UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGIC SURVEY

A Summary of U.S.G.S. Marine Geological Data Collected in the Beaufort Sea, Alaska; 1983.

by

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Open-File Report

84-117

Geological Survey, Menlo Park, CA 94025

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The U.S. Geological Survey Research Vessel Karluk ran approximately 825 km of geophysical tracklines on the inner shelf of the Beaufort Sea, Alaska during the months of July and August 1983. The field season in the Beaufort Sea was divided into two cruise legs, covering the area from Demarcation Bay to Pt. Barrow (see figures 1 & 2). In addition to the geophysical tracklines run, current drifters were launched along the eastern portion of the field area and 36 major sediment samples were collected at various localities (see tables 1 & 2). These data were obtained as part of an ongoing study of shelf morphology, processes and sedimentation in the Arctic. Partial funding for the work being done was provided by the Bureau of Land Management's Outer Continental Shelf Environmental Assessment Program.

The purposes of investigation this field season include the following:

FIRST LEG:

1) Sampling of exposed, over-consolidated silty clays from various environments and water depths at localities on land (swash zone), and offshore (up to 8.0 meters); from Points Brower to Atigaru.

2) Detailed bathymetric and side-scanning sonar surveys of nearshore regions seaward of many of the barrier islands (Reindeer, Narwhal, Spy & Pingok) to define the general bottom configuration, examine the effects of ice ride-up, gouging and wallow on shore-face morphology; and to describe the extent of nearshore bars and their migration.

3) Shore-party observations and nearshore geophysical surveys of seaward facing beach on Thetis Island to examine the effects of impinging ice and subsequent nearshore plowing and sediment accretion.

4) Side-scan sonar and shallow sub-bottom seismic survey around large grounded ice ridges on the seaward side of Spy Island in search of associated gouges, plowmarks; and any effects of reworking of these features.

5) Detailed bathymetric survey of the Finger Shoals area in an attempt to define the geometry and configuration of component sand waves and general field orientation and boundaries; along with obtaining a precisely located and detailed record for comparison with data from other years.

6) Bathymetric, high resolution and shallow sub-bottom seismic, and side-scan sonar surveys of strudel scour locations off the Colville and Sagavanirktok River Deltas to examine scour geometries and properties of the material scoured, along with infilling rates of scours.

7) Survey run using high resolution seismic, shallow sub-bottom seismic, and side-scan sonar along a line connecting the Hamilton Brothers bore-holes just off Pingok Island with another series of bore-holes roughly 31 km to the northwest (~ 70°45', 150°05').

8) Side-scan sonar and microprofiling survey of the bottom configuration around an ice island (just inside of Cross Isl.) in search of gouges and other evidence of incoming drift direction and resultant grounding.

9) Detailed bathymetric survey of the Prudhoe Bay area around the West Dock to define initial conditions from which to study sediment accumulation rates and embayment infilling as the result of the construction of the causeway. (skiff survey).

SECOND LEG:

10) Bathymetric and side-scanning sonar survey to establish a baseline east of Barter Island for future repetitive observations of ice gouging (gouge rate determination) in an area which apparently has a very different (coarser) sediment character.

11) Preliminary surveys to obtain reconnaissance geophysical and morphological data near Demarcation Bay, Smith Bay, and in the Western Beaufort gathering side-scanning sonar records, precision bathymetry and high resolution seismic data.

12) Continued sampling of overconsolidated materials from seafloor outcrops and from beach and swash sample sites for materials properties studies.

13) Shore party observations of an ice pushed boulder ridge to the east of the Canning river to compare recent change with observations in 1979 and 1980.

14) Detailed bathymetric and side-scannig sonar survey of artificial island BF-37 to observe the changes occurring as the island is being destroyed by ice and waves as the shore protection of sand bags is lost.

15) Detailed survey with side-scanning sonar and bottom photography of sea floor craters found northwest of Demarcation Bay to ascertain their origin.

16) Shipboard and aircraft release of Woodhead bottom and surface drifters in the area of suspected divergence in surface currents between eastern Camden Bay and Demarcation Bay.

