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A SUMMARY OF U.S. GEOLOGICAL SURVEY MARINE GEOLOGIC DATA COLLECTED IN THE BEAUFORT SEA, ALASKA, JULY THROUGH AUGUST 1981

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The USGS vessel R/V Karluk ran approximately 1000 km of geophysical tracklines on the inner shelf of the Beaufort Sea, Alaska from July 14 to August 20, 1981. In addition to the trackline surveys, one area was investigated by SCUBA divers, 37 sediment grab samples were collected, and 5 sites were monitored with Ocean Bottom Seismographs (OBS), three per site. Figure 1 shows the trackline pattern; figure 2 shows grab sample locations and OBS sites. The R/V KARLUK left the Beaufort Sea on August 20 to support investigations by Drs. Ralph Hunter and Larry Phillips in the Chukchi Sea. In this report we outline the general scope of our 1981 field efforts in the Beaufort Sea, the equipment we used, and details on location and availability of the data.

Ice and weather conditions were average in 1981 for inner shelf navigation, and allowed us to survey several important areas:

1) Our primary goal, a reconnaissance survey from the Canning River to the Canadian boundary, where almost no inner shelf data were available, was accomplished (see Fig. 1). Geophysical lines were run as far offshore as ice concentrations allowed. All lines from the Canning River eastward extend seaward into very tight pack ice, beyond which further penetration was impossible. Early in the season this tight pack ice was near the coastline. As the season progressed, lines could extend farther seaward. One bay and one lagoon were surveyed along this shore. Thirty-seven samples (see table 2) were collected, mainly on the open shelf. For this reconnaissance work, navigational control is based on radar fixes and dead reckoning. The probable uncertainty in position ranges from 100 or 200 m near shore, to as much as 3 km under dead reckoning on the seaward ends of several tracklines.

2) From the Canning River to the Colville River, surveys were site specific. Detailed surveys for preparation of side-scan sonar mosaics with

bathymetry were run in four small areas, two on Stamukhi Shoal, one on the 18-m bench seaward of Narwhal Island, and another one on the 18-m bench seaward of Reindeer Island. Detailed bathymetric surveys were run around the "West Dock," and around two artificial gravel islands: Niakuk 3 and B.F. 37. Two test lines from previous years were re-run (first run in 1973, see Reimnitz, et al., 1977; and Barnes, et al., 1978) and two new test lines were established with side-scan sonar to determine yearly rates of ice gouging. For all of these detailed surveys, positions were plotted using a Del Norte trisponder system with a distance measuring accuracy of ±3 m. This system provides a position accuracy of ±8 m.

3) Three ocean bottom seismographs were deployed overnight at five different localities in shallow water between longitude 148° West and the Canadian boundary. The water depth ranged up to about 4 m. The purpose of this work was to monitor low-frequency natural seismicity in areas of decaying permafrost.

4) The diving investigation consisted of a dive sled traverse of roughly 1.5 km through the area of the north Stamukhi Shoal side-scan sonar mosaic.

Bathymetry was recorded on a Raytheon RTT 1000 dry paper recorder using either a hull-mounted 200 kHz transducer with an 8° beam width, or a 200 kHz transducer with a 4° beam width (narrow beam). All records were corrected for draft of vessel or tow depth. A 7 kHz transducer used in conjunction with the RTT recorded subbottom reflectors up to 10 m below the sea floor. Deeper penetration high-resolution seismic data were recorded on an EPC Model 1400 recorder using 1/4 second sweep and firing rate with a 300 Joule EG&G Model 234 Uniboom as a sound source. The signal was filtered to approximately 600-1600 Hz.

