DIVISION OF **FISHERIES**

1996 RESEARCH VESSEL PROGRAM

CRUISE PLAN

FRV *SOUTHERN SURVEYOR*
CRUISE SS 03/96

13 - 28 MAY 1996

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ITINERARY

DEPARTURE: EDEN 0900 H 13 MAY 1996
ARRIVE: HOBART 1700 H 28 MAY 1996

AREA OF OPERATION

East of Eden in the area of the Australian yellowfin and southern bluefin tuna longline fishery and oceanic waters east of Tasmania (Fig. 1)

RESEARCH BACKGROUND

Between 1992 and 1994 a series of cruises, aimed at examining the physical and biological oceanography of the SBT fishing grounds off eastern Tasmania, were completed (see Cruise reports SS 2/92, 4/93 and 3/94). That study was limited purposefully to waters off eastern Tasmania. However, we know that the tuna move northward to waters off the Victorian/NSW border where they are fished by longline fishers working out of the Eden/Merimbula area. The same area is also an important recreational and commercial yellowfin tuna fishing area. Tuna fishers in the area target the major fronts and eddies which are commonly located in these waters. Our aim is to quantify the biological productivity of these features on fine and broad scales. At the same time we hope to deploy acoustic tags on live-caught tuna to link tuna movements with that of the water masses and their prey. With the cooperation of the fishing fleet we will be collecting the stomachs of the tuna caught to relate to the distributions we glean from the zooplankton and micronekton surveys.

This same area has also been targeted for ground truthing of the 'SeaWiFs' ocean colour satellite. We aim to conduct optical oceanographic studies and collect pigment samples to assist in ocean colour algorithm development.

We will also focus on the adjacent shelf and slope waters, which we found to be a potentially productive area off eastern Tasmania and home to some of the more common prey species of the tunas. As many of these prey species are difficult to catch, we will also be sampling the zooplankton on which they feed. To this end we will be collaborating with the Temperate and Deepwater program which has been running a series of cruises in the same area for the past three years (see Cruise reports SS 5/93, 2/94 and 5/94). Their results have shown not only the link between pelagic and benthic production but also that inshore/offshore transport may be a key factor in providing production for demersal fisheries.

Throughout the cruise a new multi-beam sonar SD750 will be used to observe distribution and schooling behaviour of pelagic fish in the upper 500 m. Opportunistic observations of the pelagic schools encountered will be conducted using the mid water trawl, multi-beam sonar and the multi-frequency echo sounder.

CRUISE PLAN

OCEANOGRAPHIC SURVEY OF TUNA GROUNDS

From Eden we will steam along a transect perpendicular to the coast toward the area in which the main tuna fleet is working.

We will initially make a CTD transect through the study area to establish the west to east vertical structure of the main oceanographic features, and to ground truth satellite imagery prepared before the cruise. Particular attention will be placed on CTDs over the continental shelf and slope to detect any upwelling in the area. We will aim to complete 10 CTD casts at approximately 10 n.miles intervals to a depth of 1000 m, depth permitting. On each cast, temperature, salinity, dissolved oxygen, chlorophyll a concentration and nutrients (NO3, PO4, silicates) will be collected. These CTD measurements will be compared with those taken on the previous cruise (SS2/96) to examine the stability of the identified oceanographic features. Replicate vertical drop nets (mesh size 100 µm) to 100 m and 10 minute surface tows (mesh size 1000 µm) will be made after each cast.

Once completed, a north/south transect employing the same methodology will be completed. These two main transects are aimed at establishing the vertical structure of the main water masses in the study area. On transit between stations multi-frequency acoustics and multi-beam sonar measurements will be conducted to estimate the abundance and distribution of nekton.

Regardless of activity optical measurements will be taken each day at mid day. These measurements will be continued throughout the cruise and will be used to ground truth the SeaWiFs ocean colour study.
Time 5 days

ZOOPLANKTON, LARVAL FISH AND MICRONEKTON SURVEY

Once the area of the main front is established, we plan to complete five separate sets (each of 10 tows) of bongo tows. We aim to compare the biomass of the different faunal size spectra and examine the distribution of ichthyoplankton assemblages within and on either side of the main front (Sites

1, 2 and 3) as well as over the shelf and shelf break (Fig. 1). At each station a bongo net (mesh size 1 mm) will be towed obliquely from 200 m to the surface for approximately 20 minutes. Each net will be accompanied by a 10 minute surface tow of the same mesh size. At selected stations samples will be prepared for photographic analysis of the size distribution of the zooplankton.

