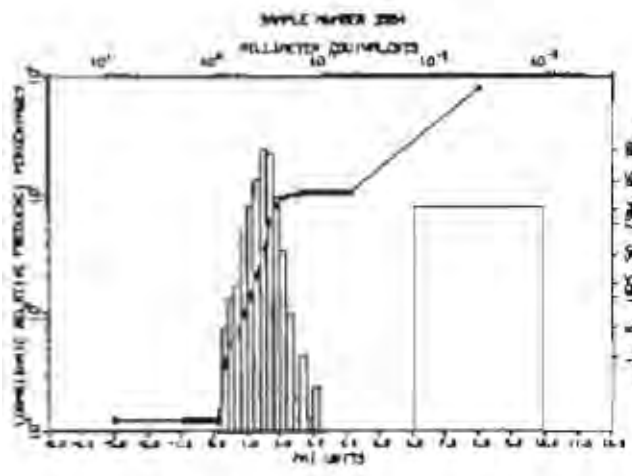


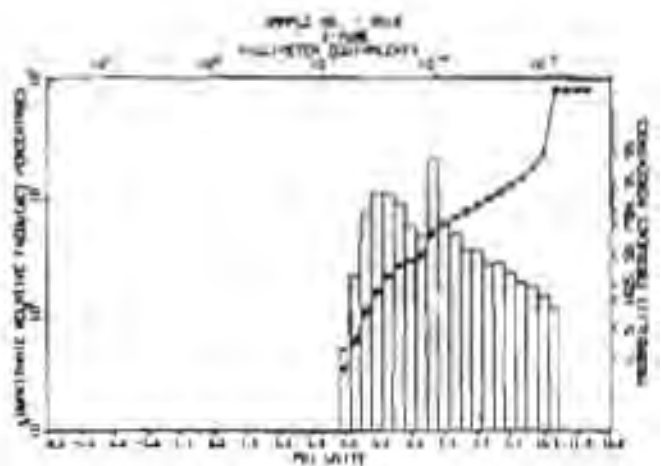
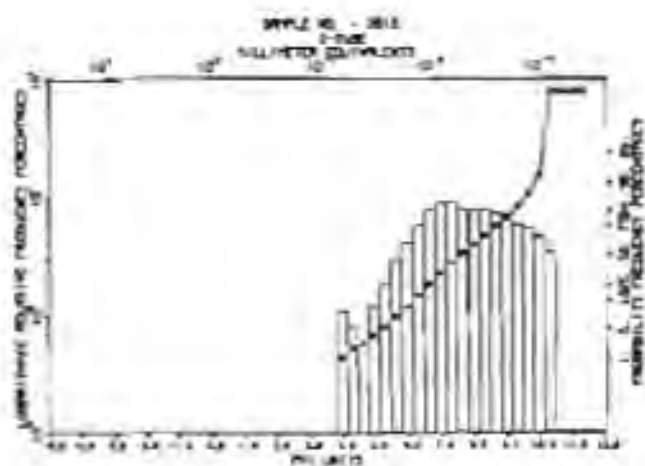
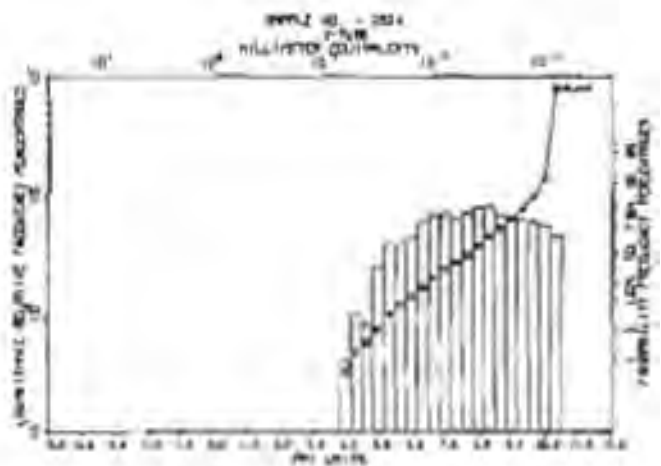
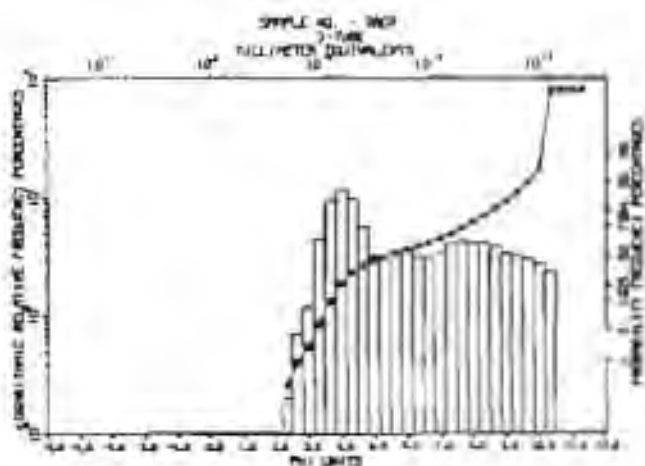
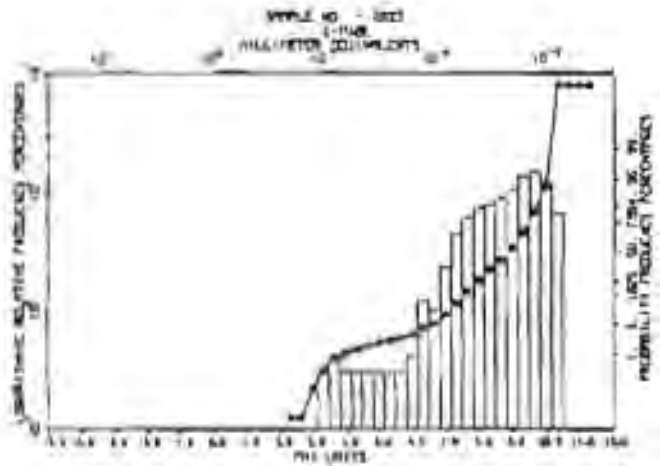
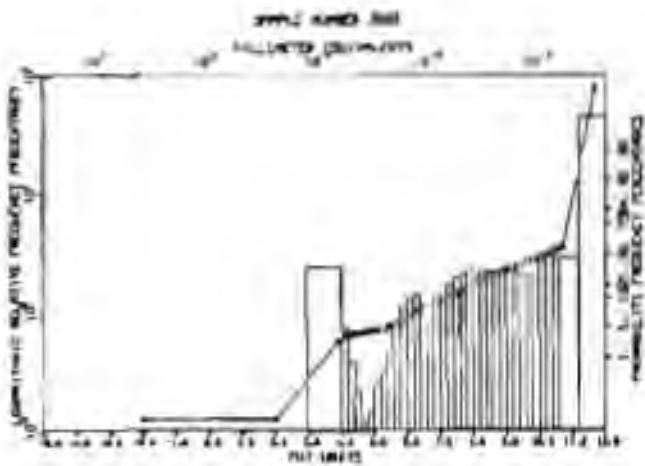
FIGURE 3 - Locations of water samples along the front of Coronation Glacier (see Figure 1 for location). See Table 1.

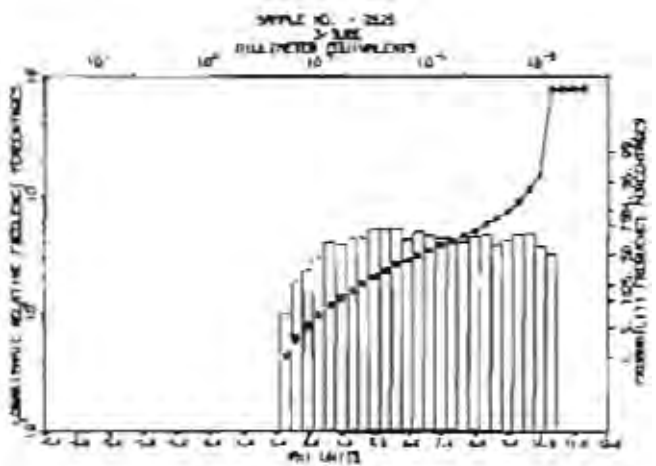
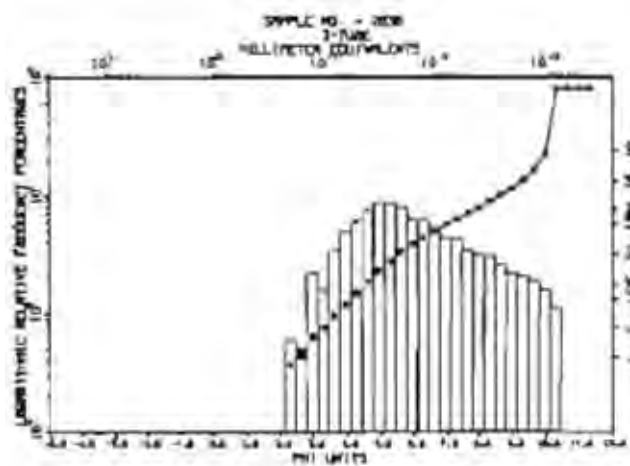
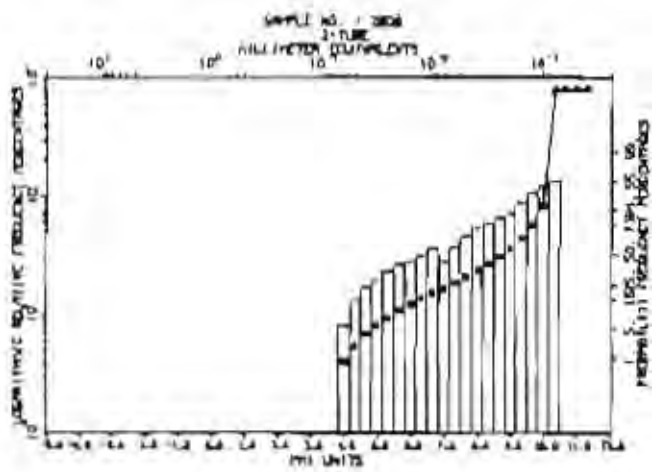
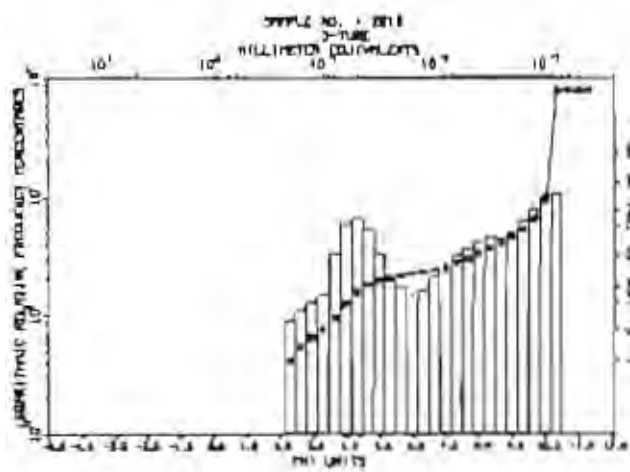
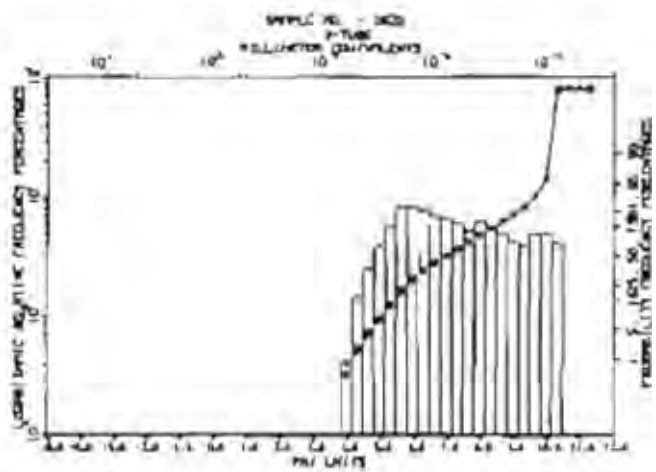
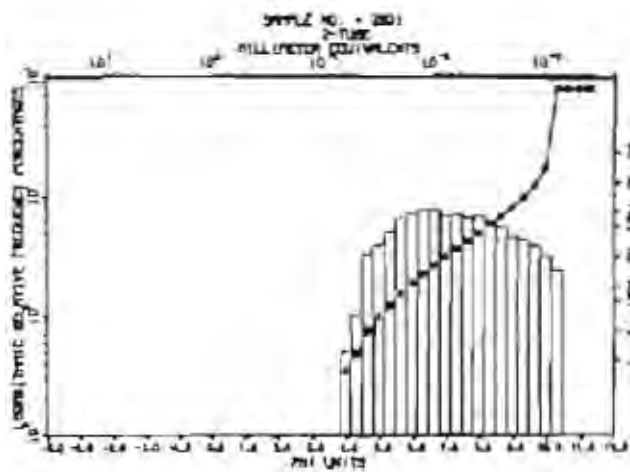


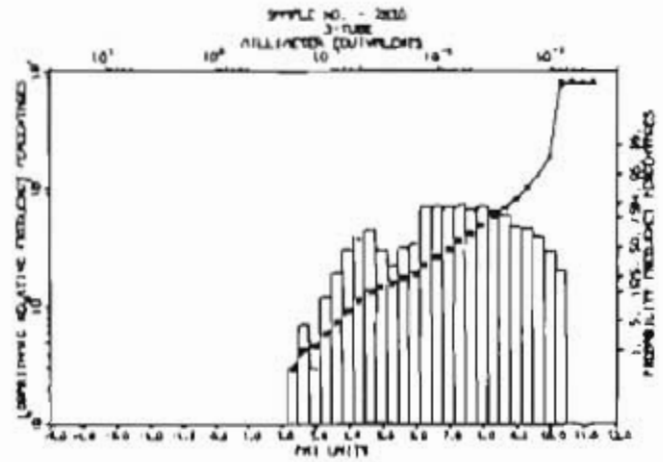
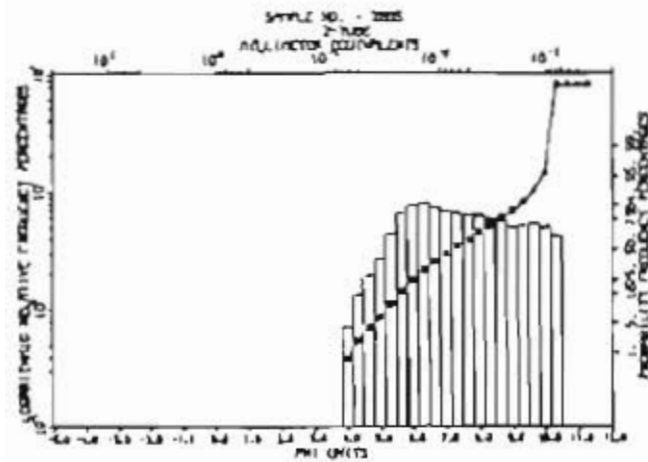
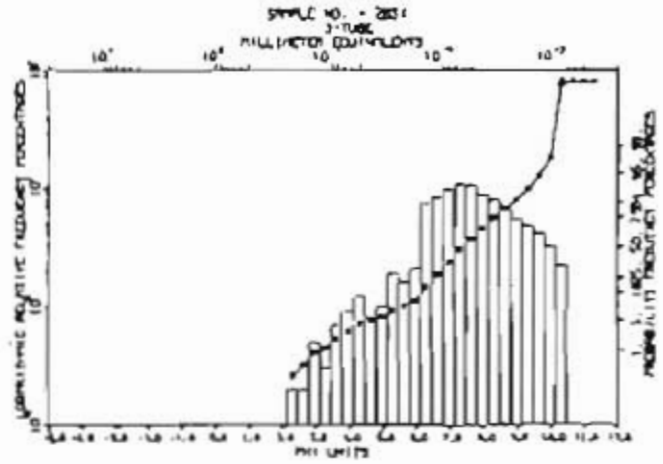
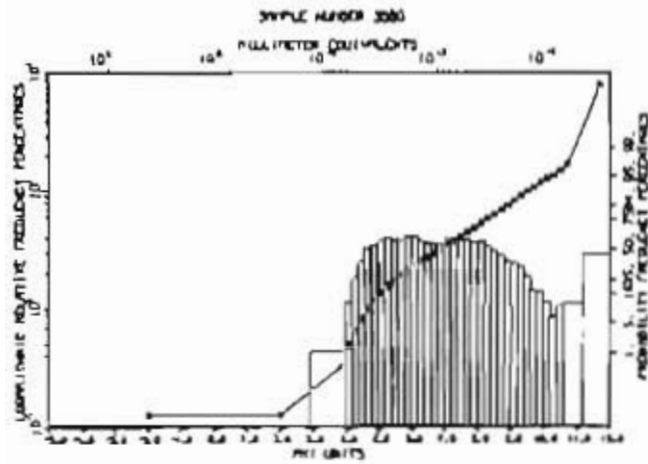
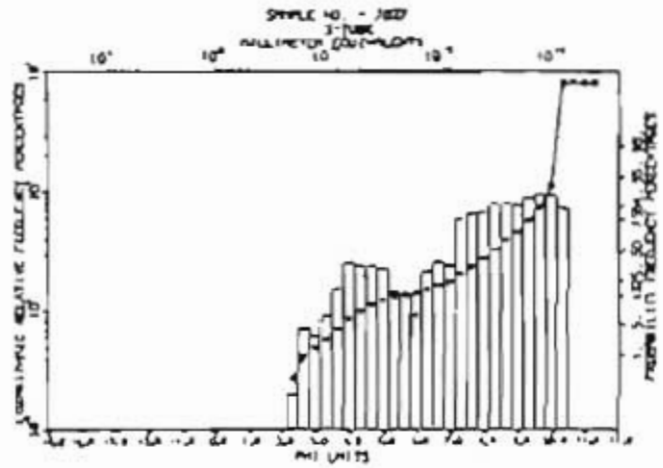
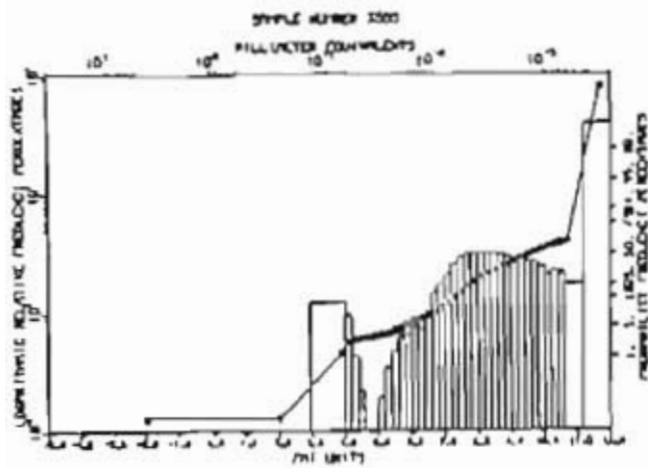


