

# **CSIRO MARINE RESEARCH**

## **1998 RESEARCH VESSEL PROGRAM**

### **CRUISE PLAN**

#### **FRV *SOUTHERN SURVEYOR***

#### **CRUISE SS 01/98**

**4 FEBRUARY - 1 MARCH 1998**

Mr T Rees  
CSIRO Fisheries Archives  
GPO Box 1538  
HOBART

CSIRO MARINE RESEARCH  
GPO BOX 1538  
HOBART TAS 7001  
AUSTRALIA

TELEPHONE (03) 6232 5222  
FAX (03) 6232 5000  
EMAIL [pirrone@marine.csiro.au](mailto:pirrone@marine.csiro.au)  
Telex AA 57-812

## ITINERARY

Departure: Hobart 1000 h Wednesday February 4, 1998  
Arrive: Eden 1200 h Sunday March 1, 1998

## AREA OF OPERATION

Great Australian Bight in the area of the southern bluefin tuna pole and line fishery (Figure 1).

## RESEARCH BACKGROUND

Southern bluefin tuna (SBT) move into the Great Australian Bight (GAB) during summer months where they are caught by the Australian surface fishery for farming and for fresh export to Japan. Their propensity to school at the surface has enabled the development of a fisheries-independent index of abundance using a line transect aerial survey. An increase in the precision of the abundance indices would result if estimates of the biomass and size composition of schools sighted from the air could be improved. Determining the variability in school shape, particularly in the vertical plane, and how this affects aerial estimates of school biomass would be an important step in improving abundance indices. The structure and behaviour of SBT schools may be site specific, in which case observations from the air could be adjusted according to whether the fish are for example, inshore or along the shelf. If sonar can be used to determine the size composition of fish in a school, acoustics would provide a powerful method for calibrating size estimates made by spotters from the air.

Acoustics may also be a powerful research tool to investigate the interaction between SBT schools and their prey. Little is known about feeding of SBT in the GAB and why they go there in summer. We know that they achieve over 50% of their annual growth in the 3–4 month period they spend in the GAB. What are the trophic links driving the recruitment of SBT to the GAB, and what sustains such high growth during that period are important questions to address in understanding possible year to year variation in the proportion of SBT recruiting to the GAB. Sampling SBT that are feeding under different situations is difficult and acoustics may be useful in detecting feeding and interaction of SBT with their prey.

The *Southern Surveyor* has recently been equipped with a Simrad multi-beam SD750 sonar that has the potential to map the extent and distribution of surface shoaling pelagic fish such as SBT. The potential for this instrument, in conjunction with the multi-frequency Simrad EK500 echo-sounder, to estimate the biomass of SBT schools and associated feed layers is open to question. To date, much of the quantitative work has concentrated on small pelagic species with the results not directly incorporated into management of the stock. For this work to be transferred to the abundance estimation of large pelagics such as tuna, research is required to establish the detectability of tuna schools and a link between school size/type and biomass.

## CRUISE OBJECTIVES

1. Conduct experiments using multi-beam sonar in conjunction with multi-frequency vertical acoustics to determine SBT school shape, behaviour, size composition and biomass, and target identification of their pelagic prey in the GAB.
2. Compare acoustic estimates of school size and composition with that obtained by aerial survey.
3. Evaluate sonar as an additional approach to aerial survey for estimating the abundance of SBT in the GAB.
4. Determine the position and extent of the main water masses in the GAB from a series of hydrographic transects.
5. Quantify the biomass of potential SBT prey species at selected sites in relation to the prevailing water masses in the GAB.

## Secondary Objectives

1. Collect data for calibration of infra-red thermometers on aerial survey planes.
2. Investigate the distribution of phyllosoma-stage rock lobster in the GAB via a series of surface and subsurface plankton and midwater tows.
3. Liaise with the GAB pole and line fisheries to collect stomachs of wild-caught SBT in the area.
4. To deploy a 35 mm camera system to investigate possible links between bottom features and the presence of SBT.

