CSIRO MARINE LABORATORIES
Division of Fisheries Research

1991 Research Vessel Programme

Report

F.R.V. Southern Surveyor, Cruise SS2/91 Leg 1

Staff

T Koslow (Scientist-in-Charge)
C Bulman
R Kloser
A Graham
B Griffiths
P Bonham
D McKenzie
G Critchley
J Cordell
P Adams (Division of Oceanography) – to Week I
C Crossley

Duration

Departed Hobart 1000 h 26 June 1991
Arrive Hobart 1600 h 16 July 1991

Locality

South and east coasts of Tasmania, around Maatsuyker Island and Flinders Island.

Cruise Objectives

1. To determine the vertical distribution throughout the diel cycle of zooplankton, midwater and demersal fishes at two sites in the midslope region off the Tasmanian coast using time series of 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.

Preliminary - internal use only !

CSIRO MARINE LABORATORIES
Division of Fisheries Research

1991 Research Vessel Programme

F.R.V. Southern Surveyor, Cruise SS2/91 Leg 1

Staff

T Koslow (Scientist-in-Charge)
C Bulman
R Kloser
A Graham
B Griffiths
P Bonham
D McKenzie
G Critchley
J Cordell
P Adams (Division of Oceanography) – to Week I
C Crossley

Duration

Departed Hobart 1000 h 26 June 1991
Arrive Hobart 1600 h 16 July 1991

Locality

South and east coasts of Tasmania, around Maatsuyker Island and Flinders Island.

Cruise Objectives

1. To determine the vertical distribution throughout the diel cycle of zooplankton, midwater and demersal fishes at two sites in the midslope region off the Tasmanian coast using time series of 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 cross-slope CTD transects to determine water mass structure at the sites.

4. To measure zooplankton biomass, primary productivity and the concentration of chlorophyll *a* at the sites and on the cross-shelf transects.

5. To investigate currents at one site by deploying moored current meters in the vicinity.

6. To investigate the flux of detritus through the water column using sediment traps on the current meter moorings.

7. To investigate the use of acoustics in conjunction with net sampling to estimate biomass fluxes through the water column.

8. To carry out measurements of acoustic absorption with depth.

9. To obtain qualitative samples of benthic macroinvertebrates at the two sites using a beam trawl.

10. To sample the vertical distribution of orange roughy eggs using the EZ net.

Narrative

Left dock at 1000, 26 June. Winds reported 60 kt off Maatsuyker, so we steamed to our first site at ~39° 12' - 14 ' NE of Flinders Is. Rudy reported that there was no response from the new transducer in the moonpool. It had not been tested after installation, which had been just a day prior to sailing.

A series of malfunctions dominated the 27 June. We began by deciding to test the CTD and whether any of the bottles leaked by making a cast to 1000 m (the salinity minimum). The remote control for the winch malfunctioned. So we decided next to test the new spooling for the towed vehicle cable, which had been set to a fixed spooling rate of 36 turns/lay. However, we were only able to pack 35 turns/lay. Much of the afternoon was spent attempting to rectify the situation, without success. Here a functioning spooling system using variable spooling was replaced and not tested prior to departure. We next put out the CTD without using the remote control. First, the readout in the winch control area was not set properly, so that it read 1000 m wire out when only 400 m wire were out. Next, none of the bottles fired.

Demersal trawling began successfully on 28 June at around midnight and proceeded without event for 24 hr, following one aborted trawl due to doors crossing because improperly set. Catches were generally substantial (on the order of hundreds of kilos) and were dominated consistently by sharks.

The switchover to the pelagic trawl (Engels 308) took all night. Pelagic towing began at 0800 in the morning (29 June). On the second shot, the doors crossed over in retrieving the gear, the warps became tangled and required cutting & re-splicing, and it appeared that the net was improperly set up. This took us into the afternoon. Seeing that there were a number of hours required for net repair, we held a cruise meeting & decided to begin a CTD transect. We steamed 15 m to the

end of a transect crossing the sampling site. We put out the CTD for a test cast with some trepidation - the wind had risen now to 35-40 kt, and there was no remote winch control, so the winchman had to sit out in the weather and learn the depth through a radio link with someone in the remote winch control. The CTD failed the test - the bottles failed to fire at depth (though they worked on deck). I then learned that the winches for the net drum were acting up, being activated when other winches were started. The chief engineer felt that he needed some time in daylight and without any sampling activity requiring the use of winches in order to determine the nature of the problem. Considering our inability to continue sampling in any case due to weather and gear problems (i.e. no CTD or pelagic trawl), we headed for the lee of Flinders Is.

