DIVISION OF **FISHERIES**

1996 RESEARCH VESSEL PROGRAM

CRUISE PLAN

FRV *SOUTHERN SURVEYOR*
CRUISE SS 06/96

20 NOVEMBER – 19 DECEMBER 1996

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ITINERARY

LEG 1
DEPARTURE: HOBART 0900 WEDNESDAY NOVEMBER 20, 1996
ARRIVE: EDEN 1800 WEDNESDAY DECEMBER 4, 1996

LEG 2
DEPART: EDEN 1200 THURSDAY DECEMBER 5, 1996
RETURN: HOBART 1200 THURSDAY DECEMBER 19, 1996

AREA OF OPERATION

Victorian and New South Wales coastal and offshore waters bounded by 36°S – 39°S and 146°E – 151°E.

RESEARCH BACKGROUND

The cruise will examine ecosystem structure in the South East Fishery region with an emphasis on the relationship of seafloor habitat to fisheries productivity. Sampling will be undertaken on the continental shelf in eastern Bass Strait and southern NSW in the vicinity of several important commercial fishing grounds. This is the last in a series of four cruises which provide seasonal coverage for the study.

Biological samples, information on seafloor topography and oceanographic data will be collected from the study area in two phases. The first phase, a broad scale survey based on seven cross-shelf transects, will provide information on the primary patterns of distribution and abundance of fish and invertebrate communities. Demersal trawling, benthic sampling, acoustic profiling and hydrological sampling will be undertaken at five sites per transect. Phytoplankton, zooplankton and micronekton will be sampled at two sites per transect. The second phase will be directed at intensive sampling on and around two or three areas of diverse bottom habitat to extend the information gathered in phase one to smaller scale highly diverse habitats. Samples will be taken with the towed video system, EK500 echosounder, benthic sled, demersal trawl, midwater trawl, plankton nets, and the CTD.

In both phases, the physical association of fish and invertebrate assemblages will be determined in relation to the physical character of seafloor habitats and overlying water masses. Biological species and the habitat they occupy will be determined through analysis of diet, trophic position and morphological adaptation.

Subsequent to the sampling undertaken by the *Southern Surveyor*, similar diverse habitat areas will be sampled with gill nets and traps deployed from commercial fishing vessels.

CRUISE PLAN

LEG 1

The vessel will steam from Hobart to the outer sampling station on the western-most survey transect off Wilsons Promontory. Biological sampling on Leg 1 will be mainly by demersal trawl and benthic sled along 7 cross shelf transects (Fig. 1). Two or three of the five stations on each transect will be sampled each day. Since several of the key fish species of interest may move into the water column at night, demersal trawling will be carried out during daylight hours only. Opportunistic midwater trawling with the opening-closing MIDOC net will be undertaken after dark at the end of each day if time allows. Scientific work on Leg 1 will be completed during a staggered daytime shift. Trawl sampling will take place during the morning and afternoon (0800–2000 hr), with sled sampling completed during the afternoon and evening (1000–2200 hr). For the first 14 days the vessel will move east and north completing one transect every two days. Sampling will be at sites identified during previous cruises at 25, 40, 80, 120, 200 m depths. At each site a 30 minute fish trawl, 30 minute sled tow and CTD cast will be undertaken. Plankton samples will be taken with oblique Bongo net tows and vertical ring net drops at the 80 and 200 m station on each transect. Vertically stratified micronekton samples will be taken with MIDOC net at the same two stations if time permits. In addition, the towed underwater video system will be deployed at a number of key sites.

Demersal trawl samples from each station will be sorted and the fish identified, enumerated and weighed. Commercial quota species and a range of other abundant fishes will be sub-sampled for further data collection. This will include taking length frequency and biological data, stomach contents, muscle samples for stable isotope analysis and otoliths from representative numbers of each key species at a range of localities. Invertebrates from infaunal and epifaunal benthic sled samples will be processed separately. Taxa will be sorted and identified to the most precise level against pre-existing collections, as well as being recorded by 'functional taxonomic classes'. Water samples for salinity, oxygen and nutrients will be collected from as many of the following depths as possible: 0, 10, 25, 50, 75, 100, 200 and 250 m. Fluorometer data from the CTD will calibrated using chlorophyll-a measurements at 0, 10, 25, 75 and 100 m from the 80 m and 200 m stations on each of 2 transects. In conjunction with this hydrological sampling, six depth-specific samples of chlorophyll from the photic zone and a spectroradiometer profile will be carried out for the SeaWiFS project— whenever possible, between 1100 and 1500 hr. At night, when the scientific crew are off-watch, the vessel will undertake a series of acoustic surveys for bottom topography and pelagic biomass distribution over predetermined areas before steaming to the next transect. Transects will be done at 10–11 knots speed under optimal sea conditions.

The vessel will finish Leg 1 in Eden on the afternoon of December 4, as soon as possible after the final stations off Bermagui are completed. A change in some of the scientific crew will occur at this time and the vessel will depart at 1200 the following

day, Thursday, December 5. A direct (small plane) flight from Merimbula will be used to transfer staff between Hobart and Eden on the Thursday morning.

