

# CSIRO DIVISION OF FISHERIES

## 1992 Research Vessel Program

### Cruise Plan

### *FRV Southern Surveyor*

### Cruise SS1/92

4 February–25 February 1992



CSIRO Division of Fisheries  
Marine Laboratories  
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Australia

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## Itinerary

Depart Hobart: 0830 h Tuesday, 4 February 1992

Arrive Hobart: 1700 h Thursday, 13 February 1992

Depart Hobart: 0830 h Friday, 14 February 1992

Arrive Hobart: 1700 h Tuesday, 25 February 1992

## Area of Operation

### Leg 1:

Continental slope south of Tasmania within latitude  $44^{\circ} 00'$ – $44^{\circ} 40'S$  and longitude  $146^{\circ} 00'$ – $147^{\circ} 35'E$  (see Figure 1)

### Leg 2:

South of Tasmania in the vicinity of Pedra Branca (see Figure 2).

## Research Background

Leg 1 of the cruise will carry out the first acoustic survey of orange roughy (*Hoplostethus atlanticus*) and deepwater oreos, smooth oreo (*Pseudocyttus maculatus*) and black oreo (*Allocyttus niger*), on the major deepwater fishing ground off southern Tasmania. This survey is CSIRO's first use of acoustics to survey a multispecies fishery and, internationally, the first such use of acoustics for deepwater fisheries. The survey will depend upon use of both the split-beam capability of the acoustic system (a Simrad EK500) and trawl sampling to estimate the species and size composition of acoustic targets. The survey will be repeated in 1993.

Leg 2 of the cruise will examine the productivity of the mid-slope region off southern Tasmania and the processes supporting the rich fisheries of this area. In particular, the cruise will examine near-surface primary productivity and microbial productivity through the water column, the flux of material from the near-surface to deep water, the vertical migrations of organisms through the water column, advection of material into the area, and the trophic pathways leading from primary producers to commercial fishes. This summer cruise is the second in a series of four cruises that will examine these processes on a seasonal basis.

## Cruise Objectives

### Leg 1:

1. Conduct echo-integration acoustic surveys of the orange roughy fishing grounds off southern Tasmania (Maatsuyker, Pedra Branca area).
2. Obtain in-situ target strength (TS) measurements of orange roughy and other species on these grounds.
3. Direct operations of commercial vessels to trawl on acoustic marks.
4. To calibrate the towed transducer at depth.

### Leg 2:

1. To determine the day/night vertical distribution of zooplankton, midwater and demersal fishes at a site off Pedra Branca, southern Tasmania using replicated, day/night demersal, midwater and plankton tows.
2. To examine the diet of the dominant fish and zooplankton species at the study sites through stomach content and stable isotope analyses, as the basis for determining the general trophic structure at mid-slope depths, the vertical distribution of feeding, and resulting vertical flux of material.
3. To carry out three cross-slope CTD transects to determine water mass structure in the sampling area.
4. To measure zooplankton biomass, primary productivity and the concentration of chlorophyll *a* at the trawl site and on the cross-shelf transects.
5. To continue the study of currents at the Pedra Blanca site begun during SS2/91, by redeploying a current meter retrieved by one of the commercial vessels during the first leg of the current cruise.
6. To investigate the flux of detritus through the water column by deploying moored and free-floating sediment traps.

7. To use acoustics in conjunction with net sampling to estimate the vertical biomass distribution and its daily vertical flux through the water column.

## Cruise Plan

### Leg 1:

The vessel will depart Hobart and proceed to the fishing grounds off southern Tasmania. These grounds consists of ~35 'hills,' on which the orange roughy and deepwater oreo dories aggregate. Of these hills, ~10 are considered of primary importance, and all of them will be surveyed, along with as many of the other hills as possible (to be randomly selected) during the time available. At each hill 2 acoustic transects (N-S & E-W) will be carried out initially to search for the presence of fish aggregations and from which the echoes may be integrated to estimate biomass. Two additional transects will be carried out if concentrations of fish are detected. These surveys will be carried out primarily with the transducer mounted in the towed body, which will be towed at ~5 kt with ~1 km (0.5 minute longitude) spacing of acoustic transects.

The composition of acoustic marks will be examined in two ways: from the *in situ* TS distribution, which will be obtained from additional acoustic transects carried out over specific targets, and targetted trawling on acoustic targets. All trawling will be carried out by 2 commercial trawlers, which will accompany FRV *Southern Surveyor*, and which will fish on targets as directed. It is expected that 'windows' in the net and constriction of the codend will limit trawl samples to no more than 5 tonne/shot. Two scientists will be present on each trawler to monitor its fishing; and to record approximate catch weight by species, as well as the length frequency distribution and biological information (sex, maturity stage) for commercial species. Two pairs of commercial vessels will be selected by ballot to assist in the survey. The first pair will assist from 4-8 February; the second from 9-13 February. CSIRO scientific personnel will switch over at Recherche Bay; Tasmania Department of Sea Fishery personnel will board at Hobart.