By early afternoon (30 June), the engineers had fixed the remote control for the CTD winch. Roger Pepper had strung out the midwater trawl and discovered that a crossover in the way it was set up, and had remedied that. Jeff Cordell had worked on the CTD stepper motor and polished a rough cam shaft. We headed out from the lee of Flinders to the nearshore station of the S CTD transect. The CTD worked without incident, and by midnight ~4 stations had been completed.

On 1 July, the CTD was again reporting that it was misfiring on the deep casts. Bottle sampling was restricted to 500 m. The first time that the misfiring occurred, the cast was re-done, resulting in a 6 hr CTD station. After that, through use of the reversing thermometers, we were able to isolate misfirings to a single bottle. Generally the CTD work proceeded smoothly, but in the end, the first transect took 30 hr rather than 18-20 originally planned. We are now running critically short of time, so the northern CTD transect was eliminated. Second CTD transect completed just before midnight (2 July), and we steamed to station to carry out the midwater trawling.

On 3 July, midwater trawling proceeded smoothly, interspersed with CTD casts for productivity work. The CTD casts took more time than expected, so it was not possible to complete the four expected midwater casts during the short daylight hours. Toward evening of 4 July, the weather picked up from Force 4/5 to Force 6/7 by 5 July. Midwater trawling program completed in evening.

EZ net put in the water ~2000 hr. Weather conditions picked up on 6 July with 35-40 kt winds in early morning. Since there was only time for a single EZ cast, which would not be possible through the day, we headed south toward St. Helens. EZ net cast carried out successfully just E of St. Helens to examine the vertical distribution of roughy eggs. Rudy Kloser carried out a transect over the hill following completion of the EZ cast.

In Hobart until 1400 hr (8 July). Transducer removed from moonpool & break in cable discovered, which will be fixed by next port call. Gauges delivered (but with wrong threads) to determine cause of

winch problem. Fixed spooling gear replaced with variable spooling on towed-body winch. IYGPT trawl delivered for midwater trawling, and new stepper motors for rosette brought on.

Passing beyond the shelf on our way to Pedra Branca, the slope descended steeply and ruggedly to 1100 m where a plain several miles wide was found behind P.B. We deployed the mooring there without incident, surveyed the area, which seemed suitable for trawling, though deeper than optimal (~1150 m). Weather was fine and a front was forecast to move in, so to take advantage of the conditions, the EZ net was deployed.

9 July: The 0-100m net failed to fire; the next net tore at a weak point. Only 2 of 6 bottles on the CTD fired at 200 m despite the replacement stepper motor. A part of the EZ net was cracked and required welding. The daytime EZ net cast went well giving 24 hr of plankton sampling. In the evening, we began midwater trawling combined with CTD casts for productivity measurements. We changed over to the IYGPT trawl.

10 July: Midwater trawling continued without incident, and 8 stations were completed in the 24 hr. Following a CTD station, demersal trawling began in the early evening. Wind and sea conditions were picking up to Force 7. We attempted a first trawl over the western peak of Pedra Branca but got hung up after about 10 minutes.

11 July: Trawling was discontinued from midnight until morning due to weather conditions. Trawling continued without significant incident in the morning on some good ground at ~1000 m. Catches were good and consistent, with roughy dominant.

12 July: Trawling continued without problem until morning. On the last: tow, over the same ground and with sea conditions fine, the net hooked up. After 2 hr. In the end, the trawl warp broke at the winch. One door, the headline with Scanmar gear, and the cod end were recovered; one door with its Scanmar transducer, 950 m warp, and most of the net were lost. We began the CTD work, which proceeded smoothly throughout the day.

13 July: CTD sampling continued. Weather sunny and calm. The power supply for the fluorometer failed and cannot be repaired.

14 July: Problems with the exhaust/muffler system on the main engine sent smoke into the engine room shortly after midnight, and it was not repaired until 0630. Sampling proceeded smoothly, except the Teflon bulb on the light sensor on the Seacat profiler did not return from one cast. Second CTD profile completed in the evening, and the EZ net was deployed without problem at 2200 around the Pedra Branca study site.