## METHODS

*Southern Surveyor* will be operating in various regions of the GAB and will search for SBT along a line transect or directed to schools by the spotter plane and or industry vessels. Oceanographic information will be obtained to determine the sound propagation properties of sonar. Schools will be investigated by measuring the school dimensions using the sonar and biomass using vertical sounding techniques. The packing density of the schools will be estimated from the vertical soundings and an estimate of the target strength of the species. Species identification will be assessed from the multi-frequency vertical soundings and in situ target strength estimates. If possible, confirmation of fish size and school biomass will be attempted though obtaining this information on a school that is to be targeted by industry for capture.

Selected SBT schools will be tracked diurnally and the school integrity and position in the water column monitored. Any interaction with feed layers will be recorded and target identification of these layers determined through discrete depth net sampling and the identification and measurement of the pelagic prey. The behaviour of the SBT school and how this effects the estimated biomass based on factors such as weather conditions, attraction or avoidance to the survey vessel will be investigated.

Baseline information on the ability of the sonar to detect near surface schools will be determined by examining sub-surface floats of known reflectance. These experiments will be carried out during a range of weather conditions and distances.

## CRUISE PLAN

We will depart Hobart on February 4 1998 with a reduced scientific team and steam to a position approximately south of Port Lincoln and twenty nautical miles seaward of the shelf. During the transit we will be deploying the surface net periodically to collect phyllosoma larvae and trialing the acoustic and sonar equipment. When we reach the GAB we will begin the first of three hydrographic transects due north to inshore Bight waters using the CTD to make an initial survey of the oceanography and biological production of the eastern end of the GAB. The transects will be made along the ground tracks of the satellite which carries the Topex/Poseidon altimeter. This is to co-locate our ADCP-measured surface currents with estimates made using the satellite, for assessment of the utility of the latter. We will aim to complete 10 CTD casts at approximately 15 nautical mile intervals to a maximum depth of 1000 m. On each cast, temperature, salinity, dissolved oxygen, chlorophyll *a* concentration and nutrients ( $\text{NO}_3$ ,  $\text{PO}_4$ , silicates) will be collected. The ADCP (current profiler) will be used to build up a picture of the major current flows in the area. Replicate vertical drop nets (mesh size 100  $\mu\text{m}$ ) to 100 m and 10 minute surface tows (mesh size 1000  $\mu\text{m}$ ) will be made after each CTD cast. During this transect we will record the movements of the main pole and line fishery and schools of SBT. Once this first transect is finished we will head for Port Lincoln to pick up the remainder of the scientific team (9 February).

We will then return to the first transect and begin acoustic and sonar studies of SBT schools sighted by the aerial survey program (led by Ms Ann Cowling, CSIRO). Two days have been set aside for this work on each of the three transects we aim to complete. We will then complete a series of midwater trawls and plankton tows targeting acoustic marks separate from those made by the SBT. We will determine whether they are prey or not by examining the stomachs of SBT caught by the fishery. When possible we will deploy an acoustic target to calibrate the acoustic and sonar equipment. As the cruise progresses we will be communicating with the aerial survey team to position ourselves in close proximity to schools of SBT. We aim to use the acoustic and sonar systems to quantify the size of the SBT schools and their prey.

We will then steam westward to begin the second transect. Again its position will be determined in relation to the fishery but also by the position of the Topex/Poseidon satellite. The second transect will follow the pattern established on the first transect. It will also be interrupted opportunistically to take advantage of schools of tuna and their prey. The third transect will complete the hydrographic survey and will provide a control as we will examine an area separate from the main fishery. Once completed we will return to Hobart. The return trip will be used to process the collected data and to collect further samples for the larval rock lobster project.

## PERSONNEL

Mr Jock Young	(Cruise leader)
Mr Rudy Kloser	(Assistant Cruise leader)
Mr Russ Bradford	
Mr Jeff Cordell	
Mr Ron Plaschke	
Ms Rebecca Deed	
Mr Tim Ryan	
Dr Clive Stanley	10 February – 1 March
Dr Tim Davis	10 February – 1 March
Mr Matt Sherlock	10 February – 1 March
Japanese electronics expert	10 February – 1 March

All personnel are CSIRO staff unless otherwise indicated.