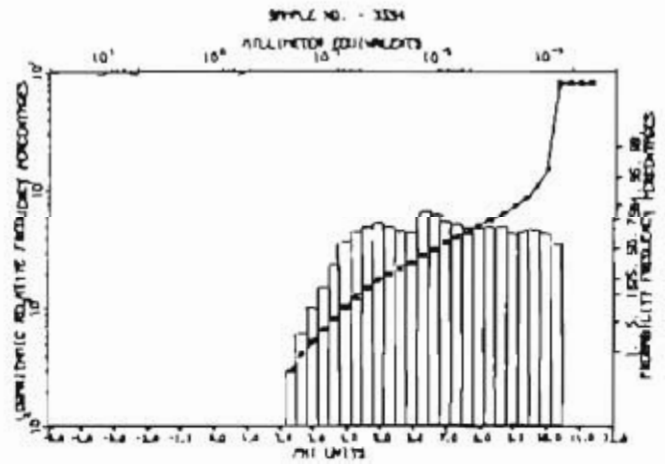
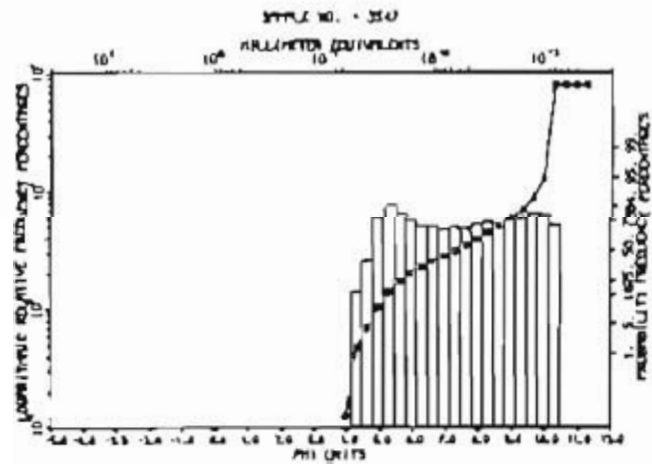
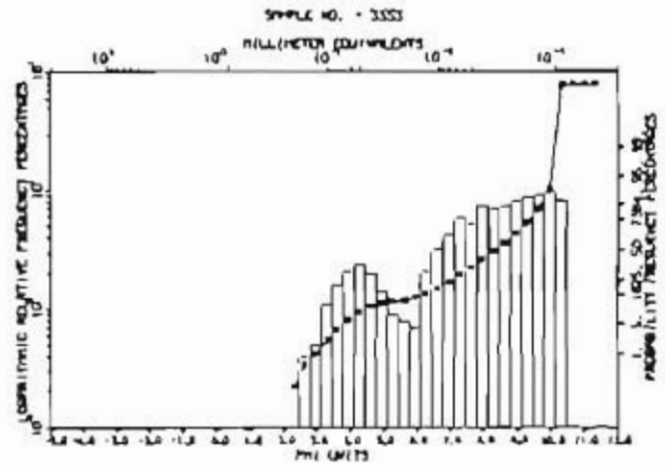
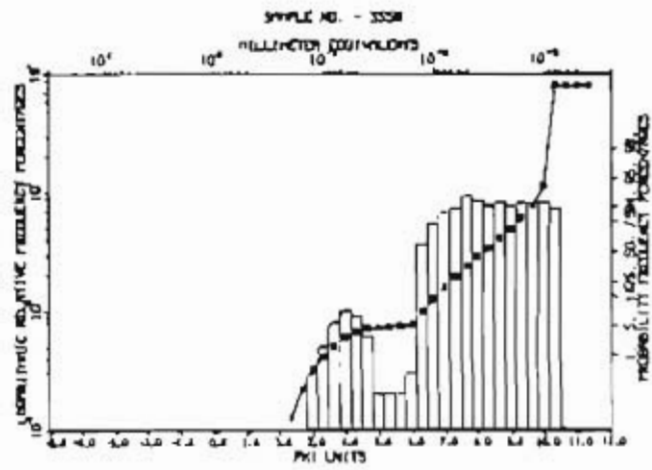
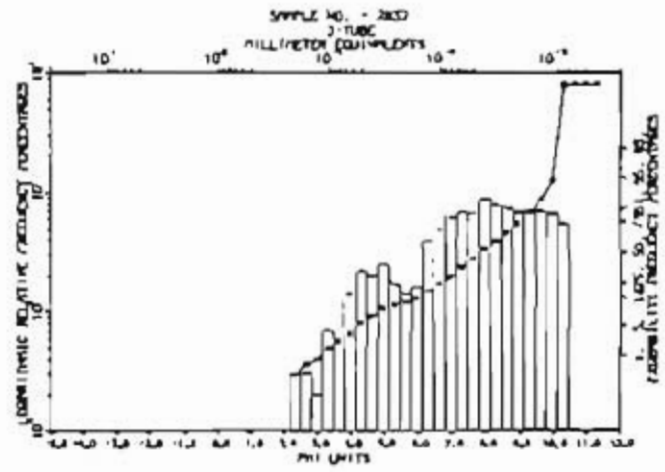
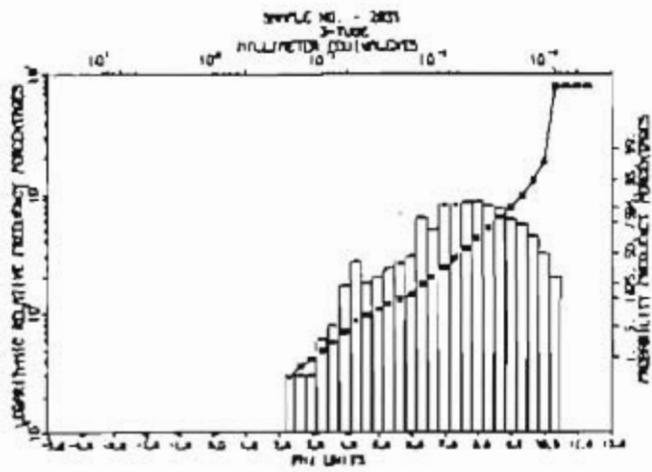


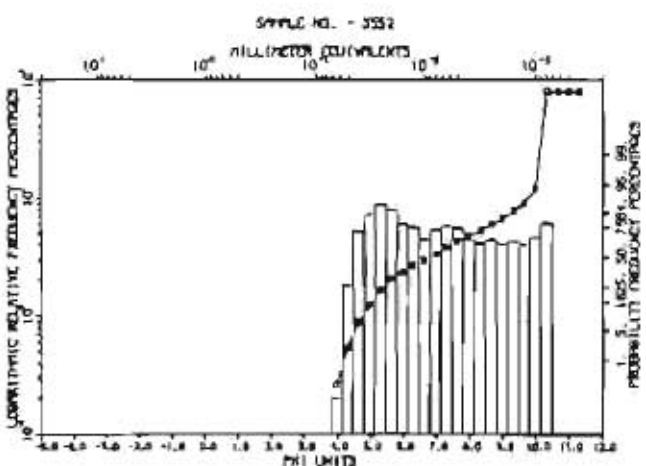
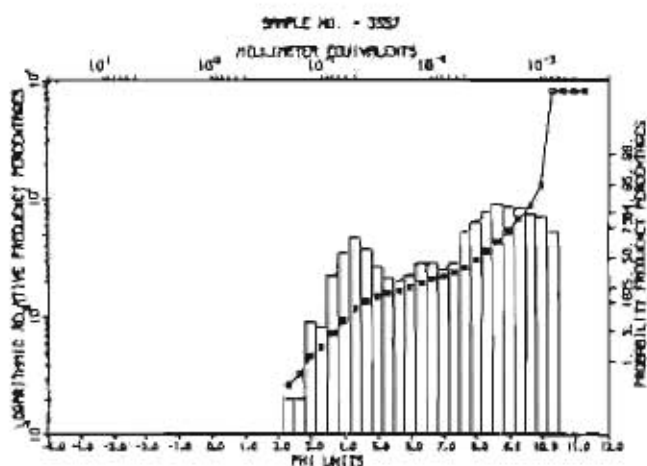
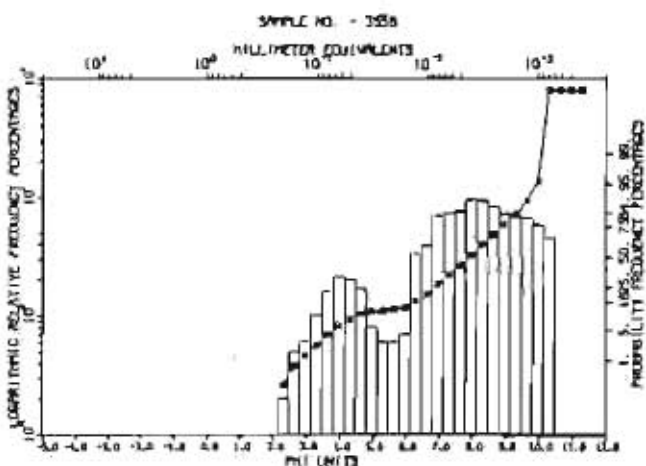
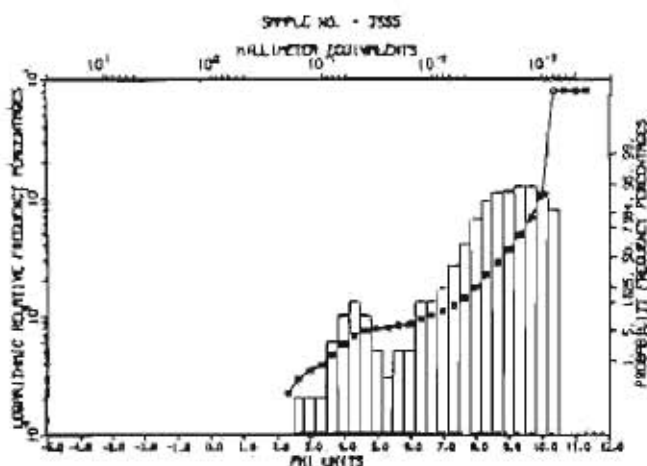
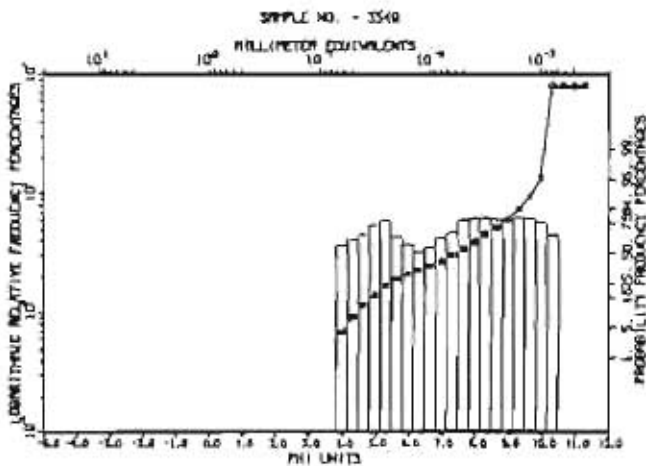
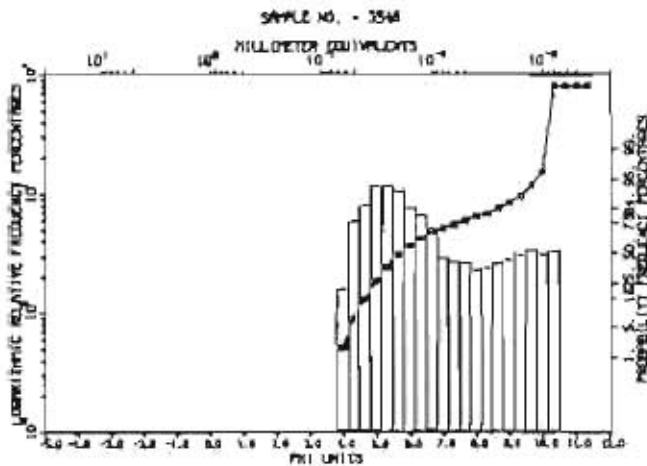


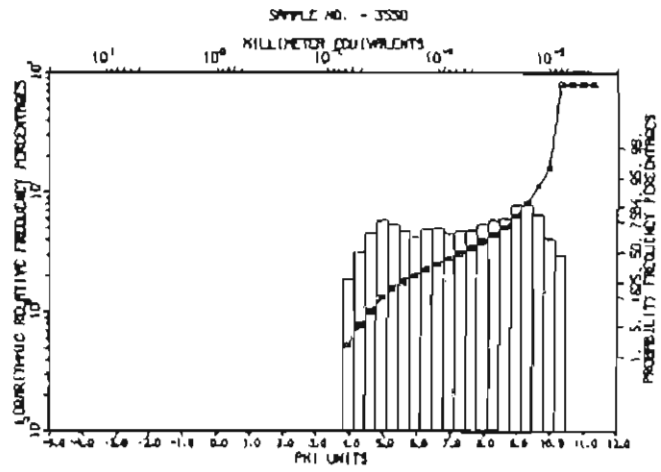
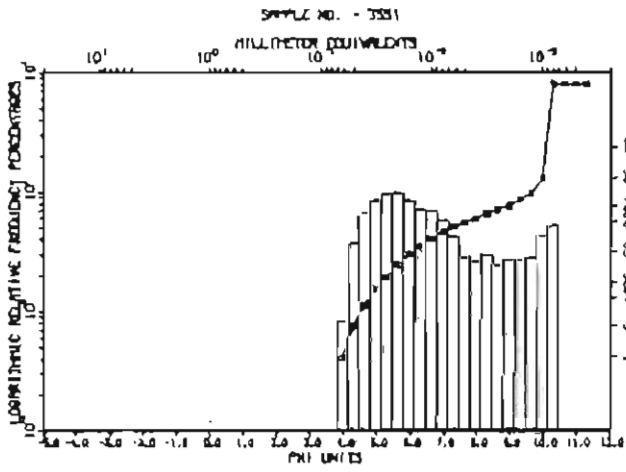














## CHAPTER 5

GRAIN-SIZE CHARACTERISTICS OF AEOLIAN SEDIMENTS FROM  
FIORD HEADS ON BAFFIN ISLAND

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For his paper on the grain-size characteristics of Quaternary sediments from Baffin Island, Andrews (1985) was able to find analyses of only 51 samples of aeolian sediment from two sites, although he and other workers recognise that these materials are a significant component of the terrestrial and marine sedimentary record, both in terms of the amount involved and the palaeoclimatic and palaeogeomorphic information they contain. Grain-size analysis of aeolian sediment has since been carried out to characterize a range of deposits in the vicinity of Crater Lake in Pangnirtung Pass (McKenna Neuman and Gilbert, 1986; McKenna Neuman, in preparation). During the shore-based portion of the S.A.F.E. operation in 1985, samples were collected from aeolian deposits in Coronation, Maktak, and Itirbilung Fiords. Several samples were collected from the south side of the sandur at McBeth Fiord, but the extensive deposit on the north side was not examined.

In the laboratory 20 to 40 g of each sample were sieved at 0.5 phi intervals from 62 um to 8 mm using Canada standard 8" diameter sieves. Analysis in a Sedigraph 5000D apparatus was carried out on the portion less than 62 um (silt size) in samples containing more than 5% by weight.

The results are presented in tables following arranged according to location and environment of deposition. The fractions of gravel (>2 mm diameter), sand, and silt (<62 um diameter) are listed. None of the samples contained measurable clay-sized material. Summary statistics are moment measures following Friedman (1961). Detailed descriptions of sample locations and grain-size distributions are available from the authors.

On the crest of the ice-cored esker at Coronation Glacier two samples were recovered (Table 1) C1 granular particles from the crest of ripples, C2 the finer particles in the troughs. Miscellaneous samples from Itirbilung Fiord are shown in Table 2. IT2-8, and 11-12 are from deposits above the beach and on a fan on the south side of the sandur, both near the head of the fiord. It9 is from a deposit of granules in the lee of a small cut bank near the south side of the sandur about 500 m from the fiord head. It10 is from a silty sand veneer on the south valley side especially in the lee of boulders about 25 m above the sandur surface 2 km up sandur. Samples from the surface of infilling of the top of an ice wedge, part of a polygonal structure on the sandur surface about 1 km up sandur are listed in Table 3.

Samples in a transect of Maktak aeolian deposit are shown in Table 8. The transect is from west to east (down the prevailing wind) along a line about half way across the deposit (north-south). The sample interval is about 165 m (200 paces). Total transect length is 2.14 km. The samples in Table 7 are from among the rocks of a vegetated talus fan (the main ground cover is the heather, Cassopia tetragonia) about 500 m east of the main sand body. The samples in Table 6 are from the blowout immediately east of the main sand body. Samples MA8-11 (Table 5) are on a transect up the valley side above the east end of the main sand body from the top edge of the body and at heights of 25, 75 and 100 m above. Samples MA12 and 13 are from granules and silts at the top of the main sand body about 300 m west.

Samples shown in table 9 are from the south side of McBeth Fiord along the sides to the south of the muddy sandur surface and at the base of the island on the sandur.

Samples shown in Tables 10 through 30 are from the Crater Lake area in Pangnirtung Pass (Fig. 1). The samples are organized by type of aeolian deposit.

Tables 10 through 12 contain grain size data for samples collected from three large sand sheets due east of Crater Lake. Sand and granular ripples comprise much of the surface area of these sheets (Fig. 2a), although they are occasionally planar. The ripple crest, ripple trough and planar surface samples are organized in tables 10, 11 and 12 respectively.

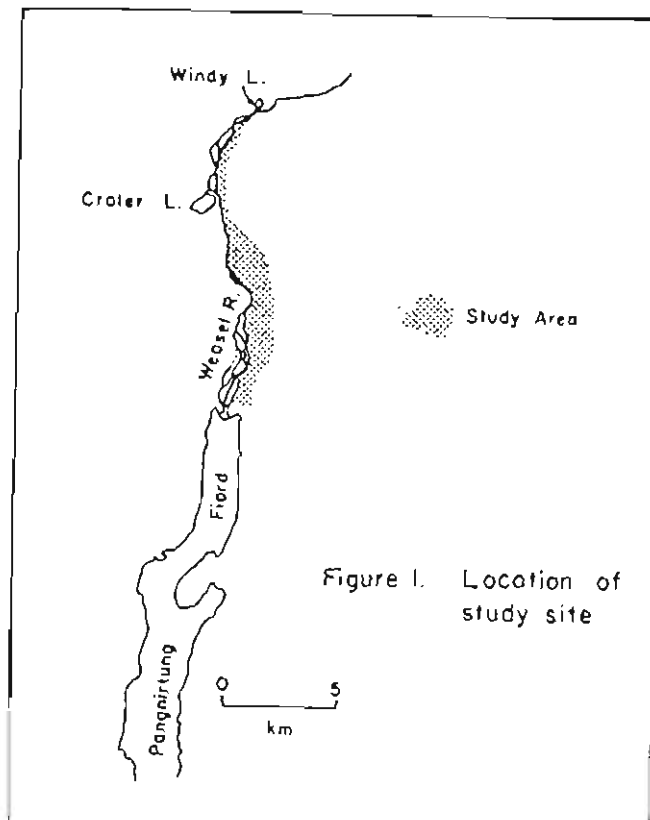
Climbing dunes (Fig.2b) are found exclusively on the south facing sides of the larger moraines and terraces in Pangnirtung Pass. Samples were collected along two transects, one upslope in a north-south orientation and one along the major axis in an east-west orientation, for each of three dunes as found in Tables 13 to 17.