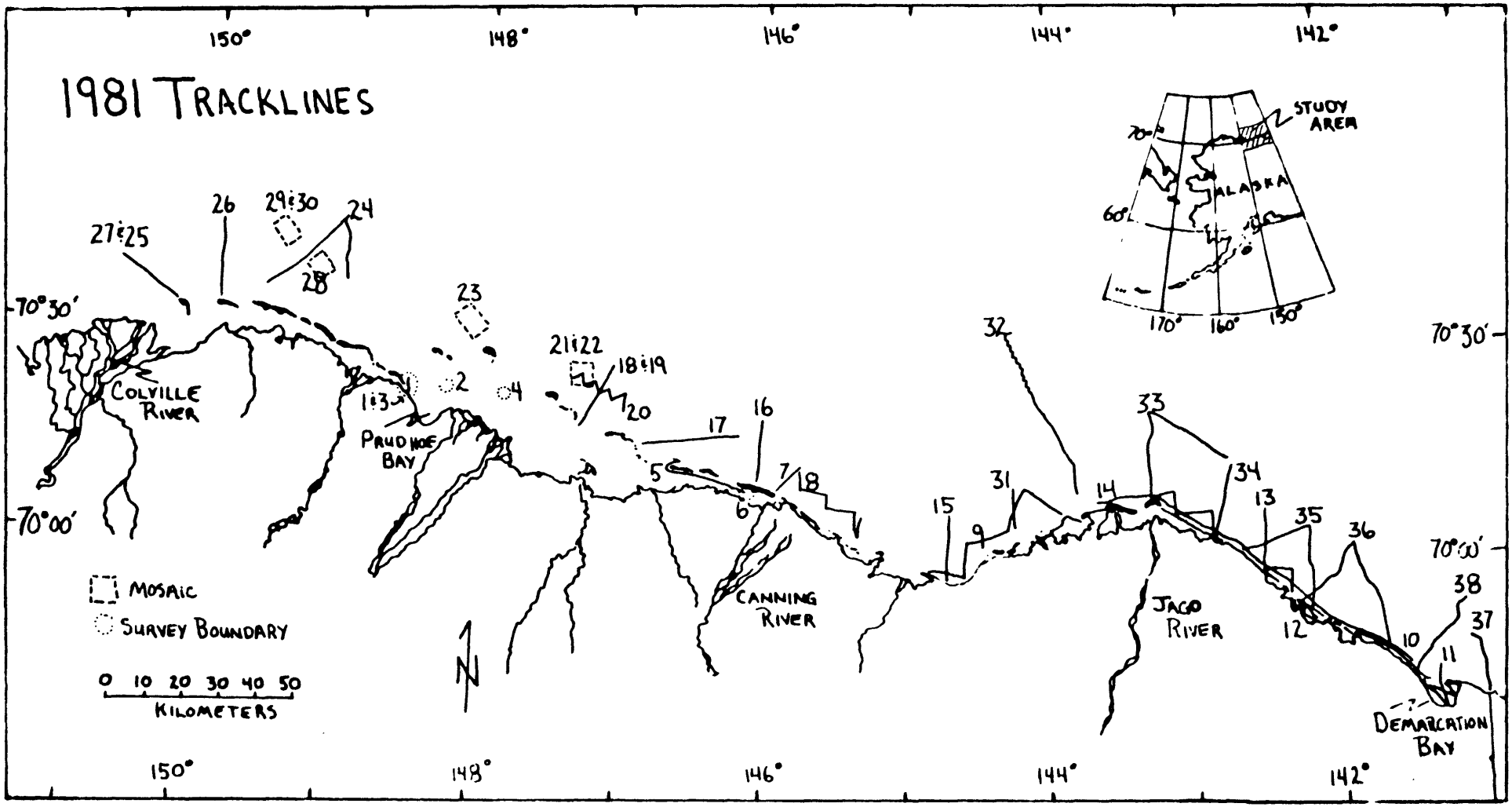

Figure 1. 1981 Tracklines

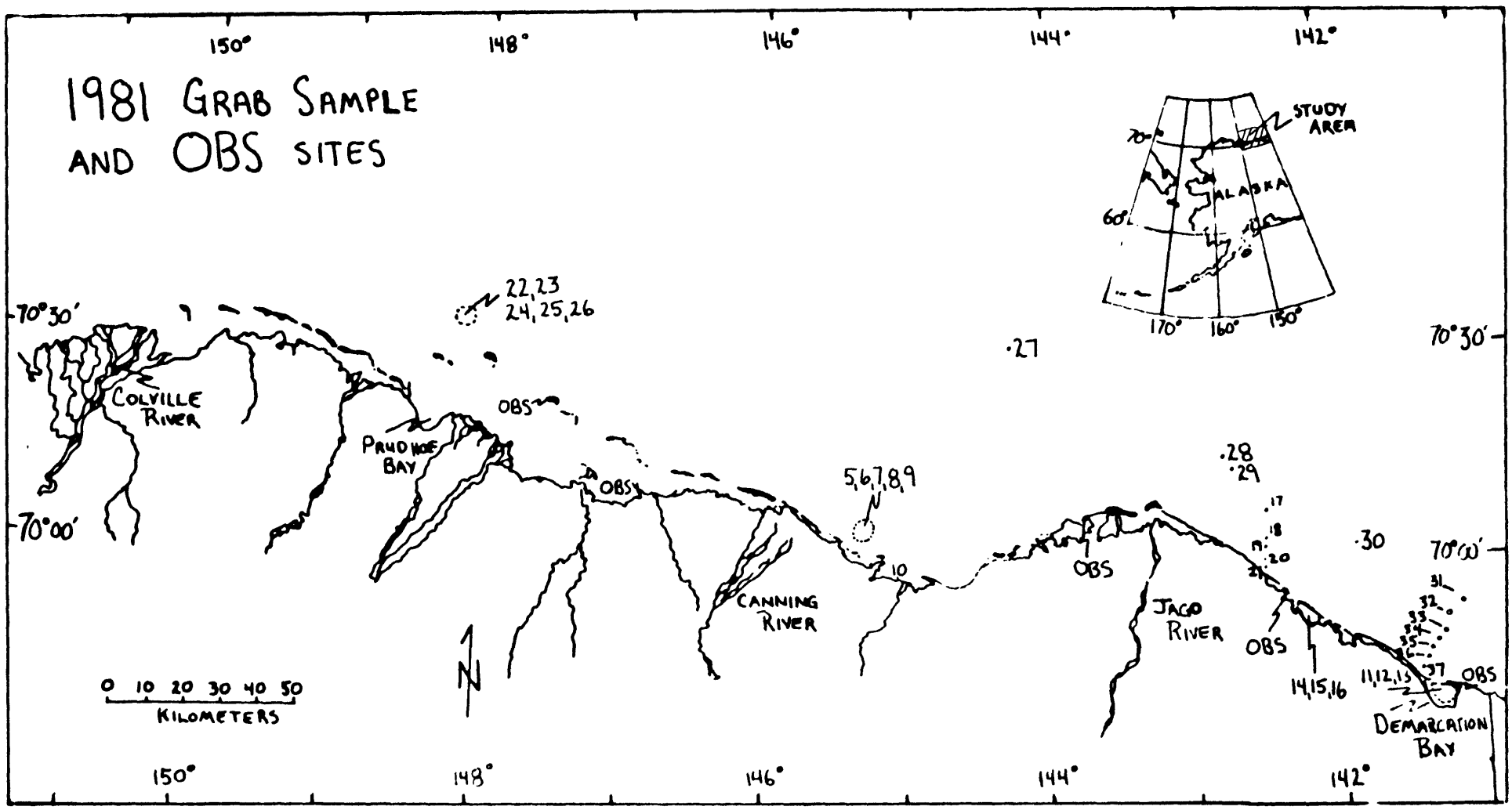

Figure 2. Grab sample and OBS sites.

Side-scan sonar records were taken using a Model 259-3 EG&G wet paper system and a Model 272 sonar fish with a 105 kHz 1/10 second pulse at a 20° beam angle depression. Records were also taken on a Model SM 960 EG&G digital system. The digital data for the mosaics were recorded on magnetic tape on a Kennedy Model 9000 magnetic tape recorder. The Model 272 sonar fish was used for both systems--the digital and the wet paper recorders.

OBS data were recorded on a 3-receiver system designed and built by Polar Research Laboratories of Santa Barbara, California.