17) Detailed bathymetric and side-scanning sonar survey in the vicinity of a gouge on test line 1 in anticipation of winter studies of gouge engineering properties and to ascertain the small scale variation in ridge geometries and gouge parameters.

18) Detailed bathymetric and seismic study and search for "Boulder Island" North of Kangavik Point.

Data acquired consists of approximately 294 kms and 200 kms of 100-khz and 500-khz side-scanning sonar records respectively; 447 kms of 500-khz microprofiles, 568 kms of 200-khz bathymetry, 375 kms of 7-khz sub- bottom profiles, 54 kms of 3.5-khz shallow seismic records, and 364 kms of variable frequency high resolution seismic reflection records. The data are in the form of 30 rolls of side-scanning sonar, 29 rolls of combined microprofiles, bathymetry, subbottom profiles, shallow seismic; and 10 rolls of high resolution seismic. Recorded navigation is on 18 reels of magnetic tape and 9 rolls of paper printout. Table 1 lists the 1983 line numbers and briefly describes the surveys and accompanying equipment. In addition to the geophysical records obtained, a total of 36 sediment samples (plus subsamples) were collected for later processing. Table 2 lists these samples along with descriptions as to sample type and original location.

Side-scanning sonar records were collected on a Klein model 531-t wet-paper recorder. The tow-fish used was Klein model 422s-101e submersible, and it housed both the 100-khz and 500-khz scanning sonar systems and the 500-khz microprofiling transducer and the 3.5-khz shallow seismic transducer. Bathymetry was recorded on one of two systems: an E.P.C. model 1600, or an Innerspace T.D.S.R. model 440 dry-paper recorder; using a 200-khz hull- mounted transducer. A 7-khz hull-mounted transducer was used in conjunction with the T.D.S.R. and E.P.C. 1600 systems recording subbottom reflectors up to 10

meters below the seafloor. Deeper penetration, high resolution seismic data were recorded on an E.P.C. model 3200s dual channel recorder, using Del Norte, T.S.S.(Technical Survey Services) and Khron-Hite filter/amplifier systems: output was 175-joules from an O.R.E. geopulse sled with accompanying hydrophones. The side-scanning sonar, microprofiler, and unfiltered (shallow) seismic data were routinely recorded on a Hewlett Packard model 3968a 8 channel tape recorder. All records were corrected for vessel draft, except in the case of those coming from the tow-fish where notation as to changing tow depths were manually entered on the records as they were printing out.

On most survey lines a Del Norte trisponder system was used to provide accurate navigational information. This range-range positioning system has an ideal distance measuring precision of plus or minus 3 meters; with actual positioning to within plus or minus 15 meters. On lines that extend beyond the range of the Del Norte system, or where positioning inhibited reliable reception of more than one signal, navigation was in part by radar ranges off known beach and promontory targets. We estimate the accuracy of these positionings to be within 500 meters. The ship's log, magnetic tapes and paper printouts contain navigational information for any given line, along with information on systems in use while the line was being run. These data can be found with the other recorded instrumentation in the microfilm section of this report.

Copies of all field data are available on microfilm from the National Geophysical and Solar Terrestrial Data Center, N.O.A.A., Boulder, Colorado. The microfilms contain copies of all geophysical records, ship's log, and computer listings of navigational way points. Reference to reports from previous years are listed in table 4. The original records are archived at the U.S. Geological Survey, 3475 Deer Creek Road, Palo ALto, California 94304.

Field data available from: NGSDC, Code E-64, NOAA, 325 Broadway, Boulder, CO 80303.

