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A summary of U.S. Geological Survey Marine Geological Data Collected in the Beaufort Sea, Alaska 1982

by

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The U.S. Geological Survey vessel R/V Karluk ran approximately 500 km of geophysical tracklines on the inner shelf of the Beaufort Sea between Point Barrow and Barter Island during August and September of 1982 (Figures 1 and 2). In addition to the geophysical lines, 63 sediment samples and 22 water/ice samples were collected, scuba dives were made at 7 sites, and electrical resistivity measurements were collected at 4 sites. These data were collected as part of an ongoing study of shelf processes and sedimentation, and partial funding for the work was provided by the Bureau of Land Management Outer Continental Shelf Environmental Assessment Program.

Areas and problems that we concentrated on during this field season include:

1) Re-running of the testlines in different areas along the shelf to determine the recurrent rate of ice gouging in different environments (Barnes et al., 1978).

2) Diving operations were conducted on two ice gouges and two strudel scours (Reimnitz and Kempema, 1982) of known ages in order to collect cores for determining the sediment types and sedimentary structures found in these features. A total of 6 diver-collected cores were gathered for analysis.

3) Detailed bathymetric surveys were run on the 18-meter bench off Cross Island and in the nearshore zone seaward of Cross Island Island in order to gather more information on bottom morphology and processes in these areas.

4) In a cooperative effort with Harding Lawson Associates, direct current electrical resistivity measurements were taken at the locations of 4 borehole sites near Prudhoe Bay (Shearer, 1979). These measurements were made for evaluating the resistivity technique as a method of measuring the depth to the top of ice bonded permafrost.

5) Studies were made of the freeze-up processes around Prudhoe Bay. These studies included collecting water and ice samples, making observational scuba dives, time lapse photography of beach and nearshore processess during freeze-up, and aerial reconnaisance of Simpson Lagoon and Steffanson Sound.

Data acquired consists of approximately 500 km of 200 KHz bathymetry and 7 KHz subbottom profiles, 400 km of side-scanning-sonar records, and 160 km of Uniboom high resolution seismic reflection profiles. The data are in the form of 14 rolls of bathymetry, 12 rolls of side-scanning-sonar, 3 rolls of Uniboom records, and 2 rolls of Simrad fathometer records. Table 1 lists the line numbers for 1982, and shows what equipment used on each line. In addition to the geophysical records, a total of 106 samples of various types were collected for later processing. Table 2 lists these sample sites, along with a description of the type of sample collected at each site. Table 3 lists the location of dive sites.

Bathymetry was recorded on a Raytheon RTT 1000 dry paper recorder using a hull-mounted 200 kHz transducer with an 8 degree beam width. All records were corrected for vessel draft. A 7kHz transducer used in conjunction with the Raytheon recorded subbottom reflectors up to 10 meters below the seafloor. Deeper penetration high-resolution seismic data were recorded on either an EPC

