CRUISE REPORT SS 02/96

April 16 – May 12, 1996

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CSIRO
AUSTRALIA

DIVISION OF **FISHERIES**

ITINERARY

LEG 1

Departure: Hobart 0900 Tuesday 16 April
Arrival: Eden 1230 Wednesday 1 May

LEG 2

Departure: Eden 1200 Thursday 2 May
Arrival: Eden 1200 Sunday 12 May

AREA OF OPERATION

The cruise was carried out in waters off the east coast of Tasmania, southeastern Victoria and southern New South Wales (NSW) between latitudes 36°00'S – 44°00'S and longitudes 144°00'E – 151°00'E.

RESEARCH BACKGROUND

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

Biological samples, information on seafloor topography and oceanographic data were collected from the study area in two phases. The first phase, a broad scale survey based on seven cross-shelf transects (Fig. 1), provided information on the primary patterns of distribution and abundance of fish and invertebrate communities. Demersal trawling, acoustic profiling and hydrological sampling was undertaken at five sites per transect, while phytoplankton and zooplankton were sampled at two sites per transect. Benthic and epibenthic dredging, and pelagic trawling was undertaken at selected target areas. The second phase was directed at intensive sampling of different habitat types to extend the information gathered in phase one. Sampling gears used in this intensive sampling also included a recently developed towed camera system. The array of cameras in this system provided real-time video to the vessel and independent Hi-8 video and 35 mm slide recordings.

In both phases, the physical association of fish and invertebrate assemblages was determined in relation to the physical character of seafloor habitats and overlying water masses. Relationships between 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*, the same reef area will be sampled with gill nets and traps deployed from commercial fishing vessels.

A related study is examining the effects of ten years of commercial fishing on the benthic composition and associated fish community off Maria Island, eastern Tasmania. A study site in this area was first examined by CSIRO fisheries scientists in 1984 before the start of commercial trawling. It has been subsequently resampled during cruises SS05/93 and SS05/94. During this cruise an underwater camera was deployed on the benthic sled to photograph the seafloor of the study area.

CRUISE OBJECTIVES

1. Over a broad area of the continental shelf off southeastern Victoria and southern NSW:
a) determine the autumn distribution and abundance of demersal fish species by demersal trawling;
b) determine the autumn abundance and size structure of mollusc species by benthic/ epibenthic sled sampling at specific sites;
c) identify and determine the distribution of seafloor habitat types through photographic, acoustic and sediment sampling of bottom topography and bottom type, and their associated fish and epibenthic faunas; and
d) determine the characteristics of the primary water masses in the sampling area during the survey.

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 intensive survey of different habitat areas:
a) determine the composition of the fish and invertebrate communities associated with reef and adjacent habitats by sampling with demersal and pelagic trawls, benthic sled, cameras and acoustics; and
b) determine the characteristics of the primary water masses over the sampling areas.

6. By photographic surveying of the seafloor, determine the abundance and pattern of distribution of brittle stars off Maria Island for comparison with historical (pre-commercial fishing) data.

7. Collect specimens, muscle samples and take photographs of fish and invertebrates for new CSIRO project: Handbook of Australian seafood.

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

9. Collect fish specimens for ecomorphological analysis

RESULTS

1. BROAD-SCALE SURVEY OF THE CONTINENTAL SHELF OFF SOUTHEASTERN VICTORIA AND SOUTHERN NSW

Overall, 33 demersal trawls, 34 CTD casts, 34 sediment samples and 14 plankton samples were completed on the transect stations; 4 target benthic sled tows were also completed (Appendix 1). All stations were sampled fully except for two: no trawls were undertaken in 200 m depth on Transect B (where no trawlable bottom was found), or on Transect F where a steeply sloping bottom at the 25 m depth contour was dangerously close to shore. A total of about 8.3 tonnes of fish (~91,700 specimens) were caught at an average of about 251 kg per 30 min trawl (about 500 kg per hour) during Leg 1. At all stations the composition of fish catches (total numbers and weights) was recorded by species. In addition, a considerable volume of samples for biological analysis was collected (see below).

A new shipboard data acquisition system developed by Miroslaw Ryba was used for the first time at sea. Shipboard use permitted fine tuning of several components of the system resulting in data for station details, trawl catch compositions and biological data to be entered into the Oracle database and checked. In addition, all length data were edited and reformatted for Oracle during Leg 1.

Acoustic data from the EK500 sounder and the RoxAnn seafloor classification software were logged continuously throughout the cruise. Successful acoustic surveys to characterise seafloor types were carried out at night around several fishing grounds (Smithy's Corner, Ten by Ten Reef, Everard Reef, Little Horseshoe, Gabo Reef, Howe Reef and areas of the shelf break north of Eden).

Several successful trial deployments of the newly developed towed camera array (TACOS) were conducted ahead of its intensive use during Leg 2.

2. COLLECTIONS FOR STABLE ISOTOPE ANALYSIS

Tissue samples from a diverse range of fish, plankton and seafloor invertebrates were collected for laboratory analysis of stable isotopes. The fish species sampled and the numbers of samples taken are shown in Table 1; many of the invertebrate species sampled await species level identification. Zooplankton were collected in oblique bongo net tows (500 micron mesh) and drop net samples (100 micron mesh) at the 40 m and 200 m stations. Phytoplankton was collected from filtered water samples at the same stations. Analysis of stable isotope ratios will indicate the relative trophic levels of each organism and therefore their position in the community food web. Analysis of stable isotopes and percentages of carbon and nitrogen in the sediment samples should indicate the origins of organic carbon and hence assist in identifying sources of productivity in the system.

3. COLLECTIONS FOR DIETARY ANALYSIS

Stomach contents were collected from a diverse range of commercial and other abundant fish species for dietary analysis (Table 1). This work will determine the immediate feeding links and will compliment the results of stable isotope analyses of trophic structure.

4. COLLECTIONS FOR PIGMENT ANALYSIS, AND ZOOPLANKTON IDENTIFICATION AND ABUNDANCE

Biological samples for analysis of phytoplankton pigments were taken from the plankton nets and sediment sampler on the benthic sled. Samples were taken from all deployments of both gears and immediately frozen. These samples will be analysed to determine the presence and concentrations of chlorophyll compounds and their breakdown products. This analysis will assist in determining the origin of primary production in the ecosystem, and the herbivores responsible for its decomposition. Additionally, there is a possibility that distinct chemical signatures in sediment samples will be associated with different benthic communities.

Zooplankton were also collected for later taxonomic identification in the laboratory and for estimation of the zooplankton biomass. Zooplankton communities will be examined for links with the water masses in which they were found and for relationships with water column phytoplankton pigments and nutrient levels.

5. INTENSIVE SURVEY OF DIFFERENT HABITAT TYPES

Preliminary onboard analysis of Roxanne and EK500 transect data identified different seafloor substrate types within Disaster Bay— three areas off Black Head (25 – 40 m) and three inside the Howe/ Gabo Reef (80 – 90 m)— and two off Point Hicks (40 m). Habitat characteristics were assessed from samples taken with the benthic sled, towed camera array, CTD and demersal trawl (where practical) to provide data on substrate type, infaunal and epifaunal invertebrates assemblages, fish assemblages and hydrological environment. Stomachs were collected from three fish species, John dory (*Zeus faber*), ocean perch (*Helicolenus percoides*) and bellowsfish (*Macroramphosus scolopax*), in each habitat to compare diet. Large collections of invertebrates were identified and photographed. Characteristics of their physical structure were categorised to match the extraction of data from photographic records. About 20 hours of high quality video tape was recorded using the new towed camera array. It was successfully towed over all the habitat types surveyed, including the 'hard-ground' habitats— low-relief, undercut, rock-slab and heavy rock outcrops with steep and sizable (to 5 m) edges. Sampling of fish assemblages from the hard-ground habitats (where trawling was not possible) has been subsequently completed with traps and gillnets from commercial vessels. A total of about 6.7 tonnes of fish (7,000 specimens) was taken from the eight habitats with trap and gillnet.

6. SURVEY OFF MARIA ISLAND

Darcys Patch at 350 to 450 m off Maria Island was sampled once with the Engels Hi-Rise net to collect some deepwater specimens for the Handbook of Australian Seafood project. The Quest film crew took extensive video footage of this shot for their "Mysteries of the Deep" film. The trawl was followed by a benthic sled transect oblique to the standard trawl shots to obtain still pictures of the benthic habitat at the margins of the trawlable ground and to obtain specimens to assist identification of benthic fauna on still pictures. The pictures obtained were not of good quality and the oblique transect is to be repeated on SS3/96.

7. COLLECTIONS FOR THE PROJECTS – 'HANDBOOK OF AUSTRALIAN SEAFOOD' AND UPDATE OF THE 'FIELD GUIDE TO THE SOUTHEAST FISHERY'

Specimens were selected from trawl catches for samples and distributional information for the updated 'Field Guide to the Southeast Fishery' and 'Handbook of Australian Seafood' projects.

Ten specimens of most target species were collected. The best specimen of each was photographed and retained as a voucher in the CSIRO Munro Fish Collection, two large specimens were retained whole for fillet analysis and tissue samples were taken from the remaining seven specimens. These tissues will be used to obtain protein fingerprints for distinguishing between fillets of different species.

Additional specimens of some species were retained for genetic analysis. These will be used to compare closely related species, which are more difficult to distinguish biochemically, using allozyme electrophoresis.

The following is a summary of material collected (* indicates an approximate number of samples).

	Bony fishes	Sharks & rays	Shellfish	Total
Species examined	15	10	3	28
Voucher specimens retained	10	7	2	19
Fillet samples	12	3	4	19
Genetic samples	*350	10	14	*375
Species finalised	11	5	2	18

8. COLLECTIONS FOR COLLABORATIVE STUDIES AND FOR OTHER INSTITUTIONS

A number of miscellaneous specimen collections were made for collaborative studies, to address requests from workers in other institutions and for stock assessment purposes. Specimens saved from trawl or sled samples were as follows:

- Early juvenile life history stages of commercial species for the Central Ageing Facility, Department of Conservation and Natural Resources, Victoria.
- Jack mackerel (*Trachurus declivis*) for Mr Grant Pullen, Tasmanian Department of Sea Fisheries.
- Trumpeter (*Latridopsis forsteri* and *Latris lineata*) for Dr Jeremy Lyle, Tasmanian Department of Sea Fisheries.
- Miscellaneous taxonomic specimens (including *Parapercis* spp. and Brachionichthyidae) photographed and retained for ongoing taxonomic studies by Dr Peter Last, CSIRO Division of Fisheries.
- Live handfish (*Brachionichthyidae*) for biological studies by Drs Peter Last and Barry Bruce, CSIRO Division of Fisheries.
- Samples of introduced screwshell (*Maoricolpus roseus*) for length frequency measurement.