## CONTACTS

For further information about this cruise please contact:

Mr Jock Young  
CSIRO Marine Research  
GPO Box 1538  
Hobart, Tasmania 7001  
Phone (03) 6232 5222  
Fax (03) 6232 5000

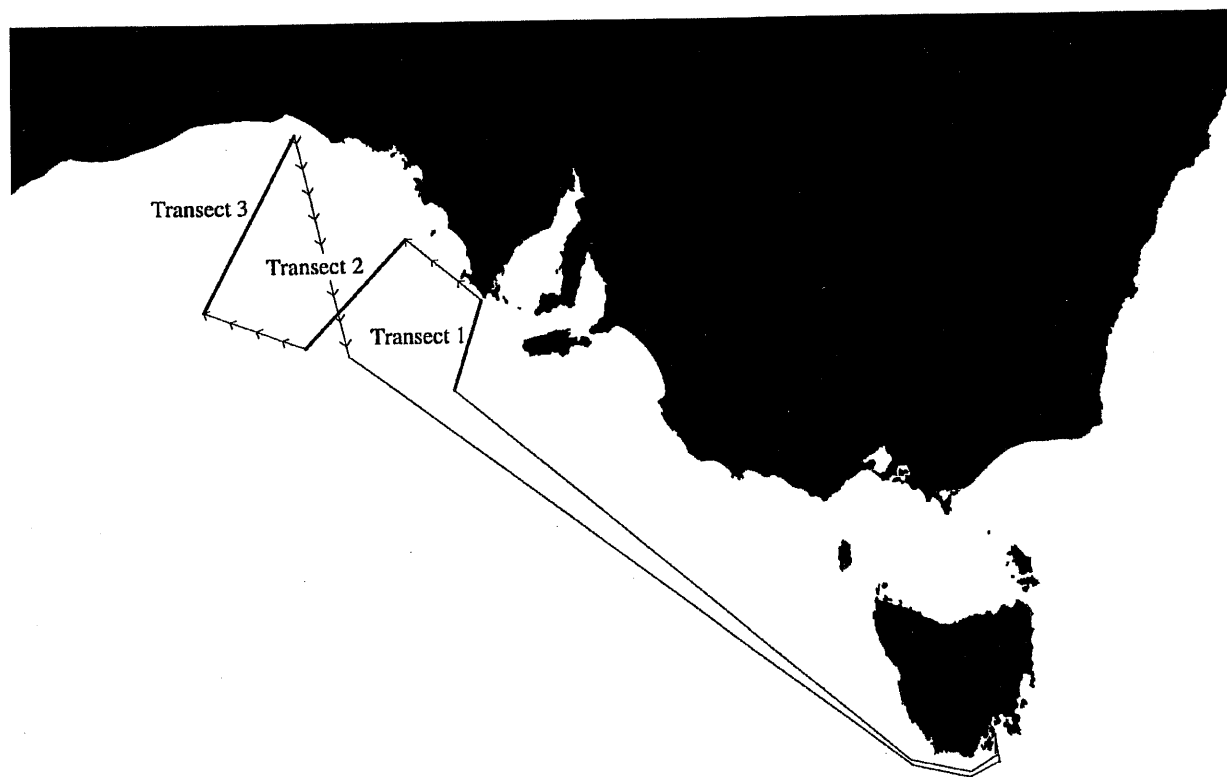
Mr. Clive Liron  
Vessels Operations Manager  
CSIRO Marine Research  
GPO Box 1538  
Hobart, Tasmania 7001  
Phone (03) 6232 5222  
Fax (03) 6232 5000



Dr Nan Bray  
Acting Chief, CSIRO Marine Research

Date

Figure 1. Proposed cruise track for SS 01/98.



