

CSIRO Marine Research

1999 Research Vessel Program

Cruise Plan

FRV Southern Surveyor

Cruise SS 1/99

10 January – 4 February 1999

CSIRO Marine Research

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Itinerary

Depart Hobart: 0900 h Sunday, 10 January 1999

Arrive Hobart: 0800 h Thursday, 4 February 1999

Area of Operation

The cruise will operate in the area of Macquarie Island and the Macquarie Ridge, from approximately 53° 30'S. 159° 10'E to 55° 30'S 158° 30'E.

Research Background

The cruise is designed to provide the scientific basis for management of the Macquarie Island Patagonian toothfish fishery, based upon, on the one hand, an assessment of population size and hence sustainable yield, and on the other hand, additional information on ecological interactions of the fishery with marine mammal and seabird populations that breed on the State Reserve of Macquarie Island. A benthic survey will contribute to the planning and development of a Commonwealth Marine Protected Area within Australia's EEZ around Macquarie Island.

Cruise Objectives

- 1) Conduct an acoustic/trawl survey around Macquarie Is. and along the Macquarie Ridge to 1500 m to assess the distribution and relative abundance of Patagonian toothfish and, so far as possible, an assessment of absolute abundance. To complete this objective the following sub-objectives will be achieved:
 - Obtain *in situ* target strength measurements of Patagonian toothfish and other dominant species.
 - Test use of the acoustic multi-frequency system to discriminate between species in the survey area.
- 2) Assess the diet of Patagonian toothfish and dominant nekton species in order to establish a food web for the nekton and higher predators and assess predatory and competitive interactions.
- 3) Describe the abundance and community structure of the nekton in the upper 1500 m of the water column in relation to oceanographic conditions, i.e. across the sub-Antarctic Front, on Macquarie Ridge (Patagonian toothfish habitat) and in deepwater based upon depth-stratified sampling.

- 4) Assess the abundance of zooplankton in the upper 200 m of the water column in relation to ocean conditions in the same habitats as in 3).
- 5) Undertake systematic observations of the seabirds and sea mammals in relation to physical and biological ocean conditions across the sub-Antarctic Front along the Macquarie Ridge and off Macquarie Is.
- 6) Obtain data for a baseline description of the benthic invertebrate community within and around the area of a potential MPA and assess the impact of trawling on it based on broad-scale acoustic mapping and detailed habitat assessments from camera/video transects and dredge sampling from 200-1500 m.
- 7) Collect genetic material from Patagonian toothfish for stock discrimination studies.

Cruise Plan

Southern Surveyor will steam from Hobart to Macquarie Island, where it will rendezvous with the *Austral Leader* to transfer additional observers to the fishing vessel for the duration of the acoustic survey. The acoustic survey will then commence, beginning at the Aurora Trough (Fig.1) and covering, first, known fishing positions in a northward direction to $\sim 53^{\circ} 30'S$. Randomized acoustic transects will then be carried out across the Macquarie Ridge at 10' (10 n mi) intervals, finished at $\sim 56^{\circ}S$. The southerly randomized transects are of lowest priority and will be sacrificed if time is not available. Seabird and mammal observations will be made systematically during daylight hours along the acoustic track and subsequently while in transit between oceanographic stations

The vessel will then return to Aurora Trough to begin sampling at the first of the oceanographic and benthic survey sites. The order of the sites (and order of their priority) will be: Aurora Trough, offshore site (25 n mi W of Aurora Trough), sub-Antarctic Front, Grand Canyon/Colgate Valley. (The last two areas are circa areas of fur seal aggregation.) Benthic surveys will also be carried out directly east of Macquarie Island, at $56^{\circ} S$ and north of the sub-Antarctic Front. These last sites are of lowest priority for the benthic survey and will be dropped if time is not available.

Cruise time allocation:

(Total cruise time: 26 d)

Steaming Hobart-Macquarie return (~ 825 n mi @ 10kt):	7 d
Acoustic survey	7.25 d
Aurora Trough (9 transects @ 2.5 h/transect)	24 h
Colgate Valley/Grand Canyon	12
Other known sites	36

TS measures/multi-frequency validation	24
Randomized transects (18 (every 10 nm) @ 2 h (10-15 nm transects)	36
Steaming between transects (180 n mi @ 6 kt)	30
Deepwater calibration	12

Oceanographic/food chain study 8.5 d

4 sites @ 2 d/site (Aurora Trough; SAF; Colgate Valley/Grand Canyon; deepwater)	
Sampling at each site to consist of:	
Day/night replicate MIDOC tows @ 4 h/tow	16 h
2 CTD (0-1500 m)	5
6 plankton replicates (Bongo 0-200 m, drop)	4
Acoustic transect, day/night	12
Dawn/dusk non-sampling periods	8
Steaming btwn sites (90 n m @ 10 kt)	9

Benthic survey 3 d

6 sites @ 12 h/site (N SAF, SAF (S edge of gap); Colgate/Grand Canyon; Aurora; E MI; 56°)	
Sampling at each site:	
Video/camera transect (200-1500 m)	4 h
3 dredge samples/transect (200-500 m, 500-1000, 1000-1500)	6
Steaming	2

Personnel

(Note: unless indicated otherwise, all personnel are staff of CSIRO Marine Research)

T. Koslow (cruise leader)
A. Williams
1 OMS
M. Sherlock
J. Cordell
M. Lewis
M. Ryba
K. Gowlett-Holmes
R. Kloser
T. Ryan
R. Williams (Ant Div)
1 mammal/bird observer

Figure 1. Area of operation.

⊗ : Benthic and oceanographic sampling sites.
(Note: Fishing grounds not shown due to confidentiality agreement).



CONTACTS

For further information about this cruise contact:

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A handwritten signature in black ink, appearing to read 'N. Bray', with a large, stylized initial 'N' and a trailing flourish.

Nan Bray
Chief, CSIRO Marine Research

Distribution:

Normal circulation

Cruise participants

Martin Exel, Kailis & France Group (to distribute to skippers, *Austral Leader*

Hilary Sullivan & Peter Taylor, Environment Australia

Patrick Hone, Fisheries Research Development Corporation

Jenny Scott, Parks and Wildlife, Tasmania