LEG 2

Leg 2 will sample outer-shelf (100–200 m) habitats in the vicinity of Gabo Reef, the Everard Canyon and, potentially, other outer-shelf regions further south. Sampling will have a diel component requiring scientists to revert to separate day and night shifts: provisionally shifts will be 0400–1600 and 1200–2400 hr. Acoustic profiling with the EK500 echosounder will map seafloor characteristics in predetermined areas to identify the approximate boundaries of habitats. The towed camera array (TACOS) will sample each habitat with a range of cameras to provide video and 35 mm images of the seafloor and its associated invertebrate fauna. Fish and invertebrate communities will be sampled on and off hard bottom using a variety of gears. Pelagic and demersal trawls will sample fish over and adjacent to the bottom; the benthic sled and sediment grabs will sample invertebrates; CTD casts will be made to define the overlying water mass(es). The collection and processing of biological and hydrological data will be same as during Leg 1. Invertebrate samples will be sorted, identified to the lowest possible taxonomic level and processed for length and biological information. Video images will be interpreted in real time for bottom roughness, percent bottom cover with dominant macrofauna description. Higher quality video (or still) images will be collected for subsequent measurement of the size composition of macrofauna in different habitats.

The vessel will finish Leg 2 in Hobart on the afternoon of December 19.

CRUISE OBJECTIVES

1. Over a broad area of the continental shelf off eastern Bass Strait and southern NSW:
   a) determine the summer distribution and abundance of demersal fish species by demersal trawling
   b) identify and determine the distribution of seafloor habitat types through photographic, acoustic, biological and sediment sampling of bottom topography and bottom type, and their associated fish and epibenthic faunas
   c) determine the characteristics of the primary water masses in the sampling area during the survey
   d) determine the summer distribution of zooplankton and micronekton.

2. Obtain samples of fish, plankton and seafloor invertebrates for analysis of stable isotopes to identify their positions in the community food web.

3. Sample stomach contents from commercial and other abundant fish species to

determine their immediate feeding links and to compare with stable isotope analyses of trophic structure.

4. Collect water column and benthic sediment samples for analysis of phytoplankton pigments and breakdown products.

5. Through an intensive survey of three or four habitat types:
   a) determine the composition of the fish and invertebrate communities associated with rough ground, adjacent flat bottom, and the overlying water mass(es) by sampling with demersal and pelagic trawls, benthic sled or trawl, cameras and acoustics
   b) determine the characteristics of the primary water masses over the sampling areas

6. Collect biological samples and photograph fishes for the FRDC–funded 'SEF species guide' and 'seafood guide' projects.

7. Collect biological material for collaborative studies with other Australian research institutions and for stock assessment.

8. Collect samples for the SeaWiFS project for use in algorithm development for ocean colour satellite imagery.

9. Collect a range of tissue samples from fishes and invertebrates for a bioprospecting project being undertaken by the Australian Institute of Marine Science.

PERSONNEL	LEG
Dr Alan Williams (Cruise leader/Assist. Cruise Leader)	1, 2
Dr Nic Bax (Cruise leader)	2
Dr Sebastian Rainer (Assist. Cruise leader)	1
Dr Vicki Wadley	2
Ms Stephanie Davenport	1, 2
Mr Rudy Kloser	2
Mr Bruce Barker	1, 2
Ms Di Furlani	1
Ms Franzis Althaus	1
Mr Mark Lewis	1
Mr Miroslaw Ryba	1
Ms Karen Gowlett-Holmes	1, 2
Ms Catriona Macleod	2
Mr Mark Rayner	1
Mr Dave Terhell	2
Mr Matt Sherlock	2
Mr Jeff Cordell	1
Mr Lindsay MacDonald	2
Ms Alison Turnbull (20/11/96 – 30/11/96)	1
Mr Carsten Woolf (AIMS) (30/11/96 – 4/12/96)	1
Mr Skip Zenger (US National Marine Fisheries Service)	2

All personnel are CSIRO staff unless otherwise indicated.

CONTACTS

For further information about this cruise contact:

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P. C. Young
Chief, Division of Fisheries

Date 31/10/96

APPENDIX 1: CRUISE TIME ESTIMATES

ACTIVITY	TIME (DAYS)
SEF ECOSYSTEM STUDY (30 DAYS)	
LEG 1 (BROAD SCALE SURVEY)	
Steaming (Hobart-Wilsons Promontory)	1.5
7 transects	13.5
each sampled with:	
demersal trawls	
benthic sled	
CTD	
sediment grab	
bongo nets	
drop net	
pelagic trawl (opportunistically)	
TACOS (key sites)	
LEG 2 (HABITATS SURVEY)	
Steaming (Eden-Hobart)	1.5
3 or 4 intensive survey areas	13.5
each sampled with:	
Acoustics	
TACOS	
pelagic trawl	
demersal trawl	
benthic/ epibenthic sled	
bongo nets	
CTD	
sediment grab	
TOTAL	30

FIGURE 1. LOCATION OF TRANSECTS SAMPLED DURING BROAD-SCALE PHASE OF ECOSYSTEM STUDY (LEG 1).