

**MARINE**  
**NATIONAL FACILITY**

**voyageplan**  
**transit SS03-2009**  
**Hobart-Sydney**

**2009** *RV Southern Surveyor*  
**program**

The composition of shelf and deep sea benthos in the Bass Canyon and the distribution of larval fish off the Eastern Tasmanian coast

**Itinerary**

Mobilise Hobart 08:00hrs, Saturday 10th October, 2009.

Depart Hobart 08:00hrs, Sunday 11th October, 2009.

Arrive Sydney 10:00hrs, Thursday 15th October, 2009 demobilise.

**Principal Investigators**

Dr Sebastian Holmes (Chief Scientist/benthic invertebrates)  
The University of Sydney (USYD).

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Dr Will Figueira (larval fish)  
The University of Sydney (USYD).

**Email:** will.figueira@bio.usyd.edu.au **Phone:** (02) 9351 2039

Dr Rudy Kloster (BOAGS)  
CSIRO Marine and Atmospheric Research.

**Email:** rudy.kloster@csiro.au **Phone:** (03) 6232 5222



## Scientific Objectives

For Holmes & Figueira, the main purpose on the voyage is to introduce University students to life and work on board an oceanographic research vessel, experience a variety of different sampling methods, carry out some on board experimentation and expose them to some of Australia's deep sea fauna. The students will have two scientific aims:

- 1) to examine the deep sea fauna of the Bass Canyon and investigate how faunal composition changes with bathymetry and bottom composition;
- 2) to examine the distribution of larval fish along the Eastern shelf of Tasmania and conduct a series of onboard experiments to examine the relationship between temperature and otolith growth increments.

Specimens collected under the first aim will potentially feed back into the work of two Ph.D. students at Sydney University (one looking at food webs with stable isotopes) and one looking at connectivity (population genetics). They may also feed into the research of Holmes (connectivity and phylogeny). In addition, there are obvious synergies between the data collected by the students and the aims of Kloser et al. For the second aim, the data collected will feed into the research of Figueira (climate change and population distribution/connectivity).

For Kloser, the voyage provides an ongoing opportunity to use vessel transit time to complete a national mapping of the upper-mid slope seabed with multi-beam mapping and associated ecological interpretation. The upper-slope and mid-slope seabed 100 m to 1500 m depth range, are regions important for regional marine planning, biodiversity and conservation assessments and fisheries habitat mapping.

The projects objectives relevant to this voyage are:

- 1) using transit time, map key areas within 100 to 1500 m identified in gap analysis;
- 2) develop methods of improving data quality and calibrating the EM300 bathymetry and backscatter data;
- 3) develop and test new rapid methods of seabed optical and physical sampling;
- 4) develop multi-scale methods to provide ecological interpretations and identify key areas for more detailed function and process investigations.

On this voyage we will test a newly developed piece of equipment, Benthic Optical, Acoustic and Grab sampler (BOAGS), which can both survey, by video and acoustically, and selectively sample (surface fired Smith-Macintyre grab) the benthos. The benthic sampling carried out by the students will supplement the testing of BOAGS. Conversely and importantly, BOAGS will allow the students to survey a much broader area and ensure the correct gear is deployed, thereby increasing their exposure to deep sea fauna. In addition, time permitting, it is intended to fill in some of the swath gaps, including a presently unmapped region of Bass Canyon, on the transit to Sydney.