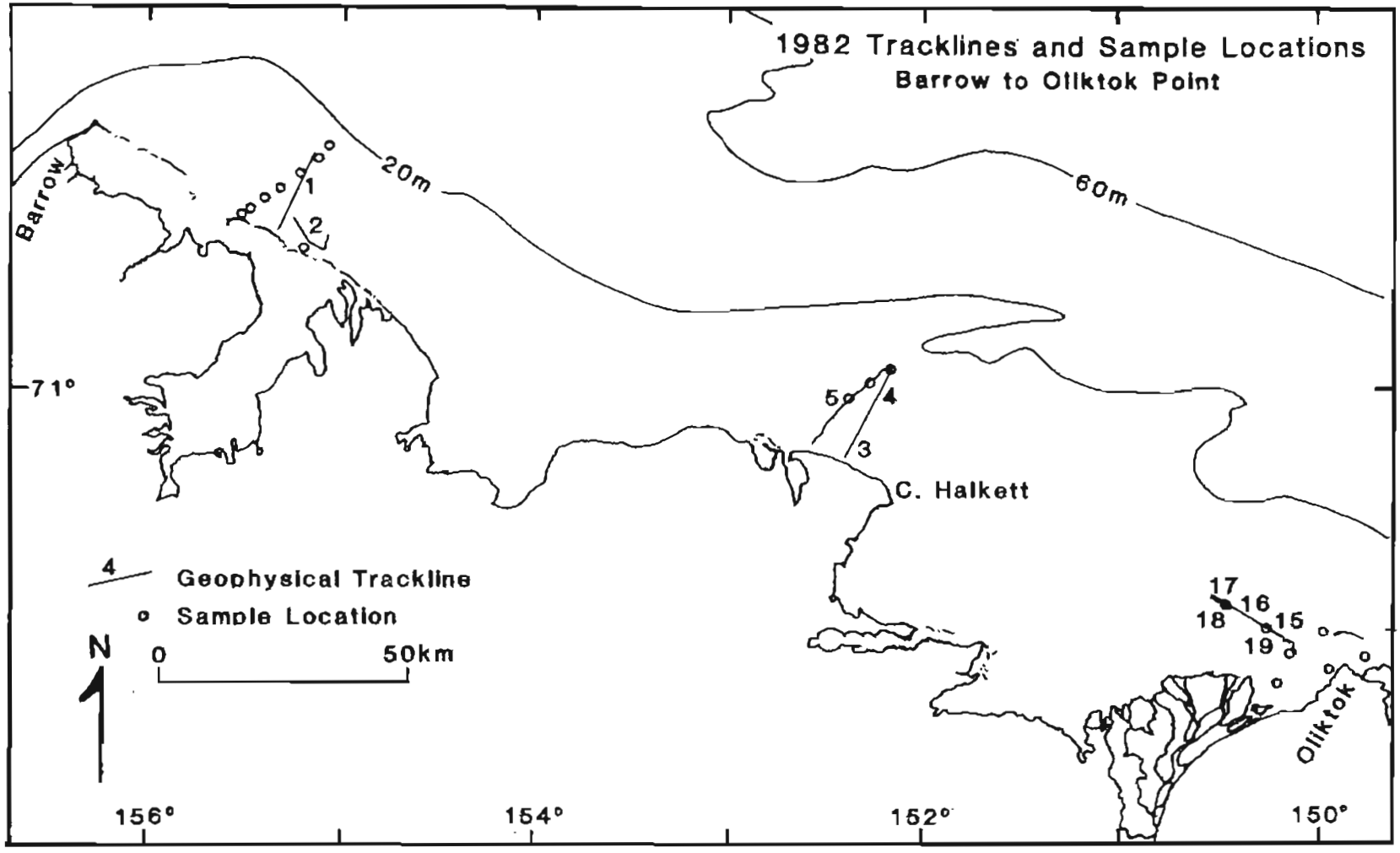

Figure 1. 1982 geophysical tracklines and sample locations between Barrow and Oliktok Point. The numbers by the tracklines are the line numbers used in Table 1.