Small dunes less than 1 m in height are typically deposited on the south facing sides of a majority of ventifacts in the region (Fig. 2c). Samples from crests, interdune areas and tails of these deposits are presented in Tables 18, 19 and 20 respectively.

Plants are very important in trapping windblown sand in outwash areas and in shielding these sediments from further deflation. The resultant accumulations range in size from small patches of sand trapped by individual plants (Fig. 2d, Table 21) to parabolic, linear and other complex dunes which may grow to more than 1 m in height (Fig. 2e, Tables 22 to 29). The most prolific of these vegetation trapped features are found up on the valley sides and are typically finer than similar deposits on the valley floor.

## References:

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- Friedman, G.M. 1961. Distinction between dune, beach, and river sands from their textural characteristics. *Journal of Sedimentary Petrology*, 31, pp. 514-529.
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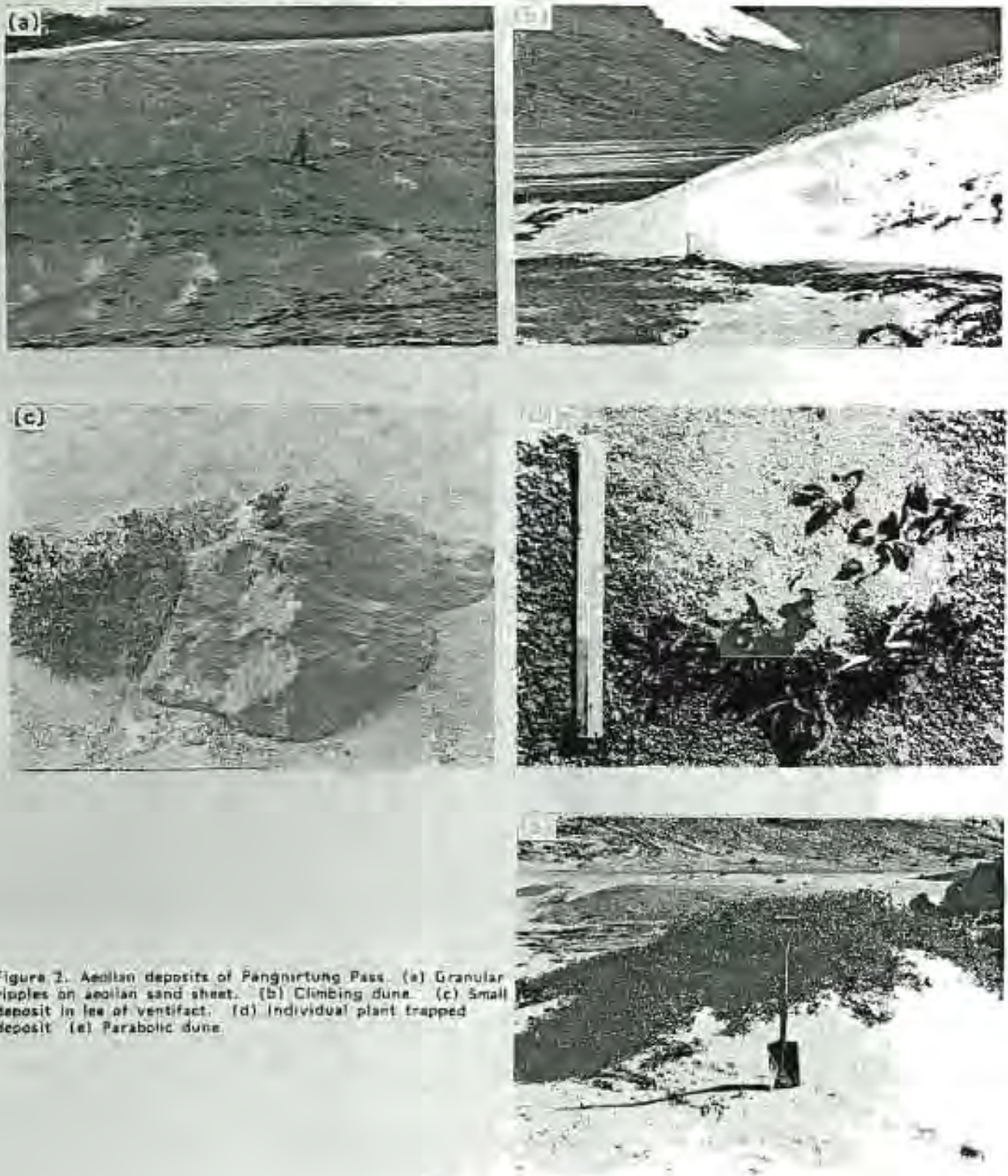


Figure 2. Aeolian deposits of Pangnirtung Pass. (a) Granular ripples on aeolian sand sheet. (b) Climbing dune. (c) Small deposit in lee of ventifact. (d) Individual plant trapped deposit. (e) Parabolic dune.

TABLE 1. GRAIN SIZE SUMMARY FOR CORONATION  
JUVENILE AEOLIAN DEPOSIT ON ESKER NEAR GLACIER

SAMPLE	GRAVEL	SAND	SILT	MEAN		STD. DEV.	SKEWNESS	KURTOSIS
				(PHI)	(MM)			
C1	0.0293	0.8710	0.0997	2.056	0.2405	1.390	-0.419	2.926
C2	0.0031	0.9094	0.0875	2.486	0.17851	0.944	-0.020	3.405

TABLE 2. GRAIN SIZE SUMMARY ITIRBIUNG  
ASSORTED AEOLIAN DEPOSITS

SAMPLE	GRAVEL	SAND	SILT	MEAN		STD. DEV.	SKEWNESS	KURTOSIS
				(PHI)	(MM)			
IT 2	0.0000	0.9867	0.0133	1.253	0.4195	0.996	0.811	3.154
IT 3	0.0000	0.9545	0.0455	2.867	0.1370	0.808	-0.261	2.353
IT 4	0.0000	0.9649	0.0351	2.426	0.1861	0.746	0.289	3.123
IT 5	0.0004	0.9989	0.0007	3.268	0.4151	0.616	0.106	3.388
IT 6A	0.0016	0.7946	0.2038	2.776	0.1459	1.082	-0.353	2.793
IT 6B	0.0000	0.9993	0.0007	1.177	0.4423	0.524	0.456	4.280
IT 8	0.0006	0.9403	0.0590	2.473	0.1800	0.846	0.362	2.695
IT 9	0.7854	0.2130	0.0016	-1.178	2.2629	0.981	2.769	11.176
IT 10	0.0007	0.4203	0.5790	3.668	0.0786	0.948	-2.058	7.271
IT 11	0.0024	0.9751	0.0225	2.423	0.1864	0.683	-0.047	5.647
IT 12	0.0000	0.9735	0.0265	2.047	0.2420	0.912	0.320	2.607

TABLE 3. GRAIN SIZE SUMMARY ITIRBIUNG2  
AEOLIAN INFILLED ICE WEDGE CASTS

SAMPLE	GRAVEL	SAND	SILT	MEAN		STD. DEV.	SKEWNESS	KURTOSIS
				(PHI)	(MM)			
IT1	0.0183	0.8637	0.1380	2.656	0.1586	1.285	-1.160	4.326
IT7	0.0060	0.9864	0.0077	0.415	0.7499	1.033	1.609	5.379

TABLE 4. GRAIN SIZE SUMMARY HAKTAK1  
DEPOSITS ADJACENT TO EAST END OF SAND SHEET

SAMPLE	GRAVEL	SAND	SILT	MEAN		STD. DEV.	SKEWNESS	KURTOSIS
				(PHI)	(MM)			
HA 6	0.0692	0.9308	0.0000	-0.307	1.2370	0.716	2.292	11.486
HA 7	0.0000	0.9932	0.0069	2.083	0.2494	0.804	0.212	2.571

TABLE 5. GRAIN SIZE SUMMARY HAKTAK2  
TRANSECT UPSLOPE FROM AEOLIAN SAND SHEET

SAMPLE	GRAVEL	SAND	SILT	MEAN		STD. DEV.	SKEWNESS	KURTOSIS
				(PHI)	(MM)			
MA 8	0.0000	0.9508	0.0492	2.881	0.1357	0.601	0.196	3.243
MA 9	0.0000	0.9439	0.0561	3.057	0.1201	0.586	-0.312	4.327
MA 10	0.0000	0.6945	0.3055	3.540	0.0859	0.672	-1.265	6.223
MA 11	0.0000	0.7792	0.2208	3.437	0.0923	0.670	-1.409	8.248
MA 12	0.3046	0.6026	0.0928	1.365	0.3883	2.234	-0.383	1.513
MA 13	0.0000	0.8653	0.1347	2.999	0.1250	0.822	-0.262	2.576

TABLE 6. GRAIN SIZE SUMMARY HAKTAK3 -- AEOLIAN RIPPLES

SAMPLE	GRAVEL	SAND	SILT	MEAN		STD. DEV.	SKEWNESS	KURTOSIS
				(PHI)	(MM)			
MA 3	0.0000	0.8303	0.1697	3.376	0.0963	0.566	-0.250	3.646
MA 4	0.0000	0.8331	0.1669	3.303	0.1013	0.608	-0.440	4.868
MA 5	0.0000	0.7411	0.2589	3.457	0.0910	0.619	-0.338	2.808

TABLE 7. GRAIN SIZE SUMMARY HAKTAK4 -- VEGETATED DEPOSITS

SAMPLE	GRAVEL	SAND	SILT	MEAN		STD. DEV.	SKEWNESS	KURTOSIS
				(PHI)	(MM)			
MA 1	0.0000	0.6395	0.3605	3.621	0.08329	0.613	-0.926	4.631
MA 2	0.0000	0.5771	0.4229	3.732	0.07528	0.559	-1.183	6.198

TABLE 8. GRAIN SIZE SUMMARY HAKTAK5 -- SAND SHEET

SAMPLE	GRAVEL	SAND	SILT	MEAN		STD. DEV.	SKEWNESS	KURTOSIS
				(PHI)	(MM)			
HA14LA	0.1064	0.8810	0.0127	0.599	0.6601	1.411	0.535	2.448
HA15LA	0.0000	0.9897	0.0104	2.013	0.2478	0.819	0.036	3.056
HA16LA	0.0520	0.9180	0.0300	1.234	0.4251	1.479	0.034	2.050
HA17LA	0.0459	0.9541	0.0000	0.452	0.7312	1.206	0.888	3.111
HA18LA	0.0003	0.9848	0.0149	1.312	0.4028	1.035	0.607	3.041
HA19LA	0.0096	0.9572	0.0332	1.461	0.3631	1.278	0.268	2.355
HA20LA	0.0050	0.9950	0.0000	0.616	0.6526	0.948	0.924	3.671
HA21LA	0.0037	0.9703	0.0260	1.472	0.3605	1.300	0.242	2.124
HA22LA	0.0021	0.9856	0.0123	0.652	0.6363	1.146	1.146	3.913
HA23LA	0.0065	0.9803	0.0132	1.076	0.4743	1.221	0.535	2.537
HA24LA	0.0025	0.9879	0.0096	0.970	0.5103	1.079	0.287	3.201
HA25LA	0.0103	0.9874	0.0022	0.608	0.6560	1.188	0.897	3.000
HA26LA	0.0000	0.9704	0.0296	1.535	0.3450	1.171	0.540	2.391
HA27LA	0.0000	0.9876	0.0124	1.195	0.4366	1.124	0.717	2.703

TABLE 9. GRAIN SIZE SUMMARY HCBETH

SAMPLE	GRAVEL	SAND	SILT	MEAN		STD. DEV.	SKEWNESS	KURTOSIS
				(PHI)	(MM)			
MC 1	0.0077	0.9829	0.0094	1.383	0.3833	0.772	0.623	6.056
MC 2	0.0005	0.9925	0.0070	1.337	0.3445	0.837	0.305	3.322
MC 4	0.0000	0.9991	0.0009	1.780	0.2912	0.444	0.311	4.155
MC 5	0.7571	0.2415	0.0014	-1.231	2.3486	0.949	2.552	9.991
MC 3	0.0830	0.9139	0.0031	-0.008	1.0056	0.960	1.019	4.338

TABLE 10. GRAIN SIZE SUMMARY FANGKINTUNG SAND SHEET RIPPLE CRESTS

SAMPLE	GRAVEL	SAND	SILT	MEAN		STD. DEV.	SKEWNESS	KURTOSIS
				(PHI)	(MM)			
22552T1	0.4296	0.5702	0.0000	-0.843	1.7936	0.865	0.450	3.362
221552T1	0.2651	0.7349	0.0000	-0.489	1.4032	0.848	0.779	4.292
229552T1	0.3143	0.6857	0.0000	-0.548	1.4621	1.030	0.853	4.106
215552T1	0.3479	0.6521	0.0000	-0.567	1.4812	1.075	0.715	3.589
233552T1	0.1607	0.8398	0.0000	-0.435	1.3523	0.892	1.000	3.068
234	0.1823	0.8177	0.0000	-0.282	1.2156	0.886	1.047	4.089
235552T1	0.5500	0.4500	0.0000	-1.013	2.0181	0.800	1.052	5.438
210552T1	0.1522	0.8478	0.0000	-0.345	1.2704	0.760	0.986	6.018
521(19)C	0.8551	0.1449	0.0000	-1.795	3.4693	0.934	1.987	7.643
521(20)C	0.7927	0.2073	0.0000	-1.564	2.9564	0.902	1.375	3.788
521(17)C	0.8051	0.1949	0.0000	-1.682	3.2077	0.794	0.689	3.605
521(15)C	0.6416	0.3584	0.0000	-1.102	2.1465	1.290	1.152	4.083
521(13)C	0.8916	0.3084	0.0000	-1.466	2.7623	1.084	1.066	4.260
521(12)C	0.7436	0.2564	0.0000	-1.567	2.9623	1.029	1.050	4.243
521(10)W	0.6986	0.3014	0.0000	-1.503	2.8346	1.789	1.200	3.367
521(10)C	0.4353	0.5647	0.0000	-0.959	1.9436	1.145	0.553	3.773
5213C	0.4850	0.5150	0.0000	-0.691	1.6146	1.368	0.711	2.889
5214C	0.5959	0.4041	0.0000	-0.951	1.9332	2.020	0.685	2.225
5212C	0.7008	0.2992	0.0000	-1.208	2.3095	1.891	1.082	2.737
329552T2	0.5604	0.4396	0.0000	-0.995	1.9929	0.505	0.803	4.302
333552T2	0.6804	0.3196	0.0000	-1.215	2.3221	0.750	1.358	5.651
352552T2	0.8095	0.1905	0.0000	-1.320	2.4970	0.445	0.413	4.307
340552T2	0.2176	0.7824	0.0000	-0.561	1.4749	0.646	1.167	5.918
342552T2	0.0882	0.9118	0.0000	-0.398	1.3179	0.515	0.798	3.437
349552T2	0.0605	0.9395	0.0000	-0.263	1.2001	0.715	1.790	7.844
345552T2	0.0037	0.9963	0.0000	-0.355	0.9977	1.180	-2.068	7.393
330552T2	0.1176	0.8824	0.0000	-0.443	1.3590	0.513	0.490	4.677
5228WC H	0.5637	0.4363	0.0000	-0.753	1.6849	1.642	0.905	2.711
5229C	0.4825	0.5175	0.0000	-0.744	1.6750	1.473	0.663	2.616
388552T3	0.7349	0.2651	0.0000	-1.345	2.5401	0.735	1.290	6.027
398552T3	0.8342	0.1658	0.0000	-1.512	2.8524	0.586	1.032	4.477
385552T3	0.8611	0.1389	0.0000	-1.493	2.8139	0.521	0.990	4.648
382552T3	0.5236	0.4764	0.0000	-1.023	2.0219	0.507	0.367	3.568
393552T3	0.9966	0.0034	0.0000	-2.120	4.3471	0.282	1.438	5.869
397552T3	0.5708	0.4292	0.0000	-1.083	2.1177	1.130	1.128	4.743
399552T3	0.4341	0.5659	0.0000	-0.681	1.6028	1.184	1.293	4.769
381552T3	0.9276	0.0724	0.0000	-1.613	3.0812	0.410	0.642	3.703

TABLE 10, continued ...

