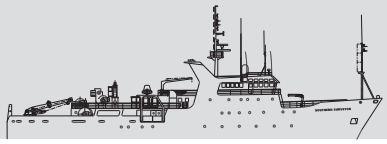


MARINE
NATIONAL FACILITY

2011 program

RV *Southern Surveyor*

voyageplan
ss2011_t04

2,000 years of oceanic history offshore southern Australia *in combination with* National upper slope seabed multi-beam mapping and ecological interpretation

Itinerary

Depart Fremantle 1600hrs, Thursday 10 November 2011
Arrive Hobart 1400hrs, Sunday 20 November 2011 and demobilise

Principal Investigators

Prof. Patrick De Deckker (Chief Scientist) – Australian National University
Research School of Earth Sciences, ANU, Canberra ACT 0200

Dr Tony Rathburn, Indiana Sate University, Earth and
Environmental Sciences, Terre Haute, IN 47809. USA

Dr Sabine Schmidt, Université de Bordeaux I, UMR CNRS 5805
EPOC, Avenue des Facultés, 33405 Talence cedex, France.

CSIRO

Scientific Objectives

Project 1:
2,000 years of oceanic history offshore southern Australia

Principal investigator: Prof. Patrick De Deckker

This project will generate high-resolution records of sea-surface temperature [SST] changes that have occurred offshore southern Australlia over the last two millennia. A variety of innovative proxies will be employed and used for comparison with lake records on land. International collaboration is a feature of this program, linking with the Royal Netherlands Institute for Sea Research [NIOZ] to determine past sea-surface temperatures and wind-induced upwelling conditions using specific organic compounds recovered in deep-sea cores, and with the marine radio-isotope laboratory in Bordeaux, France, to accurately date cores over short time scales.

De Deckker is to collect samples using a multicorer and a PhD student from NIOZ is to participate on the voyage and will be helped by an ANU student who are to analyse the samples under the supervision of Dr Schouten.

Water samples are to be collected during the voyage to extract specific organic compounds that are secreted by different algae fore comparison with organic compounds to be found in the short cores. These compopunds are used to reconstruct past sea-surface temperatures. De Deckker will be assisted by both a research assistant and a PhD student at ANU to extract microfossils and date some of them using the radiocarbon technique.

Schmidt is to return to France with some of the samples obtained with the multicorer to date them in her radio-isotope laboratory.

Rathburn is to subsample several of the cores with his postgraduate student to study the live infaunal microbiota that live in the upper few cm of the sea floor.

A CTD profile has been selected offshore western Tasmania down to 2.4km to collect water samples for radiocarbon analysis at the ANU for a PhD student working on the palaeoenvironmental record of deep-sea corals offshore Tasmania.

Project 2:
National upper slope seabed multi-beam mapping and ecological interpretation

Principal Investigators: Dr Rudy Kloser

Spatial management is becoming increasingly common and Australia leads the world in developing a National Representative System of Marine Protected Areas (NRSMPA) by 2012. However, the NRSMPA by itself will not be adequate to manage and protect the marine environment and spatial management of areas outside the NRSMPA will be required. This places an increased demand on scientists to know the physical structure of those areas and their value to biodiversity and ecosystem function.

Voyage Objectives

Project 1 Objectives

Priority 1 is to collect multicores at 10 stations along the the southern coast of Australia between Fremantle and Hobart. The location of these stations was chosen for sites which are fairly flat lying, away from the coast [to avoid the transport of material by coastal currents] and close to the 1,000m contour line [to avoid sediments that would have registered biogenic carbonate dissolution if taken at greater depths]. Once retrieved from the sea floor, the sediment cores will be sliced in 1cm sections for analysis in various laboratories. The proposed map shows the 9 stations that have been identified, but alternative sites are also identified in case others had to be abandoned due to poor weather conditions etc.

Priority 2 is to collect surface water samples and plankton at the core sites and also in between the core sites at approximately every 100km intervals. These samples again are to gather information of the nature of calcareous micro- and nano-plankton that live in the ocean along the voyage track. The ecological conditions that control the distribution of these organisms are to help interpret the fossil remains of these organisms to be extracted form the cores.