15 July: EZ net retrieved and redeployed at 0830. Midway through the sampling steerage was lost due to a malfunctioning gyro. Then while steaming back to station to re-deploy the gear, an injector on the main engine needed replacement. However we managed to get the net

back in the water by 1500. We then steamed to 30 nm offshore of the shelf break to begin the 3rd CTD transect. Last CTD station completed at 1100 hr (16 July). One Niskin bottle and 1 thermometer were broken during the night. Docked in Hobart, 1600.

Results

1) Due to weather conditions and lack of time, only 1 night-time EZ net cast was carried out from the surface to 900 m (100 m strata) over off Flinders Is.; 4 casts over 48 hr were carried out off Pedra Branca to examine the diel vertical distribution of zooplankton, . 22 midwater trawls over ~48 hr and stratified by 250 m depth intervals were carried out with an Engels 308 net off Flinders Is., and 8 midwater trawls over 24 hr were carried out with an IYGPT net off Pedra Branca to describe the diel vertical distribution of midwater fishes and macroplankton. 7 and demersal trawls were carried out with the Engels net over 24 hr periods at Flinders Is. and Pedra Branca, respectively.

2) Stomachs were collected from the species listed below from the demersal trawls. Specimens were preserved as well from midwater trawls and plankton samples for gut content analysis.

Flinders Island

Species	**Number of samples**
Deania calcea	20
Centroscymnus crepidater	14
C. owstoni	39
Diastobranchus capensis	11
Mora moro	1
Halargyreus johnstonni	11
Lepidion microcephalus	13
Coelorinchus innotabilis	6
C. kaiyomaru	1
Coryphaenoides serrulatus	79
C. subserrulatus	131
Hoplostethus atlanticus	153
Neocyttus rhomboidalis	6
Pseudocyttus maculatus	8
Epigonus lenimen	28
Total	521*

Pedra Branca

Species	**Number of samples**
Deania calcea	16
Centroscymnus crepidater	47
C. owstoni	3
Etmopterus baxteri	64
Diastobranchus capensis	43
Alepocephalus sp. 1	71
Halargyreus johnstonni	1
Lepidion microcephalus	4
Macrourus carinata	1
Coryphaenoides serrulatus	3
C. subserrulatus	104
Coelorinchus kaiyomaru	16
Hoplostethus atlanticus	140
Neocyttus rhomboidalis	4
Pseudocyttus maculatus	4
Allocyttus verrucosus	10
Oreosoma atlanticum	1
Epigonus lenimen	2
Total	534

3-4) Two cross-shelf CTD/productivity transects, and a 24 hour productivity/CTD station (6 casts) were completed east of Flinders Island. Three cross-shelf transects and a 24 hour productivity/CTD station were completed in the Pedra Blanca area. Estimates of column chlorophyll at both sampling sites were hampered by failure of the power supply in the SeaTech fluorometer, and light profiles at the southern site were curtailed by the loss of the light sensor head.

The 24 hour station at Flinders Island showed two production peaks, indicating a diel periodicity in primary production. There was nearly constant production with depth (about 0.35 mg carbon (mg Chl *a)* hr–1), reflecting the very deep mixed layer (>150 m) at the trawl site. At Pedra Blanca, there was a single production peak in the 24 hour period (at 0830) with a minimum at 1930 hours. The thermocline depth varied between about 60 and 90 m during the sampling period, and this is reflected in the variation of production with depth. In general, production here was slightly lower (about 0.30 mg carbon (mg Chl *a*) hr–1) compared with Flinders Island.

Drop net samples were taken at all CTD stations on the transects and at the 24 hour stations.

5-6) A current meter mooring was deployed off Pedra Branca. Sediment traps were not available so were not deployed with the mooring.

There is considerable analysis of nutrient and chlorophyll samples, particle size data, and CTD data still to be completed. This was the first real test of the oceanographic capabilities of Southern Surveyor, and the results were good. The spooling on the CTD winch needs to be sorted out, and the A-frame travel speed needs to be increased, but otherwise work went very well. The CTD data will be processed both by the new software, and the existing processing system to facilitate a comparison between the two systems for ease of use and efficiency. It is anticipated that this comparison will take between two and three months.

7) Acoustic measurements were recorded during net tows.

8) Measurements of acoustic absorption with depth were postponed to leg 2.

9) There was inadequate time to deploy the beam trawl.

