

**CSIRO**

DIVISION OF FISHERIES

CRUISE PLAN

**SS4/92**

HOBART TO HOBART

3 NOVEMBER – 17 NOVEMBER 1992

HOBART TO HOBART

18 NOVEMBER – 1 DECEMBER 1992

FRV  
*SOUTHERN  
SURVEYOR*





## **Itinerary**

### **Leg 1**

Depart Hobart: 0830 h Tuesday, 3 November 1992

Arrive Hobart: 1700 h Tuesday, 17 November 1992

### **Leg 2**

Depart Hobart: 0830 h Wednesday, 18 November 1992

Arrive Hobart: 1700 h Tuesday, 1 December 1992

## **Area of Operation**

### **Leg 1**

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

### **Leg 2**

Continental slope south of Tasmania within latitude 44°00'–44°40'S and longitude 146°00'–147°35'E (see Figure 1)

## **Research Background**

Leg 1 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, 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 spring cruise is the third in a series of four cruises that will examine these processes on a seasonal basis. The first two cruises (SS2/91 and SS1/92) were completed in winter 1991 and summer 1992, respectively.

Leg 2 of the cruise will assess the fine-scale distribution of nekton around three undersea pinnacles in the southern zone of the orange roughy (*Hoplostethus atlanticus*) fishery off southern Tasmania. The species and size composition of acoustic targets will be assessed through use of both the split-beam capability of the acoustic system (a Simrad EK500) and pelagic and demersal trawl sampling. This assessment of community structure will be combined in 1993 with a large-scale survey of the southern zone fishery.

## Cruise Objectives

### Leg 1

- 1 To determine the day/night vertical distribution of zooplankton, midwater and demersal nekton 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-slope transects.
- 5 To continue the study of currents at the Pedra Blanca site begun during SS2/91, by redeploying a current meter retrieved during 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.

### Leg 2:

- 1 To conduct depth-stratified surveys of the nekton associated with three under-sea pinnacles off southern Tasmania (e.g. Maatsuyker, Pedra Branca, and a third, deeper pinnacle dominated by oreosomatid fishes) through the combined use of acoustics, the opening/closing (MIDOC) pelagic trawl, and the Engels high-rise demersal trawl.
- 2 To obtain *in situ* target strength measurements of orange roughy (*H. atlanticus*), oreo dories (Oreosomatidae), myctophids (Myctophidae) and other dominant fishes on these grounds.
- 3 If spawning smooth oreo (*Pseudocyttus maculatus*) and black oreo (*Allocyttus niger*) can be caught, to fertilise and incubate the eggs to assess development; to assess the vertical distribution of eggs with the EZ net.

- 4 To assess the influence of trawl duration on the species composition of catches with the MIDOC pelagic trawl.
- 5 To calibrate the towed transducer at depth and test a lighter towed body.

## Cruise Plan

### Leg 1

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 made 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 about equally between 1) sampling 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::

- 48 h 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 h, and the tows will be carried out during hours of full daylight (0700–1700) and darkness (2000–0400); periods of dawn (0400–0700) and dusk (1700–2000) will be avoided so far as possible.
- There will be 3–4 d sampling of the depth distribution of midwater fishes. An IYGPT trawl with the MIDOC codend system will be used to sample 125 m depth strata from the near-surface to 900 m. The trawl duration at each stratum will be 30–45 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.
- The target strength distribution of the midwater and demersal strata will be sampled acoustically in conjunction with the net sampling in order to relate trawl and acoustic samples.
- 24 h sampling of the demersal fishes will be carried out with the Engels high-rise trawl. Trawls of 30 min duration will be made at 4 h intervals, with (preferably) 7 stations in all.

- Three CTD transects will be run at ~ 30 nm spacing centred on 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 salinity, temperature, oxygen, 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.
- A 24-h productivity station will be carried out to estimate within-site variability in chlorophyll, nutrients and primary production. We will deploy a free-drifting sediment trap at the beginning of the station and follow it for the 24 h. A 20 min CTD cast to 200 m will be made every 6 h 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.
- The current meter and sediment trap will be deployed and retrieved in April 1993 providing data on long-term water movements and the vertical flux of detritus at mid-slope depths.
- A free-floating sediment trap will be deployed for 1–2 days at the central site to provide comparison of the vertical flux of detritus and primary production.

## **Leg 2**

Intensive surveys will be carried out around 2-3 undersea pinnacles with large concentrations of fish (e.g. Maatsuyker and Pedra Branca) to assess in detail the vertical and horizontal distribution, and biomass, of fish species. The composition of acoustic marks will be examined in two ways: from the in situ TS distribution obtained from acoustic transects carried out over specific targets and by targeted trawling on acoustic targets in the water column and on the bottom immediately afterwards.

If black or smooth oreo dories are encountered in spawning condition, their eggs will be fertilised and incubated under controlled conditions, and the EZ net will be deployed to determine the vertical distribution of eggs in the water column.