9. COLLECTION OF SPECIMENS FOR ECOMORPHOLOGICAL ANALYSIS

Specimens of a range of fishes were collected for a study of the relationship of body form to ecology (ecomorphology) (Table 2). Up to five individuals of each of three size classes were collected (small, medium and large specimens based on <30%, 30 – 70% and >70% max. length). This study will provide information on morphological and functional adaptations of fishes to their ecological niches and their habitat requirements.

ADDITIONAL OBJECTIVE COMPLETED

10. SEAL OBSERVATIONS

Observations of seals were recorded throughout the survey, and details of time, location, depth and gear interactions noted. Seals (probably the Australian fur seal, *Arctocephalus pusillus doriferus*) were observed at times around all the deployed gear types (except the benthic sled. Observations of seals around the sled were made on previous surveys. Seals were seen on all except the two most northern transects — off Merimbula and Bermagui.

Of particular interest, was the response of the seals to the towed camera unit. During night time camera deployments on Leg 2 in the Disaster Bay area, seals often appeared near the stern of the vessel as soon as the camera unit was lowered into the water and floodlights switched on. Video images of the bottom at night during tows over sandy bottom, showed jack mackerel (*Trachurus declivis*) attracted by the lights on the camera unit. The camera floodlights illuminated planktonic organisms; the mackerel fed on these. Seals often appeared in front of the cameras chasing (and presumably feeding) on the mackerel. Seals were often seen following the trawl net as it was retrieved, and subsequently feeding on discarded fish. Seals also displayed great curiosity around any other deployed gear; however, no seals were caught or entangled.

CRUISE NARRATIVE

The following narrative comprises preliminary notes made at sea. Precise information will be available following further analysis.

LEG 1

TUESDAY 16 APRIL

FRV *Southern Surveyor* departed the CSIRO wharf in Hobart at 0900. A test deployment of the benthic sled planned for the Derwent estuary was delayed because there was insufficient preparation time. We proceeded around the Tasman Peninsula and met the RV Quest in Fortesecue Bay to take on her film crew. The crew of six were transferred, in driving hail, to spend the rest of the day filming our operations for part of a TV documentary series. The first operation was the delayed sled test which was undertaken en route to Maria Island. During the first shot (Operation 1) the sled landed and was towed upside down on bottom. During the re-

test, (Operation 2) the sled came up to vessel upside down, but had been right side up when on the bottom. The catch was small and contained no *Asterias amurensis*. A few New Zealand screw shells, *Maoricolpus roseus*, were sorted and the live ones retained frozen. We then headed to Darcey's Patch off Maria Island to commence the sampling program. The operations, a demersal trawl, benthic sled tow and CTD, were completed by midnight.

WEDNESDAY 17 APRIL

After returning the film crew to the RV Quest in the early hours of the morning we headed for the first sampling station in eastern Bass Strait. The weather was fine and good speed was made in light northwesterly conditions; our schedule was to be on station at 0500 on Thursday morning. During the steaming leg we deployed the new MIDOC system on the Engel 308 to test this new gear configuration (Operation 6). Three nets did not drop indicating a problem with the timer. One net took a moderately large catch (~50 individuals) of the gurnard *Lepidotrigla mulhalli*.

THURSDAY 18 APRIL

First deployment (Operation 7) was the market trawl at the deep station (200m) on transect B at 0600. A small (<100 kg) mixed catch of fish characteristic of the deep shelf/ shelf break resulted. We completed the first routine CTD and sediment grab samples without incident and then repeated all sampling on next station (transect B, 120 m) successfully. The trawl catch here was larger (~250 kg) with abundant species including leatherjacket (*Parika scaber*), balloon fish (*Allomycterus pilatus*), swell shark (*Cephaloscyllium laticeps*) and tiger flathead (*Neoplatycephalus richardsoni*). At this time the weather was deteriorating rapidly. As proved to be a common occurrence during the cruise, several fur seals were observed around vessel whilst the trawl was being hauled.

FRIDAY 19 APRIL

We moved inshore to the shallow stations on Transect A and experienced relatively sheltered conditions. Trawl catches were moderately large, very diverse (including invertebrates) and time consuming to sort. Plankton samples (Operations 17 and 19) were moderately diverse and included copepods, siphonophores and chaetognaths. All sampling proceeded well. Steamed to inshore stations on Transect B overnight.

SATURDAY 20 APRIL

Calm conditions persist. Inner station (Operation 22) catch of over 500 kg was diverse and was subsampled. Dominant species were leatherjackets (*Upeneichthys vlamingii* and *Thamnaconus degeni*, and *Monocanthus* sp.). The 40m station (Operation 29, 650 kg) was similarly diverse dominated by octopus, leatherjackets (*P. scaber* and *T. degeni*), scorpion fish (*Neosebastes scorpaenoides*), swell sharks (*C. laticeps*) and some large rays (*Trygonoptera* sp. B, Raja *whitleyi* and *Myliobatis australis*). Little diversity in inshore plankton samples (Operations 27 and 28) — mostly small with a few larger copepods. All sampling on two inshore stations (25 m and 40 m) completed by early afternoon permitted a trial deployment of the towed camera system (TACOS) to be made. The system worked well in 40 m, although one laser casing flooded.

Carried out an acoustic survey of Ten by Ten Reef fishing ground overnight. Three commercial vessels fishing in area of Transect A and B outer stations.

SUNDAY 21 APRIL

Commenced sampling on the 80 m station on Transect A in fine conditions. First trawl catch (Operation 31) was less diverse than the inshore stations and quickly processed. Dominant species included tiger flathead (*N. richardsoni*), morwong (*Nemadactylus macropterus*), dogshark (*Squalus megolops*), gurnards (*Lepidotrigla species*), red rock cod (*N. scorpaenoides*) and arrow squid (*Nototodarus gouldi*). A CTD and grab sample were completed. The first trawl at 120m (Operation 34) was aborted, and the station retrawled (Operation 35). Plankton samples (Operations 38 and 39) taken but no shipboard observations noted.

MONDAY 22 APRIL

An acoustic survey of Smithy's Corner, a fishing ground in the shelf break region, was completed overnight. Sampling commenced at position C5, the outermost station on the Lakes Entrance transect, with a demersal trawl (Operation 43) at 0615. The moderately large catch contained a high proportion of large fish in which commercial species, primarily morwong (*N. macropterus*) and spotted warehou (*Seriolella punctata*), were dominant. The catch also contained large individuals of several species including redfish (*Centroberyx affinis*) and spotted gurnard (*Lepidotrigla argus*). The presence of many large crinoids and other macroinvertebrates indicated we had trawled over a reef area – consistent with a small ridge seen on the echo sounder during the tow. The drop net samples (Operation 46) consisted mainly of small copepods and a few salps; there was more diversity in the bongo samples (Operation 47) which included, in addition to copepods of various sizes and salps, a few larval fish, various stages of euphausid and at least one larval stomatopod (mantis shrimp). The trawl catch at 20 m (Operation 48) was small and dominated by cucumber fish (*Chlorophthalmus nigripinnis*) and gurnard (*Lepidotrigla modesta*). Another small trawl catch in 80 m at position C3 (Operation 51) was dominated by cucumber fish and dragonets (*Synchiropus calauropomus*). A pelagic tow was carried out over the shelf break at the end of the transect. Large catches of three-spined cardinalfish (*Apogonops anomalus*) were taken from large marks seen over the ridges either side of a gully. Plankton samples not taken due to large swell. Completed an acoustic survey of the Horseshoe (Everard Reef) overnight.

TUESDAY 23 APRIL

After completing an acoustic transect of the western part of the Horseshoe (or Everard Reef) fishing ground overnight, we proceeded in to the shallow stations on Transect C. Sampling commenced with a bottom trawl (Operation 55) at 0615 on station C2 (40 m). The catch was dominated in weight by elasmobranchs: stingarees (*Urolophus cruciatus* and *U. paucimaculatus*), spurdog (*S. megolops*), eagle rays (*M. australis*), swellsharks (*C. laticeps*) and skates (*Raja* sp. A). Small individuals of jack mackerel (*T. declivis*) were most numerous. Hydrology, sediment and plankton samples were collected before moving in to the 25 m station, C1, the last on this transect. Plankton samples (Operations 58 and 59) were similar to those from inshore Lakes Entrance transect; a low diversity fauna, consisting mainly of small copepods with a few larger calanoid and cyclopoid copepods. The dominant species in the 25 m trawl sample

(Operation 60) were similar to those at C2, although butterfly perch (*Caesioperca lepidoptera*) were also numerous. A benthic sled sample was also carried out specifically to sample the abundant mollusc fauna at this site. Sufficient time remained to complete a second trial deployment of the TACOS towed video camera apparatus before nightfall. Another trial shot was also completed after dark in preference to a pelagic trawl (there was insufficient time to remove the TACOS tow wire from the gilson winch and replace the heavy haul wire). The second video transect was orthogonal to the 40m trawl transect. Marks left by the door, sweeps and bobbins were visible. A brown epibenthic fauna was evident outside the path of the trawl but not where the trawl had passed. The TACOS travelled obliquely over the bottom when towed across the current, but in the direction of travel when towed into the current. Weather remained fine. Carried out further acoustic survey of the Horseshoe fishing ground overnight before moving to Transect D off Gabo Island.

WEDNESDAY 24 APRIL

We commenced sampling on the outer station (5) of Transect D at 0600. This trawl, Operation 67, contained a small sample of outer shelf/ shelf break species including mirror dory (*Zenopsis nebulosus*), three-spined cardinalfish (*A. anomalus*) and ghost shark (*Hydrolagus ogilbyi*). Several coffinfish (*Chaunax endeavouri*) were seen for the first time. After completing the remaining sampling successfully (CTD, sediment grab, plankton drop nets and bongo nets) we moved into 120 m to station D4. The plankton samples (Operations 70 and 71) contained mostly salps, copepods and euphausids, with a few larval fish, small medusas, amphipods and chaetognaths. The 120 m trawl catch (Operation 72) was small – about 300 kg – and dominated by cucumber fish (*C. nigripinnis*) and swell shark (*C. laticeps*). The trawl catch at station D3 in 80 m was larger – about 400 kg – and contained many abundant species including velvet leatherjacket (*Parika scaber*), jack mackerel (*T. declivis*), silver dory (*Cyttus australis*), swell shark (*C. laticeps*), stingarees (*U. paucimaculatus*), bellowsfish (*Macrorhamphosus scolopax*) and ocean perch (*Helicolenus percoides*). Due to the lack of a suitable pelagic mark to trawl, the shelf edge in this region being in the shipping lane and a 'pea-souper' fog we did not attempt a pelagic trawl. Surveyed the outer edge of Gabo Reef with acoustics overnight.