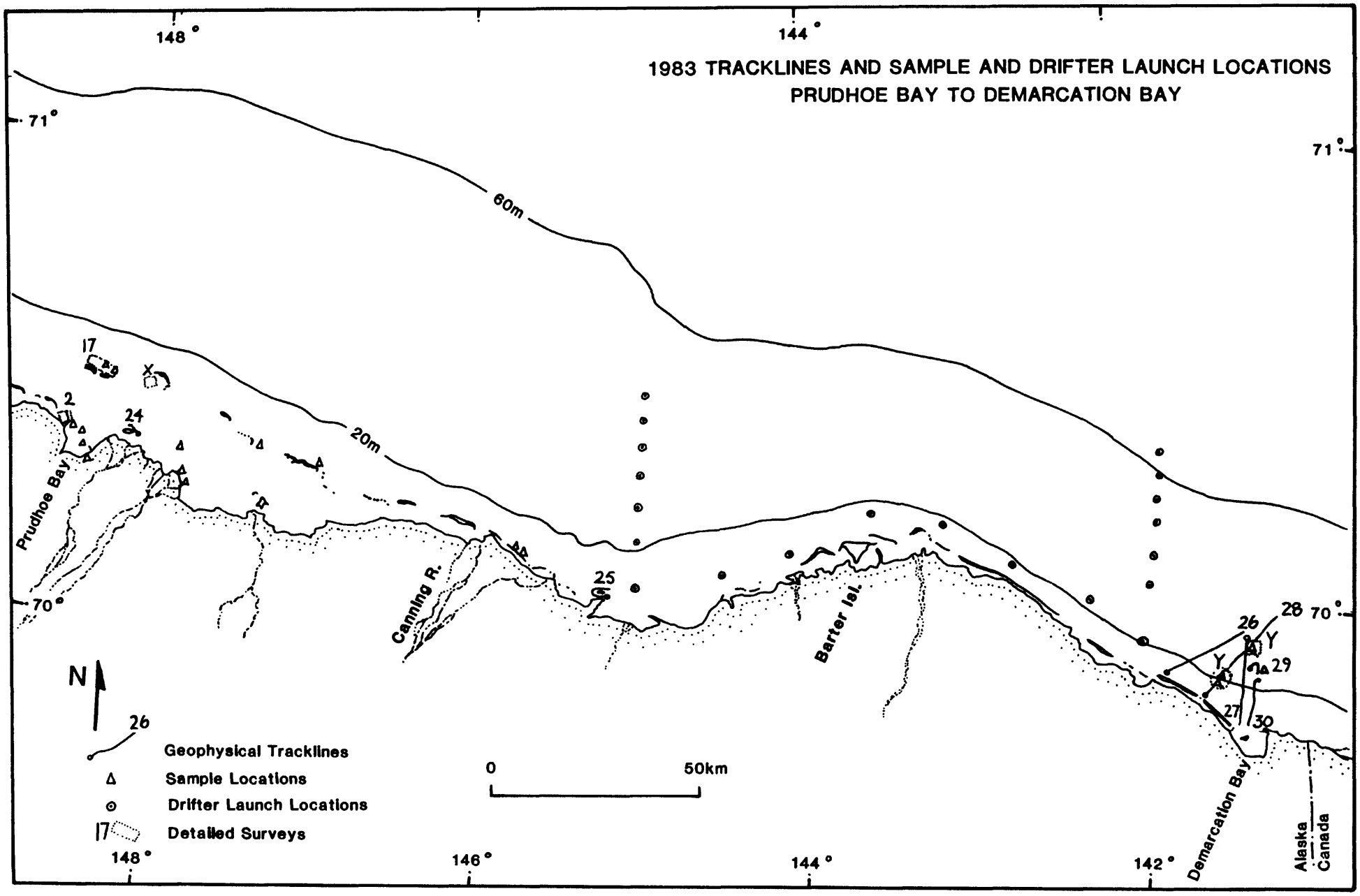

Figure 1. 1983 geophysical tracklines, and drifter launch and sample locations between Demarcation Bay and Prudhoe Bay. Line and location numbers are those used in tables 1,2, and 3.

