

VOYAGE PLAN NO. SS02/2004

Title

Dynamics of the Perth Canyon, Western Australia — Linking oceanographic drivers, plankton, fish communities and seasonal blue whale aggregations.

Itinerary

Depart Fremantle 1000 hrs, Thursday 29 Jan 2004
Arrive Fremantle 1000 hrs, Wednesday 04 Feb 2004

Principal Investigators

Dr. Robert McCauley (Chief Scientist)
Centre for Marine Science and Technology
Curtin University
GPO Box U 1987 Perth, 6845, Western Australia
Phone 08 9266 7460, fax 08 9266 4799
Dr. Doug Cato
Defence Science and Technology Organisation
PO Box 44 Pyrmont, NSW 2009
Phone 08 9692 1483

Scientific Objectives

This project will contribute to linking observations of oceanography, zooplankton, fish choruses and blue whales in the Perth Canyon, a biological 'hotspot'. Specific aims of the voyage are to carry out fine scale sampling of the Perth Canyon, as per:

- carry out oceanographic measurements at the eastern canyon end to link with modelling;
- map and discriminate zooplankton communities about the canyon using acoustic backscatter;
- physically sample zooplankton and pelagic fish communities about the canyon;
- study the sources of evening choruses known to occur around the canyon.

Blue whales aggregate in the Perth Canyon through November to May with highest numbers sighted during February to March. Blue whales using the canyon are primarily engaged in feeding, with animals seen surfacing with krill streaming from their mouths. The voyage will entail oceanographic measurements within the region commonly visited by blue whales, physical sampling of zooplankton communities using pelagic nets and an investigation of regular evening fish noise sources, using passive and active acoustic systems, and pelagic nets. The measurements are part of a project to understand the dynamics of the Perth Canyon and why blue whales aggregate there.

Voyage Objectives

Daytime 06:00-18:00

For most of the voyage, daytime work will be allocated to oceanographic casts with the lowered CTD rosette and water sampling bottles, on a set grid around the Perth Canyon. The head of the Perth Canyon lies 32 n mile west of Fremantle Harbour, with the Canyon snaking NW 6 mile, SW 14 mile then NW 42 n mile to reach the abyssal plain. Our primary area of interest lies near to the Canyon head or eastern end as shown on Figure 1. Oceanographic cast locations will replicate those successfully taken during voyage SS09/2003 down the canyon axis, plus include a uniform grid about the eastern Canyon end. This grid of oceanographic measures will then be compared with modelling results. Water sampling measurements will be taken to gauge levels of productivity below the Leeuwin current and to understand what is supporting the krill aggregations the blue whales utilise. Daytime net sampling will be carried out on Tuesday 3 Feb to sample the daytime deep scattering layer which forms at 300-400 m depth in the Canyon. Oceanographic casts will entail use of the lowered rosette with CTD and light measuring electronics, water sampling from Niskin bottles and the lowered ADCP attached to the rosette. Casts will be made to full water column depths. A grid of oceanographic cast coordinates and tracks will be supplied to the ships Master before sailing.

Late in the afternoon of each day, drifting gear will be deployed to measure ambient sea noise at different depths over each night and into the next day. The drifting gear will have surface floats (two large red fender buoys for buoyancy, a 15 m line and one large red fender buoy) with a Taiyo GPS radio beacon attached, and a weighted string down to 350 m depth containing two canisters with sea noise logging equipment, possibly a deep light trap for zooplankton sampling and a dump weight (total weight estimate of 80 – 100 kg). The gear will be tracked continuously using a Taiyo GPS radio receiver, to be mounted somewhere near the bridge. The buoy will need to be recovered around 13:00-15:00 the next day (at the Masters discretion), re-configured, then re-deployed a few hours before dusk for the next evening. It is intended for the buoy to be set at doubling ranges from the Canyon centre (centre of circle shown in Figure 2) over the six evenings of the voyage, out to the largest dimensions of oceanographic sampling.

