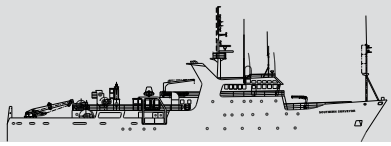


MARINE
NATIONAL FACILITY

2010 program

RV *Southern Surveyor*

CSIRO

voyage summary SS2010_T03

SS2010_T03

Next Wave Transit, Hobart to Sydney

Voyage period

Start: 17/09/2010

End: 21/09/2010

Port of departure: Hobart, Australia

Port of return: Sydney, Australia

Responsible laboratory

Fisheries and Marine Environmental Research, University of NSW

FAMER, School of BEES, UNSW, Sydney, NSW, 2052 Australia

Chief Scientist(s)

Jock Young, CSIRO Marine and Atmospheric Research

Scientific Objectives

"Next Wave" is a new programme of the Marine National Facility Steering Committee to encourage young scientists to experience research at sea. SIMS has hosted two recent transit voyages Transit SS03-2008 (Aug08, Gladstone to Sydney) and Transit SS01-2009 (Jan09, Sydney to Wellington), with students from all over Australia. The students and leaders usually work 12 h shifts between 07:00-23:00 to operate the CTD rosette and N70, XBT casts, a well as underway TSG, fluorometer etc, bird/whale counts, etc.

This transit provides experience and supports the research of:

1) two UNSW PhD students examining the community composition of euphausiids and salps (Ben Harris 2010-12; Natasha Henschke 2010-12); (for those back on land, the voyage also provides oceanographic data for a new UNSW PhD student (Josh Humphries) studying the IMOS glider data with UTS researcher Dr Mark Baird);

2) a prospective honours student (Paloma Matis, U.Syd) and PhD student (Ben Roennfeldt, Deakin U) studying plankton;

3) a U.Tas MSc student (Sarah Payne) and a UNSW MSc.Phil. student starting a project on salp fecundity (Lauren Ooi, 2010-2011, and;

4) 5 keen undergraduates selected from the UNSW third year Ocean Biology & Fisheries class.

Our scientific objectives are to provide at-sea experience of working on a moving platform and working as a team. Specifically, students will work with CTD, N70 net, acoustics and EZ net, at two locations: approximately off Eden (~19th for 10 h) and off Jervis Bay (~20th for 10 h), to arrive off Sydney Heads on morning of 21st. These two main sampling sites will be preceded by tool box meetings and trial deployments of the gear in the morning (~18th for 4 h) off NE Tasmania.

The scientific objectives at each site are:

1) The change in abundance of krill and salps between on-shelf (~150 m isobath) and off-shelf (~1500 m isobath), and in relation to CTD casts, ADCP, MODIS SST and ocean colour images.

2) Determine spatial (negative) correlation between salps and crustacean zooplankton (copepods and krill).

3) To determine the composition and dynamics of the ascending, deep scattering layer (DSL) around sunset (approx 17:30 in late September) at a site off the shelf.

4) Where possible to opportunistically investigate oceanographic features of the East Australian Current such as fronts and eddies off the NSW coast identified from MODIS images and BlueLink.

Voyage Objectives

Our voyage objectives are :

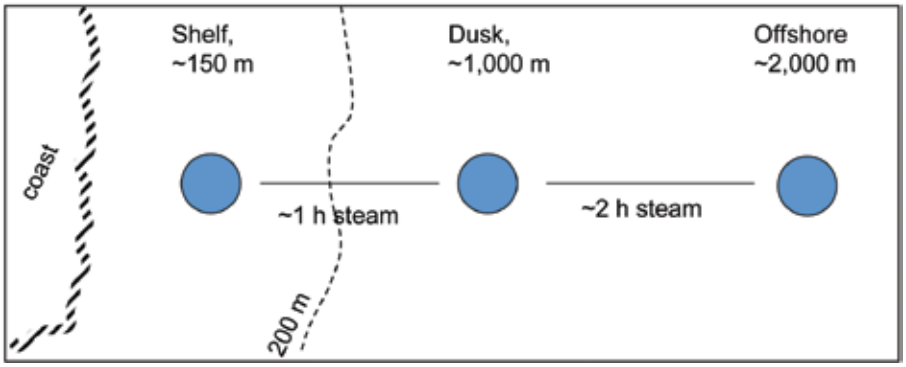
i) To expose students to the challenges of research voyages, by using the basic equipment of the vessel and occasional lectures or tutorials by the scientists, MNF support staff and the bridge deck officers; to appreciate the importance of communication, mutual respect, lines of authority and safety "toolboxes" for each operation by Friday morning;

ii) To tow the Continuous Plankton Recorder from Tasmania to NSW, to make up for the missing August 2010 deployment;

iii) To determine the cross-shelf gradient in nutrients, phytoplankton and zooplankton (particularly salps and krill) - as well as counting seabirds and whales. At each site, CTD casts and plankton tows will occur during the afternoon and evening, and will be aligned with any oceanographic features;

iv) To monitor the ADCP and underway data (T, S and fluorescence at 4 m intake) as the vessel crosses eddies and other oceanographic features;