## Voyage Objectives

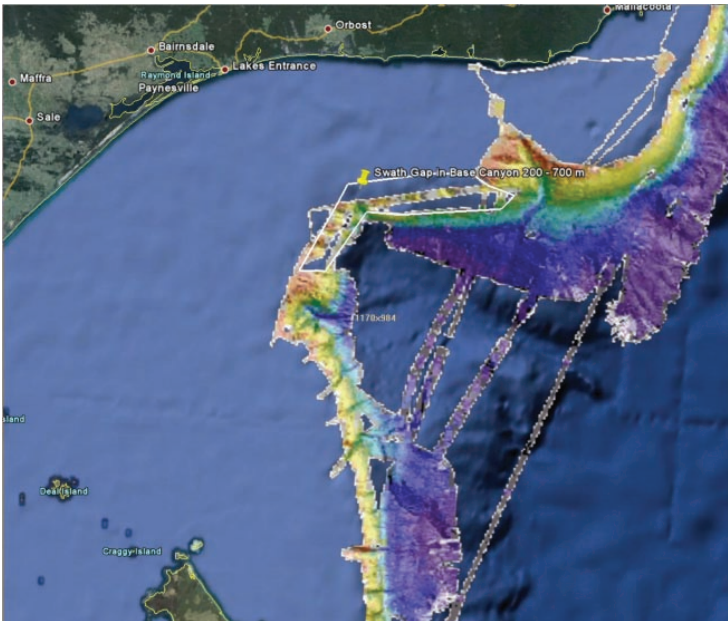
The voyage objectives fall into two categories, benthic sampling and pelagic sampling for larval fish. Pelagic sampling will be carried out using a vertical neuston trawl at six stations on route to Bass Canyon, two stations at Bass Canyon and two stations, time permitting, on route to Sydney. In addition to the trawl, CTD (including bottles) and expendable bathythermograph (XBT) casts will be made to characterise the water masses and absorption and sound velocity profiles for calibrating the swath mapper. Larval fish collected during the early part of the voyage will be used in a series of on board experiments examining the relationship between otolith growth increment and temperature. All fish collected will be identified to the lowest taxonomic level possible and key specimens photographed.

The benthic sampling activities can be split into three components. The physical sampling of the benthos, the testing of BOAGS and the fine scale Swath mapping of Bass Canyon. Physical sampling will be carried out using the beam trawl, epi-benthic sled, rock dredge, the Smith-Macintyre grab and BOAGS. Benthic sampling will occur at six different sites, the first site just out of port to test BOAGS and the five remaining sites at Bass Canyon at 400, 1600, 2800, 1600 and 400 m from the southern to the northern flank. Before any physical sampling takes place, BOAGS will be used, as a part of its testing procedure, to carry out a 30 minute video survey to characterise the site (students will log the fauna seen and nature of the sea floor) which will then determine what sampling gear is deployed, e.g. beam trawl versus rock dredge. It is hoped that each piece of the gear will be deployed at least once during the voyage so that the students can gain an idea of their efficacy. BOAGS will take a grab sample at each site which will be used to examine the meiofauna and provide sediment samples for geological (Kloser) and microbial characterisation (Holmes). All macro fauna collected will be identified to the lowest taxonomic level possible, key specimens photographed and all organisms preserved. All data and specimens collected by the students will be made freely available to the key voyage participants (Holmes, Figueria, Kloser (Williams) and Trull).

### Voyage Track



**Figure 1.** Indicative map of the transit from Hobart to Sydney following the upper slope contour with a detour into Bass Canyon for benthic sampling and swath



**Figure 1.** Outline of the area at the top of Bass Canyon for Swath mapping

## Time Estimates

Departing Hobart at 08:00 on Sunday the 11th October, the vessel will steam along the eastern Tasmanian shelf northwards to Bass Canyon following the edge of a previous swath along the 150-200 m contour. Approximately 2 h out from port, BOAGS will be tested (bottom video survey and grab sample) in shallow water (50 – 100 m) and the epibenthic sled or rock-dredge deployed depending on the bottom composition. Every 8 h, once at sea, the vessel will stop and a vertical neuston trawl and CTD cast taken, both from 200m. An XBT may be deployed when opportune.

Highest priority tasks are in blue, medium priority tasks are underlined and lowest priority tasks are *italicised*.

### **Hobart to Bass Canyon (380 kn)**

Location	Day/time arrival	Day/time depart	Gear (deployment time)	Sampling depth	Cumulative time (distance)
Hobart		Sunday 08:00			
Station 1 (BOAGS initial test, Storm Bay?)	Sunday 10:00	Sunday 11:30	<b>Deployment and grab sample taken with BOAGS (60 min).</b> <i>Epibenthic sled/rock dredge (30 min)</i>	50/100 m	3 ½ h (22 Nm)
Station 2 (larval fish)	Sunday 17:30	Sunday 18:30	<b>Vertical neuston net (20 min)</b> + <u>CTD cast (20 min)</u>	200 m	10 ½ h (88 Nm)
Station 3 (larval fish)	Monday 02:30	Monday 03:30	<b>Vertical neuston net (20 min)</b> + <u>CTD cast (20 min)</u>	200 m	19 ½ h (176 Nm)
Station 4 (larval fish)	Monday 11:30	Monday 12:30	<b>Vertical neuston net (20 min)</b> + <u>CTD cast (20 min)</u>	200 m	28 ½ h (264 Nm)
Station 5 (larval fish)	Monday 20:30	Monday 21:30	<b>Vertical neuston net (20 min)</b> + <u>CTD cast (20 min)</u>	200 m	37 ½ h (352 Nm)
Arrival Bass Canyon (380 Nm Hobart)	Tuesday 00:00				40 h (380 Nm)