Night time 18:00 — 06:00

The night time work will entail targeted net sampling using the EZ net system for zooplankton (krill) and the Engel nets for pelagic fish. Net sampling will be concentrated into the eastern end of the canyon as shown by the shaded region on Figure 2. One deep tow (800 - 1500 m) down the Canyon axis may be attempted if time allows. Net sampling will be to targeted depths as determined from the echosounder records. Some evening work will be set aside for mapping zooplankton aggregations with the ships echosounders. We are negotiating with CSIRO for an experimental trial of the new 18 kHz swathe mapping sonar to be fitted to the Southern Surveyor in December 2003. Two XBT deployments will be made each night, one near to 22:00, one near to 02:00. Exact times will depend on the net deployments. Net tow lengths will be determined in consultation with the Fishing Master and in light of catches. Generally, only one net type (Engel for fish or EZ for plankton) will be set per nights sampling.

In order to sample the daytime deep scattering layer, sampling on the morning of the 03-Feb will extend to 18:00 hours on the 03-Feb. Oceanographic casts will then be made throughout the night until the vessel recovers the drifting gear then steams into Fremantle on the 04-Feb.

The ships echo sounders will be logged the entire voyage for biomass assessment. The above sampling strategy may shift depending on the success of sampling.

Voyage Track

The general area of the voyage is shown on Figure 1. This shows locations of the planned oceanographic cast grid and the axis of the Canyon which will also be sampled with the lowered CTD rosette. The general location of net sampling is shown on Figure 2 as within the shaded circle.

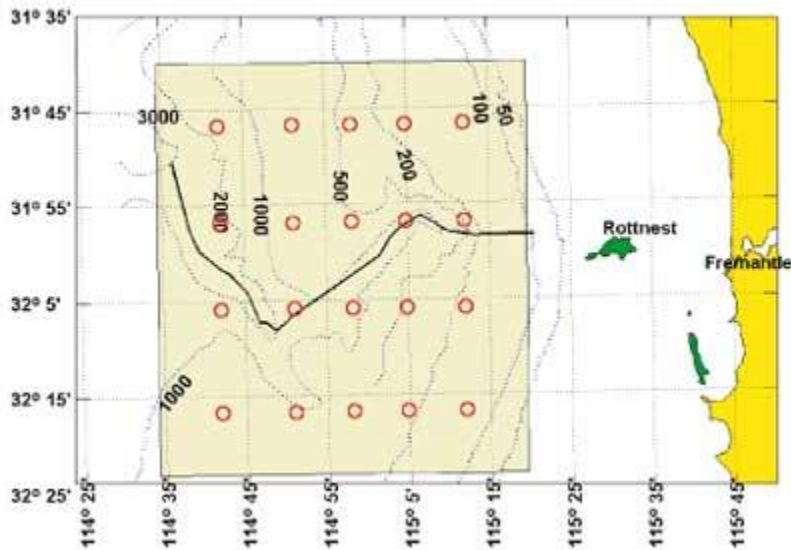


Figure 1: The Perth Canyon, with our primary area of interest shown highlighted within the box, locations of the grid of CTD casts shown as the red circles, and the line on which CTD casts will be taken down the canyon axis, shown in black.