THURSDAY 25 APRIL

We were on station (position D2) in 40 m at 0600. As the first trawl touched bottom it became fast and during retrieval the main warp parted. The remainder of the morning was spent getting the trawl gear back on board and changing the net which had been badly damaged. We used the time on a variety of jobs including getting all the outstanding data entered. A small-scale acoustic survey of some inshore reef in 60 m water off Little Rame Head was completed. Sampling commenced back on station at 1400; from there the day's sampling was concluded successfully. There was a large biomass in both drop net and bongo samples (Operations 81 and 83) — mostly salps (possibly *Salpa democratica*) with small copepods, a few larval fish (including a scorpaenid) and small euphausids. After nightfall we spent considerable time searching for a pelagic mark to sample. The water column from around 80 m out to the shelf edge seemed barren, with no marks found during more than two hours of searching. A small mark out near the shelf edge was fished eventually; a large quantity (>15,000) of lanternfish (*Lampanyctodes hectoris*) were caught but there appeared to be no predators in association with the school. Acoustic transects were run up the outer edge of Gabo Reef overnight.

FRIDAY 26 APRIL

Work commenced in 80 m on the Disaster Bay transect (station E3). We booked the harbour pilot to take us into Twofold Bay at 1600 to drop off the damaged trawl net leaving from 0600 to 1400 to sample the three inner stations. All three were completed without incident. In the first trawl (Operation 88) of 200 kg the dominant species were bellowsfish (*M. scolopax*), ocean perch (*H. percoides*) and red rock cod (*Scorpaena papillosa*). The second trawl in 40 m contained predominantly swell shark (*C. laticeps*) and orange spotted catshark (*Asymbolus* sp. D) in a total catch of 256 kg. At 25 m, the trawl (Operation 96) caught only 163 kg. However, the fish species were mostly small and several were abundant; these included the sparsely spotted stingaree (*U. paucimaculatus*), gurnard (*L. mulhalli*), stinkfish (*S. calauropomus*) and small unidentified leatherjacket (*Monacanthus* sp.). Plankton samples (Operations 93 and 94) were small samples containing a few euphausids, copepods and amphipods, a ctenophore and little else.

We steamed into Twofold Bay where the trawl was passed to the Eden netmaker, John Symonds, with the vessel holding position on the wharf. The fee for the pilot and use of the wharf in this way was a staggering $1,200. A prohibitive cost for transfer of gear or personnel except where unavoidable. We steamed back south to complete the survey position sampling with a benthic sled tow at E2 around 1900 in the evening. A pelagic tow (using only a single net of the MIDOC frame) caught around 200 kg of jack mackerel (*T. declivis*) from a large but dispersed mark in about 80 m depth. Acoustic survey work overnight covered part of the southern end of Gabo Reef with a series of cross-reef transects.

SATURDAY 27 APRIL

We commenced sampling at 0600 on the outer station (E5) of the Disaster Bay transect. The first trawl was aborted due to the cod ends being left open. A repeat sample, (Operation 102) contained 357 kg, predominantly redfish (*C. affinis*), three-spined cardinalfish (*A. anomalus*) and ocean perch (*H. percoides*). With the remaining sampling at this station complete we moved in to the 120 m station (E4). The wind was freshening at this time to 25 knot southwesterlies – the first blow we've had in 10 days. A small trawl catch at E4 of less than 100 kg was dominated by bellowsfish (*M. scolopax*) and three-spined cardinalfish (*A. anomalus*). Moderate sized plankton samples (Operations 105 and 106) included many euphausids and copepods, a few salps and fish larvae, a larval crab, pteropod, chaetognath and larval squid. After finishing sampling at this point we moved inshore to the 80 m station at E3 to deploy the TACOS camera gear – using it in greater depths and rougher weather than in previous deployments. The resulting video footage was of high quality and showed a large number of trawl tracks on the bottom, with many crisscrossing in places. In two deployments at position E2 (40 m) following this, the camera did not settle properly and the tows were aborted. A final attempt in 40 m was successful with a good footage from a 1-hour tow. Acoustic survey transects were run over Howe Reef overnight.

SUNDAY 28 APRIL

Commenced sampling at position F2, the 40 m station off Merimbula, at 0600. A moderate size catch resulted in which jack mackerel (*T. declivis*), school whiting (*Sillago flindersi*) were dominant in numbers and eagle rays (*M. australis*) dominant by weight. We then steamed back

into Twofold Bay to pick up our second trawl net which had been repaired. The net was brought out to us by a local fisherman and quickly transferred in the calm conditions at the southern end of the bay. This enabled us to avoid the high port charge associated with using the wharf. From here we steamed up to the 200 m station on the Bermagui transect, G5. Sampling commenced at 1215 with a demersal trawl. The plankton sample (Operations 117 and 118) was a moderately large and diverse sample: many euphausids and copepods (including *Sapphirina* spp.), several fish larvae of different species, ctenophores, squid larvae, megalopa, ostracods. The two outer stations were completed by nightfall. We steamed out to the shelf edge for the pelagic trawl around 1900. Although there was a problem with the MIDOC (a broken weld on one of the net bar releases) a moderately large catch of myctophids (primarily *L. hectoris* and *Diaphus danae*) resulted. Three medium sized redfish (*C. australis*) and one blue warehou (*Seriolella brama*) were caught in the deepest depth range sampled. Overnight we completed acoustic transects across the shelf north and south of Transect G, and along the shelf edge to the north. The Roxanne data indicated some interesting areas of hard bottom just south of out 80m transect and out towards Montague Island.

MONDAY 29 APRIL

Sampling commenced at 0600 with a trawl at station 2 (40 m) on Transect G. Angel sharks (*Squatina australis*) and stingarees (*U. paucimaculatus*) made up about 80% of the total catch of 100 kg. The catch was noteworthy for the large number of small individuals of jack mackerel (*T. declivis*) and bellowsfish (*M. scolopax*). The plankton sample (Operations 126 and 127) was large samples with lots of gelatinous material, probably damaged ctenophores; also euphausids, copepods, larval fish and squid, ostracods and chaetognaths. In 80 m, station G3, the bellows fish (*M. scolopax*) was also numerous. It was the most abundant fish by weight and numbers despite the presence here of many small individuals. Starry toadfish (*Arothron firmamentum*) and silver trevally (*Pseudocaranx dentex*) were the other dominant species. In 25 m, station G1, the dominant species in the trawl catch were similar. Eagle rays (*M. australis*) and angel sharks (*S. australis*) made up most biomass and silver trevally (*P. dentex*) most numbers. The starry toadfish (*A. firmamentum*) was also abundant. Sampling on this transect was completed with a benthic sled tow in 40 m. Although the sled went out correctly, on hauling it was found to have overturned on its way to the bottom. The tow was repeated four times in total; the sled sampled right-way up only twice and caught small samples on both occasions. After this we steamed to Eden to pick up Lindsay MacDonald from the wharf. The transfer, using one of the vessels inflatables was completed by about 2230. From Twofold Bay we steamed back up to the Merimbula transect and spent the night doing cross-shelf acoustic transects either side of Transect F.

TUESDAY 30 APRIL

At this point in time we have completed six of the seven transects plus the 40 m trawl on Transect F so are well positioned to finish all the broad scale sampling scheduled for Leg 1. Sampling commenced today with a benthic sled tow targeting the NZ screwshell, *M. roseus* at the 40 m station. Again the sled towed upside down on the first shot but rightway up on the second attempt – taking a large catch of shells. The remaining samplers (CTD, grab, drop net and bongo net) were deployed before moving in to the 25 m station. Plankton samples were moderate sized samples with copepods the most numerous group; also ctenophores and larval

fish. Rocky headlands extending across the 25 m depth line prevent trawling at this site so only a grab and CTD were deployed. We moved from here out to do the 80 m and 200 m stations today. The catch at 80 m (station G3) was small and dominated by the bellowsfish (*M. scolopax*). A large catch of about 1.2 tonnes was taken at station G5 in 200 m. Three-spine cardinalfish (*A. anomalus*) made up most numbers and biomass, while large redfish (*C. affinis*) and jack mackerel (*T. declivis*) were also abundant. All remaining samples at these stations and the CTD in 120 m were completed today leaving only the trawl and sediment grab on station F4 to be done on the last day. Salps (possibly *S. democratica*) made up the largest biomass in the plankton samples (Operations 152 and 153); also copepods (including *Sapphirina* spp.), euphausids, larval squid and megalopa. A MIDOC tow at the deep end of transect F completed the days sampling. Acoustic transects of the shelf south of transect F were completed overnight.

WEDNESDAY 1 MAY

The final Operations of Leg 1, a sediment grab and trawl at station F4 (120m), were on deck by 0700. The trawl catch (in an area of rougher ground) was just over 1.5 t. Redfish (*C. affinis*) made up over a tonne of this, with the next most abundant species – jack mackerel (*T. declivis*), ocean perch (*H. percoides*), and jackass morwong (*N. macropterus*) – an order of magnitude lower. Redfish were smaller than those caught at the deeper station. Specimens of other species were generally larger. A test deployment of the MIDOC was completed successfully on the way in to Eden. *Southern Surveyor* docked at Eden at 1230.

LEG 2

THURSDAY 2 MAY

Departed Eden at noon after morning coffee on board with local operators, ABC radio and the Eden Gazette. Followed the 40m contour to Point Hick, turned around and followed the 50 m contour back to Green Cape. Evaluation of Roxanne and EK500 data indicated that an area just north of Black Head (37°20' to 37°28') between the shoreline and Gabo Reef offered several habitat types and is an area that is commercially trawled. A survey grid was set up at 2' intervals latitude in the east-west direction and following 20 ,40, 60, 80 and 100 m depth contours in the north-south direction.

