

DEFENCE SCIENCE & TECHNOLOGY ORGANISATION
AERONAUTICAL AND MARITIME RESEARCH LABORATORY
MARITIME OPERATIONS DIVISION

CRUISE REPORT MOD C/94

HIGH-FREQUENCY ACOUSTIC
BOTTOM BACKSCATTER STUDIES

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FRV SOUTHERN SURVEYOR, 23 SEPTEMBER - 6 OCTOBER 1994

CRUISE LEADER, M. J. Bell

R & D AUTHORITY:



R. CREASER
Chief, Maritime Operations Division
December 1994

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1. INTRODUCTION

Cruise MOD C/94 was conducted between 26 September and 4 October in FRV SOUTHERN SURVEYOR in and around Jervis Bay. The purpose of the cruise was to gather scientific data on the backscattering of high-frequency acoustic energy from the sea floor. This work is relevant to the performance of mine hunting sonars currently in service with the RAN and the systems proposed for the MHC vessels.

As well as the bottom backscattering (BBS) measurements, ancillary measurements were made to assist in interpretation and analysis of the measured backscattering. These measurements included stereo photography, sediment sampling and sound speed profiling of the water column.

During the cruise SOUTHERN SURVEYOR was sound ranged using the Jervis Bay facility.

Bottom backscatter measurements were conducted in the shallow and the deep practice minefields, bounded by the co-ordinates:

AREA A (shallow)	35° 04.40'S, 150° 44.80'E	35° 05.90'S, 150° 46.90'E
	35° 05.25'S, 150° 43.90'E	35° 06.70'S, 150° 46.10'E
AREA B (deep)	35° 06.00'S, 150° 48.00'E	35° 06.00'S, 150° 50.00'E
	35° 08.00'S, 150° 48.00'E	35° 08.00'S, 150° 50.00'E

Measurements in the shallow field were restricted to the flat sandy area in the north-western half of the field. Measurements in the deep field were confined to the western half so as not to exceed 100m depth which is the maximum safe depth of the MOD equipment.

Sediment grab samples to determine bottom type were conducted in area C located approximately 8 miles SE of Pt. Perpendicular. Water depths at this location exceeded 200 m.

AREA C	35° 08.35'S, 150° 58.05'E	35° 09.48'S, 151° 00.01'E
	35° 10.95'S, 150° 58.60'E	35° 09.95'S, 150° 56.65'E

2. PROGRAMME

SOUTHERN SURVEYOR arrived at Pymont from Hobart on Sunday 25 September. Due to late return from a previous series of experiments the bottom backscatter equipment was not available for loading until PM Monday 26 September. On completion of loading SOUTHERN SURVEYOR sailed late that evening for overnight transit to Jervis Bay.

The sound ranging which had been planned for Thursday 29 September was conducted during the morning of Wednesday 28 September so as to avoid a planned

power outage scheduled for noon. Unfortunately strong winds prevented the drifting and some low speed runs.

Date	Event
Sun 25 Sep	SOUTHERN SURVEYOR berths at Pyrmont.
Mon 26 Sep	Load and install MOD equipment. SOUTHERN SURVEYOR sails late PM.
Tue 27 Sep	SOUTHERN SURVEYOR arrives in Jervis Bay area. Set to work and calibrate bottom backscatter equipment.
Wed 28 Sep	Sound ranging in AM Commence backscatter measurements on completion.
Thu 29 Sep - Mon 3 Oct	Backscatter measurements
Tue 4 Oct	SOUTHERN SURVEYOR berths at Pyrmont. DSTO equipment unloaded. SOUTHERN SURVEYOR sails for Hobart on completion.

3. PERSONNEL

MOD - DSTO

Mr. Michael Bell	Cruise leader
Mr. Jim Thompson	Scientist
Mr. John Shaw	Engineer
Mr. Ross Susic	Engineer
Ms. Jane Cleary	Scientist
Mr. Neil Taverner	Electronics & Mechanics
Mr. Bill Martin	Electronics & Mechanics
Dr. Stuart Anstee	Stereo Photography

4. PROCEDURES

Bottom Backscatter Experiments

Bottom backscatter (BBS) experiments were conducted in both areas. Deployment details are listed below in table 1. The deployment numbers commencing at number 89 continue from previous cruises. Figure 1 shows the positions of experiments and their location relative to Jervis Bay.