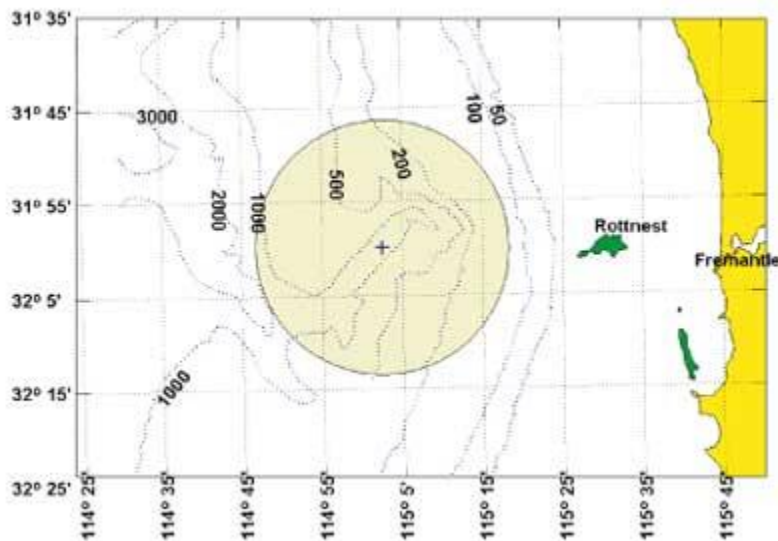


Figure 2: The primary region for net casts shown highlighted within the circle. If time permits one cast will be made down the canyon axis to approximately 1500 m depth.

Time Estimates

The start of CTD sampling is a three hour steam west of Fremantle. The vessel will steam to the first CTD location and commence sampling at 13:00. The entire voyage will be limited to approximately the region shown highlighted in Figure 1. The daily routine will be CTD casts over 06:00-18:00 with somewhere in the afternoon (13:00-15:00) drifting gear being recovered, reconfigured, then reset at 17:00.

Night time work (18:00-06:00) will involve several hours of echosounder traverses to define layering, then net work, with one net type only (Engel pelagic or EZ plankton) being used each night, starting with the Engel gear on night one. Two XBT casts will be made at approximately 22:00 and 02:00 hours. The exact time of casts will depend on the state of net deployments.

On the 3 Feb the routine will swap over, the net and echosounder work will carry over until 18:00 and the CTD casts will then carry on until a time determined by the Master, on which the drifting gear will be recovered and the vessel will steam back to Fremantle to arrive 10:00, 04-Feb.

Piggy-back Projects (if any)

Staff from the Western Australian Museum (fish taxonomy), Bristol University (UK, fish sensory systems) and possibly the Australian Institute of Marine Science (fish larvae), will collaborate in sampling the EZ and Engel nets. This work will not require extra sampling gear or time.

Associated sampling

This sampling voyage forms a part of a larger project currently running in the Perth Canyon, studying blue whales. Some oceanographic equipment (bottomed sea noise loggers and vertical strings of temperature loggers) will be deployed in the Canyon over the voyage duration (separately to this voyage). This gear is scheduled to be deployed in Dec-03, with the approximate location shown on Figure 3. The vertical risers will come from the bottom to within 30-50 m of the sea surface. Details of the gear location will be supplied to the Master in Dec-03 and prior sailing. Additionally, a 7.2 m ocean going inflatable and aerial surveys for blue whales may take place in the study area, over the voyage duration (weather dependant). There will be communication between the PI's and these survey platforms which may be used to guide zooplankton net sampling and echosounder traverses.

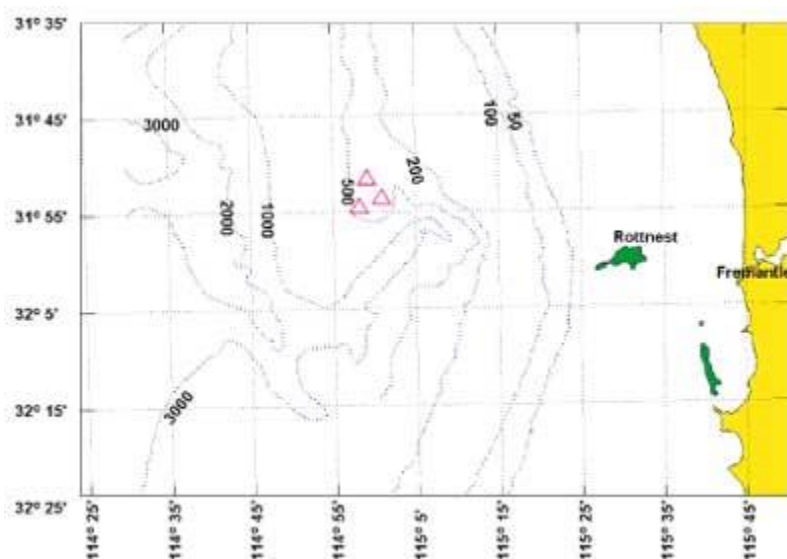


Figure 3: Approximate location of moorings (triangles) to be deployed in December 2003 which will be in place over voyage.