SAMPLE	GRAVEL	SAND	SILT	MEAN		STD. DEV.	SKEWNESS	KURTOSIS
				(PHI)	(MM)			
394552T3	0.5182	0.4818	0.0000	-0.988	1.9840	0.665	0.436	3.028
387552T3	0.8081	0.1919	0.0000	-1.231	2.3468	0.366	0.391	4.832
395552T3	0.2658	0.7342	0.0000	-0.827	1.7733	0.705	0.185	3.496
304552T3	0.6739	0.3261	0.0000	-1.197	2.2927	0.371	0.701	4.127
299552T3	0.4164	0.5836	0.0000	-0.881	1.8414	0.637	0.666	4.266
316552T3	0.2992	0.7008	0.0000	-0.307	1.2388	1.223	0.932	3.276
325552T3	0.3686	0.6314	0.0000	-0.849	1.8017	0.360	1.725	9.076
313552T3	0.4999	0.5002	0.0000	-0.948	1.9287	0.625	1.238	6.902
5224WC	0.8758	0.1242	0.0000	-1.920	3.7846	1.189	2.181	8.093
5226WC	0.8722	0.1278	0.0000	-1.929	3.8068	1.271	2.245	7.781
5229WC	0.7520	0.2480	0.0000	-1.450	2.7326	1.388	1.399	4.467
52210WC	0.7408	0.2592	0.0000	-1.440	2.7129	1.301	1.345	4.708
5229C	0.7497	0.2503	0.0000	-1.419	2.6735	0.812	1.137	4.999
5225WC	0.9479	0.0521	0.0000	-1.936	3.8260	0.634	1.982	12.000
5233WC	0.7719	0.2281	0.0000	-1.475	2.7799	1.281	1.483	5.055
232553	0.9272	0.0728	0.0000	-1.498	2.8749	0.375	0.321	3.700
247553	0.1170	0.8830	0.0000	-0.286	1.2194	0.722	1.089	5.334
244553	0.2800	0.7200	0.0000	-0.733	1.6626	0.563	0.863	3.783
238553	0.2251	0.7749	0.0000	-0.488	1.4027	0.644	0.897	4.067
241553	0.2376	0.7624	0.0000	-0.557	1.4713	0.611	0.716	3.338
240553	0.1001	0.8999	0.0000	-0.176	1.1300	0.664	0.432	3.761
249553	0.2012	0.7988	0.0000	-0.782	1.7190	0.339	-0.067	4.447
235553	0.5209	0.4791	0.0000	-0.927	1.9011	0.551	1.761	8.854
385553	0.1635	0.8365	0.0000	-0.610	1.5259	0.451	0.525	3.963
237553	0.2933	0.7067	0.0000	-0.864	1.5845	0.629	1.279	5.966
250553	0.3487	0.6513	0.0000	-0.814	1.7579	0.527	0.495	4.228
251553	0.4865	0.5135	0.0000	-1.141	2.2060	0.546	1.180	6.155
261553	0.1842	0.8158	0.0000	-0.521	1.4350	0.510	0.090	2.940
264553	0.0548	0.9452	0.0000	-0.077	1.0545	0.636	0.851	4.387
238553	0.4523	0.5477	0.0000	-0.964	1.9535	0.290	0.169	3.008
5344C ME	0.8528	0.1472	0.0000	-1.389	2.8195	0.660	2.535	12.955
5343CHM	0.1744	0.8256	0.0000	-0.091	1.0650	1.003	0.754	3.247
5342C ME	0.8989	0.1011	0.0000	-1.539	2.9063	0.615	2.123	10.691
5341C ME	0.4463	0.5537	0.0000	-0.779	1.7136	0.719	1.592	6.777
5353C ME	0.8939	0.1061	0.0000	-1.441	2.7152	0.448	2.751	23.921
177551	0.6386	0.3614	0.0000	-1.115	2.1660	0.453	0.760	5.448
193551	0.1143	0.8857	0.0019	0.368	0.7748	1.370	0.656	2.127
203551	0.0828	0.9172	0.0007	0.428	0.7432	1.327	0.560	1.947
191551	0.0095	0.9905	0.0000	-0.127	1.0922	0.597	1.569	6.911
198551	0.0362	0.9638	0.0000	-0.293	1.2271	0.587	1.994	9.706
179551	0.1642	0.8358	0.0000	-0.505	1.4194	0.555	0.524	3.767
363551	0.0069	0.9931	0.0006	0.343	0.7881	0.699	1.845	7.499
151551	0.0018	0.9982	0.0023	0.432	0.7411	0.850	1.552	6.404
156551	0.0000	0.9936	0.0064	1.271	0.4344	0.830	0.629	3.223
146551	0.0083	0.9917	0.0000	-0.137	1.0992	0.578	1.692	7.917
163551	0.0077	0.9923	0.0000	-0.107	1.0767	0.513	1.423	8.717
133551	0.0917	0.8983	0.0127	0.787	0.5797	1.452	0.338	2.229
131551	0.0044	0.9956	0.0000	0.063	0.9574	0.451	1.801	8.234

TABLE 11. GRAIN SIZE SUMMARY PAUNCHITUNG SAND SHEET RIPPLE TROUGH

SAMPLE	GRAVEL	SAND	SILT	MEAN		STD. DEV.	SKEWNESS	KURTOSIS
				(PHI)	(MM)			
231552T1	0.0490	0.9392	0.0118	0.993	0.5025	1.400	-0.049	2.341
207552T1	0.0318	0.9595	0.0087	0.879	0.5436	1.111	0.469	3.624
213552T1	0.0496	0.9324	0.0180	1.259	0.4179	1.350	-0.171	2.790
230552T1	0.2073	0.7927	0.0000	0.442	0.7358	1.588	0.006	2.120
211552T1	0.1149	0.8670	0.0181	1.353	0.3914	1.574	-0.484	2.335
218552T1	0.0662	0.8958	0.0381	1.587	0.3327	1.415	-0.344	2.618
208552T1	0.2636	0.7344	0.0000	0.297	0.8139	1.774	0.076	2.057
227552T1	0.2121	0.7879	0.0000	-0.338	1.2637	0.954	1.113	4.572
214552T1	0.0193	0.9807	0.0000	0.927	0.5259	1.101	0.272	2.431
217552T1	0.2718	0.7282	0.0000	-0.403	1.3219	0.952	0.759	3.776
223	0.3442	0.7558	0.0000	-0.362	1.2847	1.061	0.719	3.469
228552T1	0.1553	0.8447	0.0000	0.082	0.9447	1.230	0.835	2.849
212552T1	0.0508	0.9310	0.0182	-0.865	0.5491	1.280	0.665	2.822
218552T1	0.4201	0.5643	0.0157	-0.026	1.0184	1.789	0.537	2.111
206552T1	0.1015	0.8985	0.0000	-0.158	1.1156	0.959	1.355	5.222
5213T	0.3171	0.6829	0.0000	0.479	0.7172	2.117	-0.228	1.725
331552T2	0.0778	0.9196	0.0027	0.712	0.6103	1.287	0.177	2.118
354552T2	0.0589	0.9399	0.0012	0.480	0.7171	1.212	0.486	2.315
326552T2	0.5773	0.4228	0.0000	-0.818	1.7625	1.009	1.702	5.961
338552T2	0.0159	0.9837	0.0004	0.291	0.8173	0.933	1.193	4.202
327552T2	0.0373	0.9411	0.0216	1.633	0.3225	1.144	-0.519	4.210
350552T2	0.2416	0.7584	0.0000	0.166	0.8911	1.555	-0.099	2.228
335552T2	0.0371	0.9409	0.0000	1.086	0.4711	1.505	0.088	2.089
337552T2	0.0351	0.9643	0.0000	0.827	0.5637	1.216	0.373	2.390
336552T2	0.0150	0.9584	0.0286	1.850	0.2773	1.278	-0.434	2.568
348552T2	0.0820	0.9180	0.0000	0.822	0.9850	0.914	1.154	5.097
386552T3	0.1936	0.7937	0.0127	0.665	0.8308	1.622	0.155	2.011
400552T3	0.2800	0.8000	0.0000	0.309	0.8030	1.379	0.146	2.424
383552T3	0.0750	0.9242	0.0008	0.484	0.7851	1.107	0.140	2.292
384552T3	0.2561	0.7348	0.0091	0.083	0.9442	1.494	0.692	2.869
389552T3	0.3254	0.6581	0.0165	0.302	0.8109	1.734	0.334	1.954
390552T3	0.2624	0.7376	0.0000	0.413	0.7509	1.608	-0.031	1.802
391552T3	0.2407	0.7593	0.0000	0.743	0.5973	1.844	-0.351	1.964
398552T3	0.0130	0.9827	0.0043	0.943	0.5207	0.988	0.477	3.079
380552T3	0.3232	0.6768	0.0000	0.030	0.9795	1.489	0.327	2.189
314552T3	0.1120	0.8818	0.0082	0.756	0.5919	1.395	0.139	2.080
315552T3	0.0483	0.9344	0.0173	1.413	0.3754	1.305	-0.355	2.831
318552T3	0.1409	0.8334	0.0257	1.374	0.3857	1.687	-0.515	2.261
312552T3	0.1071	0.8858	0.0071	0.465	0.7242	1.266	0.490	2.630
372552T3	0.0293	0.9650	0.0057	0.826	0.6480	1.224	0.591	2.538
243553	0.1428	0.8569	0.0003	0.278	0.8244	1.088	-0.029	2.354
260553	0.1589	0.8411	0.0000	-0.225	1.1691	0.974	0.588	3.616
238553	0.2780	0.7290	0.0000	-0.222	1.2507	1.004	0.173	2.607
267553	0.0345	0.9635	0.0000	0.518	0.6982	1.051	0.820	3.015
245553	0.0313	0.9687	0.0000	0.968	0.5113	1.072	-0.150	3.089
259553	0.2800	0.7200	0.0000	-0.047	1.0732	1.479	0.884	2.675
248553	0.3715	0.6285	0.0000	-0.343	1.2686	1.200	0.871	3.230

TABLE 11. continued ...

SAMPLE	GRAVEL	SAND	SILT	MEAN		STD. DEV.	SKEWNESS	KURTOSIS
				(PHI)	(MM)			
254553	0.2461	0.7539	0.0000	0.351	0.7841	1.446	0.196	2.028
256553	0.0168	0.9832	0.0000	0.707	0.6124	1.067	0.374	2.290
239553	0.0215	0.9634	0.0151	1.467	0.2618	1.320	-0.199	3.165
246553	0.1251	0.8749	0.0000	0.342	0.7891	1.157	0.151	2.490
263553	0.0672	0.9328	0.0000	0.510	0.7022	1.129	0.440	2.504
242553	0.0841	0.9159	0.0000	0.612	0.6366	1.150	0.038	2.308
257553	0.1117	0.8883	0.0000	1.026	0.4909	1.258	-0.634	2.701
253553	0.0735	0.9265	0.0000	0.663	0.6315	1.146	-0.035	2.844
5353C ME	0.8939	0.1061	0.0000	-1.441	2.7152	0.449	2.751	23.921
5344T ME	0.0577	0.9289	0.0134	1.565	0.3379	1.294	-0.611	3.075
5342T ME	0.1070	0.8930	0.0000	0.983	0.5057	1.258	-0.594	2.752
5341T ME	0.1158	0.8842	0.0000	1.009	0.4967	1.312	-0.494	2.385
5343T ME	0.0541	0.9347	0.0112	1.298	0.4064	1.351	-0.229	2.280
5353T ME	0.0452	0.9465	0.0084	1.442	0.2680	1.190	-0.534	2.972
188551	0.0230	0.9886	0.0084	1.979	0.2537	1.129	-1.382	5.583
197551	0.0295	0.9642	0.0063	1.435	0.3697	1.398	-0.427	1.974
195551	0.0025	0.9912	0.0064	1.506	0.3520	1.082	-0.025	2.421
201551	0.0038	0.9862	0.0103	1.448	0.3665	1.225	-0.054	2.102
180551	0.0200	0.9749	0.0051	1.843	0.2787	1.181	-1.005	3.473
178551	0.0064	0.9858	0.0078	1.053	0.4819	0.921	0.771	3.815
154551	0.0550	0.9177	0.0274	1.589	0.3323	1.546	-0.418	2.046
129551	0.0025	0.9937	0.0038	0.999	0.5004	1.059	0.580	2.623
138551	0.0256	0.9742	0.0002	2.315	0.2010	1.172	-0.896	4.073
161551	0.0000	0.9333	0.0467	1.859	0.2756	1.148	0.190	2.391
144551	0.0608	0.9242	0.0352	0.764	0.5889	1.566	0.505	1.878
147551	0.0026	0.9717	0.0257	1.322	0.4000	1.181	0.669	2.678

TABLE 12. GRAIN SIZE SUMMARY PANGNIRTUNG SAND SNEET -- PLANAR SURFACE

SAMPLE	GRAVEL	SAND	SILT	MEAN		STD. DEV.	SKEWNESS	KURTOSIS
				(PHI)	(MM)			
2225S2T1	0.1522	0.8478	0.0000	0.093	0.9376	1.254	0.785	2.937
3515S2T2	0.4146	0.5854	0.0000	-0.213	1.1588	1.705	0.594	2.188
3375S2T2	0.0560	0.9440	0.0000	0.105	0.9300	0.889	1.008	4.536
3925S2T3	0.1974	0.8026	0.0000	0.547	0.6845	1.531	-0.147	2.066
1835S1	0.0269	0.9692	0.0040	0.299	0.8128	1.085	1.273	4.058
2045S1	0.0159	0.9611	0.0230	1.651	0.3185	1.180	-0.166	2.749
1765S1	0.0164	0.9738	0.0078	1.285	0.4103	1.205	0.015	2.307
1745S1	0.0000	0.9969	0.0031	2.036	0.2438	0.617	0.206	3.429
1755S1	0.0036	0.9875	0.0089	1.442	0.3679	1.113	0.141	2.501
2005S1	0.0000	0.9746	0.0255	2.391	0.1906	0.740	0.206	2.909
1865S1	0.0127	0.9873	0.0000	0.655	0.6349	1.051	0.753	2.953
1995S1	0.0000	0.9991	0.0009	0.828	0.5634	0.943	0.757	2.882
1875S1	0.0016	0.9823	0.0161	1.649	0.3187	1.068	0.023	2.683
1895S1	0.3876	0.6124	0.0000	-0.533	1.4465	1.090	1.576	4.980
2025S1	0.0000	0.9896	0.0104	1.555	0.3403	0.904	0.503	3.281
1905S1	0.0159	0.9841	0.0000	1.092	0.4689	0.857	-0.405	3.180
1815S1	0.0099	0.9779	0.0122	1.683	0.3113	1.064	-0.045	2.869
1925S1	0.1851	0.8097	0.0053	-0.053	1.0371	1.309	1.338	3.755
1855S1	0.0093	0.9900	0.0007	0.757	0.5917	0.780	0.646	4.023
1945S1	0.0327	0.9637	0.0036	1.077	0.4741	1.241	-0.067	2.083
1825S1	0.0107	0.9878	0.0015	0.965	0.5122	1.085	0.305	2.384
3715S1	0.0000	0.9711	0.0289	2.085	0.2356	0.993	-0.013	2.587
3565S1	0.0000	0.9530	0.0480	2.173	0.2217	1.020	-0.011	2.731
3795S1	0.0060	0.9619	0.0321	1.511	0.3507	1.301	0.253	2.052
3595S1	0.0008	0.9050	0.0942	3.018	0.1236	0.703	-0.583	5.630
3705S1	0.0000	0.9884	0.0116	2.268	0.2075	0.875	-0.420	3.358
3685S1	0.0030	0.9519	0.0451	2.154	0.2246	1.069	-0.177	2.779
3575S1	0.0000	0.9987	0.0013	0.495	0.7094	0.745	1.636	6.305
3725S1	0.0000	0.9180	0.0820	2.669	0.1572	0.783	0.205	3.186
3745S1	0.0000	0.9715	0.0285	2.517	0.1747	0.672	0.551	3.102
3645S1	0.0000	0.9832	0.0168	2.812	0.1424	0.565	0.147	2.784
3735S1	0.0000	0.9903	0.0095	1.414	0.3752	1.108	0.467	2.292
3555S1	0.0000	0.9670	0.0330	1.661	0.3162	1.283	0.363	1.892
3675S1	0.0000	0.9582	0.0418	2.589	0.1662	0.682	0.368	3.443
3615S1	0.0000	0.9257	0.0743	2.696	0.1543	0.757	-0.169	3.174
3655S1	0.0000	0.9469	0.0531	2.461	0.1816	0.909	-0.018	2.638
1485S1	0.0000	0.9164	0.0836	2.399	0.1896	0.871	0.174	2.491
1345S1	0.0009	0.9834	0.0157	1.115	0.4616	1.179	0.716	2.653
1315S1	0.0000	0.9829	0.0171	1.785	0.2902	0.996	0.204	2.546
1605S1	0.0094	0.9782	0.0124	1.237	0.4243	1.089	0.337	2.909
1525S1	0.0000	0.9919	0.0081	1.275	0.4133	0.873	1.057	4.021
1555S1	0.0370	0.9585	0.0044	0.172	0.8676	1.145	1.483	4.548
1575S1	0.0005	0.9713	0.0082	1.221	0.4288	1.090	0.317	2.472
1585S1	0.0644	0.9340	0.0016	0.080	0.9461	1.021	1.201	4.319
1505S1	0.0005	0.9935	0.0059	1.001	0.4995	0.934	1.062	4.017
1535S1	0.1034	0.8931	0.0035	0.302	0.8110	1.287	0.871	2.872
1425S1	0.0235	0.9752	0.0014	0.489	0.7125	1.047	0.809	3.149
1495S1	0.0000	0.9886	0.0114	1.305	0.4047	0.949	0.449	3.286
1625S1	0.0148	0.9748	0.0103	0.856	0.5525	1.348	0.452	2.134
1595S1	0.0028	0.9840	0.0132	1.035	0.4879	1.204	0.703	2.643

TABLE 12. continued ...

SAMPLE	GRAVEL	SAND	SILT	MEAN		STD. DEV.	SKEWNESS	KURTOSIS
				(PHI)	(MM)			
1415S1	0.0892	0.9108	0.0000	-0.292	1.2244	0.811	1.772	6.669
1365S1	0.0364	0.9497	0.0139	1.170	0.4444	1.291	0.099	2.353
1325S1	0.0000	0.9985	0.0015	0.921	0.5282	0.717	1.176	5.108
1405S1	0.0017	0.9817	0.0165	2.084	0.2358	1.103	-0.503	2.913
1435S1	0.0287	0.9713	0.0000	0.562	0.6775	1.110	0.521	2.449
1455S1	0.0643	0.9329	0.0028	0.387	0.7647	1.152	0.895	3.262

TABLE 13. GRAIN SIZE SUMMARY PANGNIRTUNG CLIMBING DUNE 1 E-W TRANSECT

SAMPLE	GRAVEL	SAND	SILT	MEAN		STD. DEV.	SKEWNESS	KURTOSIS
				(PHI)	(MM)			
39CD1	0.0000	1.0000	0.0000	0.717	0.60840	0.574	1.113	4.263
23CD1	0.0000	1.0000	0.0000	0.351	0.78393	0.458	0.865	5.254
29CD1	0.0070	0.9904	0.0026	0.307	0.53329	0.749	0.846	5.422
36CD1	0.0000	1.0000	0.0000	1.466	0.36187	0.544	0.351	4.145
24CD1	0.0000	0.9985	0.0015	1.096	0.46779	0.727	0.917	4.067
34CD1	0.0008	0.9992	0.0000	0.436	0.73932	0.627	1.351	5.666
32CD1	0.0019	0.9981	0.0000	0.786	0.58007	0.607	0.869	4.448
40CD1	0.0000	1.0000	0.0000	0.448	0.73695	0.559	1.335	5.870

TABLE 14. GRAIN SIZE SUMMARY PANGNIRTUNG CLIMBING DUNE 1 -- N-S UPSLOPE TRANSECT

SAMPLE	GRAVEL	SAND	SILT	MEAN		STD. DEV.	SKEWNESS	KURTOSIS
				(PHI)	(MM)			
25CD1	0.0146	0.9831	0.0024	0.584	0.6669	1.097	0.698	2.780
37CD1	0.1750	0.8137	0.0113	3.309	0.4037	1.663	-0.782	2.448
31CD1	0.0000	0.9935	0.0065	2.119	0.2302	0.701	-0.030	3.459
38CD1	0.0000	0.9997	0.0003	1.155	0.4493	0.689	0.773	3.412
21CD1	0.0000	0.9995	0.0005	1.619	0.3256	0.485	1.076	4.810

TABLE 15. GRAIN SIZE SUMMARY PANGNIRTUNG CLIMBING DUNE 2 E-W TRANSECT

SAMPLE	GRAVEL	SAND	SILT	MEAN		STD. DEV.	SKEWNESS	KURTOSIS
				(PHI)	(MM)			
51CD2T1	0.0000	0.9757	0.0243	2.364	0.1943	0.673	0.746	3.211
52CD2T1	0.0000	0.9956	0.0044	2.167	0.2227	0.633	-0.098	4.627
42CD2T1	0.0007	0.9994	0.0000	1.565	0.3379	0.719	-0.130	3.302
41CD2T1	0.0000	0.9820	0.0180	1.943	0.2601	0.882	0.238	2.748
60CD2T1	0.0036	0.9871	0.0104	1.524	0.3677	0.941	0.254	3.014

TABLE 16. GRAIN SIZE DATA PANGNIRTUNG CLIMBING DUNE 2 -- N-S UPSLOPE TRANSECT

SAMPLE	GRAVEL	SAND	SILT	MEAN		STD.DEV.	SKEWNESS	KURTOSIS
				(PHI)	(MM)			
43CD2T1	0.0000	0.9128	0.0872	2.851	0.1385	0.663	0.452	3.069
50CD2T1	0.0000	0.9986	0.0015	1.299	0.4064	0.896	0.120	2.778
56CD2T1	0.0000	0.9774	0.0226	2.367	0.1938	0.703	0.578	2.860
55CD2T1	0.0000	0.9947	0.0053	2.686	0.1554	0.431	0.434	3.547
49CB2T1	0.0000	0.9830	0.0170	2.438	0.1845	0.578	0.621	4.078