10) The vertical distribution of orange roughy eggs was investigated with one set of EZ net tows on this leg of the cruise and was continued on the following leg.

Equipment Lost or Damaged

Two thermometers broken
One niskin bottle cracked
Power supply for SeaTech fluorometer blew up
Sensor head of Biospherical Instruments PAR sensor lost

Ship problems

1) Computerized data logging

This is not so much an equipment defect as an issue related to the further development of the vessel as a research platform. It was apparent during this cruise that present methods of handling much of our fishery data - a rather ad hoc mix of computer files and pieces of paper - are both inefficient and fraught with potential for data loss and confusion. It will be a considerable improvement when basic stations log data are entered on computer from the wheelhouse and are then accessible from terminals in other labs. However, several issues should be addressed:

i: All forms when completed must be printed out so that there is a hard-copy of all data entered.

ii: Attention should be given to computerizing the fish lab area. Routine catch composition data should be directly entered into the computer along with other biological data (e.g. sex, gonad staging,

etc). A printer should be available to print out data as it is entered both to provide a hard copy and so the operator may verify the data as it is input. Data from electronic balances should directly enter the computer much like data from the fish-measuring boards.

Proper completion of this overall task will require further support for software development.

2) Winch controls

The sensitivity of the winch controls continues to pose a hazardous situation to personnel and equipment. These concerns are not hypothetical. Early in the cruise, when the CTD was being lowered, it dropped onto the deck from 1+ m height. There was no damage either to the CTD or to the cruise leader's foot but it was very close. At another time, a reversing thermometer was broken on the CTD rosette due to a suddden drop in the rosette combined with an unfortunate roll of the ship. Winch control may also have contributed to the loss of a rosette bottle.

3) CTD A-frame

The movement of the A-frame in and out is very slow, and this means that instruments being deployed are swinging in the air for a considerable period. This slow movement contributed to the damage to the Niskin bottle, and breaking of two thermometers. There is a risk that personnel could be hurt, or hurled overboard, attempting to control suspended instruments. Is it possible to get the travel speed increased by a factor of two or three, or to be made variable?

There is also an urgent need for an open communication channel between the winch house, the bridge, the ops room, and the A-frame when instruments are being deployed through the A-frame. The present telephone system is inadequate. At one stage, the CTD was sitting on the bottom, and because the winch driver was talking to the bridge, the perdon in the ops room could not tell the winch driver to raise the CTD. We were extremely lucky not to have damaged or lost the CTD. Is it possible to have a conference call system for these four positions?

4) Hero platform

The open hero platform for the CTD is a worry in rough conditions, since water can sweep over the side of the ship while we are putting out the CTD or other gear. There needs to be an additional railing with removable chain in front of the open section.

5) Preservation room fume hood and photographic stand

The sliding glass panel in front of the fume hood does not slide properly and the glass is broken. The glass on top of the photographic stand was also broken. There probably needs to be a cover placed on this to protect it in future.

6) Electronic balances

There are continuing problems with the electronic balances in the fish sorting area. First, the values that they give are far too variable to give more than approximate weights. Second, the larger balance was giving a confusing "Help" message repeatedly that indicated it may be malfunctioning.

7) Brine tank

The brine tank in the cold room is contaminated with a green substance and is not suitable at present for maintaining live organisms.

Tony Koslow (Scientist-in-Charge)
Date:

Cruise Leader
Date:

Initialled: P C Young (Chief of Division)

Distribution:

Normal Distribution
T Koslow (Scientist-in-Charge)
C Bulman
R Kloser
A Graham
B Griffiths
P Bonham
D McKenzie
G Critchley
J Cordell
P Adams (Division of Oceanography) – to Week I
C Crossley

CSIRO MARINE LABORATORIES
Division of Fisheries Research

1991 Research Vessel Programme

Report

F.R.V. Southern Surveyor, Cruise SS2/91 Leg 2

Acoustic biomass survey of the "St Helens Hill" spawning aggregation of orange roughy

Staff

T Koslow (Scientist-in-Charge)
R Kloser (Assistant cruise leader)
C Bulman
C Stanley (21/7/91 – 3/8/91)
M Sherlock
A Williams
D Moriarty
C Crossley (18 – 21/7/91)
D McKenzie (18 – 21/7/91)
I Helmond (18 – 21/7/91)
T Reid (RAOU)

Duration

Leg 2: Departed Hobart on Thursday 18 July 1991 at 0900 h
Leg 2: Docked at Hobart on Saturday 3 August 1991 at 1730 h

Locality

The acoustic survey covered an area of approximately 5 nm^2 known as St Helens Hill on the East Coast of Tasmania with centre position 41°13.9'S 148°45.5'E. This area is a known spawning ground for orange roughy that has been commercially fished annually since 1989.