Data acquired (see table 1) consist of approximately 1000 km of trackline bathymetry along with 7 kHz subbottom profiles, 800 km of side-scan sonar records, and 500 km of Uniboom seismic reflection records. The data are in the form of 29 rolls of bathymetry, 20 rolls of side-scan sonar, 10 rolls of Uniboom records, 5 rolls of Simrad fathometer records, 38 reels of recorded side-scan magnetic tape, 120 hours of OBS magnetic tape, 8 field maps, and the ship's log. The ship's log contains important information on systems in use on each line, system settings (scale, filters, etc.), navigational data used in plotting positions, severity of ice conditions and course-holding problems and unique observations or systems difficulties. 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 the geophysical records, ship's log and computer printout of digitized way points. The printout of these way points would allow for reproduction of tracklines at any scale, and correlation to geophysical records through time points. Originals are archived at the U.S. Geological Survey, Deer Creek Facility, 3475 Deer Creek Road, Palo Alto, California 94304.

The data presented here are currently being studied by the authors as part of a long-term study of the Beaufort Sea. The authors may be contacted for a bibliography of publications using the above data and data from previous years.

ACKNOWLEDGMENT

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Barnes, P.W., McDowell, D.M., and Reimnitz, Erk, 1978, Ice gouging characteristics: their changing patterns from 1972-1977, Beaufort Sea, Alaska: U.S. Geological Survey Open-File Report 78-730, 42 p.

Table 1 - Geophysical data*

Line No.	Description	Raytheon	Side-scan	Uniboom	Kilometers
1	West Dock	yes	--	--	22
2	Niakuk Island	1	--	--	10
3	West Dock	1	--	--	22
4	Exxon Island	2	--	--	7
5	Outside Leffingwell Lagoon	2	--	1	24
6	Flaxman Island channel	2	--	1	6
7	Outside Flaxman Island	3	1	--	9
8	West Camden Bay	3	1	--	17
9	East Camden Bay	4	2	1	56
10	East of Jago Spit	6	5	--	81
11	Demarcation Bay	7	6	2	30
12	Beaufort Lagoon	8	7	3	17
13	Outside Beaufort Lagoon	9	7	3	29
14	East of Jago Spit to Barter Island	10	8	4	43
15	Test Line 7	11	9	4	19
16	Test Line 8	12	9	5	17
17	East of Pole Island	12	--	--	26
18	Test Line 6	13	10	5	17
19	Reciprocal, Test Line 6	13	11	--	17
20	18-m bench delineation	14	--	--	28
21	Mosaic northeast of Narwhal Island	15	12	--	55
22	Continue mosaic	16	12	--	
23	18-m bench north of Reindeer Island	16	13	--	23
24	Cat Shoal	17	--	--	45
25	Test Line 1	--	13	--	10
26	Test Line 2	18	14	--	20
27	Test Line 1	18	14	--	19
28	South Stamukhi Shoal Mosaic	19	14	--	46
29	North Stamukhi Shoal Mosaic	21	16	--	
30	Rerun 1977 lines on Stamukhi Shoals	23	--	--	65
31	Camden Bay to Barter Island	23	17	6	9
32	Continental Shelf Run off Barter Is.	23	17	6	48
33	Seaward leg offshore east of Barter Island (+ 14 km run over)	25	18	7	20
34	Shoreward leg east of Barter Island	26	18	7	19
35	Dogleg offshore & back into Pogok Bay	26	19	8	41
36	Offshore and back outside Beaufort Lagoon	27	19	8	52
37	Line at U.S./Canadian Border	29	20	9	19
38	Offshore Demarcation Bay	29	20	10	24

*Numbers in the Raytheon, side-scan and uniboom columns represent beginning roll numbers and signify data gathered on that line by that system. No number means the system was off.