The towed transducer will be calibrated at depth when weather conditions permit.

**Leg 2:**

The cruise is designed to describe the food chain that supports orange roughy and other deepwater fishes at midslope depths and to investigate mechanisms responsible for transporting production from near-surface to near-bottom layers and also from inshore or offshore onto the slope. The investigation will be carried out off southern Tasmania in the region of a major orange roughy fishery and presumed feeding aggregation. The site is in ~1000 m water depth. The cruise will be divided approximately equally between 1) sampling of the fish and plankton to determine their vertical distribution and diurnal movements and to obtain samples for trophic analyses; and 2) sampling to determine the vertical and horizontal distribution of physical, chemical, and biological water column properties. The sampling regime will include the following:

- 1) 48 hr sampling of the vertical distribution of zooplankton and small midwater fishes with the opening-closing EZ net (350 mm mesh). The tows will sample 9 depth strata (at 100 m depth intervals between the surface and 900 m) with 20 min tow duration per stratum. Each series of tows will require about 4 hr, and the tows will be carried out during hours of full daylight (0800 - 1600) and darkness (2000 - 0400); periods of dawn (0400 - 0800) and dusk (1600 - 2000) will be avoided so far as possible.
- 2) 72 hr sampling of the depth distribution of midwater fishes. An IYGPT trawl with the newly-acquired opening/closing codend system will be used to sample 4-5 depth horizons from the near-surface to 900 m as identified acoustically during the previous leg of the cruise. The trawl duration at each stratum will be 45 min. The O/C net system will be deployed twice during each day and night period. The O/C system can sample 4 strata per cast. If >4 strata are identified, 4 will be sampled on days 1-2 and the last on day 3.
- 3) The target strength (TS) distribution of the midwater and demersal strata will be sampled acoustically during a day and night period, if possible at the beginning and end of the depth-stratified sampling.
- 4) 24 hr sampling of the demersal fishes will be carried out using the Engels high-rise trawl. Trawls will be 30 min duration. Three will be carried out in daylight hours and three at night.

- 5) Three CTD transects will be run at ~ 30 nm spacing centred around the trawl site. There will be 10 stations per transect at distances of ~3 and 6 nm inshore of the shelf break, at the shelf break, and 3, 6, 10, 15, 20, 25, and 30 nm offshore of the break. Samples will be taken for salinity, oxygen, nutrients, chlorophyll, particle size analysis, and primary production at depths of 0, 25, 50, 75, and 100 m, with additional samples for S, T, O<sub>2</sub>, nutrients, and particle size analysis at 250, 500, 750, and 1000 m. Two additional stations will be occupied on the central transect at 45 and 60 nm offshore. Zooplankton biomass will be estimated from drop net samples. Fluorescence and light measurements will be made with the Seacat profiler.
- 6) A 24-hr productivity station will be carried out to estimate within-site variability in chlorophyll, nutrients, and primary production. This will probably be done during the 3rd day of midwater trawl sampling. It will require a 20 min cast to 200 m every 4 hr with samples taken for chl, nutrients, particle size analysis, and primary production. Drop net samples will be taken to examine diel variability of zooplankton biomass in the upper 100 m. The seacat profiler and fluorometer will be deployed after each CTD cast to give a light and fluorescence profile.
- 7) Microbial productivity will be measured using water from the CTD transects a) to obtain summer values for C cycling by bacteria in the upper mixed layer; b) to examine bacterial activity with depth, in particular to confirm earlier indications of a peak in microbial activity in the Antarctic Intermediate Water; and c) to confirm the previous observation that most bacterial production was on particles and thus available to larger organisms in the food chain.
- 8) The current meter and sediment trap will be deployed and later retrieved to provide data on long-term water movements and the vertical flux of detritus at mid-slope depths.
- 9) There will be a 1-2 day deployment of a free-floating sediment trap at the central site to provide comparison of the vertical flux of detritus and primary production.