Cruise Objectives

1. Conduct echo-integration acoustic surveys of the St Helens spawning aggregation of orange roughy.

2. Obtain in-situ target strength (TS) measurements of orange roughy using the split-beam transducer.

3. Determine the composition of demersal and mid-water acoustic marks around the spawning area using photography, trawling and in-situ TS measurements.

4. Calibrate the hull-mounted and towed transducers, including a calibration of the towed transducer at depth.

3. Determine the composition of demersal and mid-water acoustic marks around the spawning area using photography, trawling and in-situ TS measurements.

4. Calibrate the hull-mounted and towed transducers, including a calibration of the towed transducer at depth.

5. Conduct preliminary experiments to measure the absorption of sound in sea water at 38 kHz.

6. Establish the dead zone height and density of fish within the dead zone by comparing hull-mounted and towed transducer returns.

7. Incubate orange roughy eggs at sea level and mid-water pressures to determine development rate.

8. Examine the feasibility of tagging orange roughy.

9. Assess the sex ratio of orange roughy on the spawning ground in relation to depth and height above the sea floor.

10. Calibrate the deepwater camera in depth.

11. Compare packing density estimates obtained with the camera and acoustics.

12. Determine the buoyancy of orange roughy eggs through use of a graded density series of Ficoll solutions (C. Crossley, U. Sydney).

Narrative

The vessel departed Hobart on Thursday 18 July 1991 at 0900 h and steamed to Port Arthur due to favourable weather conditions to calibrate the 38 kHz hull-mounted and towed transducers. The vessel anchored at Port Arthur at 1330 h and the calibration was completed by 0500 h on Friday 19.

On leaving Port Arthur the vessel steamed to St Helens Hill and commenced EZ net sampling. Bad spooling delayed deployment of the EZ net by several hours. Further EZ net casts were hampered with poor weather and SDL communications.

Acoustic towed body trials were conducted on the morning of the 21 July but mechanical problems with the cable termination caused by the bad spooling severely limited the work. Trials were suspended to transfer personnel at Binalong Bay including a crewman who was suffering a back problem. Attempts to sample sediments on our way in and out of Binalong Bay were unsuccessful due to inadequate equipment.

Several mid-water tows were conducted on the 22 and 23 July at various depths around the hill to identify acoustic scatterers. Winch control problems began to occur but did not hamper operations. Work progressed on the termination of the tow cable and a solution to the slippage problem was found on 23 July by using a mechanical termination designed by Ian Helmond. Several demersal shots were aimed at fish marks on the hill with one shot yielding a large catch of orange roughy. Bad weather on 23 July halted work for several hours.

The sampling of marks around the hill continued from 24 – 27 July with a combination of camera drops, pelagic and demersal tows. A break in the weather permitted a hull-mounted acoustic survey to be performed. Work continued on the towed body with an intermittent electrical fault causing problems. A CTD cast was also performed to collect water for David Moriarty.

We steamed inshore in the late afternoon of 27 July due to poor weather and to meet with Tasmanian Enterprise to fix a problem with their sounder.

The fault with the acoustic towed body was rectified on 28 July and a comparison of the hull and towed transducer in-situ target strengths was performed in shallow water off St Helens Point. From 28 July to 1 August the towed body was used continuously to perform echo-integration surveys and in-situ target strength work on and around the hill. Deepwater calibrations of the camera and towed body and several CTD drops were also performed during this period.

The EZ net was redeployed on 1 August to collect orange roughy eggs and two attempts to measure the absorption of sound in sea water at 38 kHz followed.

Due to problems with the winch controls we curtailed the cruise at this point and steamed to Port Arthur to perform a calibration of the acoustic transducers.

The vessel was brought into Hobart on Saturday 3 August at 1730 h so that a Bratvaag representative could fix the winch problems and the scientific members disembarked.

Most cruise objectives were met but bad weather and equipment problems took their toll. The problem with the winches severely limited the pelagic and demersal towing that could be performed during the cruise.