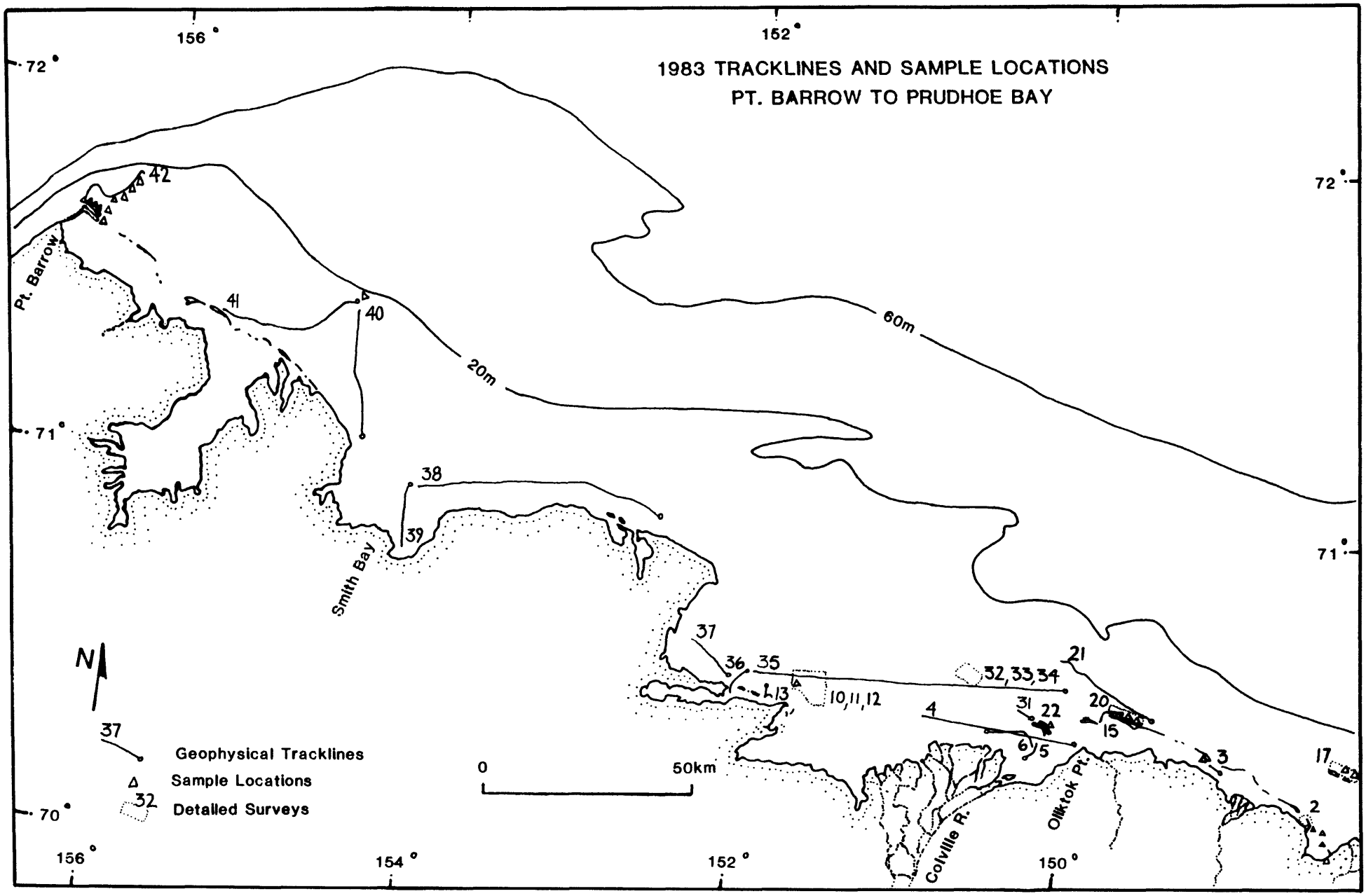

Figure 2. 1983 geophysical tracklines and sample locations between Prudhoe Bay and Point Barrow.