The sites of Flinders, Eden and Jervis Bay do not have to be precisely determined, as long as we start around 1300 and finish before midnight, and the Dusk station starts around 1700-1830 to capture dusk in around 1000 m, to capture the sequences of vertical migration. Reserve the last 10-12 h to steam towards Sydney Harbour entrance by around 1300 Tuesday, dock by 1500.



Sketch of general sampling strategy off the 3 locations, with one CTD+N70 vertical haul, and one EZ net tow per station (approx. 3 h per station). St Helens site is a lower priority compared to the Eden and Jervis sites. Off Eden start at 1300 from the coast end; off Jervis start at 1300 off the offshore end (or vice versa; they are assumed to be replicates).

Results

Departure was delayed for 12 h, to Thursday morning. Force 7 winds were experienced on departure and for the first half of the transit. Fortunately the CPR was deployed off Tasmania for 400 nm. Two eddys were investigated along the east coast; a warm core situated off Jervis Bay and a cold core off Sydney (Fig. 1). The cold core eddy had a Sea Glider mission within it since early August. The deep mixing in the warm-core eddy off Jervis Bay was confirmed, and it was presumed to be in the process of becoming capped with spring heating and with a new shallow mixed depth layer should provide a plankton bloom. For each eddy a CTD transect of 3 stations were covered across both eddies showing the different water types, and the resulting deep mixed layer (250m) of the warm core eddy. Through the use of the ship's onboard ADCP, we were able to locate the centre and edge of the cold core eddy which was obscured by satellite view as a result of cloud cover in the region throughout the voyage.

Description of gear: The N70 net is a 70 cm diameter net with a range of mesh sizes from 200 um, to 400 um, to 6 mm diamond mesh around the collar. It attempts to replicate the net used extensively off NSW by Thompson 1939-1942).

Voyage Narrative

Shortly after the commencement of the voyage a muster was conducted whilst still in the protection of the Derwent River. On arrival at Storm Bay we were met with large swells from the south west and headed straight towards the shelter of the Tasmanian east coast, where we deployed the IMOS supplied CPR for the beginning of a 400 nm tow. Whilst the CPR was under tow and crossing Bass Strait, an Argo float was deployed as part of the World Climate Research Program (WCRP). As the first waypoint was reached off the coast of Jervis Bay the CPR was retrieved and a series of tool boxes were completed for the use of the CTD, EZ net and the new N70 net set up. Whilst on the shelf and just outside of the warm core eddy the CTD was deployed and two N70 nets were also deployed. An attempt of using the EZ net was then made as planned, though due to a failure in the hydraulic winch, the use of the EZ net was abandoned for the remainder of the voyage. From here further stations were sampled in the same fashion at both the edge and the centre of the warm core eddy by heading north-east to help cut towards the cold-core eddy.

Due to the lack of satellite imagery (Fig. 2), we assumed a course towards the centre of the cold core eddy from the older map (Fig. 1), watching the ship board ADCP and flow through temperature. On locating the cold core eddy, we then undertook a similar transit starting from the north-eastern sector just past the limit of the eddy in EAC waters. We then travelled back into the centre of the eddy to sample it and one more sample back on the shelf near Sydney. On completion of the physical sampling Jock Young and three PhD students (Ben Harris, Natasha Henschke and Ben Roennfeldt) gave talks of their research, how this transit complements it and other types of marine based research.

Throughout the voyage the swath equipment was used to add data to the national network of benthic mapping.

Summary

Although it was disappointing that the EZ net could not be used the voyage was still largely successful and showed young scientists how work in this field has to be able to adapt to the prevailing conditions. The CTD and N70 net samples collected from this transit will be very helpful for comparison with further sampling of this warm core in the following voyage ss2010-v08 and the transit returning to Hobart in November of this year.