FRIDAY 3 MAY

Area 1, comprising a habitat of harder ground (position 3: 37°26') at 40 – 60 m depth separating two trawlable habitats (position 1: 37°24' – 37°25.5' and position 2: 37°27' – 37°29') with different acoustic signatures was selected. Surveys were concentrated on the 50 m depth contour. Sled tow duration was set at 20 min and the trawl at 30 min. Position 1 was sampled with the sled (Operation 159). Empty polychaete tubes (4.8 kg) and *M. roseus* (4.6 kg) were dominant in the infaunal large catch of 14 kg. The epifaunal catch of 53 kg comprised sponge (11 kg), bryozoans (2 kg), asteroids (1.3 kg), *M. roseus*, *S. papillosa* (88) and *H. percoides* (66). Position 1 was sampled with a TACOS video drift (Operation 160). The bottom was muddy with little macrofauna.

A series of CTD casts (20, 40, 60, 80 m; base and top of Gabo reef) along the 37°25' latitude line was selected to determine the fine-scale physical oceanography of the domain between Black Head and Disaster Bay. The 20 m cast was completed (Operation 161).

A camera drop on Position 2 (Operation 162) was aborted as the camera was incorrectly suspended. A second camera drop (Operation 163) aimed at Position 2 ended up on Position 3 and some very good closeup footage of a raised slab habitat with diverse macrofaunal cover and fish was obtained before the chain caught and the weak link parted. Benthic sled was deployed at Position 2 (Operation 164), resulting in much sponge (18 kg), bryozoans (2 kg), starfish (0.5 kg), and *Caesioperca lepidoptera* (14) in the infauna large, and much sponge (51 kg), bryozoans (16 kg) asteroids (4 kg) and *C. lepidoptera* (82 in the small mesh).

The 70 and 80 m depth contours, the 37°28'and 37°26' cross shelf transects were acoustically surveyed overnight.

SATURDAY 4 MAY

The camera drop at Position 2 was repeated (Operation 165) and good footage obtained as it drifted into Position 3. A 50 m CTD was completed (Operation 166), and the camera drop repeated (Operation 167). The drop started in trawlable ground and moved shallower. As bottom depth decreased below 50 m, many boulders appeared and good footage was obtained of macrofauna and fish schools (also seen on EK500). The drift was quite fast because of the onshore winds. A demersal trawl in Position 1 was completed (Operation 168) with a catch over 200+ kg, with jack mackerel (*T. declivis*), ruddy gurnard perch (*H. percoides*), and bellowsfish (*M. scolopax*) dominating. *Helicolenus percoides*, *M. scolopax* and *C. affinis* were sampled for biologicals. A demersal trawl in Position 2 (Operation 169) yielded 300+ kg with jack mackerel, and butterfly perch dominant. The same three species were sampled for biologicals. The 60 and 80 m CTD casts were completed (Operations 170 and 171).

The habitat differences between the 3 positions determined by acoustics were supported by the subsequent video and benthic sled operations. Trawl catches were less distinctly different, and replicate trawls were needed to improve discrimination. The trawl got hung up on the first replicate at Position 2 (Operation 172) codend mesh was wrapped around the propeller, and the *Southern Surveyor* limped slowly back to Eden at 1.5 knots

SUNDAY 5 MAY

Limped to Eden at 1 – 2 knots. Arrived at 1500. Diver cleared propeller and videoed damage by 1630. Sailed at 1700. Net repairs until 2400. Completed 37°20', 37°22', and 37°24' cross domain transects. Carried out smaller criss-cross acoustic grid of Area 2 (37°19' and 37°24', 150°02' and 150°10').

MONDAY 6 MAY

Acoustic surveys showed that a transect along 150°04' covered two bottom types of equal roughness but with harder habitat south of 37°21.4'. Sled towed upside down three times

(Operations 172, 173, 174). Bridle position changed and fourth tow south of 37°21.4' on habitat 1 was successful (Operation 176). Epifaunal catch of 40 kg, composed of sponge, solitary ascidians, starfish, soft bryozoans and 480 *S. papillosa*. Infaunal catch of 3 kg composed of sponge and solitary ascidians. Camera drop on same area (Operation 177) unsuccessful due to water leakage into the TVP cable connector. Sled tow on habitat 2 (Operation 178) caught 130 kg epifauna with soft bryozoans (72 kg) and solitary ascidians (32 kg) dominating, and included 360 *S. papillosa* and 50 *H. percoides*. The infaunal catch of 1.8 kg was primarily sponge. Camera drop on habitat 2 (Operation 179) curtailed due to another leakage. First pictures showed sediment storm even though weight was 6 m off the bottom according to scanmar. Proceeded to 37°25' to complete final two CTD's in this domain (Operations 180 and 181). There was a distinct change in temperature and salinity at 90 m.

Returned to Position 1 for camera drop. First drop (Operation 181) on hard bottom reasonably clear though one light was not in place due to earlier leakage. Second drop (Operation 182) was aimed at soft bottom but ended up on hard bottom as well. Footage was very poor and discarded, except for 35 mm slides. Set up for acoustic transects of the 90 and 100 m contours over Gabo overnight.

TUESDAY 7 MAY

Video transect (Operation 184) aborted due to equipment failure. Sled on rough bottom (habitat 3, Operation 185) completed with epifaunal large (251 kg) dominated by low encrusting sponge (112 kg), bushy sponge (36 kg), lump sponge (30 kg)and massive bryozoans (15 kg). There were also *H. percoides* (66) and *S. papillosa* (17). The infaunal large catch (81 kg), comprised lump, low and bushy sponge (13, 9 and 7 kg, respectively). This shot on rough ground had more sponge than hard and a soft habitat, and hard bryozoans, which would provide complex habitat, were found in quantity for the first time.

A trawl on hard/soft bottom (Operation 186) caught 380 kg comprised primarily of jack mackerel (*T. declivis*), dragonets (*S. calauropomus*), perch (*H. percoides*), bellowsfish (*M. scolopax*) cucumber fish (*C. nigripinnis*) and *S. papillosa*. A second demersal trawl on the soft ground (Operation 187) caught 300kg composed primarily of *S. papillosa*, bellowsfish (*M. scolopax*), jackass morwong (*N. macropterus*), silver dory (*C. australis*) and velvet leatherjackets (*P. scaber*).

A trawl on hard ground (Operation 188) was successful (220 kg) despite the gear hanging up after about 20 minutes. There was a high species overlap with the catches from softer habitats (although *C. lepidoptera* were more abundant) but individuals were noticeably larger; the dominant species, ocean perch (*H. percoides*), was a good example. A replicate trawl over the hard ground habitat (Operation 189), completed during the last 90 minutes of daylight, resulted in c. 350 kg, of jack mackerel (*T. declivis*), perch (*H. percoides*), jackass morwong (*N. macropterus*) and redfish (*C. affinis*). Biologicals were done on bellowsfish (*M. scolopax*), ocean perch (*H. percoides*) and John dory (*Zeus faber*). Redfish (*C. affinis*) were caught, perhaps due to the lateness of the trawl.

WEDNESDAY 8 MAY

Sampling commenced at 0500 with a pelagic tow (Operation 190) across the 80 m sampling area. One tow covered the soft and rough grounds. The small catch was consistent with the lack of fish marks seen on the echosounder. Large jack mackerel (*T. declivis*) and small three-spine cardinalfish (*A. anomalus*) were the only species caught. At 0830 a replicate demersal trawl (Operation 191) on the soft ground (position 2) at 80 m in Area 2 caught 250 kg, mainly *S. papillosa*, bellowsfish (*M. scolopax*), velvet leatherjackets (*P. scaber*) and jack mackerel (*T. declivis*). After the trawl was clear we steamed to the shelf edge for a deep water (below 200 m) test deployment of the CTD to check the operation of its conductivity cell (Operation 192).

Returning to Area 1 (50 m) we repeated the demersal trawls on hard and soft bottom. Operation 193 on hard bottom caught 500 kg, mostly dragonets (*S. calauropomus*), ocean perch (*H. percoides*), jack mackerel (*T. declivis*), tiger flathead (*N. richardsoni*) and bellowsfish (*M. scolopax*). Opertation 194 on soft bottom caught 250 kg, mainly bellowsfish (*M. scolopax*), velvet leatherjackets (*P. scaber*), jack mackerel (*T. declivis*), *H. percoides*, *C. lepidoptera*, and dragonets (*S. calauropomus*).

A video transect (Operation 195) over rough habitat in Area 2 (position 3) was successful, although may have been more over hard ground then rough ground. This was followed by a MIDOC (Operation 196) that started over soft bottom (Position 1) and reached the rough bottom (Position 3) on the fifth net. Marks and catches were small; a few jack mackerel (*T. declivis*), a larval *A. anomalus*, a leptocephalus, a small squid and many ctenophores and salps. We then proceeded to Point Hicks along the 60 m depth contour.

THURSDAY 9 MAY

Arrived early in the morning off Point Hicks and commenced an acoustic transect grid of the area out to 100 m. Found an area of hard and rough ground that was videoed (Operations 197 and 198), but failed to find any trawlable hard ground, so moved back to Gabo Island and videoed along a track used by a local fisherman. Bottom had extensive ripples, but no major rocks or epifauna.

FRIDAY 10 MAY

Sampled 40 m Gabo transect (D2) with the sled (Operation 199). The epifaunal large catch of 5.5 kg was composed primarily of asteroids, *Ibacus peroni*, bryozoans (massive/branching), and solitary ascidians. The infaunal large catch of 72 kg was primarily broken shell and pebbles. The 2.4 kg of live animals was composed mostly of solitary ascidians, sponges (in sand) and bivalves. Two CTDs were completed (Operations 200 and 201). Carried out three videos (Operations 202 to 204). The first covered transect D2 which was coarse sand with large ripples and shells accumulated in the furrows. The second transect along a line provided by a local fisherman; the bottom was of hard sand and shell, with deep furrows and accumulated shell patches. The third transect covered a narrow ridge identified by a local fisherman. The substrate was hard sand and shell fragment with furrows, until close to the 2 – 5 m dropoff where sponge gardens were present. A sled along this same ridge (Operation 205) produced a large infaunal

catch (240 kg) mostly bushy sponge, encrusting and low sponge and lumpy sponge, together with some *H. percoides* and *S. papillosa*. *Helicolenus percoides* were sampled for biologicals. The epifaunal net was blown out probably due to large amounts of sponge – only 8 kg remained.

A MIDOC (Operation 206) 5 – 10 m above the ridge and following the 30 – 40 m depth range over to the gummy shark track caught 350 kg of jack mackerel (*T. declivis*) one frost fish (*Lepidopus caudatus*) and one eagle ray (*M. australis*).