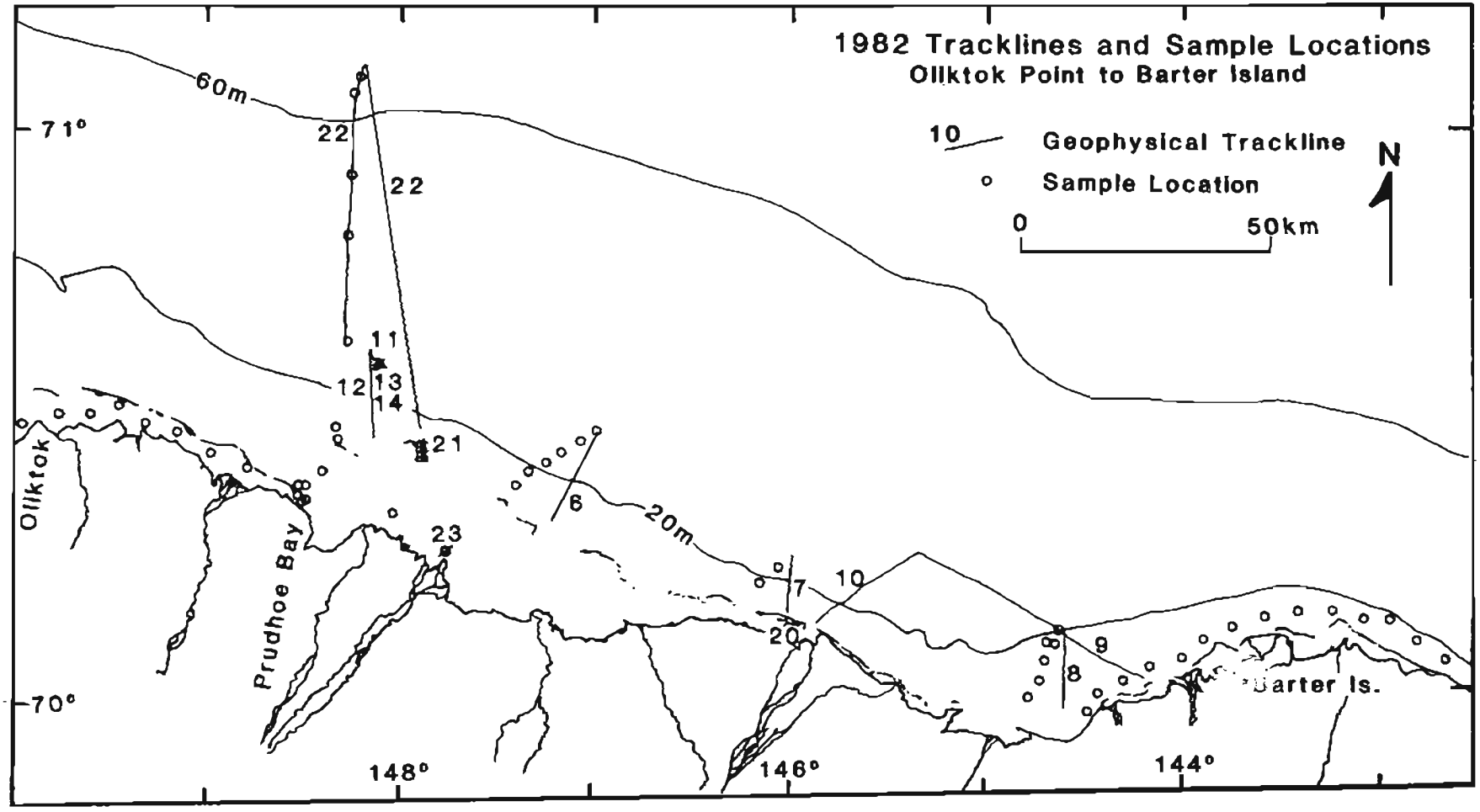

Figure 2. 1982 geophysical tracklines and sample locations between Oliktok Point and Barter Island.

4100 or an EPC 3200S recorder with a EG&G Model 230-1 Uniboom and a Model 234 power supply at 300 joule output a sound source. Side-scanning-sonar records were collected on an EG&G Model 259-4 wet paper recorder. The sonar fish was a EG&G model 272, with a 105 kHz pulse at a 20 degree beam angle depression.

On most lines, a Del Norte Trisponder System was used to record navigation information. This range-range positioning system has a distance measuring accuracy of ±3 meters, allowing precise navigation control. On lines that extended beyond the range of the Del Norte system, we used a Magnavox model MX1242 satellite navigation system, which provides position accuracies of about 500 m. However, navigation between satellite fixes was by dead reckoning, and we estimate tracklines plotted in figure 1 using satellite navigation information may be off by about 2 km. On nearshore lines beyond the range of the Del Norte system navigation was by radar ranges off beach targets. We estimate the accuracy of these positions is within 500 m. The ship's log contains navigation information for any given line, along with information on systems in use while the line was being run.

Copies of all field data are available on microfilm from the National Geophysical and Solar-Terrestrial Data Center, NOAA, Boulder, Colorado. The microfilm is a copy of geophysical records, ship's log, and a computer listing of navigation waypoints. The original records are archived at the U.S.Geological Survey, 3475 Deer Creek Road, Palo Alto, CA 94304.