TABLE 17. GRAIN SIZE DATA PANGNIRTUNG CLIMBING DUNE 3

SAMPLE	GRAVEL	SAND	SILT	MEAN		STD.DEV.	SKEWNESS	KURTOSIS
				(PHI)	(MM)			
4CD3	0.0019	0.9435	0.0546	2.629	0.1616	0.826	-0.591	4.988
9CD3	0.0000	0.9766	0.0234	2.617	0.1629	0.599	0.068	4.065
19CD3	0.0062	0.9756	0.0181	1.643	0.3301	1.160	-0.015	2.355
8CD3	0.0000	0.9236	0.0764	2.394	0.1903	0.935	0.143	2.807
17CD3	0.0000	0.9875	0.0125	2.479	0.1794	0.676	-0.107	3.010
13CD3	0.0000	0.9399	0.0601	2.748	0.1488	0.675	0.316	3.006
15CD3	0.0047	0.9337	0.0616	2.362	0.1944	1.015	-0.428	3.562
12CD3	0.0000	0.9987	0.0013	0.760	0.5905	0.840	1.043	3.909

TABLE 18. GRAIN SIZE SUMMARY PANGNIRTUNG--LEESIDE VENTIFACT DUNE--CREST

SAMPLE	GRAVEL	SAND	SILT	MEAN		STD.DEV.	SKEWNESS	KURTOSIS
				(PHI)	(MM)			
64LVD	0.0070	0.9625	0.0305	1.763	0.2946	1.079	-0.026	3.104
269LVD	0.0047	0.9227	0.0726	2.346	0.1967	1.016	-0.238	3.470
83LVD	0.0011	0.9817	0.0172	1.460	0.3635	1.010	0.348	3.157
275LVD	0.0000	0.8963	0.1037	2.544	0.1714	1.008	-0.206	2.786
84LVD	0.0020	0.9481	0.0500	2.294	0.2039	1.010	-0.267	2.964
164LVD	0.0000	0.9917	0.0083	1.696	0.3085	0.768	0.384	3.647
86SC15A	0.0000	0.9749	0.0251	2.238	0.2119	0.785	0.193	3.151
64SC7	0.0000	0.9324	0.0676	2.521	0.1742	0.884	-0.130	3.213
172SC7	0.0000	0.9392	0.0608	2.177	0.2210	1.040	0.048	2.563

TABLE 19. GRAIN SIZE SUMMARY PANGNIRTUNG -- LEESIDE VENTIFACT DUNE -- INTERDUNE

SAMPLE	GRAVEL	SAND	SILT	MEAN		STD.DEV.	SKEWNESS	KURTOSIS
				(PHI)	(MM)			
171LVD	0.3644	0.6356	0.0000	-0.639	1.5575	0.872	1.428	5.367
295LVD	0.0289	0.9711	0.0000	1.646	0.2780	1.271	-0.267	2.701
441LVD	0.3198	0.6802	0.0000	-0.184	1.1356	1.150	0.789	2.838
87SC1	0.2914	0.7086	0.0000	-0.624	1.5413	0.688	1.264	5.234

TABLE 20. GRAIN SIZE DATA PANGNIRTUNG--LEESIDE VENTIFACT DUNE--TAIL

SAMPLE	GRAVEL	SAND	SILT	MEAN		STD.DEV.	SKEWNESS	KURTOSIS
				(PHI)	(MM)			
85LVD-IE	0.0030	0.9837	0.0133	1.466	0.3618	0.966	0.241	3.359
281LVD	0.0000	1.0000	0.0000	1.213	0.4314	0.648	0.489	3.336
89LVD	0.0154	0.9783	0.0064	0.660	0.6326	1.110	0.759	3.130
270LVD	0.0061	0.9417	0.0522	1.708	0.3060	1.224	0.300	2.429
88LVD	0.0795	0.9058	0.0147	0.663	0.6316	1.378	0.555	2.445
82LVD	0.0000	0.9954	0.0046	1.967	0.2558	0.684	0.104	3.513
81SC1	0.0000	0.9913	0.0087	1.817	0.2837	0.817	0.133	3.253

TABLE 21. GRAIN SIZE SUMMARY PANGNIRTUNG- INDIVIDUAL PLANT TRAPPED DEPOSITS

SAMPLE	GRAVEL	SAND	SILT	MEAN		STD.DEV.	SKEWNESS	KURTOSIS
				(PHI)	(MM)			
141PTF	0.0000	0.9669	0.0331	1.692	0.3094	1.087	0.378	2.536
51PTF	0.0000	0.9861	0.0139	1.973	0.2547	0.815	-0.076	3.590
201PTF	0.0014	0.9246	0.0739	2.224	0.2141	1.039	0.073	2.731
101PTF	0.0006	0.9868	0.0126	1.678	0.3125	0.824	0.553	3.511
161PTF	0.0000	0.9965	0.0035	1.524	0.3477	0.745	0.654	3.371
111PTF	0.0000	0.9897	0.0103	1.318	0.4011	1.041	0.451	2.632
31PTF	0.0027	0.9751	0.0222	1.706	0.3065	1.021	0.177	2.882
181PTF	0.0000	0.9669	0.0331	2.012	0.2478	0.925	0.216	3.007
761PTF	0.0315	0.9386	0.0319	1.696	0.3085	1.102	-0.104	3.626
71PTF	0.0126	0.9593	0.0281	1.623	0.3246	1.271	-0.257	2.469

TABLE 22. GRAIN SIZE SUMMARY PANGNIRTUNG VEGETATED DUNE CRESTS--SITE 1

SAMPLE	GRAVEL	SAND	SILT	MEAN		STD.DEV.	SKEWNESS	KURTOSIS
				(PHI)	(MM)			
27HSVDC-	0.0000	0.9831	0.0169	1.252	0.4198	1.025	0.823	3.312
111HSVDC	0.0000	0.9862	0.0138	1.570	0.3367	1.052	0.041	2.616
95HSVDC/	0.0000	0.9328	0.0672	2.370	0.1934	1.096	-0.457	2.827
62HSVDC/	0.0000	0.9758	0.0242	1.821	0.2830	1.150	-0.070	2.263
73HSVDC/	0.0000	0.9172	0.0828	2.128	0.2288	1.261	-0.170	2.235
69HSVDC*	0.0000	0.8778	0.1222	6.458	0.0113	2.906	-2.639	5.247
99HSVDC	0.0000	0.9909	0.0091	0.647	0.6387	1.057	1.332	4.298
61HSVDC	0.0008	0.9803	0.0189	0.942	0.5203	1.170	0.984	3.253

TABLE 23. GRAIN SIZE ANALYSIS PANGNIRTUNG VEGETATED DUNES--INTERDUNE--SITE 1

SAMPLE	GRAVEL	SAND	SILT	MEAN		STD.DEV.	SKEWNESS	KURTOSIS
				(PHI)	(MM)			
78HSVDC	0.0000	0.9928	0.0072	2.077	0.2370	0.603	0.661	3.717
90HSVDC	0.0075	0.9906	0.0020	0.249	0.8416	0.898	1.487	5.291

TABLE 24. GRAIN SIZE ANALYSIS PANORITUNG VEGETATED DUNES--LEESIDE--  
SITE 1

SAMPLE	GRAVEL	SAND	SILT	MEAN		STD. DEV.	SKEWNESS	KURTOSIS
				(PHI)	(MM)			
22NSVDC	0.0000	0.9043	0.0957	2.761	0.1475	0.861	-0.305	3.139
117NSVDC	0.0000	0.9760	0.0240	1.729	0.3018	0.980	0.494	2.748
51NSVDC/	0.0000	0.9335	0.0665	2.400	0.1894	1.066	-0.762	3.898
209NSVDC	0.0000	0.9330	0.0670	2.430	0.1856	0.974	-0.216	2.845
72NSVDC/	0.0000	0.9284	0.0716	2.630	0.1615	0.843	-0.108	3.000
378NSVDC	0.0000	0.9914	0.0086	2.003	0.2494	0.690	0.433	3.488
110NSVDC	0.0000	0.9246	0.0754	2.446	0.1835	0.843	0.334	2.986

TABLE 25. GRAIN SIZE SUMMARY PANORITUNG VEGETATED DUNES--WINDWARD--  
SITE 1

SAMPLE	GRAVEL	SAND	SILT	MEAN		STD. DEV.	SKEWNESS	KURTOSIS
				(PHI)	(MM)			
124NSVDC	0.0000	0.9704	0.0296	1.787	0.2897	1.137	-0.034	2.523
79NSVDC/	0.0000	0.9145	0.0855	2.408	0.1884	1.008	-0.042	2.681
96NSVDC/	0.0000	0.9308	0.0692	2.175	0.2214	1.044	0.350	2.577
71NSVDC	0.0000	0.9584	0.0416	2.225	0.2138	1.000	-0.269	3.021

TABLE 26. GRAIN SIZE ANALYSIS PANORITUNG VEGETATED DUNE CRESTS --  
SITE 2

SAMPLE	GRAVEL	SAND	SILT	MEAN		STD. DEV.	SKEWNESS	KURTOSIS
				(PHI)	(MM)			
103NSVDN	0.0000	0.9145	0.0855	2.599	0.1250	0.652	-0.040	3.064
109NSVDN	0.0000	0.9449	0.0551	2.619	0.1628	0.767	0.080	2.885
107NSVDN	0.0000	0.9344	0.0656	2.420	0.1888	0.980	-0.321	3.157
108NSVDN	0.0000	0.9457	0.0543	2.408	0.1884	0.790	0.508	2.988
1005812	0.0000	0.9375	0.0625	2.490	0.1549	0.753	0.131	2.729

TABLE 27. GRAIN SIZE ANALYSIS PANORITUNG VEGETATED DUNES--INTERDUNE--  
SITE 2

SAMPLE	GRAVEL	SAND	SILT	MEAN		STD. DEV.	SKEWNESS	KURTOSIS
				(PHI)	(MM)			
122NSVDN	0.0000	0.9932	0.0068	1.443	0.3678	0.693	1.308	5.369
106NSVDN	0.0000	0.9649	0.0351	2.104	0.2231	0.764	0.886	3.474
94NSVDNC	0.0000	0.9938	0.0062	1.030	0.4897	0.880	1.166	4.233
1305812	0.0000	0.9567	0.0433	2.534	0.1726	0.772	0.001	3.295

TABLE 28. GRAIN SIZE ANALYSIS PANORITUNG VEGETATED DUNES--LEESIDE--  
SITE 2

SAMPLE	GRAVEL	SAND	SILT	MEAN		STD. DEV.	SKEWNESS	KURTOSIS
				(PHI)	(MM)			
101NSVDN	0.0000	0.9458	0.0542	2.893	0.1346	0.590	0.209	2.984
98NSVDNC	0.0000	0.9786	0.0214	2.143	0.2263	0.770	0.544	2.934
1045812	0.0000	0.9262	0.0738	2.657	0.1585	0.853	-0.300	3.194

TABLE 29. GRAIN SIZE ANALYSIS PANORITUNG VEGETATED DUNES--WINDWARD--  
SITE 2

SAMPLE	GRAVEL	SAND	SILT	MEAN		STD. DEV.	SKEWNESS	KURTOSIS
				(PHI)	(MM)			
105NSVDN	0.0000	0.9390	0.0610	2.757	0.1479	0.732	-0.259	3.756
92NSVDNC	0.0000	0.9511	0.0489	2.712	0.1526	0.685	0.210	2.856

TABLE 30. GRAIN SIZE ANALYSIS PANORITUNG -- SHALL VEGETATED DEPOSITS  
ON VALLEYSIDE

SAMPLE	GRAVEL	SAND	SILT	MEAN		STD. DEV.	SKEWNESS	KURTOSIS
				(PHI)	(MM)			
277NSVFN	0.0000	0.9274	0.0727	3.029	0.1225	0.593	-0.007	3.939
264NSVFN	0.0000	0.9941	0.0059	2.135	0.2276	0.690	0.125	2.855
282NSVFN	0.0000	0.9655	0.0345	2.488	0.1782	0.693	0.475	3.074
268NSVFN	0.0000	0.9942	0.0058	2.273	0.2068	0.627	0.024	3.199
274NSVFN	0.0000	0.9818	0.0182	2.556	0.1699	0.618	0.029	3.851
267NSVFN	0.0000	0.9585	0.0415	2.541	0.1718	0.700	0.408	3.198
276NSVFN	0.0000	0.9382	0.0618	2.934	0.1308	0.567	0.387	3.503
278NSVFN	0.0000	0.9942	0.0058	2.687	0.1553	0.463	0.050	3.917



## CHAPTER 6

### PROXIMAL PRODELTA INVESTIGATIONS AT TWO ARCTIC DELTAS: ITIRBILLING AND CAMBRIDGE FIORDS, BAFFIN ISLAND

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#### OBJECTIVES

In 1983, weather stations and oceanographic moorings were placed in Itirbilung and Cambridge Fiords (Syvitski et al., 1984). That study was continued in 1985 attempting to address the following objectives:

- (1) determine the relationship between wind velocity and fjord circulation near the delta front;
- (2) determine the proximal sedimentation rates off each delta;
- (3) detect sediment gravity flows by comparing sediment trap data with current meter measurements.

#### METHODS

In Cambridge Fiord, the 1983 instrumentation was positioned on the active Keel River Delta, whereas the 1985 stations were placed near the inactive and isostatically-raised Cambridge Delta (Fig. 1). In Itirbilung Fiord, the 1983 and 1985 weather station sites are identical, but oceanographic moorings were placed within an active submarine channel in 1985 (Fig. 2). The instrument packages collected data for 41 days at the Cambridge site (compared to 14 days in 1983) and 39 days at the Itirbilung site (compared to 18 days in 1983).

Oceanographic moorings and Aanderaa weather stations were deployed using a Bell Jet Ranger helicopter sponsored by the Polar Continental Shelf Project. The 50 m isobath was located by lead line and marked with a surface float. The oceanographic moorings were laid out and assembled on the delta flats and then lifted via helicopter and gently lowered beside the surface marker buoy. Figure 3 is a schematic of the mooring and equipment used.

The Aanderaa current meters and thermistor chains, and the weather stations, were cycled and recorded on magnetic tape every 10 and 20 minutes, respectively. Data was later massaged using a 0.5 hour filter and averaged over 1 hour. The sediment traps had an aspect ratio of 7:1 with an inner diameter of 12 cm. The magnetic trap configuration is described in Asprey (1984).

Grain size analyses were performed using the methods described in Chapter 8. Moment statistics and frequency plots were generated using program READY (Hackett et al., 1986).

#### RESULTS

The sediment trap array at Cambridge Fiord was lost in deployment due to a faulty swivel connected to the subsurface float. The thermistor chain in Cambridge malfunctioned and no data was recovered. In Itirbilung Fiord, the thermistor chain recorded temperatures every 3 m within the water

column. However, most of the temperatures recorded were values below  $-2^{\circ}\text{C}$  and these did not correspond with values recorded within the Aanderaa current meters. These values are consequently not presented here.

Tables 1, 2 and 3 present the Itirbilung sediment trap results. The lower trap contained 3 times more sediment of a sandier nature and with a lower bulk density than the two near-surface traps. The traps contained laminae of alternating silty clay and coarser sands. No attempt was made to correlate the current meter data, i.e. gravity flow events, with the grain size data from the lower trap. Trap sediment was subsampled at regular intervals which may incorporate several or partial depositional events.

Both Itirbilung and Cambridge fjords had a number of up and down wind events, reaching maximum velocities of  $13\text{ m s}^{-1}$  ( $47\text{ km h}^{-1}$ ). However, within Cambridge Fiord there is a complex wind pattern that may relate to positioning the station near a Y-junction of valleys, at the fjord head. The up- and down-fjord wind direction designations for Cambridge should therefore be used only as a guide. In Itirbilung, relatively strong and daily land-sea breezes occur and may reflect a katabatic influence. In addition, there are a number of unidirectional wind events that last for a number of days and may represent the passing of storm fronts (Fig.4).

The near-surface (11 m deep) water currents in Itirbilung Fiord range from quiet water conditions to  $0.35\text{ m s}^{-1}$  (Fig. 5). A tidal component, although present, has little effect on the major velocity events. These events are correlatable to both up-inlet winds and discharge events: the former is best recognized by a temperature increase (associated with downwelling at the delta front); the latter is best identified in the  $v$  component (down-fjord) of the deconvoluted current velocity (Fig. 5).

The deep current meter (2 m above the sea floor) in Itirbilung Fiord, was located within a submarine channel. Mostly very low currents ( $< 0.1\text{ m s}^{-1}$ ) were recorded (Fig. 6) except for 9 gravity flow events best registered on the down-fjord ( $v$ ) component of the current velocity. Each event lasted between 1 and 5 hours. The maximum current detected was  $0.35\text{ m s}^{-1}$ . Two types of events were identified: (1) powerful single events (which may represent coarse-grained delta front chute failures); and (2) weaker multi-events (which may represent retrogressive slide failures of the prodelta muds). Most of the downwelling events identified by temperature fluctuations at the near surface current meter were also registered by the near bottom meter. In addition, each gravity flow event was also associated with a slight bottom water temperature increase (i.e. the bringing down of warm surface water in sediment/water mixtures). The largest gravity flow event was apparently powerful enough to move the mooring array into deeper (1.6 m) water (the event registered on the pressure sensors of both the shallow and deep current meter). Given a slope of  $3^{\circ}$ , the possible downslope translation is 31 m.

The near-surface (5 m) current meter at the head of Cambridge Fiord had relatively low velocities (Fig. 8), although some reached  $0.16\text{ m s}^{-1}$ . The larger velocities are correlatable with up-fjord wind intensity but with a notable tidal component. Pressure fluctuations after day 254 are not yet reconciled (no similar pressure fluctuations are recorded by the deep current meter: Fig. 9). The deep (1.5 m above the sea floor) current meter measured very quiet water conditions ( $< 0.1\text{ m s}^{-1}$ ). The temperature increased twice and this may reflect downwelling induced by up fjord winds, or deep water renewal events over the inner sill.

## ACKNOWLEDGEMENTS

I would like to thank Ken Asprey for helping to get the equipment together and shipped up to the arctic, and Bob Taylor and Jay Stravers for their field support. Donald Clattenburg performed the textural analyses. Dan Praeg assisted in the preparation of the figures.

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**Table 1:** 1985 Itirbilung sediment trap results

trap depth (m)	height above seafloor (m)	sedimentation rate ( $\text{kg m}^{-2} \text{day}^{-1}$ )	bulk density ( $\text{kg m}^{-3}$ )	sand (%)	mud (%)
10	43	0.428	1223.	4.0	96.0
51	1.8	1.225	1021.	41.9	58.1

**Table 2:** Textural data from 1985 Itirbilung sediment trap bulk samples. See frequency distribution plots (Figure 10).