Table 1. 1983 TRACKLINE LOG

Line#	Description	Date	Recorded Instrumentation (roll#) E.P.C.1600	Klein-system	E.P.C.3200s	T.D.S.R.	data-tapes	Nav.tape,roll	kms
01	West Dock ice-pileup	7-20	#1 500khz mpf	#1 500khz sss					2.8
02	West Dock skiff survey	7-21			- (bathymetry with Seafloor Flasher) -				4.5
03	Long Isl. sand waves	7-22	#1 500khz mpf	#2 500khz sss					4.3
04	Oliktok to Thetis (pipeline route)	7-22	#1,2,3 500khz mpf	#3&4 500khz sss				#1,#1	38.0
05	Coleville R. strudel sc.	7-23	#3 200khz bats 7khz subbttm	#5 100khz sss				#2,#2	8.5
06	Coleville R. to Thetis Isl.	7-23	#3&4 200khz bats 7khz subbttm	#5&6 500khz sss	#1 175J seism			#2,#2	16.1
07	Scour at end of line #6	7-23	#4&5 500khz mpf 3.5khz subbttm	#6 500khz sss				#2,#2	2.5
08	Search for ssc & ice wallow relief off Thetis Isl.	7-23	#5 500khz mpf	#6 500khz sss					3.0
09	Bathym. off Thetis	7-24	#5 500khz mpf 3.5khz subbttm	#7 500khz sss					5.0
10	Finger Shoals	7-25	#5,6&7 200khz bats 7khz subbttm					#3&4&5,#2	96.0
11	Finger Shoals cont.	7-27	#8 200khz bats					#6,#2	12.0
12	Finger Shoals cont.	7-27	#9 500khz mpf 3.5khz subbttm	#7 500khz sss				#6,#2	4.8
13	Bathym & subbttm off Atigaru Pt.	7-27	#9 200khz bats 7khz subbttm		#1 175J seism			#6,#2	3.0
14	Bathym. off Spy Isl.	7-28	#9 500khz mpf 3.5khz subbttm	#7 500khz sss				#7,#2	3.2
15	Bathym. off Pingok Isl.	7-28	#9&10 500khz mpf	#8 500khz sss					6.2

Line#	Description	Date	Recorded Instrumentation (roll#)										kms
			E.P.C.1600		Klein-system		E.P.C.3200s		T.D.S.R.		data-tapes		Nav.tape,roll	
16	Search for ssc off Reindeer Isl.	7-29	#10	500khz mpf 3.5khz subbttm	#8	500khz sss								4.8
17	Bathym. off Reindeer Isl.	7-30							#1	200khz bats			#7,#2	54.0
X	Ice Island survey	7-30	#10	500khz mpf	#9	500khz sss							#7,#2	1.0
18	Bathym. off Narwhal Isl.	7-31	#10	500khz mpf	#9	500khz sss			#1	200khz bats				7.5
19	Bathymetry & Side-scan off BF-37	7-31	#10	500khz mpf	#9	500khz sss								1.2
20	Bathym. off Pingok Isl.	8-01	#10	500khz mpf	#9	500khz sss			#1	200khz bats			#8,#2	36.5
21	Ice gouge search Hamilton bros. bore holes to others NE	8-01	#11&12	3.5khz subbttm	#10&11	500khz sss	#1&2	175J seism						31.3
22	Search for ssc off Thetis Isl.	8-02	#12	500khz mpf	#11	500khz sss								3.6
23	Strudel scour #05 McClelland Engineers	8-03	#12	500khz mpf 3.5khz subbttm	#11&12	500khz sss								2.2
24	Strudel scour (B)	8-03	#12	500khz mpf	#12	500khz sss								4.0
25	Search for boulders off Konganevik Pt.	8-07	#13	500khz mpf	#14	500khz sss	#4	175J seism						5.9
26	Search for ssc NE of Demarcation Bay	8-08	#14	500khz mpf	#15&16	100khz sss	#4	175J seism	#3	200khz bats 7khz subbttm	#1	Klein EPC 3200	#9,#3	2.2
27	Line south into Demarcation Bay	8-08	#14	500khz mpf	#16&17	100khz sss	#5	175J seism	#3	200khz bats 7khz subbttm	#1&2	Klein EPC 3200	#9&10,#3	26.5
28	Line NE from Demarcation Bay	8-09	#14&15	500khz mpf	#18	100khz sss	#5	175J seism	#3	200khz bats 7khz subbttm	#2&3	EPC 1600 Klein EPC 3200	#10,#3	25.8
29	Gas crater survey north of Demarcation Bay	8-09	#15	500khz mpf			#6	175J seism	#4	200khz bats 7khz subbttm			#11,#3-4	13.3
30	Line south into Demarcation Bay	8-09							#4	200khz bats 7khz subbttm			#11,#3-4	10.0
Y	Gas crater survey in Demarcation Bay	8-10			#19	100khz sss	- (underwater camera system used) -							3.5