REFERENCES

Barnes, P. W., McDowell, D. M., and Reimnitz, Erk, 1978, Ice gouging characteristics: their changing patterns from 1975 to 1977, Beaufort Sea, Alaska: U. S. Geological Survey Open-File Report 78-730, 42 p.

Reimnitz, Erk and Kempema, E.W., 1982, High rates of bedload transport measured from infilling rate of large strudel-scour craters in the Beaufort Sea, Alaska: U. S. Geological Survey Open-File Report 82-588, 18 p.

Shearer, G. B., 1979, Preliminary results of corehole drilling on the Beaufort Sea Shelf, Alaska: U. S. Geological Survey Open File Report, 63 p.

Table 1
1982 Trackline Log

Line No.	Description	Raytheon	Side-Scan	Uniboom	Length in Km
1	Test Line 9 - Cooper Is	1	1	1	16
2	Off Igalik Island	1	1	--	8.5
3	Test Line 4-Cape Halkett	2	2	--	3
4	Test Line 4-Cape Halkett	2	2	--	19
5	Run from TL4 to Esook	2	--	--	18.5
6	Test Line 6-Karluk Is.	3	3	1	23
7	Test Line 8 - Flaxman Is.	4	3	2	11
8	Test Line 7 - Camden Bay	5	4	2	20
9	Offshore Camden Bay	5	4	2	49
10	Offshore Camden Bay	6	5	3	24
11	18 m bench survey	7	6	--	25
12	Test Line 3	8	6	3	17
13	18 m bench survey	8	--	--	2
14	18 m bench survey	9	7	--	19
15	Gouge #2, T.L. 1	10	7	--	2
16	Test Line #1	10	8	--	15
17	E. Harrison Bay Gouges	10	9	--	2
18	E. Harrison Bay Gouges	10	9	--	6
19	Dive Site 62	10	9	--	2
20	Flaman Is. Boulder Patch	11	10	--	2.5
21	Cross Island Bats	11	--	--	76
22	Shelf Break	12	11	--	128
23	Sag River Delta	14	--	--	2

Numbers show roll number used on each instrument on each line.

Table 2
1982 Sample log

Sample	Latitude	Longitude	Water depth (m)	Sample type*	Reference location	Description
82-APB-1	71°22.60'	155°11.35'	19	G	T.L.9	stiff sandy mud
82-APB-2	71°21.42'	155°14.61'	17	G	T.L.9	soupy mud
82-APB-3	71°19.59'	155°19.56'	15	G	T.L.9	sandy mud
82-APB-4	71°18.04'	155°25.77'	12.5	G	T.L.9	unconsolidated muddy sand
82-APB-5	71°16.94'	155°30.20'	11	G	T.L.9	sandy mud
82-APB-6	71°15.78'	155°34.55'	9	G	T.L.9	mud
82-APB-7	71°15.05'	155°37.30'	7	G	T.L.9	fine muddy sand
82-APB-8	71°15.04'	155°22.88'	10	G	T.L.9	slightly sand mud
82-APB-9	71°1.76'	155°17.45'	8	G	Cooper Is.	fine muddy sand
82-APB-10	71°01.95'	152°11.00'	19	G	T.L. 4	dark grey sand and muddy sand
82-APB-11	71°00.50'	152°17.40'	17	G	T.L. 4	dark grey slightly sandy firm mud
82-APB-12	70°58.63'	152°23.23'	14	G	T.L. 4	dark grey sticky, slightly sandy mud
82-APB-13	70°57.00'	155°27.71'	10	G	T.L. 4	dark grey muddy sand
82-APB-14	70°55.27'	155°32.20'	7	G	T.L. 4	very stiff, dark rey mud
82-APB-15	70°30.79'	147°00.05'	32	G	T.L. 6	stiff gravelly muddy sand
82-APB-16	70°29.82'	147°04.60'	30	G	T.L. 6	stiff grey sandy mud
82-APB-17	70°28.71	147°10.36'	29	G	T.L. 6	stiff grey sandy mud with shell fragments
82-APB-18	70°27.63'	147°15.00'	25	G	T.L. 6	pebbly clay
82-APB-19	70°26.81'	147°20.33'	20	G	T.L. 6	pebbly clay
82-APB-20	70°25.50'	147°24.72	14	G	T.L. 6	stiff clayey sand
82-APB-21	70°17.10	146°01.00'	25.5	G	T.L. 8	very stiff pebbly sandy mud
82-APB-22	70°16.52'	146°05.30'	20	G	T.L. 8	very stiff sandy mud
82-APB-23	70°15.41'	146°10.20'	15	G	T.L. 8	muddy sandy gravel
82-APB-24	70°09.49'	144'41.18'	20.5	G	T.L. 7	sandy mud
82-APB-25	70°08.37'	144°44.70'	19	G	T.L. 7	stiff sandy mud
82-APB-26	70°08.27'	144°42.38'	18	G	T.L. 7	stiff silty clay -
82-APB-27	70°06.37'	144°45.69'	17	G	T.L. 7	muddy sand
82-APB-28	70°04.51	144°47.40'	13	G	T.L. 7	muddy sand
82-APB-29	70°02.69	144°50.85'	10	G	T.L. 7	sand
82-APB-30	70°00.91'	144°33.40'	7	G	Camden Bay	fine grained, muddy sand
82-APB-31	70°02.72'	144°30.40'	10	G	Camden Bay	fine grained, muddy sand