SATURDAY 11 MAY

A demersal trawl (Operation 207) on transect D2 caught 300 kg, primarily stingarees (*U. cruciatus* and *U. paucimaculatus*), swell sharks (*C. laticeps*), and barracouta (*Thyrsites atun*). A second demersal trawl fished obliquely across the ridge (Operation 208). Total bottom time was 3 minutes and the trawl caught 50 kg of stingarees (*U. cruciatus* and *U. paucimaculatus*), dragonets (*S. calauropomus*) and sponge. Although the transect was oblique, the ridge area may have formed a small fraction of the sampled habitat. We returned to Area 1 Position 3 (rough ground, Operation 209) to repeat the video and obtained good footage of sponge gardens until the chain snagged and the weak link parted. We then repeated an earlier video transect (Operation 110) on transect E3 (Operation 210) and trawl marks were again found. If these tracks are the same as seen two weeks prior, then it indicates that trawl marks in this habitat may last for at least weeks. Acoustic transecting was carried out overnight.

SUNDAY 12 MAY

A sled transect was repeated to obtain live specimens of handfish (Operation 211). We then proceeded to Eden where we docked at noon – the end of leg 2.

SUMMARY

LEG 1

A broad-scale sampling program was completed along seven transects between Wilson's Promontory to the south and Bermagui to the north in five depth strata from 25 m to 200 m. Overall, 33 demersal trawls, 4 benthic sled tows, 34 CTD casts, 35 sediment samples and 14 plankton samples were completed. A total of about 8.3 tonnes of fish (~91,700 specimens) was caught. Fish assemblage structure will be determined from these data. Stomach contents were collected from a diverse range of commercial and other abundant fish species for analysis of their immediate feeding links. Tissue samples from a diverse range of fish, plankton and seafloor invertebrates were collected for laboratory analysis of stable isotopes to indicate the relative trophic levels of each organism and therefore their position in the community food web. Zooplankton communities will be analysed to determine their relationships with hydrology, water column phytoplankton pigments and nutrient levels. Analysis of phytoplankton pigments in plankton samples will determine the presence and concentrations of chlorophyll compounds and their breakdown products to identify the origin of primary production in this ecosystem, and the herbivores responsible for its decomposition. Invertebrate samples from the benthic sled

will permit description of the infaunal and epifaunal assemblages at each site. Data and biological material were collected for several other collaborative projects and for other agencies.

Acoustic data from the EK500 sounder and the RoxAnn seafloor classification software were logged continuously throughout the cruise to provide information on seafloor topography and structure. Nighttime acoustic surveys were completed over several important fishing grounds including Smithy's Corner, Ten by Ten Reef, Everard Reef, Little Horseshoe, Gabo Reef, Howe Reef and areas of the shelf break north of Eden. A new shipboard data acquisition system permitted station details, trawl catch compositions and biological data to be entered into the Oracle database and checked whilst at sea.

LEG 2

Preliminary onboard analysis of Roxanne and EK500 transect data identified different seafloor substrate types within Disaster Bay – three areas off Black Head (25 – 40 m) and three inside the Howe/Gabo Reef (80 – 90 m) – and two off Point Hicks (40 m). Habitat characteristics were assessed from samples taken with the benthic sled, towed camera array, CTD and demersal trawl (where practical) to provide data on substrate type, infaunal and epifaunal invertebrates assemblages, fish assemblages and hydrological environment. Large collections of invertebrates were identified and photographed. Characteristics of their physical structure were categorised to match the extraction of data from photographic records. About 20 hours of high quality video tape was recorded using the new towed camera array. It was successfully towed over all the habitat types surveyed, including the 'hard-ground' habitats – low-relief, undercut, rock-slab and heavy rock outcrops with steep and sizable (to 5 m) edges. Sampling of fish assemblages from the hard-ground habitats (where trawling was not possible) has been subsequently completed with traps and gillnets from commercial vessels.

PERSONNEL	LEG
Dr Alan Williams (Cruise leader/Assist. Cr. leader)	1, 2
Dr Nic Bax (Assist. Cr. leader/Cruise leader)	1, 2
Mr Mark Lewis	1
Ms Stephanie Davenport	1, 2
Mr Bruce Barker	1, 2
Mr Ross Daley	1
Dr Vicki Wadley	2
Ms Di Furlani	1
Mr Dave Terhell	1
Mr Mark Rayner	2
Mr Ron Plaschke	2
Mr Matt Sherlock	1
Mr Jeff Cordell	2
Mr Lindsay MacDonald	2
Mr Dave Evans, CSIRO Marmion	2
Ms Chris Grieve (AFMA)	1
Mr Miroslaw Ryba	1
Ms Karen Gowlett-Holmes	2
Mr Rudy Kloser	2
Ms Tristan Richards	1

SHIP'S COMPANY	
Mr Tim Bond, Master	1
Mr David Murphy, Master	2
Mr Roger Pepper, First Mate	1, 2
Mr John Boyes, 2nd Mate	1, 2
Mr Pat Gibbons, Chief Engineer	1
Mr Bob Begoni, Chief Engineer	2
Mr Rick Miller, 2nd Engineer	2
Mr Ian Murray, 2nd Engineer	1
Mr John Hinchcliffe, Electrical Engineer	1, 2
Mr Don Collins, Head Cook	1, 2
Mr Derek Mitchell, 2nd Cook	1, 2
Mr Gerry Lowe, Chief Steward	1, 2
Mr Alan Brownlie, Bosun	1, 2
Mr Tony Hearne	1, 2
Mr Mal McDougall	1
Mr Phil Lee	2
Mr Lou Jacomis	1, 2
Mr Graham McDougall	1, 2
Mr Jim Carson	1, 2
Mr Dave Whelan	2
Mr Demitrios Neos	1

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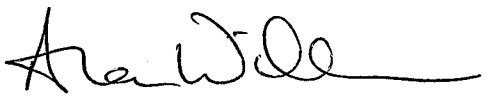
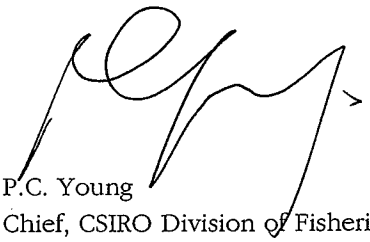


27/8/96

Alan Williams

Nic Bax
Cruise Leaders

Date:



1/9/96

P.C. Young
Chief, CSIRO Division of Fisheries

Date:

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DISTRIBUTION

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Mr John Symonds, Eden Fishing Co-op
Mr Jason Cottier, SMP, Lakes Entrance
Mr Jeff Nemec, SMP, Eden
Dr Penny Berents, AMS
Dr Doug Ferrel, NSW Fisheries Research Institute
Dr Libby Evans-Illidge, AIMS

FIGURE 1

Location of transects sampled during broad-scale phase of ecosystem study (Leg 1).

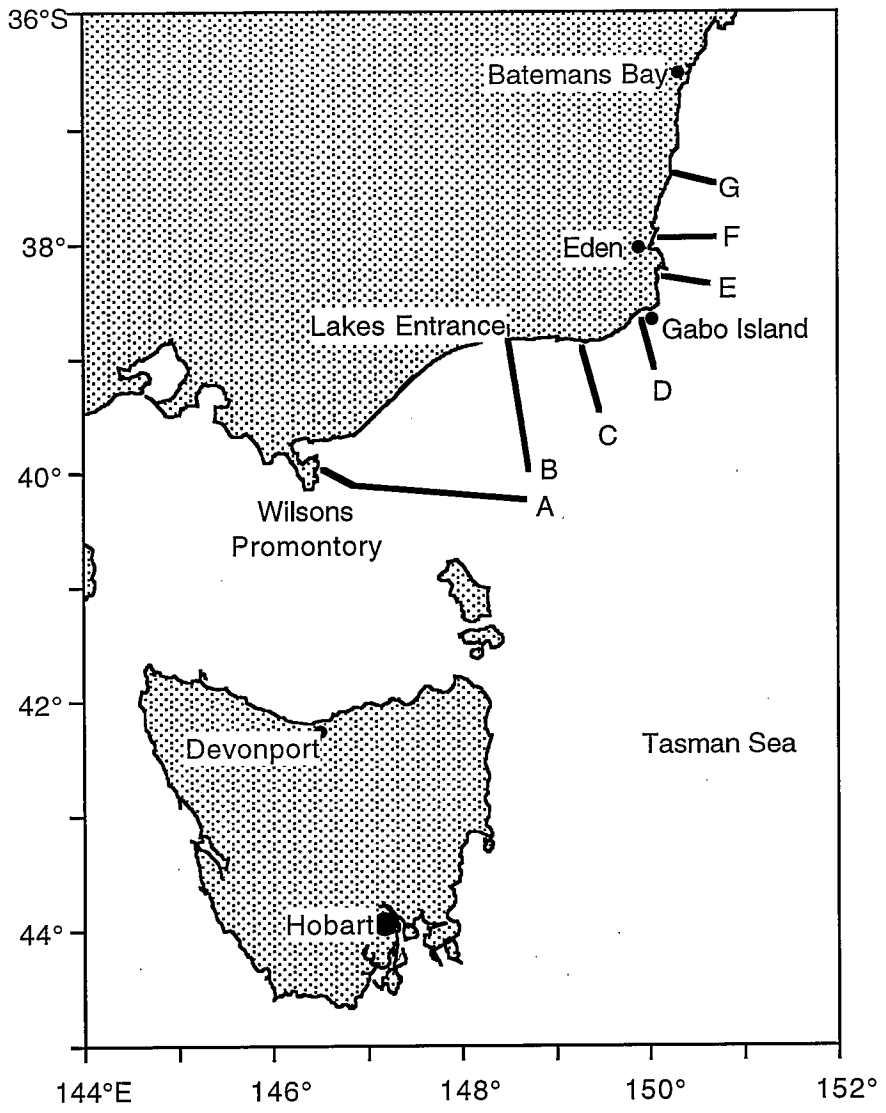

FIGURE 2

Sampling locations of intensive survey areas (Leg 2).