Deployment	Date	Task	Site	Latitude	Longitude	Depth
89	27-Sep	Calibration	C1, Jervis Bay			18
90	28-Sep	BBS	S1	35° 04.64	150° 45.03	27
91	29-Sep	BBS	D1	35° 06.90	150° 47.96	55
92	30-Sep	BBS	D2	35° 07.84	150° 48.21	85
93	30-Sep	BBS	D2	35° 07.91	150° 48.21	84
94	1-Oct	BBS	S2	35° 04.94	150° 44.38	26
95	1-Oct	Calibration	S2	35° 04.94	150° 44.38	26
96	1-Oct	Calibration	S2	35° 04.94	150° 44.38	26
97	2-Oct	BBS	D3	35° 07.27	150° 48.79	87
98	2-Oct	BBS	D4	35° 06.41	150° 49.52	85
99	3-Oct	BBS	S3	35° 05.01	150° 44.73	26
100	3-Oct	Calibration	C1, Jervis Bay			18

Table 1. Bottom backscatter sites occupied during SSC/94

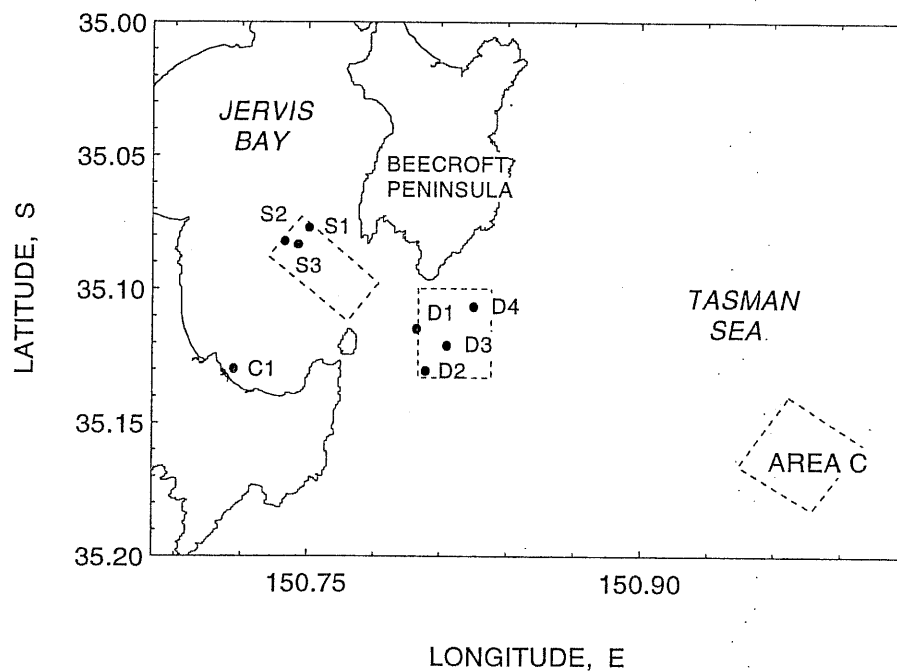


Fig 1. Experiment sites for SSC/94

At each measurement site acoustic bottom backscatter measurements were made at 34 kHz, 101 kHz and 203 kHz. At most sites measurements were made at azimuths of -85°, -45°, +0°, +45° and +90° measured relative to the tower co-ordinate system. Beam angle was varied by tilting the transducers array between 2.5° and 30° from horizontal. Azimuth sweeps from -85° to +145° in 15° steps at 10° elevation were also performed.

Water column profiles were taken on completion of the backscatter measurements using the SDL.

On recovery of the tower at the completion of the bottom backscatter measurements, bottom photography and bottom grab sampling were conducted.

Bottom grab sampling was attempted in area C late on Thursday 29 September. Strong currents and deep water thwarted attempts at three sites.

Station	Latitude	Longitude	Depth (m)	Data
DD1	35° 10.15 S	150° 56.56 E	133	SDL to 130 m + grab
DD2	35° 08.44 S	150° 58.02 E	148	SDL to 130 m + grab
DD3	35° 09.73 S	151° 00.00 E	260	No SDL, no grab
DD4	35° 10.98 S	150° 57.77 E	160	No SDL, no grab
DD5	35° 10.06 S	150° 58.32 E	155	No SDL, grab

Table 2 Station positions in area C

Equipment damage and faults

During system checks prior to deployment on Tuesday 27 September the underwater instrumentation computer did not boot. The canister was removed from the tower for diagnostic checks. Similar problems had been experienced on previous cruises but the cause had not been identified conclusively. In this instance the fault was identified as corruption of the wet end computer CMOS memory with the consequent configuration conflict preventing system boot. After resetting the CMOS the canister was refitted. No further problems of this nature were experienced.

Stereo bottom photographs were not obtained during the cruise. Early in the cruise one of the underwater cameras leaked due to a bad O-ring seal. The camera was flushed with fresh water and transported to Sydney next day for repair.

Tenure of Data

MOD holds all scientific records generated from the backscatter experiments. i.e. acoustic, SDL water column profiles, sediment samples and bottom photographs.

5. DISTRIBUTION

RAN:

Hydrographer
Director, Hydrographic Office, Sydney
Mine Hunter Coastal, Project Director
Mine Sweeper Project Director
Naval Scientific Adviser

DSTO:

Chief, Maritime Operations Division
RLSSS, Maritime Operations Division
DSTO Cruise Participants
DSTO Sydney Library
AMRL Melbourne Library
DSTO Sydney Registry, File 490-1-16

CSIRO:

Chief , CSIRO Division of Fisheries
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