The towed transducer will be calibrated at depth and a lighter towed body will be tested when weather conditions permit.

## Personnel

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

### Leg 1

T. Koslow (Cruise Leader)  
A. Williams  
R. Kloser  
M. Sherlock  
M. Lewis  
P. Bonham

D. McKenzie  
B. Griffiths  
V. Latham  
D. Terhell  
S. Garland  
C. Bulman

### Leg 2

T. Koslow (Cruise Leader)  
A. Williams  
R. Kloser  
C. Bulman  
J. Cordell  
L. MacDonald

M. Lewis  
R. McLoughlin  
I. Higginbottom\*  
T. Pauly (Antarctic Division)\*  
J. Wearing\*  
\* Will join cruise on 26 November;  
rendezvous at Recherche Bay

## Contacts

For further information about this cruise contact:

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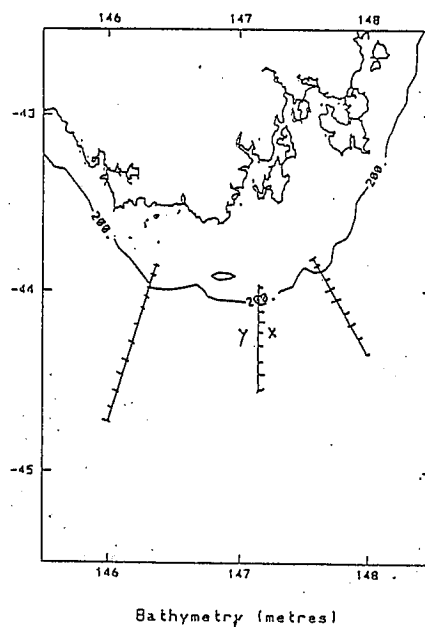


**P. C. Young**  
Chief, CSIRO Division of Fisheries

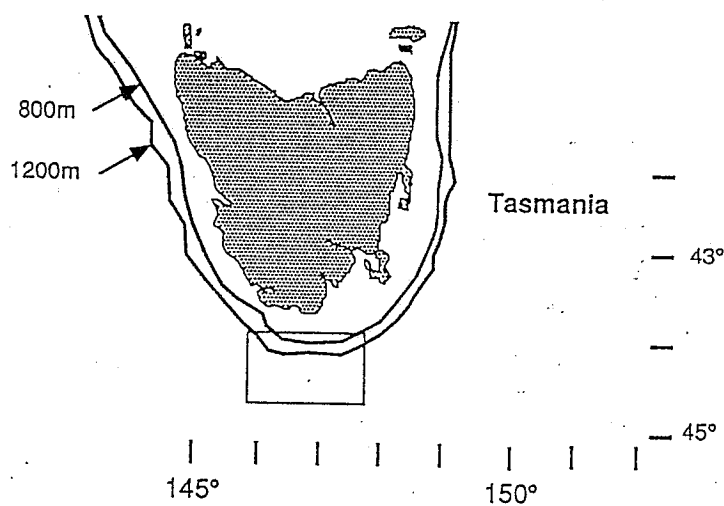
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## Distribution

Normal distribution  
Cruise participants



**Figure 1.** Area of operations for Leg 1, SS 4/92 showing the location of CTD transects. CTD stations are at 6 nm and 3 nm inshore of the shelf break, at the shelf break, and 3, 6, 10, 15, 20, 25, and 30 nm offshore of the shelf break. On the western transect, additional stations at 37 and 45 nm offshore of the shelf break will be sampled. X: Approximate location of trawl site. Y: Current meter mooring site.



**Figure 2.** Area of operations of acoustic survey during SS 4/92, leg 2.



## Appendix 1: Cruise Time Estimates

Activity	Time
<b>Leg 1</b>	
<b>Biological oceanography</b> (Total time: 7.5 d = 180 h)	
<b>Fisheries oceanography</b> (Total time: 7.5 d = 180 h)	
On trawl site:	
Zooplankton sampling (EZ net)	48 hours
Demersal trawling	24 hours
Midwater trawling (MIDOC net) + acoustic measurements of midwater layers	84 hours
Steaming from trawl site to Hobart	8 hours
Weather allowance	16 hours
<b>Leg 2</b>	
(Total time: 14 d)	
Steaming, searching (to/from Hobart, Recherche Bay)	2 days
Sampling time per pinnacle (4 days x 3 pinnacles)	12 days
<i>This time will be apportioned:</i>	
Echo integration survey (8 h/pinnacle x 3)	1 day
*Calibrations with depth (when weather permits)	1 day
*Weather allowance	1 day
Survey of spatial distribution of nekton at each site (3 d/site x 3 sites)	9 days
<i>*To be carried out upon initial arrival at a survey site</i>	

During each day and night period the towed body will be deployed twice to obtain TS measurements, followed once by a series of MIDOC pelagic tows and once by a demersal tow. Sampling will be suspended for 2 h at each dawn and dusk period due to vertical movements of the fauna.





