CRUISE REPORT 87-047, M.V. NAVICULA

CAPE BRETON NEARSHORE, FLINT ISLAND TO CAPE SMOKY

by

Robert O. Miller

Geological Survey of Canada

Bedford Institute of Oceanography

P.O. Box 1006, Dartmouth

N.S., B2Y 4A2

CRUISE SUMMARY SHEET

Ship:	M.V. Navicula
Cruise Dates:	June 13th - June 21st, 1987
Master:	Captain Niel Langille
Cruise Number:	87-047
Location:	Nearshore, Cape Breton (Flint Island to Cape Smoky)
Navigation:	Loran-C
Equipment:	O.R.E. 3.5 kHz profiler;
	Klein 100 kHz sidescan sonar;
	Ship's Sounder (30 kHz ELAC); and
	Van Veen grab sampler
Scientific Staff:	Austin Boyce (P.S.S., A.G.C.)
	Eric LeGresly (Student)
	Robert O. Miller (E.M.G., A.G.C., Senior Scientist)

PURPOSE

The purpose of this cruise was to make a preliminary assessment of the aggregate and heavy mineral potential of the nearshore zone off Cape Breton Island between Flint Island and Cape Smoky. The on-line data was collected with a 100 kHz Klein sidescan and a 3.5 kHz O.R.E. profiler. A Van Veen grab sampler was used to ground-truth the acoustic data. Analysis of these records will allow scientists at A.G.C. to map the distribution of seafloor sediments and identify bedforms.

TECHNICAL ASPECTS

Three systems were used to generate acoustic data: 1) a 30 kHz, 1 Kwatt ELAC ship's sounder provided bathymetric data; 2) a 3.5 kHz, 5000 watt O.R.E. model 140 profiler provided sub-bottom profile data; and 3) a Klein 531T sidescan sonar system using a 3/4° beam, 100 kHz towfish with 200 kHz altimeter sonar provided sonograms with exaggerated altitude data in a 3 channel presentation. The third channel altitude bottom profiler was expanded, using a Klein 611 processor unit to 25 metres with water column delays of 5, 15, 25 and 35 metres depending on altitude above the bottom. Paper rates were 40 lines/cm except during high speed tows of 6 knots or more when paper speed was increased to 30 lines/cm.

The EPC 4100 graphic recorder used to capture O.R.E. 3.5 kHz profiler data was run consistently at a fast rate which was not changed. With Time Variable Gain (T.V.G.) added and threshholds set to minimums the profiler signal had to be heavily filtered. E.P.C. spreading gain and T.V.G. delays were used to remove output pulse and boat noise from nearsurface reflectors.

The O.R.E. 140 transceiver was set on a wide bandwidth. A Krohn-Hite filter was used to remove outside noise since filter circuitry in the O.R.E. 140 was too noisy.

A T.S.S. 312B annotator synchronized to the Loran-C navigation clocks provided time marks at 2 and 1 minute intervals on the graphic records.

Towing arrangements of over-the-side gear were quite adequate aboard M.V. Navicula and indeed more sensors such as a Geopulse Sparker or a Huntec Sea Lion boomer sub-tow, could have been deployed simultaneously.

The Klein sidescan fish was towed on a 160 metre long Kevlar cable with a weighted semi-dynamic depressor added (provided courtesy of M.V. Navicula). Depth was controlled via an onboard 12 inch diameter hydraulic capstan with the tow cable routed through M.V. Navicula's starboard side arms.

The O.R.E. four-transducer, sub-towed vehicle was deployed in a fixed depth mode of 4 metres off of the port side. It was handled by the Navicula boom crane which also served as a high shive point for the Van Veen grab sampler. The sampler was attached to poly rope and routed through the sidescan capstan for recovery.

With the expert assistance of M.V. Navicula's Captain and crew, and by having the hydraulic systems operating continuously, survey lines and sample stations were completed in an efficient manner.