Priority 3 is to obtain CTD profiles at each coring site and to obtain other chemical parameters, such as nutrients and dissolved oxygen. These are to help interpret the nature of the sediments obtained in the cores. Water samples will be collected at selected depths for chemical analyses at ANU [e.g. trace elements and stable isotopes].

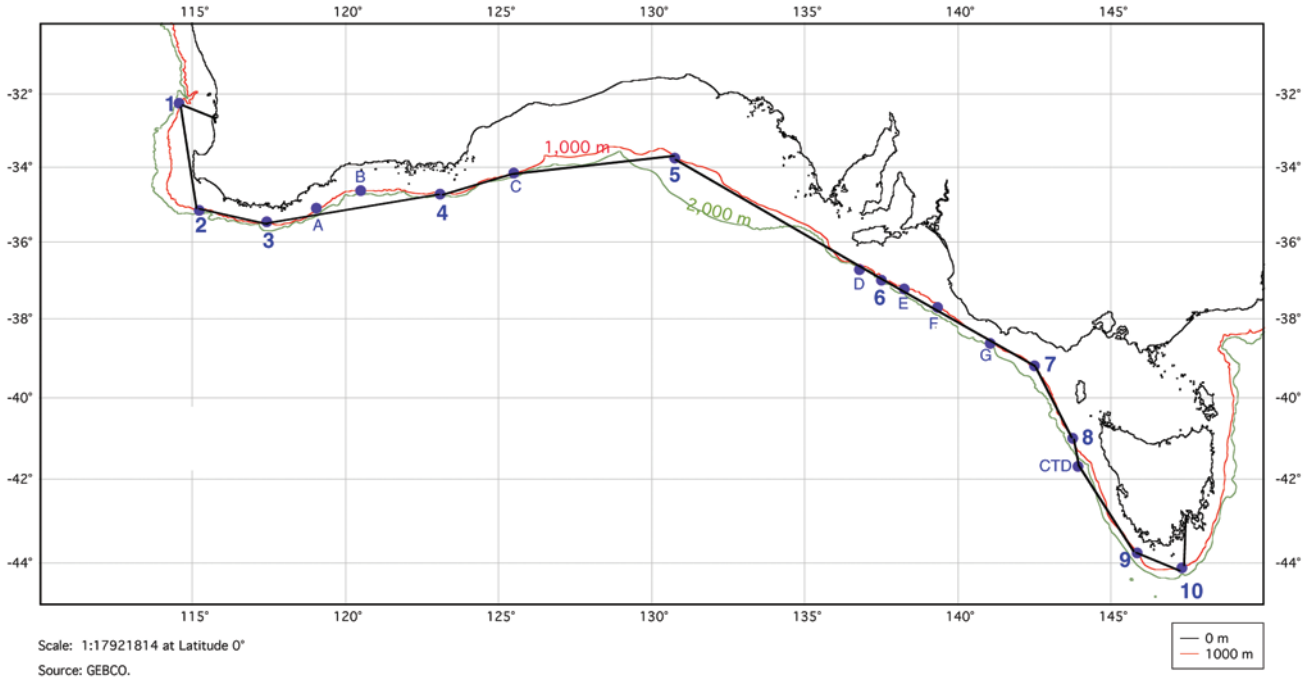
Project 2 Objective:

Using transit voyage time on the Marine National Facility vessel map the upper-slope and mid-slope seabed focusing on the 100 m to 1500 m depth range and regions important for regional marine planning, biodiversity and conservation assessments and fisheries habitat mapping in the SE and SW marine bio-regions.

Priority 1

Using the EM300 swath mapper gap fill areas of critical importance to national regional marine planning goals and sample potential key ecological features (e.g. canyons, reefs etc) in the 100 - 1500 m range with physical, optical and acoustic devices (e.g. BOAGS, Sherman, Benthic Sled). Target sampling to cover depth and terrain type variability and testing predictive models of biodiversity patterns for regional marine planning and monitoring. The vessel will be operated within the 100 - 1500 m seabed depth range (200-700 m high priority) and the voyage track set to maximise the underway swath coverage for the transit voyage and to map a canyon near site 9.