Trap	Depth (m)	Lab ID	Mean ( $\emptyset$ )	St. Dev. ( $\emptyset$ )	Skewness	Kurtosis	Sand (%)	Silt (%)	Clay (%)
upper	10	3950	6.7	2.4	0.9	2.6	4.0	69.9	24.1
mag.	25	3948	7.0	2.2	-0.1	3.4	6.5	65.1	27.9
lower	51	3951	5.2	2.5	1.3	3.9	41.9	43.6	14.6

**Table 3:** Textural data from subsamples of the lower (51 m) Itirbilung sediment trap (Table 2). See frequency distribution plots (Figure 11).

Trap subsample* (mm)	Mean ( $\emptyset$ )	St. Deviation ( $\emptyset$ )	Skewness	Kurtosis	Sand (%)	Silt (%)	Clay (%)
0 - 3	7.4	2.7	0.4	1.9	7.9	53.6	38.6
3 - 6	5.8	2.6	0.9	2.8	33.3	46.9	19.8
6 - 9	4.5	2.3	1.8	5.7	60.5	29.7	9.8
9 - 12	5.3	2.8	1.1	3.2	45.2	36.6	18.1
12 - 15	5.1	2.3	1.5	4.4	44.8	42.0	13.2
15 - 18	5.2	2.2	1.6	5.0	31.7	56.2	12.1
18 - 21	5.5	2.6	1.1	3.1	38.6	42.5	18.9
21 - 24	5.5	2.5	1.2	3.5	33.8	49.3	16.9
24 - 27	5.3	2.4	1.4	4.0	36.9	48.7	14.4
27 - 30	4.8	2.4	1.5	4.7	48.6	39.6	11.8



Figure 1: Location of the 1983 and 1985 weather stations and oceanographic moorings in Cambridge Fjord, Balsfjell Island.



Figure 2: Location of the 1983 and 1985 weather stations and oceanographic moorings in Ilirbilung Fjord, Baffin Island.

## HELICOPTER DEPLOYED MOORINGS

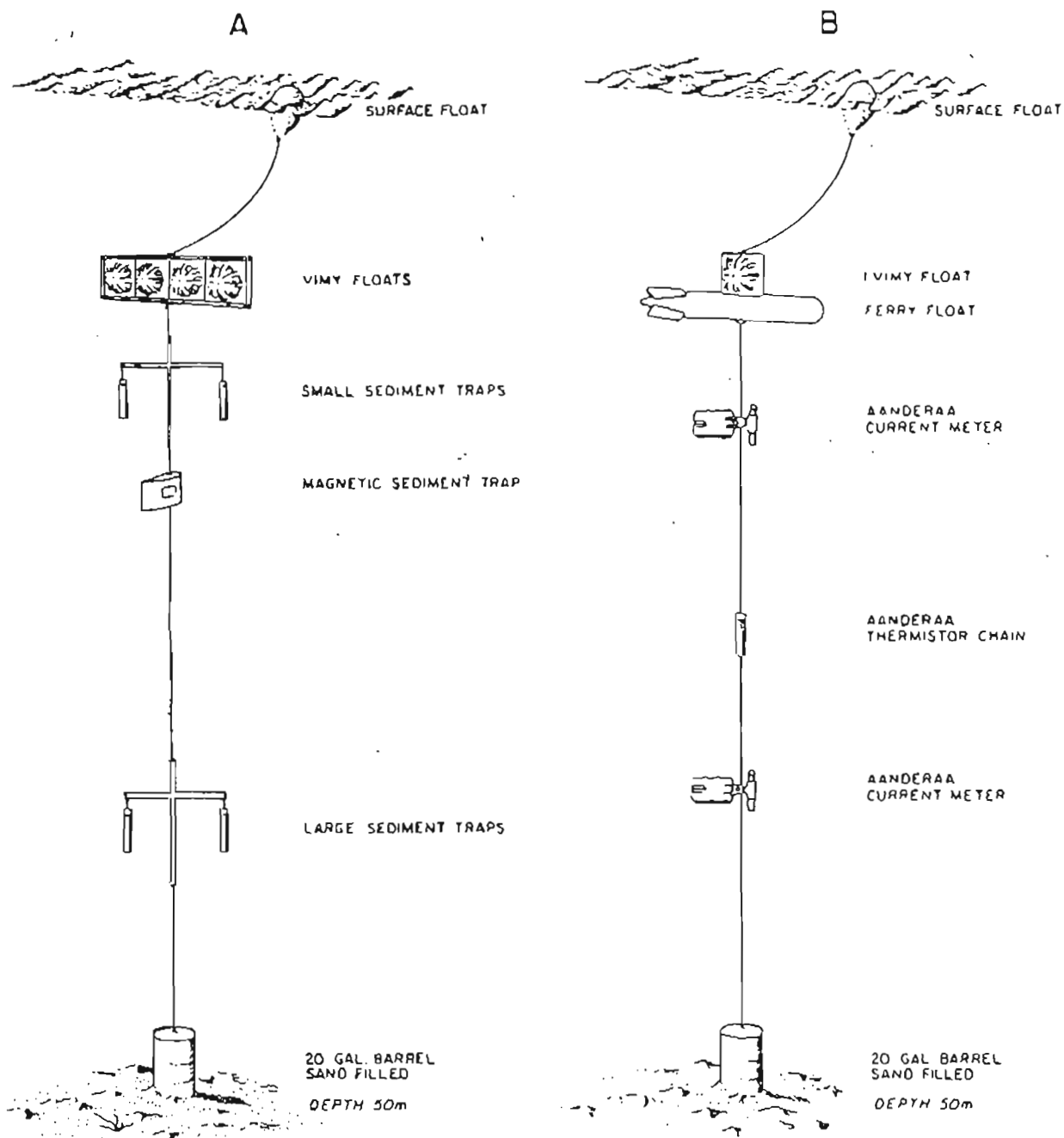


Figure 3: Schematic of the oceanographic moorings used in 1985 at Cambridge and Ilirbilung Fiords, Baffin Island.

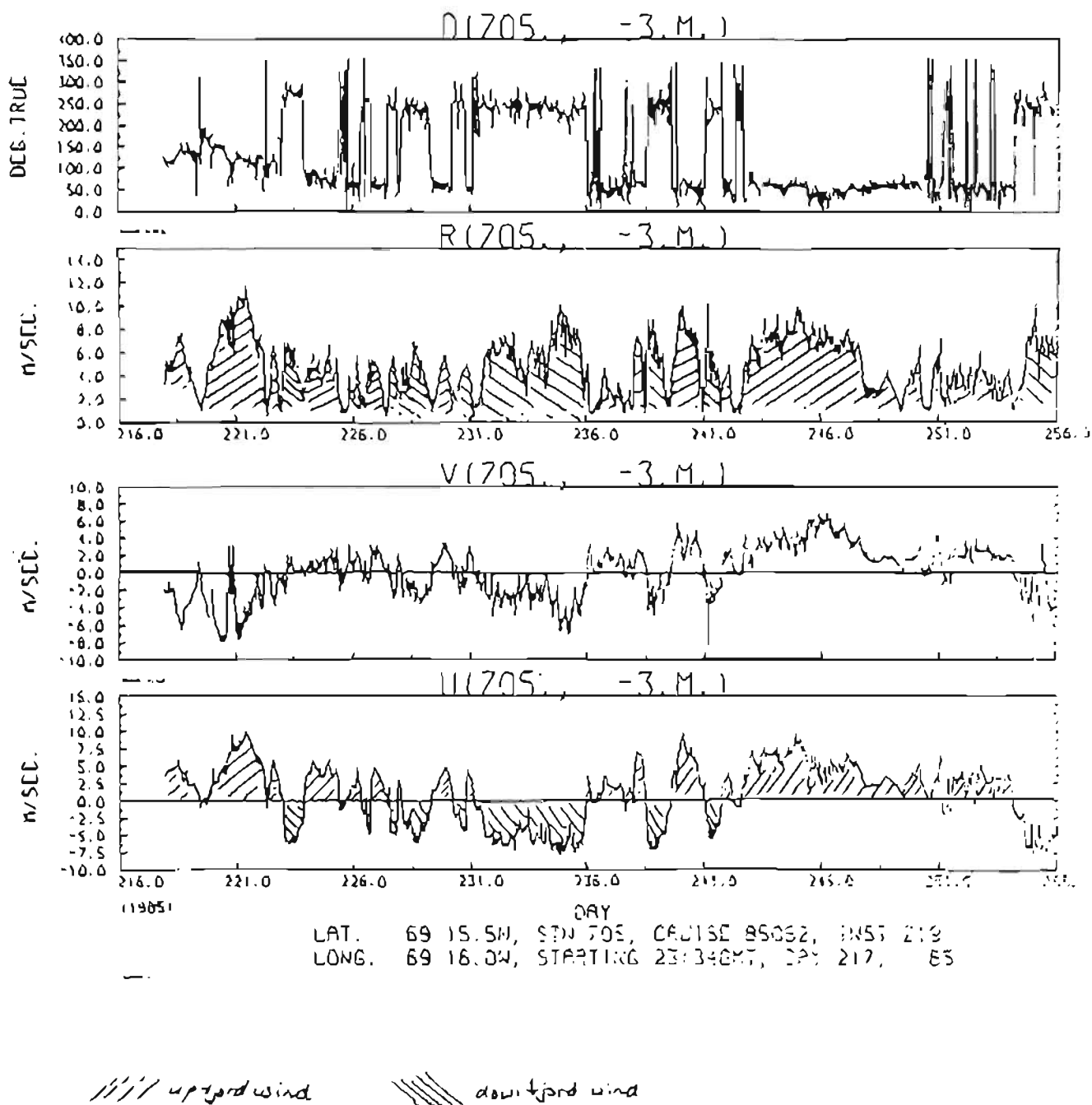


Figure 4. Wind data for the 1985 Illbilung Fiord weather station. D is the wind direction in true azimuth, R is the wind speed measured 2 m above the ground and 3 m above mean sea level; v and u are the deconvoluted lateral and transverse wind vectors.

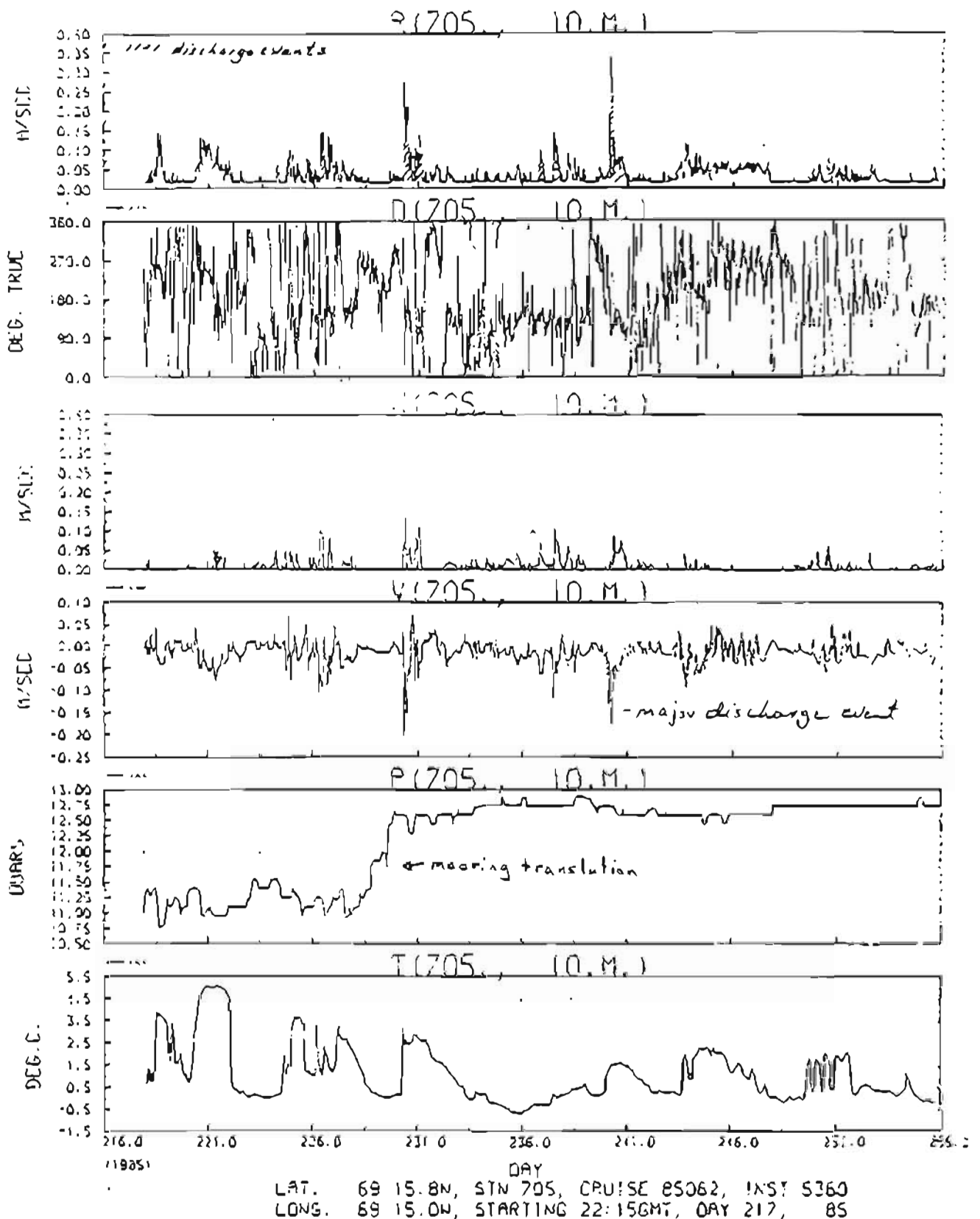


Figure 5: Aanderaa current meter data for the Ilirblling Fjord oceanographic mooring. Meter was positioned 11 m below mean sea level and 42 m above the sea floor. A is the current speed; D is the current direction; v and u are the deconvoluted vector components; P is the water pressure and T is the water temperature.

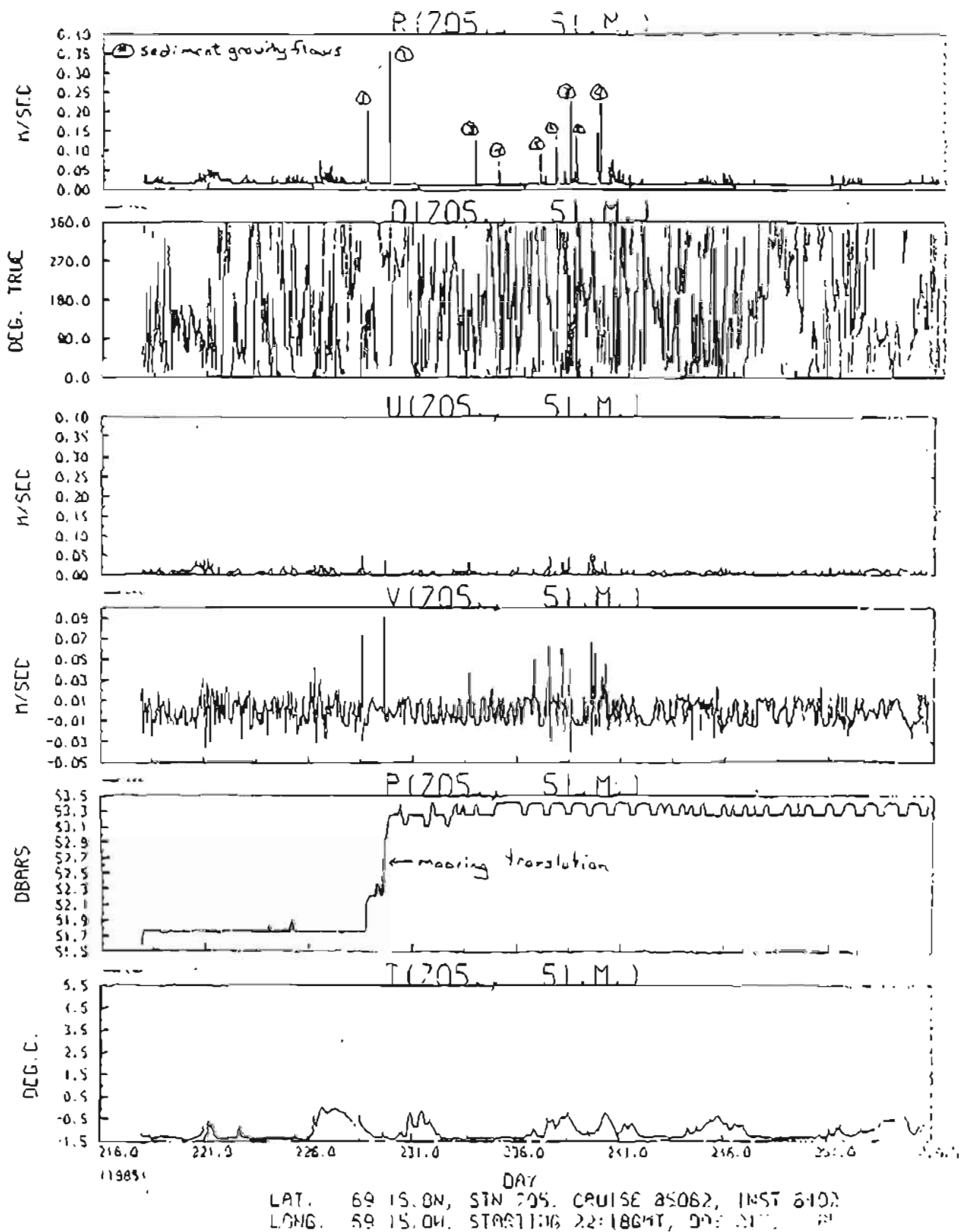


Figure 6: Aanderaa current meter data for the Hirbillung Flord oceanographic mooring. Meter was positioned 51 m below mean sea level and 2 m above the sea floor. R is the current speed; D is the current direction; v and u are the deconvoluted vector components; P is the water pressure and T is the water temperature.