Line#	Description	Date	Recorded Instrumentation (roll#) E.P.C.1600	Klein-system	E.P.C.3200s	T.D.S.R.	data-tapes	Nav.tape,roll	kms
31	Ice gouge survey NW of Thetis Isl. (testline #1)	8-16	#16 500khz mpf	#20 100khz sss	#7 200khz bats 500khz mpf		#4 EPC 1600 Klein EPC 3200	#11,#4	3.2
32	Ice gouge survey near Thetis Isl. (testline #1)	8-16	#16 500khz mpf	#21 500khz sss	#7 175J seism 500khz mpf 200khz bats		#4 EPC 1600 Klein EPC 3200	#11,#5	12.5
33	More ice gouge study off Thetis Isl. very detailed (testline #1)	8-16	#16&17 500khz mpf	#22 500khz sss	#8 200khz bats		#4&5 EPC 1600 Klein EPC 3200	#11,#5	3.7
34	Line run to locate gouge on testline #1 to place Pinger	8-16		#23 100khz sss	#8 200khz bats		#5 Klein EPC 3200	#12,#5	1.5
35	Line run west across Harrison Bay	8-17	#17&18 500khz mpf	#24&25 100khz sss	#9&10 175J seism	#4&5 200khz bats 7khz	#5,6,7 EPC 1600 Klein EPC 3200	#12&13,#5&6&7	71.3
37	Line NW from Eskimo Isl.	8-18			#10 175J seism	#5 200khz bats	#7 EPC 3200	#14,#8	12.6
38	Line west near Pitt Pt. into Smith Bay	8-20	#19&20 500khz mpf	#26&27 100khz sss	#11&12 175J seism	#5&6 200khz bats 7khz subbttm	#8&9 EPC 1600 Klein EPC 3200	#14&15&16,#8	66.7
39	Line south into Smith Bay	8-20	#20 500khz mpf	#27 100khz sss	#12 175J seism	#6 200khz bats 7khz subbttm	#10 EPC 1600 Klein EPC 3200	#16,#8	17.1
40	Line north from Cape Simpson	8-21	#20&21 500khz mpf	#28 100khz sss	#12 175J seism	#6&7 200khz bats 7khz subbttm	#10&11 EPC 1600 Klein EPC 3200	#16&17,#8&9	31.0
41	Line W-SW near Dease Inlet	8-21				#6 200khz bats 7khz subbttm		--,#9	38.5
42	Search for ssc NE from Pt. Barrow	8-22	#21 500khz mpf	#29 100khz sss	#13 175J seism	#6&7 200khz bats 7khz subbttm	#11&12 EPC 1600 Klein EPC 3200	#17&18,#9	29.1
43	Search for ssc off Pt. Barrow	8-22	#21 500khz mpf	#30 100khz sss		#7 200khz bats 7khz subbttm	#12 EPC 1600 Klein	#18,#9	8.0

*bats=bathymetry,mpf=microprofiler,ssc=stiff silty clay,sss=side-scan sonar,subbttm=subbottom,seism=seismic