At each trawl station multi-frequency (12, 38 and 120 KHz) acoustic measurements will be made using a Simrad EK500 for later comparison with trawl biomass. Target trawling on layers identified using the multi-frequency acoustics will be carried out on an opportunistic basis. At night, replicate, depth-stratified tows with the midoc net will be made to estimate the biomass of micronekton in the different areas.
Time 5 days

Arrangements are presently being made for a separate transect alongside the longline of an Australian longline vessel. Its position will depend on its fishing success, but is likely to be east of Eden towards the end of May. We have set aside one day to collect physical and biological data, which will be compared later with their catches.
Time 1 day

SURVEY OF LARVAL JACKASS MORWONG

We will then steam south to Hobart and aim to make replicate tows within and south of the East Australia Current filament to collect larval morwong. These samples will augment those collected over the past 4 years in the same area and help clarify our current hypotheses regarding stock structure of jackass morwong. We will aim to be dockside at 1200 h on 18 May 1996.
Time 2.5 days

ACOUSTIC TRACKING OF TUNA

During the cruise we hope to deploy acoustic tags on tuna to track their movements in the area. Arrangements are being made to tranship a CSIRO scientist from Southern Surveyor to a fishing vessel during the cruise. When a live tuna is caught it will be freed and then tracked from a receiver on board Southern Surveyor.
Time 1 day

CRUISE OBJECTIVES

1. Map the physical oceanography of the area east of Eden in which the tuna longline fishery operates.
2. Quantify zooplankton and micronekton biomass in these waters in relation to the main water masses and to the shelf and shelf break.
3. Quantify phytoplankton biomass in the region, and to characterise the in-situ optical properties, including spectral absorption and upwelling and down-welling spectral irradiance in different water masses east of Tasmania and compare these with phytoplankton pigments.
4. To characterise the diel variation in fluorescence response of the Wetstar fluorometer.
5. Continue investigations of the distribution of ichthyoplankton in relation to the major water masses off southeastern Australia.

COMPLEMENTARY OBJECTIVES

1. Deploy acoustic tags on live-caught tuna and track their movements in the area.
2. Liase with longliners to collect tuna stomachs for later comparison of gut contents with net captures.
3. Deploy an array of archival tags on a longline to examine the effect of currents and set time on hook depth.

SECONDARY OBJECTIVES

1. Quantify the biomass, and obtain estimates of the length frequency distribution, of salps (especially *Thetys*) and pyrosomas caught in midoc and bongo trawls, and to preserve some individuals to determine which phytoplankters are being eaten.
2. Collection of multi-frequency acoustic data using the Simrad EK500 at 12, 38 and 120 kHz for species identification and biomass studies.
3. Trial of a simrad sd750 multi-beam sonar for pelagic fish distribution and school behaviour studies.

PERSONNEL

(Note: All personnel are staff of the CSIRO Division of Fisheries)

Mr Jock Young	(Cruise leader)
Mr Barry Bruce	(Assistant cruise leader)
Mr Tim Lamb	
Mr Russell Bradford	
Ms Jessica Farley	
Ms Susan Long	
Ms Allison Phillips	
Mr Don Mckenzie	
Mr Matt Sherlock	
Mr Rudy Kloser	
Mr Ron Plashke	
Mr Bob Griffiths	

CONTACTS

For further information about the cruise pleases contact:

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P. C. Young
Chief, Division of Fisheries

Date 4/4/96

APPENDIX 1: CRUISE TIME ESTIMATES

ACTIVITY	TIME (DAYS)
East west transect	2.5
North south transect	2.5
Individual zooplankton sets (x5)	0.5
Paired micronekton tows (x6)	0.5
Alongside longline set	1.0
transit to Hobart	2.5
tuna tracking	1.0
Total	15

FIGURE 1. AREA OF OPERATION