Results

1. Two hull mounted and one towed transducer echo-integration surveys of orange roughy on the hill were performed during the cruise.

2. The in-situ target strength of orange roughy and other deepwater species on and around the hill were investigated with the towed body. In all, in-situ target strength data from nine transects on the NW side and seven transects on the south side of the hill, combined with four vertical drops, were collected.

3. Acoustic marks on and around the hill were investigated for composition with five demersal tows, eight pelagic tows and five camera drops. Trawling was limited due to winch control problems.

4. The hull-mounted and towed transducers were calibrated at Port Arthur at the beginning and end of the cruise. The towed transducer was calibrated to depths of 800 m three times during the cruise. Comparison of in-situ target strengths from the hull-mounted and towed transducer were collected in shallow water off St Helens Point.

5. The experiment to measure the absorption of sound at 38 kHz by measuring the reflection of a large sphere was unsuccessful.

6. The acoustic dead-zone was investigated by a direct comparison of the hull-mounted and towed transducer. The towed transducer reduced the dead-zone considerably and enabled the density of fish in this zone to be measured.

7. Incubation of orange roughy eggs was attempted several times during the cruise. These were unsuccessful probably because the material used was not viable or inability to adequately simulate ambient conditions at 700–1000 m.

8. Tagging of orange roughy was not investigated due to insufficient time.

9. Limited sex ratio data were collected due to problems with the winches.

10. The deepwater camera was successfully calibrated with depth.

11. The weather conditions did not permit a comparison of camera and acoustic densities to be made.

12. The buoyancy of orange roughy eggs was investigated by C Crossley during the first part of the cruise (see attached report).

13. Bacterial productivity was measured in the water column by D Moriarty; the bottom substrate was too hard to sample. 3 stations were occupied for CTD water collection. Bacterial production average 15 - 20 υg C m^{-3} day^{-1} or about 5 mg C m^{-2} day^{-1}. Productivity decreased exponentially to a water depth of 400 m. It increased 2 - 3 times in the Antarctic Intermediate Water Mass, even though temperatures were lower than above.

14. Ornithological observations were carried out on 15 of 17 days by T Reid as part of the Royal Australasian Ornithologists Union Atlas of Seabirds in South-east Australian waters..A total of 150 10-minute standard counts were completed. 29 species of seabird were sighted: 5 albatross, 15 petrels, 1 storm-petrel, 1 diving-petrel, 1 gannet, 3 gulls, 2 terns, and 1 skua species. Details were also kept of whale sightings.

Defects List

1. Rear gantry needs to have a positive return mechanism.

2. Movement of EZ and acoustic towed body equipment is limited on the back deck and cannot be moved out of the fishing area easily at sea.

3. Communications between operations room, bridge, winch control box and wet lab needs improvement.

4. Safety rail on CTD platform is required.

5. Spare connectors and block for main towed body wire are required.

6. Securing of EZ net and towed bodies on the back deck needs to be investigated.

9. The pole transducer was tested and failed to improve the acoustic signals.

TJ KL

Tony Koslow (Scientist-in-Charge)
Date: 31-10-91

Cruise Leader
Date:

Initialled: P C Young (Chief of Division)

Distribution:

Normal Distribution
T Koslow (Scientist-in-Charge)
R Kloser (Assistant cruise leader)
C Bulman
C Stanley (21/7/91 – 3/8/91)
M Sherlock
A Williams
D Moriarty
C Crossley (18 – 21/7/91)
D McKenzie (18 – 21/7/91)
I Helmond (18 – 21/7/91)
T Reid (21 Gladybone Street, Moonee Ponds, Victoria 3039)

Cruise Report Southern Surveyor 1991#2 : A.C. Crossley

Associate Professor Clive Crossley joined the cruise on 08 July 1991 at Hobart, and left on 21 July 1991 at Binalong Bay.

The density (specific gravity) of living fertilized and unfertilized orange roughy eggs was determined by equilibration in iso-osmotic ficoll-seawater density gradients and in hyperosmotic saline density gradients. Other eggs were used for specific gravity determinations in iso-osmotic ficoll-seawater columns by Stokes Law. The gradients were designed to mimic the change in density of seawater with depth, taking into account the local measured CTD values of temperature, salinity and hydrostatic pressure.