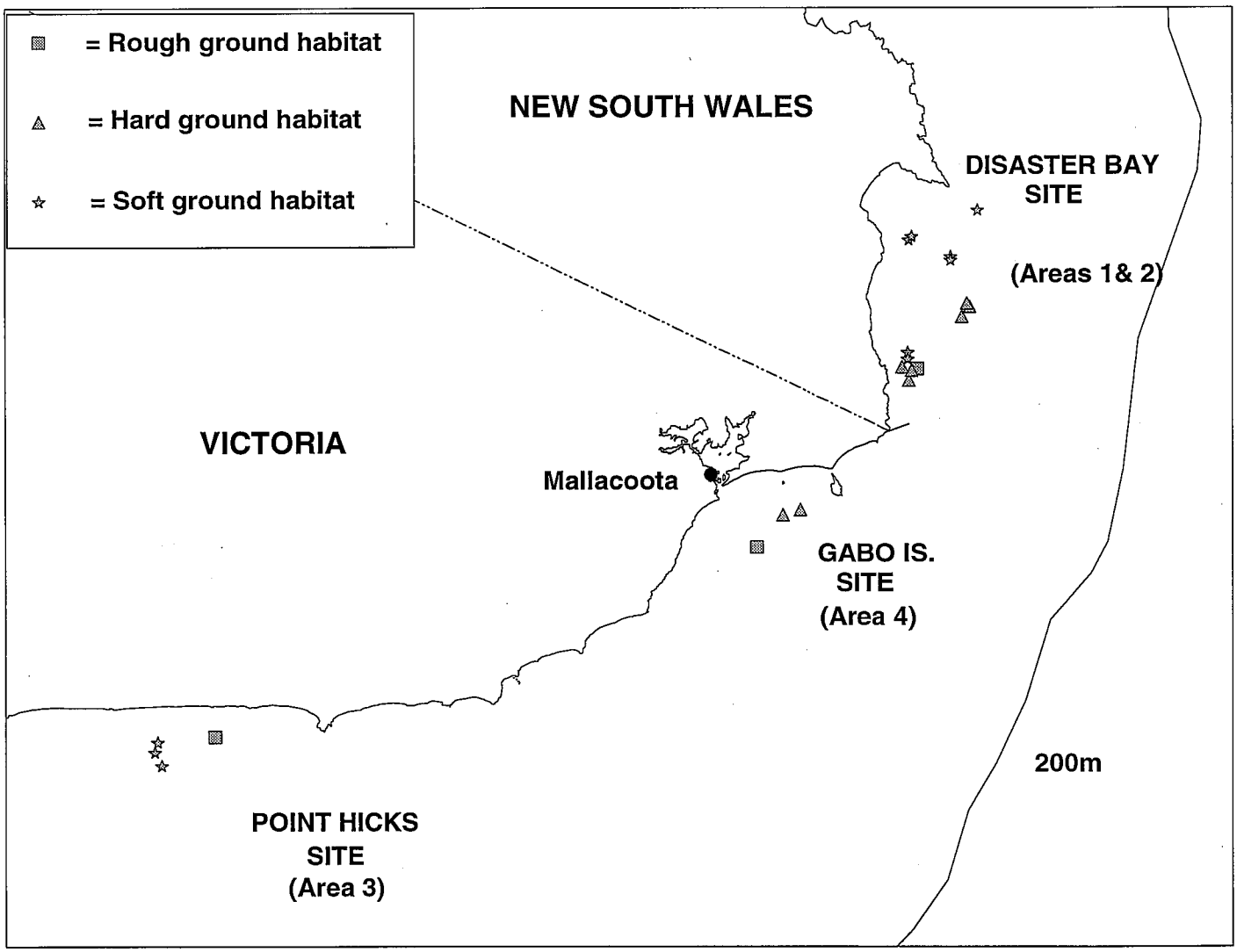

Table 1 Numbers of fish sampled for biological analysis (stomachs for direct dietary analysis, otoliths, spines and vertebrae for ageing, and muscle for stable isotope analysis of trophic position)

Species	Common name	Species code	Stomachs	Muscle	Otoliths	Vertebrae	Spines	Ref. Otolith
Allomycterus pilatus	Deepwater Burrfish	469002	7	5			7	
Anoplocapros inermis	Eastern Smooth Boxfish	466002						1
Apogonops anomalus	Three-Spined Cardinalfish	311053			7			
Arothron firmamentum	Starry Toadfish	467005	11	6	1			1
Asymbolus sp.D	Orange-spotted Catshark	15024	9	6				
Caelorinchus australis	Southern Whiptail	232001			5			1
Caelorinchus fasciatus	Banded Whiptail	232002	5	5				
Caelorinchus maurofasciatus	Faint-banded whiptail	232045						1
Caelorinchus mirus	Gargoylefish	232003	10	5	9			
Caesioperca lepidoptera	Butterfly Perch	311002	10	10				1
Caesioperca rasor	Razor perch	311003		1	1			1
Callanthias australis	Splendid Sea Perch	311055	2	3	2			
Callorhinchus milii	Elephantfish	43001	10	10		10		
Centroberyx affinis	Redfish	258003	61	36				
Cephaloscyllium laticeps	Swell shark	15001	5	5				
Chelidonichthys kumu	Red Gurnard	288001	20	17	5			1
Chlorophthalmus nigripinnis	Cucumber Fish	120001	40	35				
Cyttus australis	Silver Dory	264002	34	27				
Cyttus novaezelandiae	New Zealand Dory	264005	10	10				1
Diodon nicthemerus	Globefish	469001	13	13			10	1
Emmelichthys nitidus nitidus	Redbait	345001	10	5				
Foetorepus calauropomus	Common Stinkfish	427001	20	15				
Galeorhinus galeus	School shark	17008	3	3				
Genypterus blacodes	Pink Ling	228002	19	19				1
Helicolenus barathri	Deepwater ocean perch	287093	30	21	1			1
Helicolenus percoides	Ocean Perch	287001	122	71				
Hoplichthys haswelli	Spiny Flathead	297001	16	12	10			1
Kathetostoma canaster	Speckled Stargazer	400018	11	11	2			1
Kathetostoma laeve	Common Stargazer	400003	1	1	1			1
Lepidopus caudatus	Southern Frostfish	440002						1
Lepidorhynchus denticulatus	Toothed Whiptail	232004						1
Lepidotrigla modesta	Grooved Gurnard	288007	20	15				
Lepidotrigla mulhalli	Round-Snouted Gurnard	288008	30	20				
Lepidotrigla vanessa	Butterfly Gurnard	288003	19	10	10			1
Macroramphosus scolopax	Common Bellowsfish	279002	120	60			10	1
Meuschenia freycineti	Six-SpinedLeatherjacket	465036	6	5				1
Monacanthus sp.	Leatherjacket	465801	10	5	8			1
Myliobatis australis	Southern Eagle Ray	39001	8	8		8		
Narcine tasmaniensis	Tasmanian Numbfish	28002	7	10				
Nemadactylus douglasi	Grey Morwong	377002	7	5	7			1
Nemadactylus macropterus	Jackass Morwong	377003	22	22		15		
Neoplatycephalus richardsoni	Tiger Flathead	296001	48	42	1			
Neosebastes scorpaenoides	Ruddy Gurnard Perch	287005	18	20	10			
Pagrus auratus	Snapper	353001	4	4				2

Species	Common name	Species code	Stomachs	Muscle	Otoliths	Vertebrae	Spines	Ref. Otolith
Parequula melbournensis	Silverbelly	349001	10	10				1
Parika scaber	Velvet Leatherjacket	465005	24	18	1			
Neoplatycephalus aurimaculatus	Goldspot Flathead	296035	17	14				1
Polyprion oxygeneois	Hapuka	311006	10	7				1
Pseudocaranx dentex	White Trevally	337062	26	21	1			
Pseudophycis bachus	Red Cod	224006	10	9	10			1
Raja sp. A	Longnose Skate	31005	15	14				
Rexea solandri	Gemfish	439002	10	10	11			
Scomber australasicus	Blue Mackerel	441001	18	11	10			1
Seriolella brama	Warehou	445005						1
Seriolella punctata	Spotted Trevalla	445006	18	18				1
Sillago flindersi	Eastern School Whiting	330014	30	35				1
Squalus megalops	Cosmopolitan Spurdog	20006	18	13				
Squatina australis	Australian Angel Shark	24001	21	13				
Thyrsites atun	Barracouta	439001	15	15				1
Trachurus declivis	Jack Mackerel	337002	57	52	2			
Trachurus novaezelandiae	Yellowtail Scad	337003	10	10	10			
Urolophus bucculentus	Sandyback Stingaree	38001	5	5		5		
Urolophus cruciatus	Banded Stingaree	38002	20	15				
Urolophus paucimaculatus	Sparsely-Spotted Stingaree	38004	30	20				
Urolophus sp.B	Unidentied stingaree	38018	7	5				
Urolophus viridis	Green-Backed Stingaree	38007	25	20		10		
Zenopsis nebulosus	Mirror Dory	264003	34	23	6			1
Zeus faber	John Dory	264004	67	45	7			
TOTAL			**1295**	**981**	**138**	**48**	**27**	**33**

Table 2 Numbers of fish collected for morphometric analysis (small, medium and large specimens based on <30%, 30-70% and >70% max. length)

SPECIES	COMMON NAME	SPECIES CODE	Actual sizes collected S	M	L
Cephaloscyllum laticeps	Spotted Swellshark	15001		4	1
Asymbolus sp. D	Orange-spotted catshark	15024	1	6	5
Mustelus antarcticus	Gummy shark	17001		4	
Sphyrna zygaena	Smooth Hammerhead	19004	2	2	
Pristiophorus sp. A	Eastern sawshark	23003			1
Pristiophorus cirratus	Common sawshark	23002		1	
Squatina australis	Angel shark	24001	1	5	
Squatina sp. A	Eastern Angel shark	24004			1
Trygonorhina fasciata	Southern fiddler ray	27002		5	2
Trygonorhina sp. A	Eastern fiddler ray	27006		2	
Hypnos monopterygium	Coffin ray	28001		1	
Narcine tasmaniensis	Tasmanian numbfish	28002		5	5
Raja australis	Sydney skate	31002		3	1
Raja sp.A		31005		2	2
Raja whitleyi	Melbourne Skate	31006		1	
Pavoraja nitida	Peacock Skate	31009		2	
Urolophus bucculentus	Sandyback Stingaree	38001		1	>2<
Urolophus paucimaculatus	Sparsely-spot. Stingaree	38002		>4<	
Trygonoptera sp.B		38014		3	
Callorhinchus milli	Elephantfish	43001		5	2
Aulopus purpurissatus	Sergeant baker	117001		2	
Gonorynchus greyi	Beaked salmon	141001		1	
Asymbolus analis	Grey spotted Catshark	15027			5
Pseudophycis bachus	Red cod	224006	5		
Macruronus novaezelandiae	Blue grenadier	227001			2
Parachichthys sp.1	Sandpaperfish	255003		5	5
Cyttus australis	Silver Dory	264002			>5<
Zeus faber	John Dory	264004	1		2
Cyttus novaezelandiae	New Zealand Dory	264005	1		
Centriscops humerosus	Banded bellowsfish	279001			5
Macroramphosus scolopax	Common Bellowfish	279002	>4<		
Neosebastes scorpaenoides	Ruddy gurnard perch	287005	3	4	2
Helicolenus barathri	Ocean Perch	287008		5	5
Pterygotrigla picta	Spotted Gurnard	288005		2	1
Pterygotrigla polyommata	Latchet	288006		5	
Lepidotrigla modesta	Grooved Gurnard	288007	1		
Lepidotrigla mulhalli	Round-snouted Gurnard	288008	2		
Neoplatycephalus richardsoni	Tiger Flathead	296001	3		>4<
P.caeruleopunctatus	Blue-spotted Flathead	296007			2
Platycephalus bassensis	Sand flathead	296033		2	3
Platycephalus aurimaculatus	Gold-spot flathead	296035		5	1
Platycephalus longispinis	Long-spined Flathead	296036		>4<	
Caesioperca lepidoptera	Butterfly perch	311002	3	5	5