Table 2 (cont'd)
1982 Sample log

Sample	Latitude	Longitude	Water depth (m)	Sample type*	Reference location	Description
82-APB-32	70°04.01'	144°22.41'	10	G	Camden Bay	fine grained pebbly muddy sand
82-APB-33	70°05.27'	144°14.00'	8	G	Camden Bay	fine grained muddy sand
82-APB-34	70°06.03'	144°04.24'	7.5	G	Barter Is.	sandy mud
82-APB-35	70°07.80'	143°58.10'	12	G	Barter Is.	course muddy pebbly sand
82-APB-36	70°08.91	143°48.77'	13	G	Barter Is.	muddy sand
82-APB-37	70°09.76'	143°38.65'	13	G	Barter Is.	muddy sand with shell
82-APB-38	70°10.16'	143°28.86'	12	G	Barter Is.	clean, fine grained sand
82-APB-39	70°10.20'	143°18.60'	12	G	Barter Is.	clayey sand
82-APB-40	70°08.75'	143°10.00'	7	G	Barter Is.	clean, fine grained sand
82-APB-41	70°08.78'	143°01.65'	13	G	Barter Is.	clean, fine grained sand
82-APB-42	70°06.28'	142°53.55'	14	G	Barter Is.	clean, fine grained sand
82-APB-43	70°04.15'	142°46.50'	11	G	Barter Is.	clean sand
82-APB-44	70°37.25'	148°07.92'	18		18 m bench	pebbly mud
82-APB-45	70°37.25'	148°07.92'	17.5		18 m bench	pebbly muddy sand
82-APB-46	70°37.25'	148°07.92'	19	G	18 m bench	bouldery gravel
82-APB-47	70°37.52'	148°08.40	18	G	18 m bench	muddy pebbly sand #1
82-APB-48	70°37.52'	148°08.40	24	G	18 m bench	shift muddy gravel
82-APB-49	70°38.52'	148°08.40	22	G	18 m bench	muddy gravel
82-AER-1	70°34.61'	150°15.20	9.8	C	DS 61	Core
82-AER-2	70°37.20'	150°27.36	11.5	C	DS 62	Core
82-AER-3	70°37.20'	150°27.36'	11.5	C	DS 62	Core
82-AER-4	70°37.20'	150°27.36'	11.5	C	DS 62	Core
82-AER-5	70°37.20	150°27.36'	11.5	C	CS 62	
82-AER-6	No sample collected					
82-AER-7	70°22.17	148°02.61'		C	DS 63	
82-AER-8	71°07.22'	148°14.6'	70	G	N of Cross Is	muddy sand with 1 cobble (angular)
82-AER-9	71°05.2'	148°16.0'	49	G	N of Cross Is	pebbly sandy mud
82-AER-10	70°57.10'	148°16.7'		G	N of Cross Is	slightly pebbly mud
82-AER-11	70°50.73'	148°18.1'	40	G	N of Cross Is	slightly sandy mud
82-AER-12	70°39.8'	148°17.8'	24	G	N of Cross Is	pebbly muddy sand
82-AER-13	70°18.38'	147°46.96'	0	C	DS #64	unconsolidated mud
82-AER-14	70°29.22'	148°20.30'	0	H	Reindeer Is	sand