Table 2

1981 Sample Descriptions

Station Number	Latitude	Longitude	Water Depth(m)	Type Sample	Reference Location	Description
4	70.387°	148.515°	2	Pachunka	W. Dock	Core length 37.5 cm. Very thin soup on top overlying mud with gravelly mud at base.
5	70.105°	145.324°	15.5	Grab	Line 8	On seaward flank of shoal. Sand
6	70.104°	145.326°	12.5	Grab	Line 8	On seaward flank of shoal. Clean sand
7	70.103°	145.328°	9.5	Grab	Line 8	On crest of shoal. Coarse sand
8	70.102°	145.330°	13	Grab	Line 8	Inside shoal. Coarse sand and pea gravel (1-2 cm) over grey mud.
9	70.101°	145.333°	13	Grab	Line 8	Inside shoal. Sandy mud. Few pebbles
10	70.020°	145.315°	on beach		Camden Bay	Outcrop of stiff silty clay (?)
11	69.675°	141.319°	5	Grab	Demarcation Bay	Sandy mud with bivalves.
12	69.656°	141.281°	4	Grab	Demarcation Bay	Organic mud, silt and clay with trace of sand.
13	69.655°	141.356°	4	Grab	Demarcation Bay	Organic mud w/worm tubes.
14	69.859°	142.163°	2.2	Grab	Beaufort Lagoon	Sandy organic-rich mud. Peaty material - brown to black
15	69.898°	142.253°	3	Grab	Beaufort Lagoon	Muddy organic sand
16	69.909°	142.315°	2.5	Grab	Beaufort Lagoon	Muddy organic sand
17	70.127°	142.500°	35	Grab	Offshore Pokok Bay	Muddy sand. Soft!
18	70.056°	142.488°	23.5	Grab	Offshore Pokok Bay	Sandy mud
19	70.031°	142.536°	18.5	Grab	Offshore Pokok Bay	After 3 lowerings muddy gravel. Gravel w/benthic growth Stiff, silty clay below?
20	70.017°	142.522°	16	Grab	Offshore Pokok Bay	Fairly clean sand overlain by 1-2 cm of muddy sediments.
21	69.989°	142.518°	7	Grab	Offshore Pokok Bay	Clean fine sand

Table 2 (con'td.)

1981 Sample Descriptions

Station Number	Latitude	Longitude	Water Depth(m)	Type Sample	Reference Location	Description
22	70.633	148.160°	---	Ice	N. of Reindeer	Stamukhi ice
23	70.633°	148.169°		Ice	N. of Reindeer	Gravelly mud on only one surface of blocky ice floe.
24	70.620°	148.127°	18	Grab	18-m bench/Reindeer	Crest of ridge. Muddy gravel, overconsolidated?
25	70.620°	148.146°	18	Grab	18-m bench/Reindeer	Samples 24,25,26 at top of break in slope on 18-m bench all muddy gravel of various consistencies, from soupy on the west to stiff on the east.
26	70.620°	148.167°	18	Grab	18-m bench/Reindeer	
27	70.498°	143.203°	52	Grab	Line 32	Gravel, up to 3 cm diameter w/bryozoans and other small growth in big gouge terrain with rounded relief. Between pebbles apparently is a trace of trapped transient mud.
28	70.357°	143.292°	40		Offshore Barter Is.	Medium firm grey mud w/ a few scattered very small pebbles.
29	70.230°	142.747°	40	Grab	Offshore Pokok Bay	Firm mud w/ a 5-cm layer of soft mud on top. No shells or pebbles.
30	69.873°	141.717°	23	Grab	Line 36	Pebble rich, sandy mud, soft. Pebbles up to 5 cm w/coral growth, bryozoans.
31	69.882°	141.147°	34	Grab	Line 38	Soft mud, perhaps even transient layer separated by thin black line from finer mud below. No pebbles, probably no sand.
32	69.885°	141.242°	32	Grab	Line 38	Slightly silty clay, increasing very gradually from soupy on surface to slightly firmer below. Several small shells, no pebbles.
33	69.816°	141.259°	30	Grab	Line 38	Silty clay, grey as sample 32 w/gradual increase in strength downward, no sand, small brittle star.
34	69.786°	141.370°	23	Grab	Line 38	Slightly pebbly, sandy mud. Soft at surface (5 cm) and firmer at bottom (15 cm).
35	69.754°	141.444°	16.5	Grab	Line 38	Pebbly, slightly muddy sand. One large pebble (6 cm), subrounded, with much growth, including bryozoans, coral, etc.
36	69.739°	141.464°	12.5	Grab	Line 38	Clean pebbly sand, one clast 6 cm. No growth, no mud.
37	69.719°	141.479°	7.5	Grab	Line 38	After 3 lowerings: muddy gravel, clast to 10 cm, no growth.