## APPENDIX 1: CRUISE TIME ESTIMATES

ACTIVITY	TIME (DAYS)
Steaming to GAB	3.0
First transect (T.1)	2.0
Port Lincoln	1.0
Calibration of acoustics	2.0
Acoustic observation of SBT along T.1	2.0
Net sampling of SBT prey	1.0
Steam to T.2	1.0
Hydrographic transect T.2	2.0
Net sampling of SBT prey	1.0
Acoustic observation of SBT along T.2	2.0
Hydrographic transect T.3	2.0
Acoustic observation of SBT along T.3	2.0
Net sampling of SBT prey	1.0
Return to Hobart	4.0
Total	26

# **CSIRO MARINE RESEARCH**

**1998 RESEARCH VESSEL PROGRAM**

**CRUISE PLAN**

**FRV *SOUTHERN SURVEYOR***

**CRUISE SS 01/98**

**11 FEBRUARY - 8 MARCH 1998**

## **SS 01/98 UPDATE**

Mr T Rees  
CSIRO Fisheries Archives  
GPO Box 1538  
HOBART

CSIRO MARINE RESEARCH  
GPO BOX 1538  
HOBART TAS 7001  
AUSTRALIA

TELEPHONE (03) 6232 5222  
FAX (03) 6232 5000  
EMAIL [pirrone@marine.csiro.au](mailto:pirrone@marine.csiro.au)  
Telex AA 57-812



Personnel	Responsibilities
Leg 1	
J Young	Cruise leader, nets
R Kloser	Assistant cruise leader, acoustics
T Ryan	acoustics
P Sakov	acoustics
J Cordell	electronics
R Bradford	nets, biological processing, hydro, acoustics
C Stanley	nets, biological processing, hydro, acoustics
H. Beggs	ADCP
P Brody	ADCP
R Plashke	hydro
R Deed	hydro

Leg 2	Responsibilities
J Young	Cruise leader, nets
R Kloser	Assistant Cruise leader, acoustics
T Ryan	acoustics
C Stanley	Nets, biological processing, video?
T Davis	Acoustics, nets, biological processing
J Cordell	electronics
R Bradford	nets, biological processing, hydro, acoustics
M Lewis	nets, biological processing, hydro, acoustics
M Raynor	Fatty acid sampling
Ron Plashke	hydro
Rebecca Deed	hydro

Leg 3	Responsibilities
J Young	Cruise leader, nets
R Kloser	ACL, acoustics
T Ryan	acoustics
J Cordell	electronics
R Bradford	nets, biological processing, hydro, acoustics
C Stanley	nets, biological processing, hydro, acoustics
Rebecca Deed	hydro

## **CRUISE SS 01/98 UPDATE**

### **Itinerary**

Depart Hobart 1000 h 11 February 1998

Arrive Hobart 1200 h 8 March 1998

The cruise will now depart Hobart 11 February and return Hobart on 8 March. Because of the time in getting to the Bight from Hobart and the number of tasks that need to be completed I have arranged to divide the cruise into three separate legs. However, for purposes of station allocation, the cruise will be considered as starting 11 February and finishing 8 March 1998. I have outlined below the major activities that will be carried out on each leg and have listed the people involved in a table.

### **Leg 1**

The cruise will depart Hobart 11 Feb 1998 and steam for Port Lincoln. On route we will set up net and acoustic systems and deploy the surface net periodically for phyllosoma larvae (Fig. 1). We will also trial the acoustic doppler current profiler (ADCP) which is being installed. The trialing of the ADCP will require some deviations in the cruise track (Fig. 1). When we reach the GAB we will complete a hydrographic transect (T1) and carry out midwater net sampling before arriving in Port Lincoln midday 16 February. In port we will open the ship to the fishing community for a couple of hours to publicise the work we are intending to do.

### **Leg 2**

After a scientific crew exchange we will depart Port Lincoln 8am 17 February. We will then carry out planned and opportunistic sampling in the GAB according to the schedule outlined in the original cruise plan. In particular we hope to link sonar and acoustic estimates of biomass of individual SBT schools with those from the aerial survey and the fishery. We will also be collecting samples of common fish and crustacean species in the GAB. These samples will be used to develop an understanding of the major food pathways leading to aggregations of SBT in the area. We will then return briefly to Port Lincoln on 4 March to drop scientific personnel not required for the return to Hobart.

### **Leg 3**

Tasks remaining from Leg 2 will be completed including opportunistic acoustic sampling of SBT schools in the area. On route home we will be sampling for phyllosoma larvae, trialing the ADCP and analysing data collected during the cruise. We aim to arrive in Hobart 8 March 1998.