Apogonops anomalus	3-spined Cardinalfish	311053	5	5	5
Sillago flindersi	Eastern School Whiting	330014		1	
Trachurus declivis	Jack Mackerel	337002			2
Trachurus novaezelandiae	Yellowtail scad	337003	5	5	
Pseudocaranx dentex	White Trevally	337062			1
Emmelichthis nitidus	Redbait	345001		>4<	>3<
Parequula melbournensis	Silverbelly	349001		5	1
Pagrus auratus	Snapper	353001	5	4	1
Paristiopterus labiosus	Giant boarfish	367002	5	2	
Pentaceropsis recurvirostris	Long snout boarfish	367003		6	
Zanclistius elevatus	Long finned boarfish	367005	1	5	1
Nemadactylus douglasi	Blue morwong	377002	4/4	5/5	0/5
Nemadactylus macropterus	Jackass Morwong	377003		4	
Parapercis allporti	Barred grubfish	390001		5	1
Gnathagnus innotabilis	Bulldog stargazer	400001			1
Kathetostoma laeve	Common stargazer	400003	1	5	
Kathetostoma canaster	Speckled Stargazer	400018		1	
Foetoperus calauropomus	Common Stinkfish	427001	2		
Thyrsites atun	Barracouta	439001			4
Scomber australasicus	Blue mackerel	441001		5	5
Serionella brama	Warehou	445005		4	
Serionella punctata	Spotted Trevalla	445006	5		
Lophonectes gallus	Crested Flounder	460001	5	5	1
Pseudorhombus jenynsii	Smalltooth Flounder	460002		>2<	
Ammotretis rostratus	Long-snout flounder	461001		5	4
Acanthaluteres vittager	Toothbrush leatherjacket	465002		4	
Eubalichthys mosaicum	Mosaic Leatherjacket	465003	5	5	3
Parika scaber	Velvet Leatherjacket	465005	1		
Nelusetta ayraudi	Chinaman leatherjacket	465006	1		
Meuschenia freycineti	Sixspine Leatherjacket	465036	1	>5<	>5<
Anoplocapros inermis	Eastern smooth boxfish	466002		5	
Aracana aurita	Shaw's cowfish	466003		2	5
Omegophora armilla	Ringed toadfish	467002		5	1
Arothron firmamentum	Starry toadfish	467005			5

Appendix 1 List of stations sampled, Cruise SS02/96.

Operation number	Date	Operation name	Transect Name*	Depth code**	Start Latitude	Start Longtitude
1	16-Apr-96	Benthic sled			-42.9217	148.0950
2	16-Apr-96	Benthic sled			-42.9067	148.1033
3	16-Apr-96	Market Trawl	Darcey's Patch		-42.7117	148.4150
4	16-Apr-96	Benthic sled	Darcey's Patch		-42.6967	148.4067
5	16-Apr-96	CTD Cast 1	Darcey's Patch		-42.6683	148.4383
6	17-Apr-96	Midoc Sampling	East of Flinders Is.	3	-39.6200	148.5650
7	17-Apr-96	Market Trawl	B	5	-38.5700	148.3867
8	17-Apr-96	CTD Cast 2	B	5	-38.5467	148.4083
9	17-Apr-96	Sediment Grab	B	5	-38.5333	148.4050
10	18-Apr-96	Market Trawl	B	4	-38.6500	148.3317
11	18-Apr-96	CTD Cast 3	B	4	-38.6017	148.3633
11	18-Apr-96	CTD Cast 3	B	4	-38.6017	148.3633
12	18-Apr-96	Sediment Grab	B	4	-38.5983	148.3717
13	18-Apr-96	Market Trawl	B	3	-38.6917	148.3017
14	18-Apr-96	Market Trawl	A	1	-38.9817	146.5300
15	18-Apr-96	Sediment Grab	A	1	-38.9717	146.5500
16	18-Apr-96	CTD Cast 4	A	1	-38.9700	146.5500
17	19-Apr-96	Bongo Net	A	2	-39.0217	146.5850
18	19-Apr-96	CTD Cast 5	A	2	-38.9983	146.5950
19	19-Apr-96	Plankton Sample	A	2	-38.9983	146.5917
20	19-Apr-96	Sediment Grab	A	2	-38.9983	146.5917
21	19-Apr-96	Market Trawl	A	2	-38.9800	146.6083
22	19-Apr-96	Market Trawl	B	1	-37.8600	148.2113
23	19-Apr-96	CTD Cast 6	B	1	-37.8667	148.2000
24	19-Apr-96	Sediment Grab	B	2	-37.8633	148.2067
25	20-Apr-96	CTD Cast 7	B	2	-37.9233	148.2550
26	20-Apr-96	Sediment Grab	B	2	-37.9200	148.2567
27	20-Apr-96	Plankton Sample	B	2	-37.9200	148.2583
28	20-Apr-96	Bongo Net	B	2	-37.9200	148.2600
29	20-Apr-96	Market Trawl	B	2	-37.9550	148.2317
30	20-Apr-96	Video Transect	B	2	-37.9400	148.2400
31	20-Apr-96	Market Trawl	A	3	-38.9567	148.3517
32	20-Apr-96	CTD Cast 8	A	3	-38.9533	148.3283
33	20-Apr-96	Sediment Grab	A	3	-38.9483	148.3233
34	21-Apr-96	Market Trawl	A	4	-38.9933	148.5133
35	21-Apr-96	Market Trawl	A	4	-38.9867	148.4983
36	21-Apr-96	CTD Cast 9	A	4	-38.9933	148.5200
37	21-Apr-96	Sediment Grab	A	4	-38.9900	148.5234
39	21-Apr-96	Plankton Sample	A	5	-38.9217	148.4817
40	21-Apr-96	Sediment Grab	A	5	-38.9217	148.4783
41	21-Apr-96	CTD Cast 10	A	5	-38.9183	148.4667
42	21-Apr-96	Midoc Sampling	A	5	-38.8983	148.4567
43	21-Apr-96	Market Trawl	C	5	-38.2017	149.2650
44	21-Apr-96	CTD Cast 11	C	5	-38.1817	149.2883
45	21-Apr-96	Sediment Grab	C	5	-38.1733	149.2967
46	21-Apr-96	Plankton Sample	C	5	-38.1700	149.3000
47	22-Apr-96	Bongo Net	C	5	-38.1617	149.3083
48	22-Apr-96	Market Trawl	C	4	-38.0433	149.1450
49	22-Apr-96	Sediment Grab	C	4	-38.0300	149.1217
50	22-Apr-96	CTD Cast 12	C	4	-38.0300	149.1233
51	22-Apr-96	Market Trawl	C	3	-37.9050	149.0650
52	22-Apr-96	CTD Cast 13	C	3	-37.9083	149.0417
53	22-Apr-96	Sediment Grab	C	3	-37.9067	149.0433
54	22-Apr-96	Midoc Sampling	C	5	-38.1750	149.2633
55	22-Apr-96	Market Trawl	C	2	-37.8300	149.0950
56	22-Apr-96	CTD Cast 14	C	2	-37.8217	149.1000
57	22-Apr-96	Sediment Grab	C	2	-37.8167	149.1133
58	22-Apr-96	Plankton Sample	C	2	-37.8200	149.1100
59	22-Apr-96	Bongo Net	C	2	-37.8150	149.1133
60	23-Apr-96	Market Trawl	C	1	-37.8083	149.0300
61	23-Apr-96	CTD Cast 15	C	1	-37.8133	149.0300
62	23-Apr-96	Sediment Grab	C	1	-37.8167	149.0333
63	23-Apr-96	Benthic sled	C	1	-37.8050	149.0083
64	23-Apr-96	Video Transect	C	2	-37.8383	149.0750
65	23-Apr-96	Video Transect	C	2	-37.8250	149.0667
66	23-Apr-96	Video Transect	C	2	-37.8150	149.0700
67	23-Apr-96	Market Trawl	D	5	-37.9483	150.0317
68	23-Apr-96	CTD Cast 16	D	5	-37.9533	150.0300
69	23-Apr-96	Sediment Grab	D	5	-37.9667	150.0167
70	23-Apr-96	Plankton Sample	D	5	-37.9683	150.0150
71	24-Apr-96	Bongo Net	D	5	-37.9717	150.0167
72	24-Apr-96	Market Trawl	D	4	-37.8100	149.9017
73	24-Apr-96	CTD Cast 17	D	4	-37.8283	149.8750
74	24-Apr-96	Sediment Grab	D	4	-37.8283	149.8783
75	24-Apr-96	Market Trawl	D	3	-37.6067	149.9183
76	24-Apr-96	CTD Cast 18	D	3	-37.6083	149.9133