Unfertilized eggs and eggs with potential *in vitro* fertilization were obtained by dissection of running ripe females and spawning males, obtained from IYGPT net samples. Orange roughy eggs obtained by dissection were used for specific gravity determinations in parallel with experiments on wild eggs and embryos obtained from EZ and ring net samples. Egg samples were fixed in glutaraldehyde for electron microscopic analysis to determine fertilization status.

All EZ net samples were divided into semi-quantitative subsamples for microscopic and specific gravity analysis of the living material. The subsamples were examined for orange roughy eggs and embryos, and for vertical distribution of other fish eggs and indicator organisms.

In all, 8 vertically stratified EZ net tows were examined, 5 from Southern Ocean stations in the vicinity of Pedra Branca, and 3 from Tasman Sea stations in the vicinity of St Helens. The vertical distribution of orange roughy eggs was as follows:-

Pedra Branca: In subsamples 19 eggs were obtained from known depths. Corrected total estimate for complete samples :136 eggs, with vertical distribution: (@900-800M :12%); (@ 800-700M :12%); (@ 700-600M :46%), (@ 600-500-M :18%), (@ 300-200M :12%; all eggs collected at depths between 200-300M were obviously damaged).

St Helens: In subsamples 13 eggs were obtained from known depths. Corrected total estimate for complete samples :38 eggs, with vertical distribution: (@1000-950M:48%); (@ 950-900M :10%); (@ 900-800M :32%), (@ 600-500-M :10%).

An additional 78 eggs were obtained from oblique or uncalibrated tows, and these eggs were used in specific gravity experiments and in pressure incubation experiments (C. Bulman). Specific gravity measurements indicated that the uncalibrated eggs had come from depths between 700 and 900M.

Although the semi-quantitative data presented above is indicative of distribution of 80% of spawned eggs in water 600-1000M deep, analysis of the entire fixed samples will be required to validate vertical distribution data, especially as low numbers of eggs were obtained in the calibrated EZ samples.

Laboratory calibration of the density gradient apparatus is required to provide numerical specific gravities for eggs tested, and this calibration is in progress. It is however clear that ficoll density gradients can be used to measure the specific gravity of fish eggs and embryos, and that measurement of egg specific gravity can be correlated with vertical distribution in the water column.

In addition to sampling for specific gravity and vertical distribution, further orange roughy egg sampling was undertaken for electron microscopy. Samples of adult orange roughy tissues were also taken for HPLC analyses. One projected HPLC analysis is to explore the ageing of eye lens crystallin proteins, and in the other an attempt is to be made to detect maturation and fertilization in eggs.

I should like to express my gratitude to Dr P. Young, Chief, CSIRO Division of Fisheries, to Dr T. Koslow and other members of the Division, and to the crew of the Southern Surveyor, for their considerable help and hospitality in what was, for me, a very successful cruise.

A.C.Crossley

CSIRO Marine Laboratories
Division of Fisheries

Cruise Report
SS 2/91
leg 3

1991 Research vessel program

Report: F. R. V. Southern Surveyor Cruise 2/91/Leg 3

Scientific staff

J. Young (Cruise leader)
B. Griffiths
C. Stanley
V. Lyne
T. Davis
M. Sherlock
R. Plashke
D. Le
J. Ettershank
M. Hindell (University of Tasmania)
A. Alvestad (Bratvaag)

Duration

Departed Hobart 1300 h 6 August 1991
Arrived Hobart 0700 h 10 August 1991

Locality

Tasman Sea approximately 40 miles east of Maria Island

Aims

1. To make preliminary investigations of the hydrography of the area east of Tasmania in which the Japanese longline fishery is located.

2. To make preliminary investigations of the biological production in these waters in relation to the position of the longline fleet.

Cruise narrative

We departed Hobart at 1300 h (6 August) and steamed north along the coast of Tasmania to 42° S to begin eastward transect through an eddy previously located by satellite imagery off the coast of eastern Tasmania. This eddy had been the focus for the Japanese longline fleet through June and part of July.