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Table 2. 1983 SAMPLE LOG

(Samples collected at various localities in the Beaufort Sea, between Demarcation Bay and Pt. Barrow. = K1 & K2-83-AR)

spl#	type	date	coord.	z(m)	location	description
83-AER-Ø1	G	7-16	Ø7Ø*23.2'N 148*29.7'W	1.5	4ØØ m E of West Dock Prudhoe Bay	unc. sand,silt,clay
83-AER-Ø2	G	7-16	Ø7Ø*22.Ø'N 148*23.4'W	Ø.7	few hundred meters West of Gull Isl. (Prudhoe Bay)	unc. silt,sand
83-AER-Ø3	G	7-16	Ø7Ø*2Ø.8'N 148*22.3'W	3.Ø	Prudhoe Bay	unc. clayey silts, abundant worm tubes
83-AER-Ø4	S	7-16	Ø7Ø*18.7'N 148*19.Ø'W	Ø.Ø	beach SE of Prudhoe Bay	semi-con. silty clay
83-AER-Ø5	S	7-17	Ø7Ø*29.9'N 149*Ø5.5'W	Ø.Ø	beach on lee shore Cottle Isl.	over-con. silty mud, micro-relief at surface
83-AER-Ø6	D	7-27	Ø7Ø*35.9'N 151*36.4'W	4.5	Finger Shoals	over-con. silty clay, flame structures, buff, (oxidized) sandy interlayers; (from trough): (adjacent crest sampled w/ snapper yielded clean medium to coarse sands w/ few shells)
83-AER-Ø7	D	7-29	Ø7Ø*29.5'N 148*17.Ø'W	8.Ø	off Reindeer Isl.	over-con. silty clay
83-AER-Ø8	D	7-29	Ø7Ø*29.3'N 148*12.2'W	7.5	test-line #3	over-con. silty clay, few pebbles, sand,wood; mixed inclusions
83-AER-Ø9	S	7-3Ø	Ø7Ø*16.4'N 147*47.5'W	Ø.Ø	beach at Pt. Brower	very over-con. silty clay, pebbles throughout
83-AER-1Ø	D	8-Ø1	Ø7Ø*34.3'N 149*34.7'W	8.Ø	off Pingok Isl.	over-con. silt-clay, muds,sands; bioturbated
83-AER-11	D	8-Ø2	Ø7Ø*32.9'N 15Ø*Ø7.7'W	7.Ø	off Thetis Isl.	over-con. silty mud bioturbated, mixed inclusions

SAMPLE LOG cont.

83-AER-12	D	8-Ø2	Ø7Ø*33.8'N 149*3Ø.5'W	8.Ø	off Pingok Isl.	chemically cemented sands, stained
83-AER-13	D	8-Ø3	Ø7Ø*18.2'N 147*47.9'W	5.Ø	scour, off Sag. Delta	silty sand,organics "coffee-grinds"
83-APB-14	D	8-Ø5	Ø7Ø*23.2'N 147*54.1'W	6.Ø	around B.F.-37	over-con. sandy mud, few pebbles
83-APB-15	D	8-Ø6	Ø7Ø*2Ø.2'N 147*19.2'W	5.Ø	off Karluk Isl.	consol. pebbly mud, lots of shells
83-APB-16	D	8-Ø6	Ø7Ø*17.7'N 146*53.7'W	6.Ø	off Belvedere Isl.	over-con. muds, few encrusted pebbles
83-APB-17	D	8-Ø6	Ø7Ø*Ø8.5'N 145*44.8'W	5.Ø	4 km east of Brownlow Pt.	over-con. mud w/ pebbly-sandy surface, few pebbles within
83-APB-18A	S	8-Ø6	Ø7Ø*Ø8.1'N 145*44.5'W	Ø.Ø	beach 4 km east of Brownlow Pt.	over-con. muds
83-APB-18B	S	8-Ø6	Ø7Ø*Ø8.1'N 145*44.5'W	Ø.Ø	beach 4 km east of Brownlow Pt.	over-con. muds, (dessicated)
83-APB-19	D	8-1Ø	Ø69*53.Ø'N 141*23.Ø'W	37.Ø	off Demarcation Bay	sandy muds
83-APB-2Ø	G	8-1Ø	Ø69*47.8'N 141*33.9'W	17.Ø	off Demarcation Bay	fine grained sand, (clean)
83-APB-21	G	8-1Ø	Ø69*47.8'N 141*34.Ø'W	17.Ø	off Demarcation Bay	pebbly sand, pebbles up to 2 cm
83-APB-22	C	8-1Ø	Ø69*47.9'N 141*19.8'W (appx)	37.Ø	off Demarcation Bay	sandy muds, (sticky)
83-APB-23	S	8-2Ø	Ø7Ø*48.5'N 154*ØØ.3'W	Ø.Ø	beach SE of Smith Bay	over-con. muds, friable, (dessicated)
83-APB-24	S	8-2Ø	Ø7Ø*48.5'N 154*ØØ.3'W	Ø.Ø	beach SE of Smith Bay	over-con. muds
83-APB-25	G	8-21	Ø71*16.9'N 154*34.Ø'W	2Ø.Ø	32 km N of Cape Simpson	soft muds, shells, oxidized at surface
83-APB-26	G	8-21	Ø71*13.5'N 155*3Ø.5'W	5.4	4 km E of Cooper Isl	over-con. muds, sandy/pebbly, bioturb
83-APB-27	G	8-22	Ø71*26.7'N 155*55.9'W	17.5	North of Tapkaluk Isl. & Scott Pt.	soft silty mud, oxidized surface distinct sand layer (1cm) at 1Øcm depth