Operation number	Date	Operation name	Transect Name*	Depth code**	Start Latitude	Start Longtitude
77	24-Apr-96	Sediment Grab	D	3	-37.6100	149.9150
78	24-Apr-96	Market Trawl	D	2	-37.6067	149.8400
79	25-Apr-96	CTD Cast 19	D	2	-37.5783	149.8700
80	25-Apr-96	Sediment Grab	D	2	-37.5783	149.8733
81	25-Apr-96	Plankton Sample	D	2	-37.5783	149.8750
82	25-Apr-96	Market Trawl	D	2	-37.5783	149.8717
83	25-Apr-96	Bongo Net	D	2	-37.5833	149.8517
84	25-Apr-96	Market Trawl	D	1	-37.5833	149.8033
85	25-Apr-96	CTD Cast 20	D	1	-37.5883	149.8100
86	25-Apr-96	Sediment Grab	D	1	-37.5883	149.8100
87	25-Apr-96	Midoc Sampling	D	Shallow	-37.8817	150.0417
88	25-Apr-96	Market Trawl	E	3	-37.2967	150.0783
89	25-Apr-96	CTD Cast 21	E	3	-37.2817	150.0717
90	25-Apr-96	Sediment Grab	E	3	-37.2800	150.0717
91	25-Apr-96	Market Trawl	E	2	-37.2967	150.0300
92	26-Apr-96	CTD Cast 22	E	2	-37.3233	150.0133
93	26-Apr-96	Sediment Grab	E	2	-37.3233	150.0117
94	26-Apr-96	Plankton Sample	E	2	-37.3233	150.0100
95	26-Apr-96	Bongo Net	E	2	-37.3083	150.0200
96	26-Apr-96	Market Trawl	E	1	-37.2683	150.0033
97	26-Apr-96	CTD Cast 23	E	1	-37.3000	149.9900
98	26-Apr-96	Sediment Grab	D	1	-37.3017	149.9883
99	26-Apr-96	Benthic sled	D	2	-37.3017	150.0317
100	26-Apr-96	Midoc Sampling	D	Shallow	-37.3267	150.0767
101	26-Apr-96	Market Trawl	E	5	-37.4183	150.2900
102	26-Apr-96	Market Trawl	E	5	-37.3917	150.2983
103	26-Apr-96	CTD Cast 24	E	5	-37.4200	150.2917
104	26-Apr-96	Sediment Grab	E	5	-37.4083	150.2950
105	27-Apr-96	Plankton Sample	E	5	-37.4033	150.2967
106	27-Apr-96	Bongo Net	E	5	-37.3983	150.2950
107	27-Apr-96	Market Trawl	E	4	-37.3117	150.2033
108	27-Apr-96	CTD Cast 25	E	4	-37.3167	150.1900
109	27-Apr-96	Sediment Grab	E	4	-37.3100	150.1900
110	27-Apr-96	Video Transect	E	3	-37.3333	150.0517
111	27-Apr-96	Video Transect	E	2	-37.3167	150.0000
112	27-Apr-96	Video Transect	E	2	-37.3133	150.0033
113	27-Apr-96	Market Trawl	F	2	-36.9043	149.9672
114	28-Apr-96	Market Trawl	G	5	-36.4933	150.2900
115	28-Apr-96	CTD Cast 26	G	5	-36.5350	150.2967
116	28-Apr-96	Sediment Grab	G	5	-36.5317	150.2917
117	28-Apr-96	Plankton Sample	G	5	-36.5283	150.2883
118	28-Apr-96	Bongo Net	G	5	-36.5150	150.2900
119	28-Apr-96	Market Trawl	G	4	-36.4700	150.2367
120	28-Apr-96	Sediment Grab	G	4	-36.4317	150.2400
121	28-Apr-96	CTD Cast 27	G	4	-36.4317	150.2417
122	28-Apr-96	Midoc Sampling	G	Shelf break	-36.4533	150.2933
123	28-Apr-96	Market Trawl	G	2	-36.3700	150.1516
124	28-Apr-96	CTD Cast 28	G	2	-36.3650	150.1500
125	28-Apr-96	Sediment Grab	G	2	-36.3617	150.1517
126	28-Apr-96	Plankton Sample	G	2	-36.3617	150.1517
127	28-Apr-96	Bongo Net	G	2	-36.3617	150.1633
128	28-Apr-96	Market Trawl	G	3	-36.3867	150.1800
130	29-Apr-96	Sediment Grab	G	3	-36.4233	150.1667
131	29-Apr-96	Market Trawl	G	1	-36.3467	150.1317
132	29-Apr-96	CTD Cast 30	G	1	-36.3733	150.1117
133	29-Apr-96	Sediment Grab	G	1	-36.3750	150.1100
134	29-Apr-96	Benthic sled	G	2	-36.3700	150.1450
135	29-Apr-96	Benthic sled	G	2	-36.3967	150.1400
136	29-Apr-96	Benthic sled	G	2	-36.3900	150.1317
137	29-Apr-96	Benthic sled	G	2	-36.3783	150.1417
138	29-Apr-96	Benthic sled	F	2	-34.9277	149.9667
139	29-Apr-96	Benthic sled	F	2	-36.9208	149.9650
140	29-Apr-96	CTD Cast 31	F	2	-36.9150	149.9683
141	29-Apr-96	Sediment Grab	F	2	-36.9150	149.9700
142	29-Apr-96	Plankton Sample	F	2	-36.9150	149.9700
143	29-Apr-96	Bongo Net	F	2	-36.9150	149.9733
144	29-Apr-96	CTD Cast 32	F	1	-36.9250	149.9467
145	29-Apr-96	Sediment Grab	F	1	-36.9267	149.9483
146	30-Apr-96	Market Trawl	F	3	-36.9667	150.0517
147	30-Apr-96	CTD Cast 33	F	3	-36.9333	150.0650
148	30-Apr-96	Sediment Grab	F	3	-36.9317	150.0650
149	30-Apr-96	Market Trawl	F	5	-36.8583	150.3083
150	30-Apr-96	CTD Cast 34	F	5	-36.8483	150.3167
151	30-Apr-96	Sediment Grab	F	5	-36.8500	150.3117
152	30-Apr-96	Plankton Sample	F	5	-36.8500	150.3133
153	30-Apr-96	Bongo Net	F	5	-36.8433	150.3200
154	30-Apr-96	CTD Cast 35	F	4	-36.9633	150.2300
155	30-Apr-96	Midoc Sampling	F	4	-36.8800	150.3133
156	30-Apr-96	Market Trawl	F	4	-36.9567	150.2100
157	30-Apr-96	Sediment Grab	F	4	-36.9783	150.2033
158	30-Apr-96	Midoc Sampling	Test		-37.0383	150.1400

Operation number	Date	Operation name	Transect Name*	Depth code**	Start Latitude	Start Longtitude
159	3-May-96	Benthic sled	Area 1 50 m	1	-37.8167	149.2783
160	3-May-96	Video Transect	Area 1 50 m	1	-37.4283	149.9983
161	2-May-96	CTD Cast 36	Area 1 25 m	1	-37.4167	149.9633
162	3-May-96	Video Transect	Area 1	2	-37.4467	150.0033
163	3-May-96	Video Transect	Area 1	3	-37.4350	149.9983
164	3-May-96	Benthic sled	Area 1	2	-37.4750	150.0100
165	3-May-96	Video Transect	Area 1 40 m	2	-37.4433	149.9917
166	3-May-96	CTD Cast 37	Area 1, 50m	2	-37.4583	150.0000
167	3-May-96	Video Transect	Area 1, 50 m	2	-37.4567	150.0000
168	4-May-96	Market Trawl	Area 1 40 m	1	-37.3817	149.9900
169	4-May-96	Market Trawl	Area 1	2	-37.4550	150.0133
170	4-May-96	CTD Cast 38	Area 1 60m	3	-37.4217	150.0033
171	4-May-96	CTD Cast 39	Area 1 80m	3	-37.4183	150.0467
172	4-May-96	Market Trawl	Area 1 50m	2	-37.4433	149.9983
173	5-May-96	Benthic sled	Area 2 80 m	1	-37.3517	150.0750
174	5-May-96	Benthic sled	Area 2 80 m	1	-37.3617	150.0733
175	5-May-96	Benthic sled	Area 2 80 m	1	-37.3683	150.0683
176	5-May-96	Benthic sled	Area 1 80 m	1	-37.3983	150.0583
177	6-May-96	Video Transect	Area 2 80 m	1	-37.3417	150.0717
178	6-May-96	Benthic sled	Area 2	2	-37.3483	150.0700
179	6-May-96	Video Transect	Area 2	2	-37.2867	150.0850
180	6-May-96	CTD Cast 40	Area 2	2	-37.4117	150.0967
181	6-May-96	CTD Cast 41	Gabo reef 100m		-37.3983	150.1650
182	6-May-96	Video Transect	Area 2	1	-37.3800	150.0717
183	6-May-96	Video Transect	Area 2 Soft	1	-37.3933	150.0650
184	6-May-96	Video Transect	Area 1 80 m	2	-37.3117	150.0800
185	6-May-96	Benthic sled	Area 2 80 m	3	-37.3633	150.0983
186	7-May-96	Market Trawl	Area 2 80 m	1	-37.3100	150.0950
187	7-May-96	Market Trawl	Area 2 soft	2	-37.4017	150.0417
188	7-May-96	Market Trawl	Area2 hard	3	-37.3867	150.0883
189	7-May-96	Market Trawl	Area 2 hard	1	-37.3333	150.1117
190	7-May-96	Midoc Sampling	Area 2 80 m	All	-37.3950	150.0350
191	7-May-96	Market Trawl	Area 2 80 m	2	-37.4100	150.0383
192	8-May-96	CTD Cast 42	Test		-37.3717	150.4117
193	8-May-96	Market Trawl	Area 1	2	-37.4567	150.0067
194	8-May-96	Market Trawl	Area 1 soft	1	-37.3950	149.9878
195	8-May-96	Video Transect	Area 2	3	-37.3833	150.0750
196	8-May-96	Midoc Sampling	Area 1	N to S	-37.3783	149.9950
197	9-May-96	Video Transect	Area 3 28 m	1	-37.8100	149.1400
199	9-May-96	Benthic sled	Area 4 36m	2	-37.5950	149.8733
202	9-May-96	Video Transect	Area 4 40 m	1	-37.5850	149.8650
203	9-May-96	Video Transect	Area 4 38 m	2	-37.5900	149.8433
204	10-May-96	Video Transect	Area 4	3	-37.6217	149.8117
205	10-May-96	Benthic sled	Area 4	3	-37.5983	149.8567
206	10-May-96	Midoc Sampling	Area 4	3	-37.5783	149.8800
207	10-May-96	Market Trawl	Area 4 40 m	1	-37.5867	149.8600
208	10-May-96	Market Trawl	Area 4 55 m	3	-37.6000	149.8517
209	11-May-96	Video Transect	Area 1 rough	3	-37.4450	150.0100
210	11-May-96	Video Transect	D	3	-37.3367	150.0517

*A= Wilsons Promontory; B= Lakes Entrance; C=Pt. Hicks; D= Gabo; E= Disaster Bay; F= Merimbula; G= Bermagui

**1= 25 m, 2= 40 m, 3= 80 m, 4= 120 m, 5= 200 m