The transect was begun at 2300 h 6 August. CTD casts to 1000 m were made at 10 nm intervals from the shelf break. The transect was continued through the night in increasingly bad weather. By mid-morning wind strength had reached Force 8 and showed no sign of improvement. By 1100 h (7 August) wind strength was such that we were unable to deploy the CTD. We therefore headed for shelter in Wineglass Bay and dropped anchor at 1500 h. At anchor we prepared the bongo for use on Southern Surveyor. After spending the night at anchor we arranged to pick up a part from Louisville for the Seacat profiler, which had failed the previous day. On route from Wineglass Bay to Louisville the pelagic net (Engel 180) was deployed over the shelf break to test the main winches after their recent overhall in Hobart. According to the fishing master (R. Pepper) the winches worked very well during the test. We arrived at Louisville at 1400 h (8 August), at which time the part was transferred. A member of the scientific party who had suffered badly from seasickness over the previous two days, was put ashore. Further communications with Hobart Remote Sensing Group (Chris Rathbone) revealed that the eddy had shifted southward. We therefore adjusted the transect line and again headed east, this time along 42° 19' S.

On the way out the bongo was tested in 80 m of water. No problems were found with deployment of the net, although the lack of a return mechanism on the gantry was found to hinder the operation. Depth and temperature sensors on the bongo worked very well, although the release mechanism did not work and needs to be fixed before the next cruise. Seacat profiles were made at 10 nm intervals from the shelf break. We reached the inside of

the eddy at 2200 h. By this time the wind had swung to the southwest and had built to Force 8-9. It became impossible to work so sampling was abandoned for the evening and we steamed inshore to shelter under the cilffs of the Freycinet Peninsular.

By Friday morning (9 August) the winds had abated sufficiently for us to try again. We steamed directly to the centre of the eddy hoping to salvage some of the objectives we had set. We deployed a satellite buoy for the Division of Oceanography (G. Cresswell) in the middle of the eddy at 1300 h and made a cast with the seacat profiler. The winds had again built to Force 7 so we dodged for a while hoping for the conditions to ease. At 1600 h we were finally able to deploy the bongo net and sampled the upper 100 m without mishap. This was followed on dark (1800 h) by a pelagic trawl (Engel 180) to a depth of 500 m. The winches again worked very well, and Roger remarked that he would soon be able to "draw houses" on the monitor he was getting such good control over the net. The catch was comprised largely by the nomeid Cubiceps spp. and a wide array of myctophid species. On completion of the trawl at 2000 h we steamed for Hobart and arrived at the wharf at 0700 h 10 August.

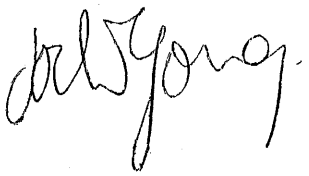
We were largely defeated by the weather on this cruise. However, we were able to test all the equipment and procedures we are likely to be using next June when the offshore tuna work begins in earnest. The ship and ship's crew worked extremely well, particularly given the weather, and there was a good feeling of cooperation and interaction on board.

Results

1. The physical structure of the eastern side of the eddy was partially mapped and samples were taken to analyse primary productivity in the area.
2. Zooplankton samples were collected from drop net casts and one bongo tow.
3. Midwater fishes were collected from the eddy for later comparisons with the diet of adult southern bluefin tuna caught in the area.
4. A satellite buoy was deployed in the eddy for the Division of Oceanography.

Equipment list

1. The small drop net winch burnt out and needs replacing. A line hauler may be a better alternative.
2. The fluorescence sensor on the seacat profiler failed but was replaced.
3. Some sort of handrail or bracing point is needed on the forward end of the hero platform as there is little for operators of CTDs and similar devices to hang on to.
4. The toilet in Cabin 1 does not work.
5. The catches on the glass doors in the preservation room are coming adrift and need replacing.
6. The glass photographic base was smashed on the previous leg and needs replacing. Shatterproof glass may be a safer alternative to the present arrangement.
7. There is no retrieval mechanism for the traveller on the aft gantry. This makes control of the position of the travelling block difficult, particularly when retrieving light sampling devices, such as the bongo net, in heavy seas.
8. The on-board computer system appears to be working very well.
9. There are no spare electronics for the winch system presently in the division. The Bratvaag representative, Mr. Alvestad, suggested that a backup system may prove to be cost-effective in the event of a failure at sea.

Jock Young
(Cruise leader) 

Initialled:
Chief of Division 

Distribution:

Normal distribution

C. Liron

J. Young

B. Griffiths

C. Stanley

V. Lyne

T. Davis

M. Sherlock

R. Plashke

D. Le

J. Ettershank

M. Hindell (University of Tasmania)

G. Cresswell