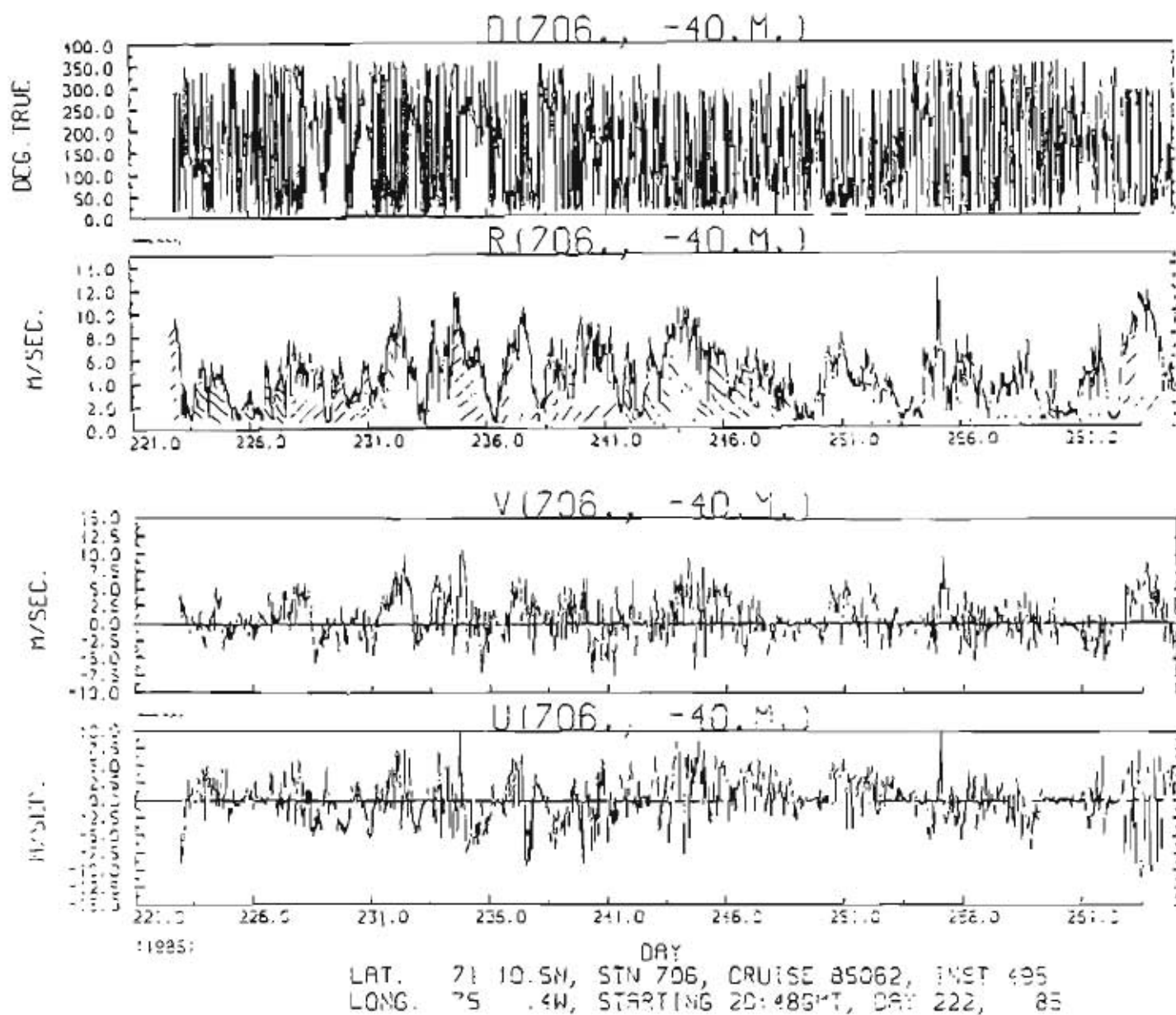
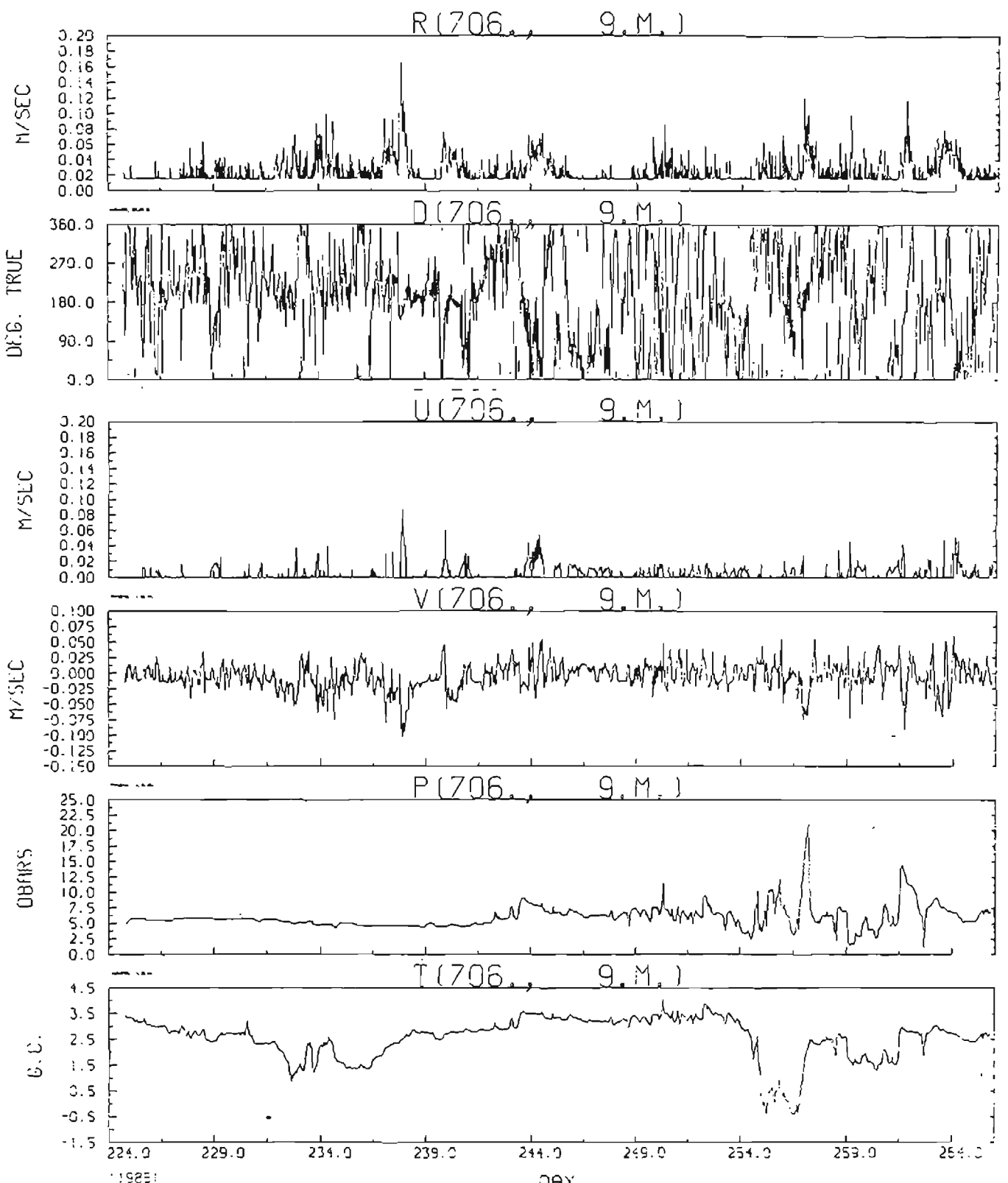


Figure 7: Wind data for the 1985 Cambridge Fiord weather station. D is the wind direction in true azimuth; R is the wind speed measured 2 m above ground level and 42 m above mean sea level; v and u are the deconvoluted lateral and transverse wind vectors.



LAT. 71 11.3N, STN 706, CRUISE 05062, INST 7134  
 LONG. 75 2.5W, STARTING 13:23GMT, DAY 224, 85

Figure 8: Aanderaa current meter data for the Cambridge Flord oceanographic mooring. Meter was positioned 5 m below mean sea level and 45 m above the sea floor. R is the current speed; D is the current direction; v and u are the deconvoluted vector components; P is the water pressure and T is the water temperature.

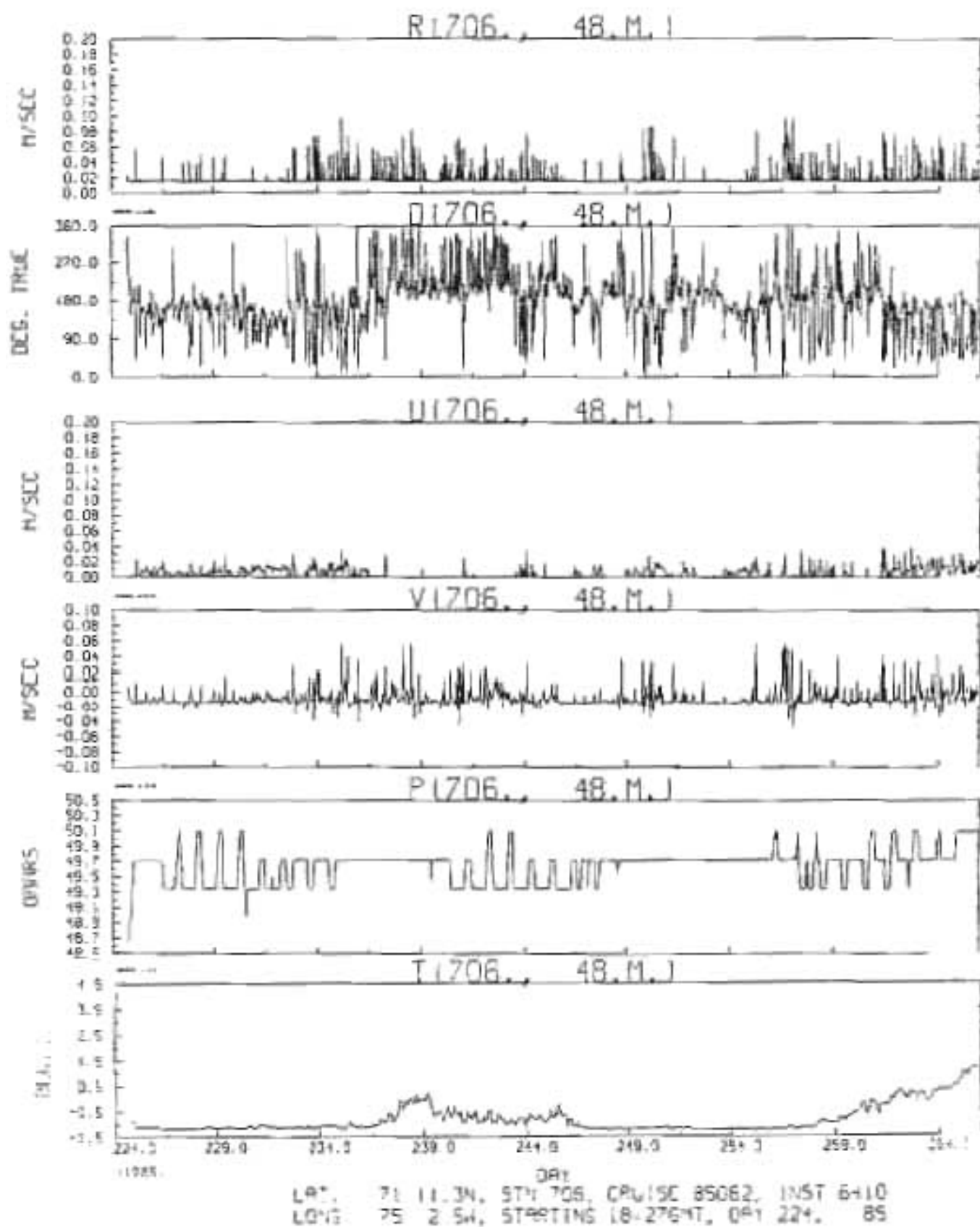


Figure 9: Aanderaa current meter data for the Cambridge Ford oceanographic mooring. Meter was positioned 49 m below mean sea level and 1.5 m above the sea floor. R is the current speed; D is the current direction; v and u are the deconvoluted vector components; P is the water pressure and T is the water temperature.

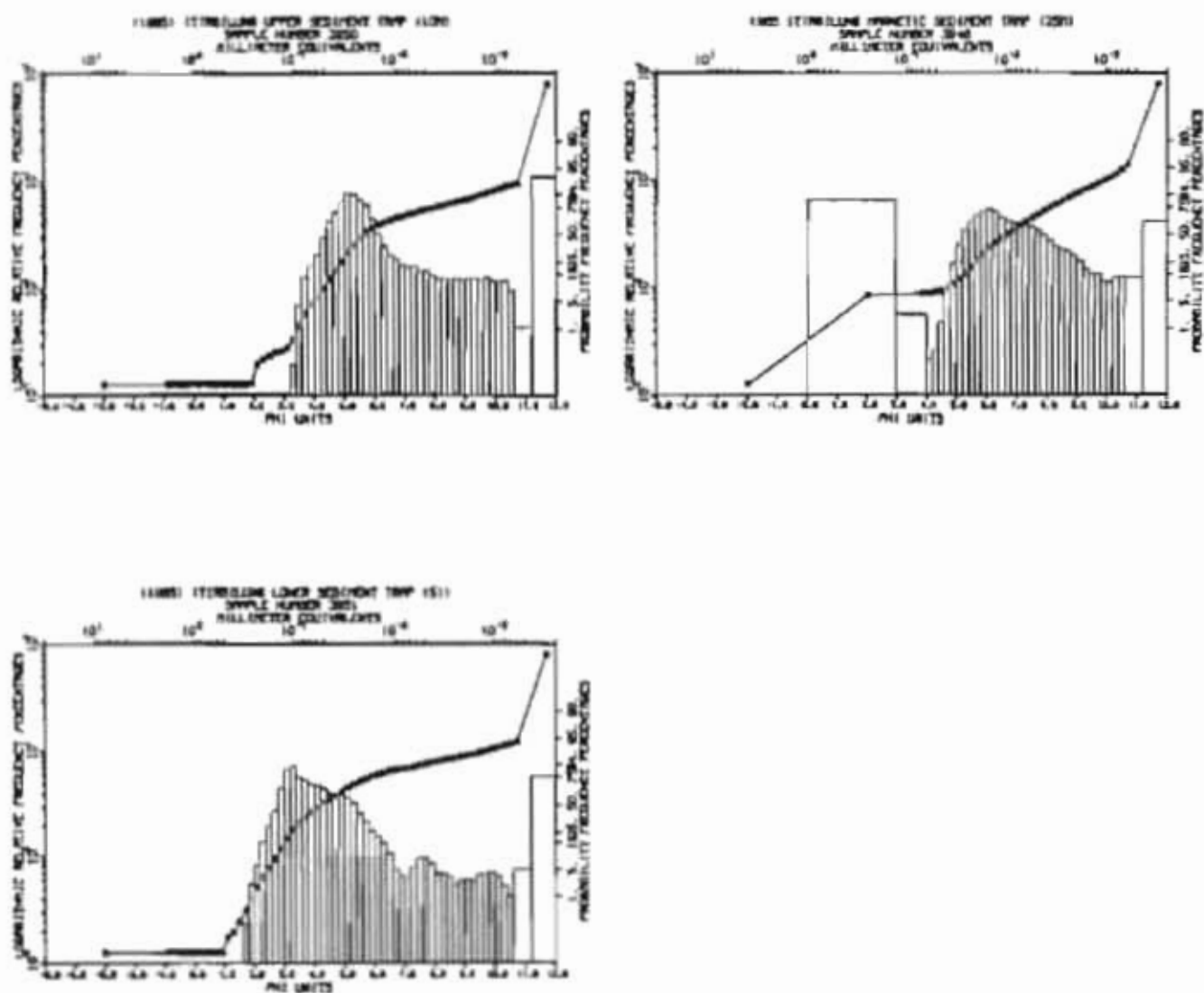


Figure 10 - Grain size frequency distribution plots for 1985 Itirbilung sediment trap bulk samples.

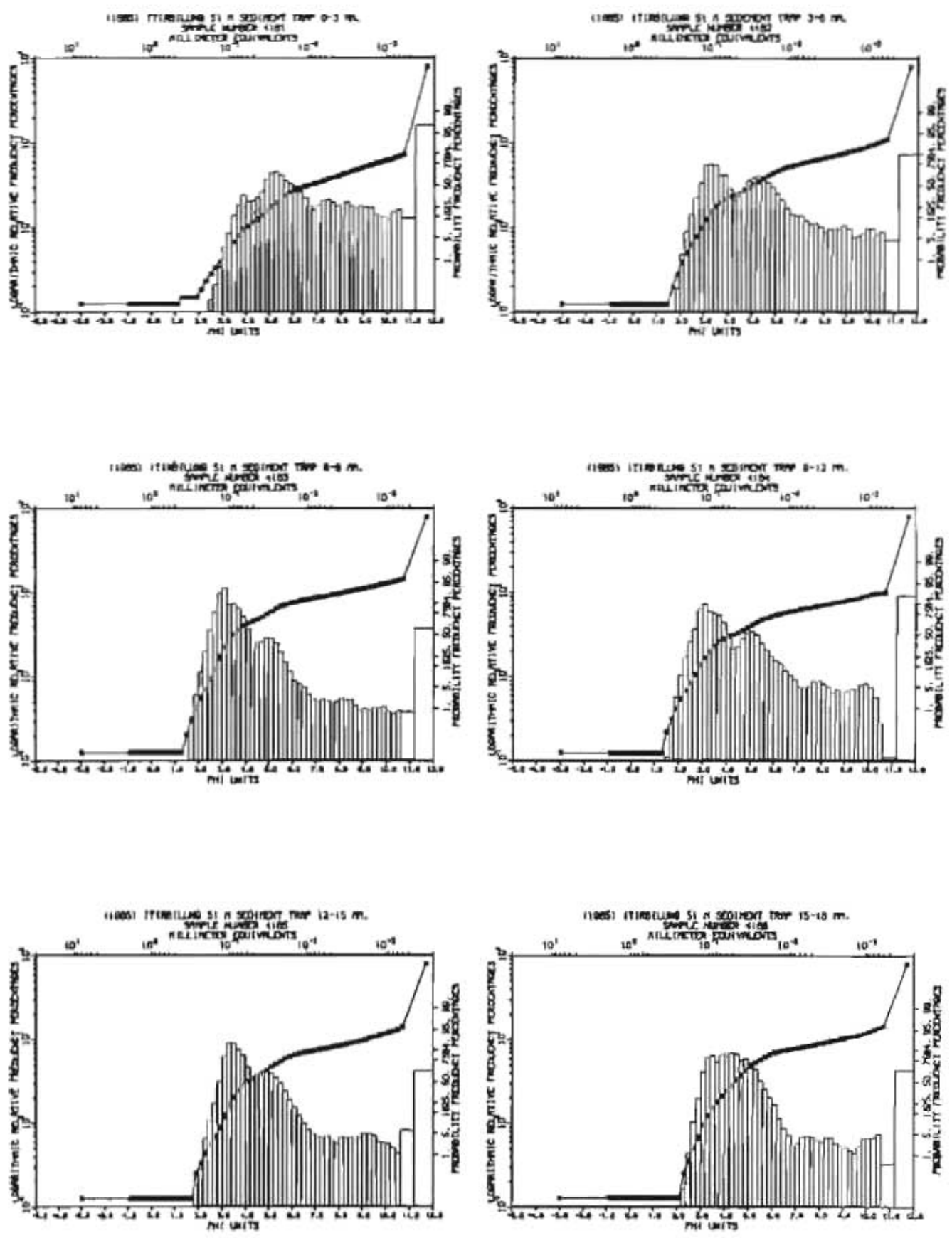


Figure 11 - Grain size frequency distribution plots for subsamples of the lower (51 m deep) Itirbilung sediment trap.