NATURE AND QUANTITY OF DATA COLLECTED

See Appendix A and B.

DISCUSSION AND COMMENTS

This survey represented the first systematic, nearshore government survey of aggregates and heavy minerals conducted off the east coast of Canada. The project was a co-operative effort by the Atlantic Geoscience Centre and Underwater Mining Division of the Mineral Policy Branch of DEMR.

Onboard evaluation of geophysical data suggests that the nearshore area from Glace Bay to New Waterford is dominated by linear ridges of bedrock with a surface veneer of gravel. The shoreline from St. Anne's Bay to Cape Smoky consists of bedrock outcrop that is restricted to the very nearshore and with rapid gradation to gravel with local patches of sand towards the offshore.

Between New Waterford and the Bird Islands, a band of gravel with recurring bedrock outcrop extended to approximately 8 km (5 miles) offshore except in the area northeast of Point Aconi where alternating bands of sand and gravel exist. Beyond the nearshore band of gravel, the seafloor gradually changed to sand.

The surficial geology of St. Anne's Bay ranged from clay in the deepest southeastern area to sands and gravels in the northwest. The northwest side of the bay was dominated by sand ribbons. This was the only occurrence of sand ribbons noted during the survey, although gravel waves and-or megaripples were ubiquitous throughout the survey area.

South Bay Ingonish was dominated by fine, well-sorted sands with occasional bedrock outcrop.

Throughout the survey a very strong correlation between the occurrence of bedrock outcrop and lobster fishing activity was noted. Virtually every outcrop of bedrock observed on the sidescan

sonograms was occupied by lobster traps. One sample collected during the survey is a glacial till which may aid future researchers in the development of a glacial model for the local area.

ACKNOWLEDGMENTS

I would like to thank Captain Langille, Henrique Diacros and Hugh Maryat of M.V. Navicula for a job well done. Austin Boyce did an excellent job of maintaining the acoustic systems throughout the survey.