Voyage track



Proposed voyage track for the voyage, starting in Fremantle and ending in Hobart, which will be principally targeting the 1,000 m contour line to obtain suitable data for Project 2. The proposed coring stations are all within the 1,000 m water depth range to obtain suitable sediments for geochemical and micropalaeontological analysis.

Numbers refer to the stations considered to be prime targets. Letters refer to sites which are to be considered as alternatives if for some reason one of the numbered stations are unsuitable because of weather conditions etc. Note the red line represents the 1,000 m contour and the green one for 2,000m. The station labelled CTD is proposed to take a set of water samples for radiocarbon dating different water masses to provide information for a PhD project by an ANU PhD student working on deep-sea corals. Those data will also be of relevance to our project on past climatic conditions at sea in our region.

This table shows the coordinates for all the sites; those that are prioritised have a number, and alternative sites have a letter. Refer to the voyage track for their location. Two hours have been allocated at each station, but if there are delays, perhaps 2 of the 10 prioritised stations will have to be ignored, or no CTD profiles will be taken after coring at some sites as allocated time is tight if we are to sail at a speed of 10 knots.

Note that no cores are to be taken at the proposed CTD station offshore Tasmania between stations 8 and 9.

If the vessel is able to sail at a speed of 11 knots, we will have ample time to perform all the proposed activities, including the mapping of the canyon near station 9 as proposed for Priority 2.

The vessel will be asked to slow down to 1 knot speed at approximately every 60Nm and stay at that speed for 5 minutes to enable us to collect plankton tows using a small plankton net and collect water samples using a bucket thrown overboard.

Station number	Alternative station	Latitude S	Longitude E	Water depth (m)	distance travelled Nm	timing in hours @10kn speed	timing in hours @11kn speed	days of sailing @10kn	days of sailing @11kn	Work time at each station in hours	Stopover (in minutes) for plankton tows & water sampling in minutes every ~ 60Nm while in transit
Fremantle harbour		32°03' 21.74"	115°44'50"								
1		32°14.84'	114° 34.30'	1093	61					2	
2		35°09.52'	115° 13.31'	~1040	172					2	30
3		35°27.63'	117° 26.08'	1002	109					2	20
	A	35°06.38'	119° 03.13'	1014							
	B	34°38.08'	120° 29.86'	1009							
4		34°43.16'	123° 05.64'	1077	282					2	40
	C	34°09.16'	125° 29.90'	1090							
5		33°45.04'	130° 45.04'	951	385					2	60
	D	36°43.65'	136° 47.05'	991							
6		36°59.98'	137° 30.00'	1013	384					2	60
	E	37°14.00'	138° 14.99'	872							
	F	37°42.00'	139° 20.17'	1014							
	G	38°37.65'	141° 03.00'	1036							
7		39°11.85'	142° 29.93'	~1100	268					2	40
8		40°59.98'	143° 44.89'	1005	122					2	20
CTD	o corin	41°50'	143° 30'	~2,400	50					2	
9		43°46.08'	145° 51.29'	1033	154					2	30
10		44°06.92'	147° 18.43'	1004	67					2	
Hobart harbour		42°46.20'	147°06.14'		70						300
					2124	212	193.1			22	5 hours
						possibly 6 h for project 2 aiming at mapping a canyon near st. 9					
						218.4h		9.1	8.25		

Total number of days for entire voyage: 9 days 20 hours.

Piggy-back Projects

Sampling the airborne microbiota offshore southern Australia.