Southern Surveyor Equipment Required

Underway data services:

- Navigation data
- DGPS
- Meteorological data
- Simrad EK500, 38 & 120 kHz data
- Simrad EA 500 12 kHz data
- XBT, two to be deployed each night (may be available?)
- Underway ADCP

Underway monitoring equipment

- Wet and dry laboratory space
- Walk in freezer space
- Fume hoods
- Access to the LAN network for a PC
- We may attempt to keep some krill alive on the back deck. Space for a small pool with a slow flow rate deck hose would be required for this.

Equipment and services with special requirements / Fishing Gear

- Trawl winches and A frame suitable for Engel pelagic nets and EZ plankton net
- CTD/Hydro winch

CTD Water sampling

- CTD, temperature, salinity, fluorescence, underwater PAR
- rosette with 24 bottles, 10 L & 5 L Niskins with user supplied silicon rubbers and O-rings, nutrients
- Nitrate, silicate, phosphate from bottles sampled, salinity and DO from some bottles (approx. 2 per cast)
- Lowered ADCP incorporated into the CTD rosette (LADCP, we are corresponding with Susan Wijffels, CSIRO Marine re. data collection and interpretation)
- Light PAR

Sampling systems and trawl nets

- Scanmar net monitoring system (limited to 1200m?)
- Engel pelagic trawls
- Trawl doors suitable for Engel nets
- EZ plankton net and associated equipment (fluorometer max. 400m)

User Equipment

Drifting gear of:

- Surface gear – 3 x 1 m dia floats separated by 10 m line, Taiyo GPS buoy
- Sub-surface drogue
- Drop line (8 mm braided sheet rope) to 300-350 m depth with 40-60 kg dump weight
- 2 x stainless canisters with hydrophones and sampling electronics, one to set at 300-350 m depth one at 50 m depth
- deep water light trap (not confirmed, AIMS to supply)

Other gear will include

- PC with removable hard disk racks for LADCP processing and echosounder data archiving — access to LAN requested
- Simrad ES60 on transducer pole, 70, 120 & 200 kHz data
- Subject to discussions with CSIRO, a small pool and cover, for keeping zooplankton alive in to be set up somewhere on the back deck

Special Requests

Access to computer network is requested from wet lab to enable LADCP to be connected from the CTD area.

Personnel List

Rob McCauley	Curtin Uni	Chief Scientist, Watch Leader (night)
Doug Cato	Defence (DSTO)	acoustics, nets (night)
Susan Rennie	Curtin Uni	oceanography, Watch Leader, ops. support* (day)
Christine Hanson	UWA	water sampling, radioisotopes, ops. support* (day)
Chandra Salgado	Curtin	oceanog. / acoust., ops. support* (day)
Glenn Moore	WA Museum	nets, ops. support* (night)
Chris Van Etten	Curtin	nets / acoustic, ops. support* (night)
Nick Mortimer	CSIRO (Perth)	nets & acoustics (night)
Ron Plaschke	CSIRO NatFac	Voyage Manager, ops. support*
Pamela Brodie	CSIRO NatFac	Computing
Jeff Cordell	CSIRO NatFac	Electronics
Mark Rayner	CSIRO NatFac	Hydrochemist

NatFac = National Facility

***Note:** A least one operational support person will be required on each watch depending on the equipment to be deployed. Details to be confirmed during voyage briefing soon after sailing. Prior training for operational staff is scheduled on Southern Surveyor, Victoria Quay, Fremantle 0900-1230hrs, Monday 19 January 2004.

This voyage plan is in accordance with the directions of the National Facility Steering Committee for the Research Vessel Southern Surveyor.

Robert McCauley
Chief Scientist