## Personnel

(Note: unless indicated otherwise, all personnel are staff of the CSIRO Division of Fisheries)

### Leg 1:

FRV *Southern Surveyor*:

T. Koslow (Cruise Leader)

A. Williams

R. Kloser

M. Sherlock

Commercial fishing vessel:

M. Lewis

R. McLoughlin

4 Others (Sea Fisheries, Tasmania Dept of Primary Industries)

### Leg 2:

T. Koslow (Cruise Leader)

A. Williams

R. Kloser

J. Cordell

M. Lewis

P. Bonham

D. McKenzie

J. Parslow

R. Plaschke (CSIRO Division of Oceanography)

R. Griffiths

G. Fenton (U. Tasmania) (leave vessel at 1200 h on 18/2 at Recherche Bay)

I. Suthers (U. NSW) (leave vessel at 1200 h on 18/2 at Recherche Bay)

M. O'Donohue (join vessel at 1200 h on 18/2 at Recherche Bay)

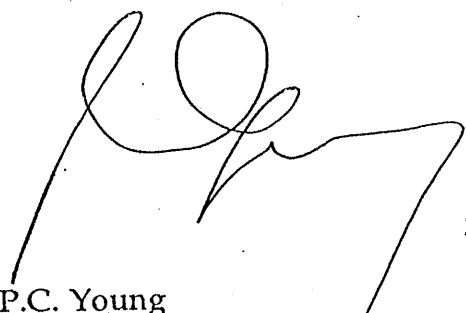
L. Clementson (join vessel at 1200 h on 18/2 at Recherche Bay)

## Contacts

For further information about this cruise contact:

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Vessel Operations Manager  
CSIRO Division of Fisheries  
GPO Box 1538  
Hobart, Tasmania 7001  
Tel: (002) 20-6234



P.C. Young  
Chief, CSIRO Division of Fisheries

17/1/92

Date

### Distribution:

Normal distribution

Cruise participants

J. Lyle (Tasmanian Sea Fisheries Laboratory, Tarooma)



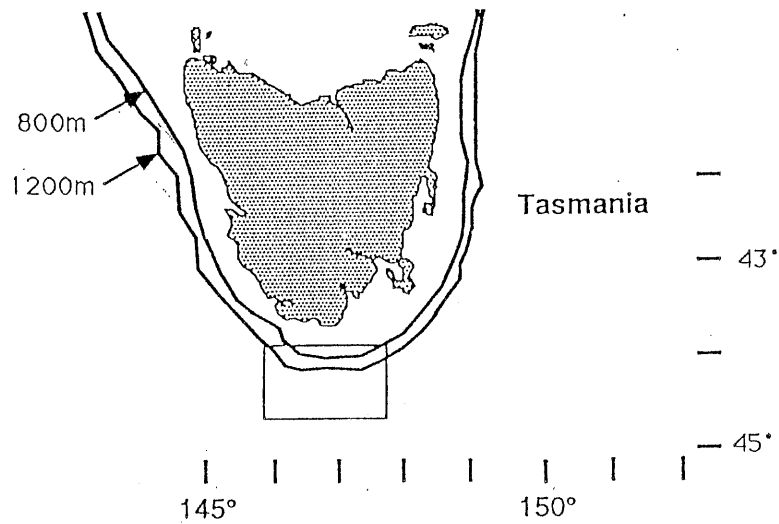


Figure 1. Area of operation SS1/92 leg 1

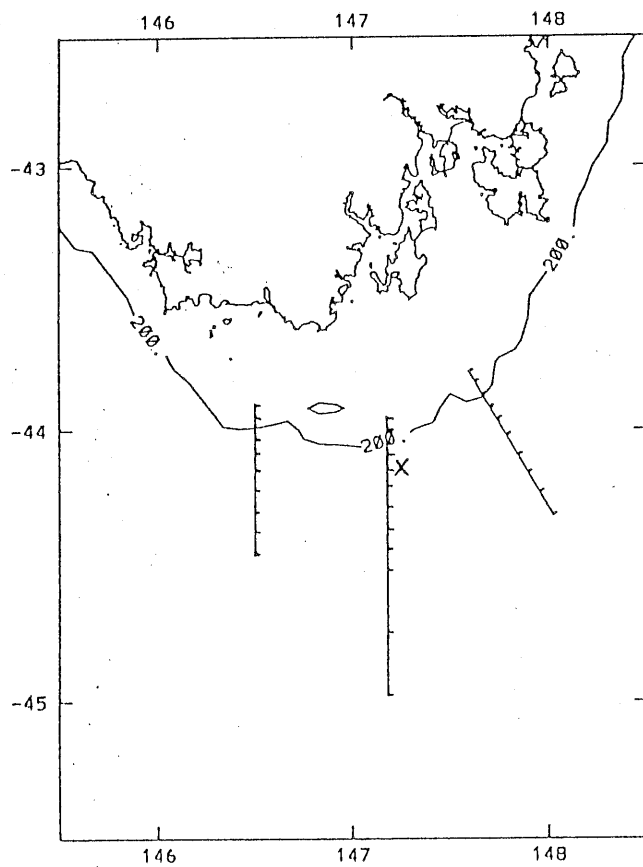


Figure 2. Area of operation SS1/92 leg 2. The three CTD transects and the approximate location of the trawl and current meter site (x) are indicated. Bathymetry is in metres.

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