Table 2 (cont'd)
1982 Sample log

Sample	Latitude	Longitude	Water depth (m)	Sample* type	Reference location
SI 1A	70°23.9'	148°31.4'	2.5	W	West Dock
SI 1B	"	"	"	I	West Dock
SI 2A	"	"	"	W	West Dock
SI 2B	"	"	"	I	West Dock
SI 3A	"	"	"	W	West Dock
SI 3B	"	"	"	W	West Dock
SI 3C	"	"	"	I	West Dock
SI 4	"	"	3	W	West Dock
SI 5 A	70°24.8'	148°31.4"	3		West Dock
SI 5 B	"	"	"	W	West Dock
SI 6 B	"	"	"	I	West Dock
SI 7 A	70°26.4'	148°46.8'	5	W	Egg Is. Chan.
SI 7 B	"	"	"	I	Egg Is. Chan.
SI 8 A	70°27.9'	148°58.4'	2	W	Long Is.
SI 8 B	"	"	"	I	Long Is.
SI 9 A	70°29.8'	149°8.7'	2	W	Cottle Is.
SI 9 B	"	"	"	I	Cottle Is.
SI 10 A	70°30.7'	149°18.6'	2	I	Kevearak Pt.
SI 10 B	"	"	"	I	Kevearak Pt.
SI 11 A	70°32.5'	149°26.5	2	W	Pingok Is.
SI 11 B	"	"	"	I	Pingok Is.
SI 12 A	70°31.7'	149°36.1	2	W	Pingok Is.
SI 12 B	"	"	"	I	Pingok Is.
SI 13 A	70°31.6'	149°45.1	2	W	Spy Is.
SI 13 B	"	"	"	I	Spy Is.
SI 14 A	70°30.5'	149°56.5	2	W	Oliktok Pt.
SI 14 B	"	"	"	I	Oliktok Pt.
SI 15 A	70°29.2'	150°12.5	2	W	Thetis Is.
SI 15 B	"	"	"	I	Thetis Is.
SI 16 A	70°32.0'	150°08.8	2	W	Thetis Is.
SI 16 B	"	"	"	I	Thetis Is.
SI 17 A	70°29.7'	147°58.35	1.5	W	Cross Is.
SI 17 B	"	"	"	I	Cross Is.
SI 18 A	70°29.3'	148°20.3'	3	W	Reindeer Is.
SI 18 B	"	"	"	I	Reindeer Is.
SI 19 A	70°30.8'	148°20.15	11	W	Reindeer Is.
SI 19 B	"	"	"	I	Reindeer Is.
SI 20 A	70°28.1'	148°17.6'	5	W	Reindeer Is.
SI 20 B	"	"	"	I	Reindeer Is.
SI 21 A	70°26.35'	148°24.0'	6.5	W	West Dock
SI 21 B	"	"	"	I	West Dock
SI 22 A	70°24.8'	148°31.4'	3	W	West Dock
SI 22 B	"	"	"	I	West Dock

*sample types: G = grab sample, C = diver collected core, H = diver collected sample, I = surface ice sample, W = water sample

Table 3
1983 Dive Sites

Dive Sites #	Latitude	Longitude	Reference Location
61	70°34.61'	150°15.20	East Harrison Bay
62	70°37.20'	150°27.36'	East Harrison Bay
63	70°22.17'	148°02.61'	Sag river delta
64	70°18.38'	147°46.96'	Sag river delta
65	70°23.85'	148°31.40'	West Dock
66	70°29.22'	148°20.30'	Reindeer Island
67	70°23.33'	148°30.73'	West Dock