De Deckker and PhD microbiology student from the Medical School at ANU, Chris Munday, will deploy an air sampler at the front of the vessel to study the airborne microbiota. This project is not going to require additional ship time. Some preliminary data were obtained on the *Southern Surveyor* in 2005 during a voyage led by De Deckker between Port Lincoln and Hobart. The equipment to be deployed during the proposed voyage is much more sophisticated than what was used before during voyage SS01-2005 and the data will be compared with was what obtained during transit voyage SS2011-T01 earlier this year. Mr C. Munday has already processed the 14 samples taken during SS01-2005

Calibration CTD

The CMAR Oceanographic Calibration Facility uses seawater in its calibrations bath, so that it can undertake CTD calibrations. This seawater only has a short usable life, so from time to time, we need to replenish our stocks of the seawater. To ensure the quality of the calibrations, we need seawater that meet specific requirements. It would be a great help to the facility if seawater from a CTD cast were collected and returned to the laboratory; 12 x 25l are to be used. The CTD will be undertaken some 500km from coast, above 1000m water depth and sampling is to occur at 100m only. As it is a 100 m cast for all the bottles at the same depth, it should only take 30 minutes to perform the task.

Southern Surveyor Equipment

Coring winch with 19mm wire to deploy the multicore that weights 800 kilos.

CTD/Hydro winches each with 8mm single core conducting cable to obtain CTD profiles and collect water samples. A 24 bottles rosette is required with 10 litre Niskin bottles.

We require the following measurements to be made by the National Facility chemist: salinity, dissolved oxygen [not listed in the original application], nitrate + nitrite, nitrite, reactive silicate, and orthophosphate.

We require access to milliQ water, and access to the chemistry laboratory.

We also require swath bathymetry data and the Topas sub-bottom profiler.

User Equipment

We will bring the multicorer that weights 800 kilos in total. It has to be assembled in Fremantle before departure, and we believe this would be achieved in approximately 2 hours, and work could continue if necessary in calm waters while exiting from the harbour. We propose to do this in the afternoon of November 10 after the gear from the previous voyage has been offloaded that day. A crane will be required to load the 4-5 boxes that contain all the multicorer parts.

We are to bring all the necessary equipment to sub-sample the cores and keep the tubes in a vertical position once the corer is brought back on deck. Access to the fish laboratory and also the chemistry laboratory is required to sub-sample the cores. Once the samples are obtained, they are to be stored in a cold room at 4°C. Estimated volume at the end of the coring process will be a crate of 50cm x50cm x100cm.

We will also bring a small plankton net [1m diameter and 2 m long], and water sampling gear [to filter water for nanoplankton].

Storage jars and special plastic bags for storing samples will be brought by us.

We will also bring a vapour shipper to store the aerosol samples. This extremely well sealed metal container contains liquid nitrogen. This container is especially designed to that it does not leak and is entirely safe [e.g. it can be taken on planes and inside cars]. It weighs 14 kilos and its dimensions are: 38 x 38 x 60 cm. This container is to be stored in the one of the cold rooms and is to be attached to a permanent fixture [e.g. below a desk, for example or against a wall].

Special Requests

An air sampler is to be deployed in front of the ship on the top deck and is to be connected to 240V power. On the last transit voyage [SS2011-t01], De Deckker was able to connect to power below on the bridge. The air sampler weight 10 kilos and its dimensions are: 40 x 50 x 60 cm.

Special Requests

None envisaged except for those items listed and described above.

Personnel List

Patrick De Deckker	ANU	Chief Scientist
Sabine Schmidt	University of Bordeaux	Co-Chief scientist, dating of sediments
Graham Nash	ANU	Multicoring
Raquel Lopes Santos	NIOZ, The Netherlands	Organic compounds
Marita Smith	ANU	Organic compounds
Lyndsay Dean	ANU	Processing multicore samples
Ashley Burkett	Indiana State University	Multicoring
Sam Eggins	ANU	Processing multicore samples
Luna Brentegani	ANU	Calcareous plankton and water sampling
Chris Munday	ANU	Microbiology
Lindsay Pender		MNF Computing/Voyage Manager
Lindsay MacDonald	MNF	Electronics support
Alicia Navidad	MNF	Hydrochemistry support
Tara Martin	MNF	Swath leader project 2
Sascha Frydman	MNF	Swath support

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:

Name	**AMSA Certificate of Safety Training No.**
Lindsay Pender	AS02763
Lindsay MacDonald	AS04157
Tara Martin	BB05761
Alicia Navidad	AS04836

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

Patrick De Deckker
Chief Scientist