Jock Young  
21 January 1998

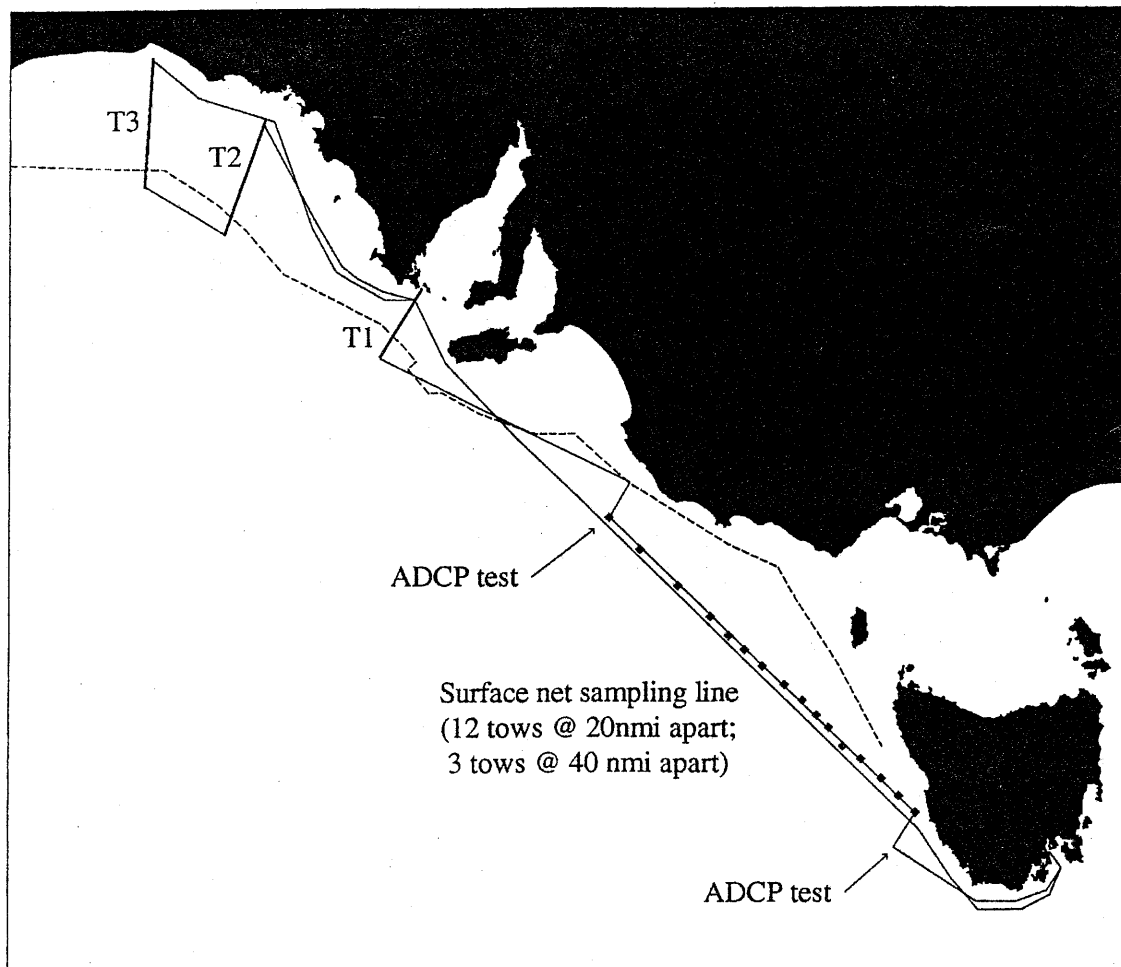


Figure 1. Alteration to the cruise track of SS 01/98 to incorporate testing of the ADCP (Acoustic Doppler Current Profiler) and additional surface net sampling for larval rock lobster (dotted line indicates approx position of the 200 m isobath; T1 = hydrographic transect 1; T2 & T3 = biological and acoustic transects 2 and 3).