Once at Bass Canyon, both BOAGS (grab and 30 minute video survey) and the beam trawl/rock dredge will be deployed at 5 different stations across the canyon at different depths. At two of the stations the neuston net and CTD will be deployed. One hour is factored in for the steam between stations and timings are rounded up to the nearest ½ hour (i.e. the timings are overestimated). If there is inclement weather, we will switch to swath and start sampling when the weather abates.

## **Bass Canyon**

<b>Location</b>	<b>Day/time arrival</b>	<b>Day/time depart</b>	<b>Gear (deployment time)</b>	<b>Sampling depth</b>	<b>Cumulative time (distance)</b>
Bass Canyon	Tuesday 00:00	Tuesday 00:00			40 h (380 Nm)
Station 6 (benthic sampling)	Tuesday 00:00	Tuesday 02:00	<b>BOAGS (60 min), beam trawl (60 min)</b>	400 m	42 h (380 Nm)
<i>Station 6a (benthic sampling)</i>	<i>Tuesday</i>	<i>Tuesday</i>	<i>BOAGS (70 min), beam trawl (90 min)</i>	<i>800 m</i>	<i>Only if time permits, 3 h needed</i>
Station 7 (benthic & pelagic sampling)	Tuesday 03:00	Tuesday 08:30	<b>BOAGS (115 min), beam trawl (140 min), vertical neuston net (20 min) + CTD cast (20 min)</b>	1600 m	48 ½ h (391 Nm)
Station 8 (benthic sampling)	Tuesday 09:30	Tuesday 15:30	<b>BOAGS (150 min), beam trawl (200 min)</b>	2800 m	55 ½ h (402 Nm)
Station 9 (benthic and pelagic sampling)	Tuesday 16:30	Tuesday 22:00	<b>BOAGS (115 min), beam trawl (140 min), Vertical neuston net (20 min) + CTD cast (20 min)</b>	1600 m	62 h (413 Nm)
<i>Station 9a (benthic sampling)</i>	<i>Wednesday</i>	<i>Wednesday</i>	<i>BOAGS (70 min), beam trawl (90 min)</i>	<i>800 m</i>	<i>Only if time permits, 3 h needed</i>
Station 10 (benthic sampling)	Tuesday 23:00	Wednesday 01:00	<b>BOAGS (60 min), beam trawl (60 min)</b>	400 m	65 h (424 Nm)
End of Bass Canyon benthic sampling	Wednesday 01:00				

**NB** for all dredges/trawls we have assumed the vessel is effectively stationary/not heading in a particular direction (normally ½ - 1 knot trawl speed) and for calculating winch times for the benthic sampling we have used a rate of 60 m per minute and the appropriate amount of extra wire for dredging/trawling. For the neuston/CTD casts we have used a winch speed of 20 m per minute.

### **Bass Canyon swath of presently unmapped area (see Figure 2)**

<b>Location</b>	<b>Day/time arrival</b>	<b>Day/time depart</b>	<b>Gear (deployment time)</b>	<b>Sampling depth</b>	<b>Cumulative time (distance)</b>
Bass Canyon	Wednesday 01:00				65 h (424 Nm)
Start of swath	Wednesday 01:00		<b>Swath (multibeam)</b>		
End of swath		Wednesday 06:00			70 h (479 Nm)

If we have spare/extra time we will complete the swath of the whole unmapped area (~ 9 h/ 4 transects).

### **Bass Canyon to Sydney (300 kn)**

<b>Location</b>	<b>Day/time arrival</b>	<b>Day/time depart</b>	<b>Gear (deployment time)</b>	<b>Sampling depth</b>	<b>Cumulative time (distance)</b>
Bass Canyon	Wednesday 06:00	Wednesday 06:00			70 h (479 Nm)
Station 11	Wednesday 14:00	Wednesday 15:00	<i>Vertical neuston net (20 min) + CTD cast (20 min)</i>	200 m	79 h (567 Nm)
Station 12	Wednesday 23:00	Thursday 00:00	<i>Vertical neuston net (20 min) + CTD cast (20 min)</i>	200 m	87 h (655 Nm)
Arrive Sydney (White Bay)	Thursday 00:00	Thursday 10:00			98 h (765 Nm)