SAMPLE LOG cont.

83-APB-28	G	8-22	Ø71*25.2'N 155*58.5'W	16.5	North of Tapkaluk Isl. & Scott Pt.	semi-con. fine clayey silt, few shells, oxidized ooze (1cm) at surface
83-APB-29	G	8-22	Ø71*23.9'N 156*Ø1.4'W	14.7	ENE of Barrow as w/ 27&28	semi-con. silty mud, oxidized ooze at surface
83-APB-3Ø	G	8-22	Ø71*23.4'N 156*Ø7.7'W	13.Ø	ENE of Barrow as 27,28,29	semi-con. silty mud, oxidized at surface, "balls" of denser silty material in the mud matrix
83-APB-31	G	8-22	Ø71*22.3'N 156*1Ø.3'W	11.Ø	ENE of Barrow as #3Ø	semi-con. silt w/ 5 cm of nasty grey- green organic ooze at top, uppermost 1 cm oxidized
83-APB-32	G	8-22	Ø71*22.1'N 156*16.1'W	6.Ø	East of Pt. Barrow	over-con. silty clay, oxidized organic ooze at surface
83-APB-33	G	8-22	Ø71*23.1'N 156*25.7'W	7.Ø	East of Pt. Barrow	consol. muds, gravely, clasts up to 5 cm,gravely ripples seen where muds are stiff, muds oxidized
83-APB-34	G	8-22	Ø71*23.Ø'N 156*25.4'W	6.7	just East of Pt. Barrow	over-con. silty- clay, sand and ooze at surface, sands oxidzed
83-APB-35	G	8-22	Ø71*22.4'N 156*21.2'W	5.4	just East of Pt. Barrow	unc. gravels, covered w/ oxidized ooze; (from ridge crest)
83-APB-36	G	8-22	Ø71*22.3'N 156*21.2'W	6.Ø	just East of Pt. Barrow	over-con. muds; (from trough)

* D = dredge, S = swash zone (hand sampled), G = Van Veen grab, C = core

Table 3.

Reports of data type, location, and year collected (records on microfilm).

YEAR COLLECTED	OPEN-FILE #	AUTHORS
1970 - 1972	73-18	Barnes, Reimnitz, Gustafson, and Larson
1973	not filed	
1974	no data collected	
1975	not filed (?)	
1976	79-766	Reimnitz, Barnes, and Maurer
1977	78-1066	Maurer, Barnes, and Reimnitz
1978	79-384	Reimnitz, Barnes, and Kempema
1979	80-603	Barnes, Reimnitz, Kempema, Minkler, and Ross
1980	81-241	Kempema, Reimnitz, and Barnes
1981	82-586	Minkler, Reimnitz, and Barnes
1982	83-493	Kempema, Barnes, Reimnitz, Asbury, and Rearic