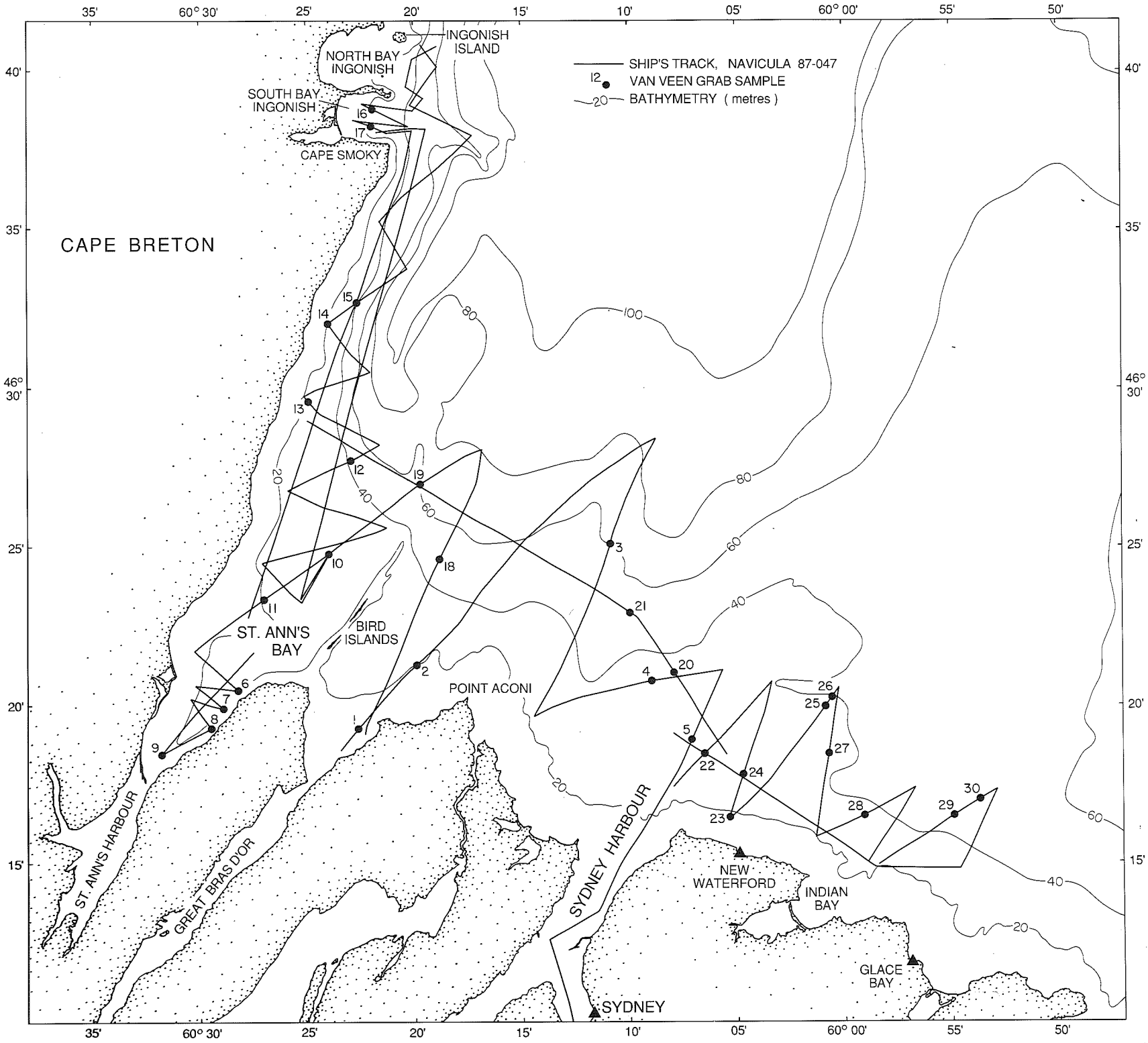
SHIP'S TRACK, NAVICULA 87-047
12 VAN VEEN GRAB SAMPLE
20 BATHYMETRY (metres)
CAPE BRETON
INGONISH ISLAND
NORTH BAY INGONISH
SOUTH BAY INGONISH
CAPE SMOKY
ST. ANN'S BAY
BIRD ISLANDS
POINT ACONI
ST. ANN'S HARBOUR
GREAT BRAS D'OR
SYDNEY HARBOUR
NEW WATERFORD
INDIAN BAY
GLACE BAY
SYDNEY
35' 60° 30' 25' 20' 15' 10' 05' 60° 00' 55' 50'
40' 35' 46° 30' 25' 20' 15'

FIG. 1

APPENDIX A

KLEIN 100 kHz SIDESCAN

ROLL #	START TIME	END TIME
1	1255/165	1556/165
2	1556/165	1804/165
3	1815/165	2150/165
4	1337/166	1632/166
5	1632/166	1924/166
6	1925/166	2048/166
7	1409/168	1729/168
8	1730/168	2034/168
9	2034/168	2136/168
10	1032/169	1514/169
11	1339/170	1801/170
12	1034/171	1248/171
13	1250/171	1500/171
14	1500/171	1806/171
15	1809/171	1618/172

O.R.E. 3.5 kHz SEISMIC

ROLL #	START TIME	END TIME
1	1240/165	2200/165
2	2210/165	0108/166
3	1334/166	2050/166
4	1200/168	1915/168
5	1919/168	1717/169
6	1342/170	1802/170
7	1050/171	1811/171
8	1622/172	1810/172

ELAC 30 kHz BATHYMETRY

ROLL #	NOTES
1	Day 165
2	Day 165
3	1315/166 - 1645/170
4	Day 170 - Day 172

APPENDIX B
STATION SUMMARY (VAN VEEN GRAB STATIONS)