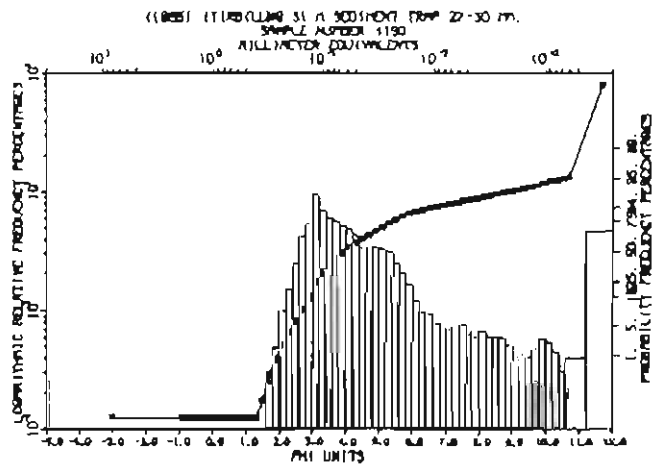
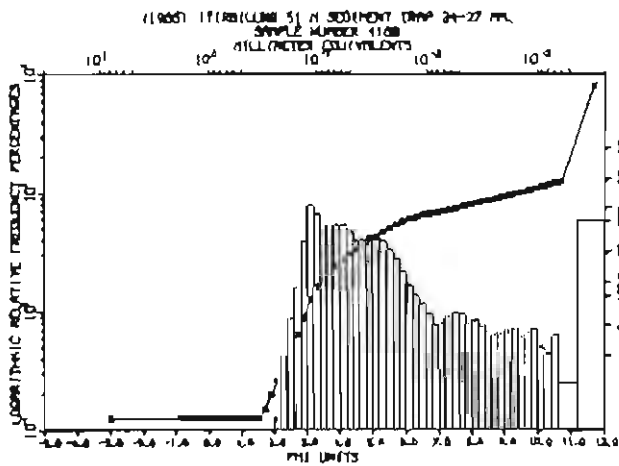
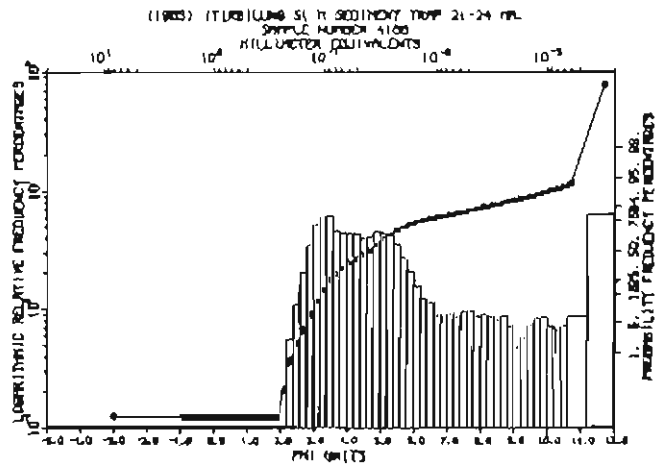
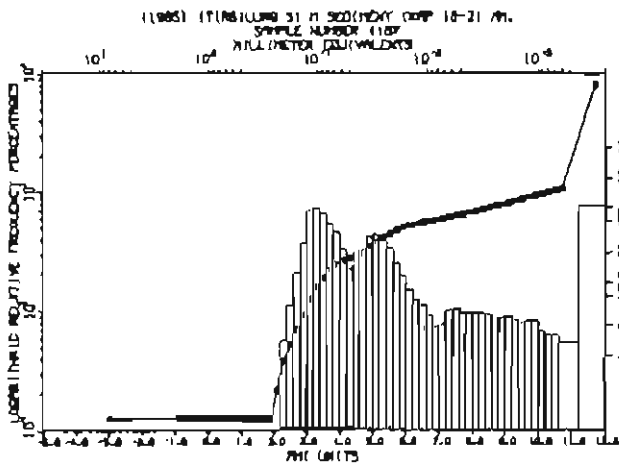


Figure 11 (continued)



## CHAPTER 7

### SUBMERSIBLE OBSERVATIONS AND OTHER ANALYTICAL RESULTS FROM THE THIRD S.A.F.E. CRUISE

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#### **Purpose:**

This report primarily sets out to release manned submersible bottom photographs of the SAFE fjords investigated on expedition PA85-062. This data is a further contribution to the investigation of the benthic environment within (SAFE) arctic fjords, described previously in Farrow (1983), Farrow et al. (1984), Syvitski et al. (1985), Syvitski and Schafer (1986) and Hein and Syvitski (1987).

The submersible PISCES IV was used for a variety of "ground-truthing" missions in 7 Baffin Island fjords (Sunneshine, Maktak, Coronation, Tingin, Itirbilung, McBeth and Inugsuln). Mission goals centered on the inspection of: (1) acoustically reflective outcrops of till-like facies including frontal-dump moraines; (2) morphology of the seafloor adjacent to tidewater glaciers; (3) sedimentation processes, such as the distribution of hemipelagic particles in the water column and observations of induced turbidity currents; (4) characteristics of gravity flow channels and slide features on prodelta slopes; (5) sidewall slope environments; (6) the density and diversity of the macrobenthos based on seabed observations of epifauna and of infaunal burrows; (7) the geotechnical characteristics of the seafloor sediment including strength and grain size.

#### **Methods:**

Details of the submersible operations and capabilities have been described in Syvitski et al. (1985). Examples of submersible coring, for instance, are shown in Figures 3 & 4. The enclosed photographs were taken from within the submersible with hand-held 35 mm cameras using 200 and 400 ASA slide film. The slides were later converted to B & W prints.

The aeolian sediment samples were analyzed by the AGC soft sediment laboratory using settling tube and Sedigraph techniques (see chapter 8 of this report for a detailed description). The size statistics are given in moment measures of weight percent of equivalent spherical sedimentation diameters.

#### **Results:**

Seafloor sediments decreased in grain size with depth: coarsest near the mouths of large rivers and in outerfjord environments where the seafloor currents are strongest. Isolated boulders are ubiquitous, transported by rock slides along the fjord walls or by ice-rafting (sea ice and icebergs).

In outerfjord environments, gravel dumped from icebergs appeared loose and fresh with little to no epilithic habitation; outcrops of till units were more highly compacted and colonized by epilithic species. The seafloor adjacent to tidewater glaciers was comprised of very soft mud (high water content) and the distribution of benthos was grain size dependent, changing from polychaete dominance in the mud to *Macoma* dominance in sandier sediments. Lateral moraines consisted of some very large boulders that were barren of epilithics (Fig. 19). Fronting Coronation glacier, one to three metre high hummocks of folded sediment with 10 to 50 degree slopes were oriented across the major axis of the fjord. The steeper slopes may represent walls of abandoned turbidity channels or isolated slump scars.

The upper 40 to 65 m of the water column lies within the photic zone. Its mean depth is reflected by the presence of *Lithothamnion* algae growth on rocks (Fig. 22), the presence of brown algae on the seafloor mud (Fig. 22), and by *Oikopleura* floating in the water column (Fig. 1). Stringers of flocculated sediment were observed in the quieter parts of the water column where internal shear forces were absent. Near the seafloor, water turbidity invariably increased, possibly as a result of increased zooplankton (Fig. 2) and benthos activity. The fjord basin benthos was dominated by a variety of polychaetes (Figs. 7 & 9), three species of *Ophiura* (Figs. 7 & 8), sea anemones (Fig. 17), gastropods (Fig. 8), *Alcyonacean* (Fig. 6), crinoids (Figs. 14 & 15), isopods, pycnogonoids, *Gorganocephalus* (Fig. 13) and other starfish, and by a limited number of small eel-like pouts. Six to ten cm diameter cone-shaped depressions that may represent the feeding traces of narwhals(?) were noted on the seafloor near the head of the fjords.

Much of the side wall slope area was barren of sediment (Fig. 21), especially in the outer parts of the fjords (Fig. 24). The particle size of the sediment veneer decreased downslope because of decreasing current energy. Benthos found on these slopes was usually dominated by sea urchins, anemones (Fig. 21) sponges, serpulids, *Asteroidea* (Fig. 22), shrimp (Fig. 20), shellfish (Fig. 17: *Hyatella arctica*, *Macoma*, *Mya truncata*, *Clinocardium*, *Serripes* and *Pecten* sp.: Figs. 14, 16 & 23). *Laminaria* occurred in the shallower waters but fragments of this species were observed at all depths. Shell hash was ubiquitous on these slopes (Figs. 14, 15 & 23).

That prodelta of Maktak and Ilirbilung basins are unstable and characterized by numerous failure surfaces (Figs. 10, 11 & 12). Even on the floors of the turbidity channels slide scars 2 to 3 m high with 35 degree slopes occur commonly.

Aeolian samples were collected at the heads of Coronation and Maktak fjords (Table 2 and Fig. 25). The Coronation sample is typical of glacial loess with its very high silt content. The Maktak samples are more typical of a dune formation.

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**Table 1. Pisces dlve information (all stations)**

<u>Dive #</u>	<u>Latitude</u>	<u>Longitude</u>	<u>Location</u>	<u>Max. Depth (m)</u>
62-01	66 29.3 N	61 31.2 W	SUNNESHINE	83
62-03	66 35.9 N	62 04.8 W	SUNNESHINE	150
62-05	66 37.8 N	62 03.8 W	SUNNESHINE	245
62-06	67 15.8 N	64 16.1 W	CORONATION	367
62-07	67 14.6 N	64 36.2 W	CORONATION	246
62-09	67 12.5 N	64 46.0 W	CORONATION	92
62-10	67 21.2 N	64 46.8 W	MAKTAK	90
62-11	67 20.4 N	64 41.2 W	MAKTAK	161
62-12	67 19.5 N	64 31.9 W	MAKTAK	246
62-15	68 59.6 N	68 57.6 W	TINGIN	119
62-16	69 01.7 N	68 56.7 W	TINGIN	116
62-17	69 06.2 N	68 53.8 W	TINGIN	320
62-18	69 04.1 N	68 54.4 W	TINGIN	269
62-19	69 16.2 N	69 15.0 W	ITIRBILUNG	85
62-20	69 16.4 N	69 14.5 W	ITIRBILUNG	91
62-21	69 18.7 N	69 07.6 W	ITIRBILUNG	162
62-22	69 19.4 N	68 46.3 W	ITIRBILUNG	393
62-23	69 15.6 N	68 04.5 W	ITIRBILUNG	278
62-25	69 33.3 N	69 55.5 W	MCBETH	182
62-27	69 33.4 N	69 38.4 W	MCBETH	256
62-28	69 33.1 N	69 33.9 W	MCBETH	183
62-29	69 31.3 N	69 19.0 W	MCBETH	417
62-31	70 12.9 N	68 37.7 W	INUGSUIN	280

**Table 2.** Grain size data from expedition PA85-062 collected aeolian sediment samples (cf. Fig. 25).

Sample ID	Gravel	Sand	Silt	Clay	Mud	Mean	St. Dev.	Skew.	Kurt.	Comments
3993	0.3	23.7	75.5	0.5	76.0	4.55	1.11	-1.4	12.8	Coronation loess
3945	-	99.2	-	-	0.8	2.13	0.51	1.2	5.8	Maktak dune, stoss side
3946	-	99.4	-	-	0.6	2.40	0.44	1.0	5.1	Maktak dune, lee side
3947	-	95.8	-	-	0.6	1.75	1.28	-1.8	7.3	Maktak dune at river cut



Figure 1. Typical distribution of *Diatomea* housings and other suspended matter at a water depth of 70 m; dive 62-18



Figure 2. Near-bottom increase in suspended particulate matter and meiofauna (krill) at a water depth of 90 m; dive 62-14



Figure 3. Short corer ready to be pushed into the seafloor (cf Fig. 4).



Figure 4. Corer pushed into bottom muds at a water depth of 300 m; dive 62-17



Figure 5. Soft coral hanging from overhangs cut into the bedrock slopes of Sunneshine Fiord: w. d. = 200 m, dive 62-5.

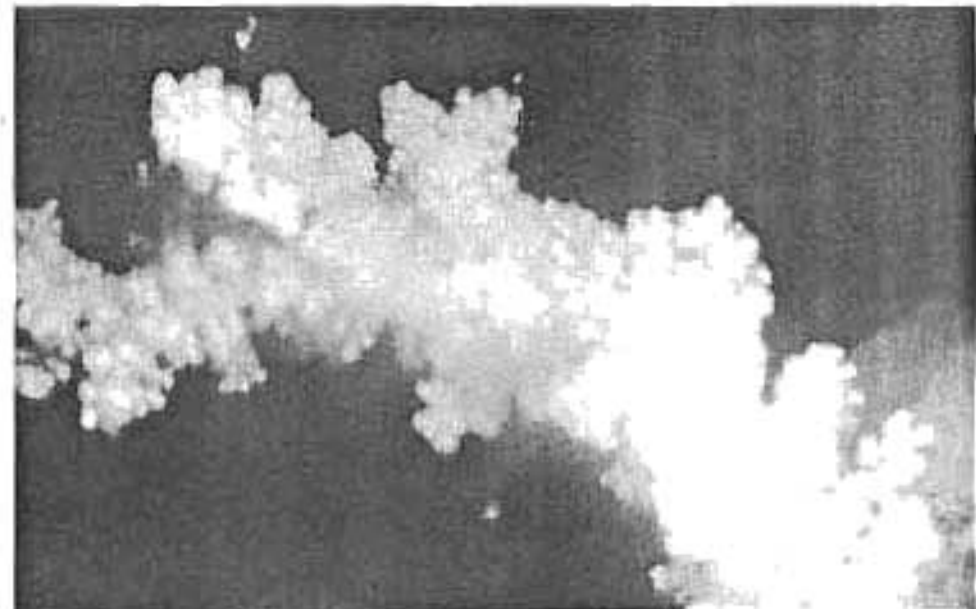


Figure 6. Alcyonacean growing on boulder in Tingin Fiord: ~ w.d. is 230 m, dive 62-16.



Figure 7. Retractable white polychaetes, brittle stars and urchin on base of sidewall mud slope. Note few burrow openings: w.d. = 190 m, dive 62-18.

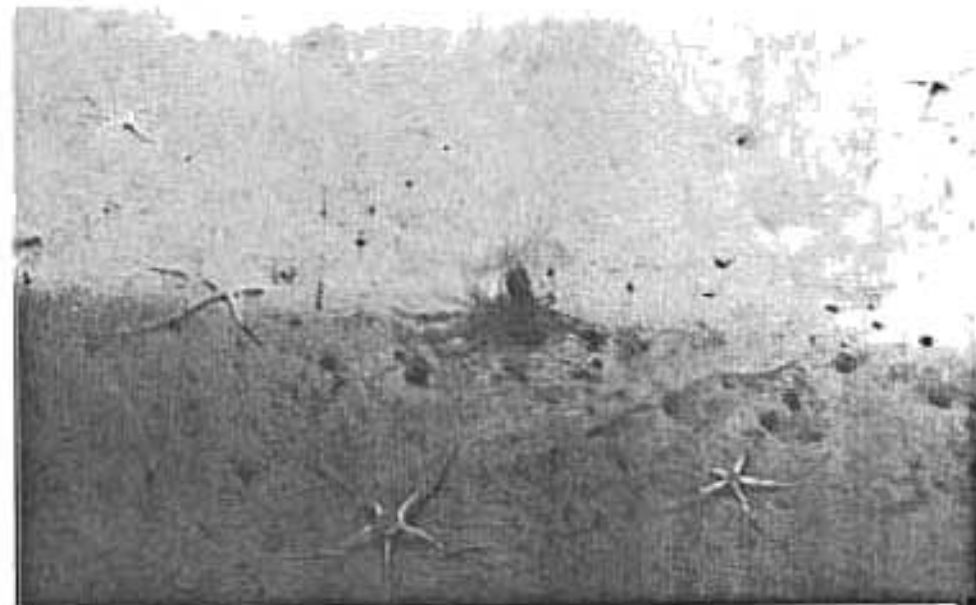


Figure 8. Significant infauna based on no. of burrow openings. Note gastropod traces: ~ w.d. is 245 m, dive 62-27.



Figure 9 Stable benthic environment of agglutinated polychaetes, scallops and brittle stars, on an interchannel "island" on the Isrbilung prodelta, an environment protected from delta front sediment gravity flows: - w.d. is 60 m, dive 62-20.



Figure 10 Bedding plane steps of an exposed 3 m high fault scarp trending parallel to the delta front in Isrbilung Fjord. Occurring within an active prodelta channel, the inundation of gravity flows has effectively eliminated all benthos: w.d. = 65 m, dive 62-20.



Figure 11. Small (10 cm) scarp along a Maktak prodelta channel wall showing in situ brecciation: w.d. = 58 m, dive 62-10.



Figure 12. Exposed fault scarp (2 m high) within an active Isrbilung prodelta channel (cf. Fig. 10): w.d. = 70 m, dive 62-20.



Figure 13. Outstretched basket star (*Gorgonocephalus*): w.d. = 135 m, dive 62-15.



Figure 14. Highly mobile crinoids on steep sidewall slope littered with pecten shells and a few gastropods and brittle stars. Also note *Laminaria* debris in w.d. of 70 m, dive 62-21



Figure 15. Recent dropstone trapping *Laminaria* on steep sidewall slope that, except for the crinoid, contains no epilithics. The recent mantling of sediment suggests that the boulder was present for weeks to months: w.d. of 60 m, dive 62-21

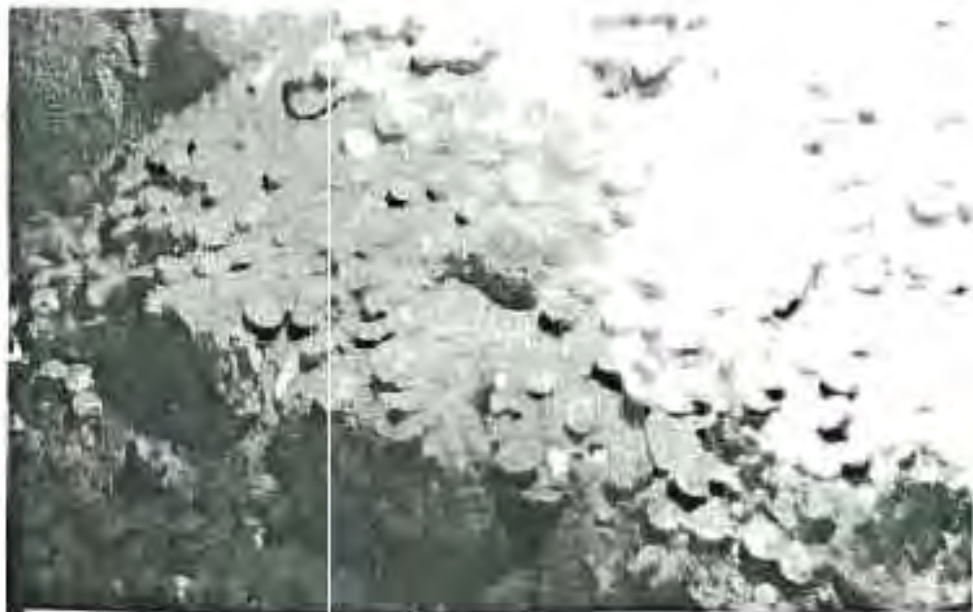


Figure 16. Talus slope infilled with a mud matrix and covered in live scallops: w.d. = 45 m, dive 62-27