## **Piggy-back Projects**

### **Calibrating coral records of EAC influence on Tasman Sea productivity**

Tom Trull (CSIRO-UTAS, ACE-CRC)

Recent work on the  $^{15}\text{N}$  content of deep-sea corals from seamounts southeast and south of Tasmania suggests that oceanographic conditions over the past few centuries have varied little in terms of the nutrient content of overlying surface waters. This suggests that either the influence of a strengthening EAC has yet to reach these locations, or that its influence is minimal in terms of ocean productivity. However, this interpretation depends on the calibration of the relationship between  $^{15}\text{N}$  content and nutrient levels, which is currently based on observations only from the south of Tasmania. Sampling during the Hobart-Sydney transit offers an opportunity to extend the range of observations and develop confidence in the use of the deep coral time series as a proxy for past nutrient conditions.

#### **Scientific objective**

To obtain surface water organic matter samples to calibrate the relationships between the presence of EAC waters to the east of Tasmania, nutrient levels, and the  $^{15}\text{N}$  content of surface derived food sources to deep corals.

#### **Voyage Objectives**

Filter the underway clean seawater supply to obtain samples of particulate organic matter using in-line  $1\mu\text{m}$  pore size silver filters. Samples will be taken hourly throughout the voyage and quantities of  $\leq 100$  liters will be filtered and the filters preserved (dried) for post-voyage analysis. At the same time as the water is being filtered, simultaneously duplicate 10 ml water samples, for nutrient analyses, will be collected and frozen.



## **Southern Surveyor Equipment**

- Smith-Macintyre grab
- Rock dredge
- Small epi-benthic sled
- XBT
- CTD + bottles
- Underway clean seawater supply
- Underway thermosalinograph, fluorometer and pCO<sub>2</sub> monitoring systems running throughout the voyage duration.

We would like to use the Chemistry (dry work and water filtration) and Fish Lab (specimen sorting, cataloguing etc. and experimental larval fish experiments) on the Shelter deck and Controlled temperature Lab (larval fish experiments) on the Main deck.

## **User Equipment**

- Beam trawl
- Neuston net
- BOAGS & winch for BOAGS.
- Filtration equipment for seawater sampling (to be installed adjacent to clean seawater supply and sink) and Lab oven (to be set up in the chemistry laboratory if possible).
- Lidded small plastic aquarium tanks (30) and heaters for larval fish experiments.
- 6 + nallies filled with general equipment (bags, notebooks etc.)
- Dissecting microscopes.
- Sieve table.
- Scales.
- Photographic equipment (to be set up in the chemistry laboratory if possible).

## **Special Requests**

Access on the rear deck to a seawater (fire pump) supply for sieving the trawl/dredge material.

Some of the students will carry out cetacean/seabird surveys during daylight hours, and will require access to the bridge for their surveys, where appropriate.

Space to set up a computer next to the feed from BOAGS in the operations room.

Use of the controlled temperature (CT) laboratory for some of the larval fish experiments.

If it is possible we would like to come off board with the swath, EK500, BOAGS electronic and underway CTD/XBT data.

## Personnel List

Sebastian Holmes	USYD	Chief Scientist
Will Figueria	USYD	Principal Investigator (larval fish)
Rudy Kloser	CMAR	Principal Investigator (BOAGS)
Matt Sherlock	CMAR	Engineer
Jeff Cordell	CMAR	MNF Voyage Manager & Electronic Support
Bernadette Heaney	CMAR	MNF Swath support
Anoosh Sarraf	CMAR	MNF Computing Support
TBA Seb/Will	Macquarie University	Student
TBA Seb/Will	USYD	Student
TBA Seb/Will	USYD	Student
TBA Seb/Will	USYD	Student
TBA Seb/Will	USYD	Student
TBA Seb/Will	UNSW	Student
TBA Seb/Will	UTS	Student
TBA Seb/Will	UWS	Student

As per AMSA requirements for additional berths on Southern Surveyor, the following personnel are designated as System Support Technicians and are required to carry their original AMSA medical and AMSA Certificate of Safety Training on the voyage:

<b>Name</b>	<b>AMSA Certificate of Safety Training No.</b>
Jeff Cordell	AS02398
Anoosh Sarraf	BB02298
Bernadette Heaney	AS02397

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

**Sebastian Holmes**  
*Chief Scientist*