STATION #	WATER DEPTH (m)	LATITUDE	LONGITUDE	SAMPLE TYPE	NOTES
87-047-001	8	46°19.27'N	60°22.51'W	Van Veen	small sample, sand dollars, med. gr. sand
87-047-002	15	46°21.28'N	60°19.88'W	Van Veen	small sample, muddy sand, rare pebbles
87-047-003	66	46°25.17'N	60°10.82'W	Van Veen	very fine grn. brown silty sand, shell hash
87-047-004	40	46°20.78'N	60°08.91'W	Van Veen	2 samples (A & B), fine gr. sand, bivalves
87-047-005	32	46°18.84'N	60°07.05'W	Van Veen	fine gr. sand, sand dollars & bivalves
87-047-006	26	46°20.63'N	60°28.15'W	Van Veen	dark brown gooey mud
87-047-007	24	46°19.99'N	60°28.97'W	Van Veen	dark brown gooey mud
87-047-008	18	46°19.27'N	60°29.42'W	Van Veen	brown/green fine grained sand and mud
87-047-009	10	46°18.42'N	60°31.75'W	Van Veen	well sorted fine gr. sand, mica & maffics
87-047-010	32	46°24.79'N	60°23.91'W	Van Veen	gravel, coarse sand-granitic, sub-angular
87-047-011	18	46°23.26'N	60°26.91'W	Van Veen	gravel to 15 cm, some sand, lithothamnia
87-047-012	45	46°27.69'N	60°22.89'W	Van Veen	well rounded gravel, some sand, lithothamnia
87-047-013	24	46°29.59'N	60°24.81'W	Van Veen	2 attempts, 7 cm cobble, kelp
87-047-014	18	46°32.02'N	60°23.95'W	Van Veen	2 attempts, no recovery
87-047-015	38	46°32.73'N	60°22.62'W	Van Veen	3 attempts, 10 cm clast, lithothamnia
87-047-016	19	46°38.84'N	60°21.87'W	Van Veen	green, fine well sorted sand; small sample
87-047-017	19	46°38.30'N	60°21.90'W	Van Veen	green, fine well sorted sand; some heavies
87-047-018	49	46°24.61'N	60°18.78'W	Van Veen	2 samples: a) green, fine-mud sand; and b) green, mud sand + 5% pebbles
87-047-019	58	46°27.03'N	60°19.62'W	Van Veen	v. poorly sorted gravel, fine mud & sand matrix
87-047-020	40	46°21.02'N	60°07.89'W	Van Veen	2 samples: a) fine grained sand, stinky organics, shells; and b) green fine grained sand, some shells
87-047-021	54	46°22.89'N	60°09.83'W	Van Veen	green, fine grained sand, some pebbles
87-047-022	36	46°18.52'N	60°06.70'W	Van Veen	moderately angular gravel, sand matrix
87-047-023	28	46°16.54'N	60°05.24'W	Van Veen	subangular poorly sorted pebbly sand; 2 attempts
87-047-024	35	46°17.67'N	60°04.59'W	Van Veen	green, fine, well sorted sand, sand dollars
87-047-025	42	46°19.90'N	60°00.85'W	Van Veen	gravel, angular cobbles, lithothamnia
87-047-026	38	46°20.26'N	60°00.54'W	Van Veen	2 attempts, boulders, silty mud attached
87-047-027	37	46°18.46'N	60°00.71'W	Van Veen	rounded gravel with fine-mud sand matrix
87-047-028	40	46°16.47'N	59°59.05'W	Van Veen	sub rounded gravel & poorly sorted sand
87-047-029	47	46°16.48'N	59°54.84'W	Van Veen	2 attempts, green, fine-mud, well sorted sand
87-047-030	54	46°16.98'N	59°53.65'W	Van Veen	2 attempts: a) fine well sorted sand; and b) gravel, cobbles sub-well rounded

Note: Sample # 1 to 9 inclusive were taken with a small Van Veen grab which was being held together on one hinge point. Also it did not have a tight seal when closed. All samples after #9 are taken with the Ven Veen which had been rebuilt.