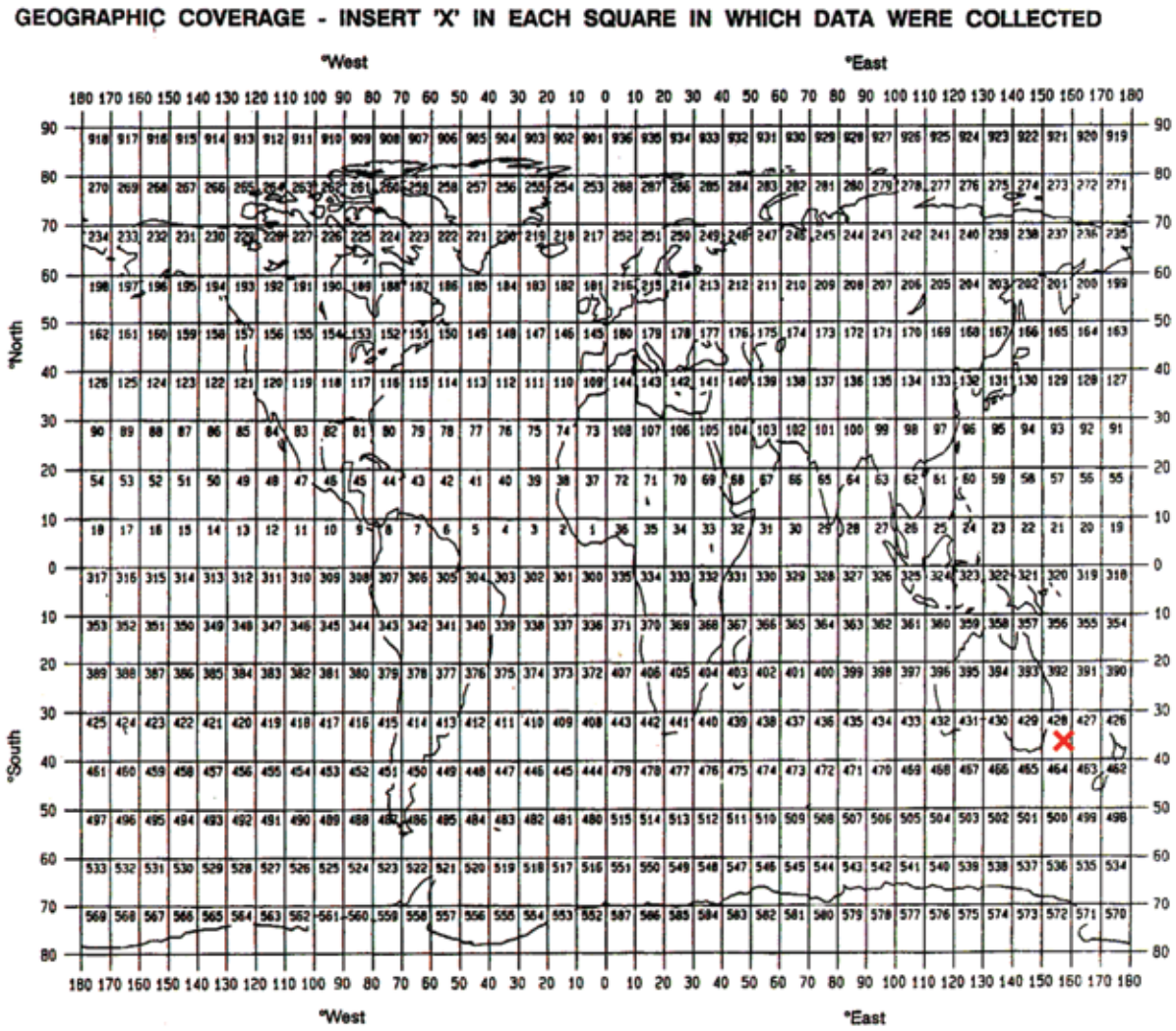
Principal investigators

A. I.M. Suthers, UNSW School of BEES, Sydney, NSW, 2052

B. J.W. Young, CSIRO, Marine & Atmospheric Research, Castray Esplanade, Hobart, TAS, 7000

C. B. Harris, UNSW School of BEES, Sydney, NSW, 2052

D. A. Richardson, CSIRO, Marine & Atmospheric Research, Cleveland, QLD, 4163.,



MOORINGS, BOTTOM MOUNTED GEAR AND DRIFTING SYSTEMS									
Item No	**PI** See page above	**APPROXIMATE POSITION**						**DATA TYPE**	**Description**
		LATITUDE			**LONGITUDE**				
		deg	min	N/S	deg	min	E/W		
1	2	40	21	S	148	53	E	D90	Argo float was deployed carrying temperature and salinity probes, sampling up to 2000m below the surface. Deployed on the 18/09/2010. Not to be recovered.
2	4	43	29	S	148	30	E	B09	Continuous Plankton Recorder

SUMMARY OF MEASUREMENTS AND SAMPLES TAKEN					
Item No.	**PI** see page above	**NO** see above	**UNITS** see above	**DATA TYPE** Enter code(s) from list on last page	**DESCRIPTION**
1	1	1	Deployment	H10	CTD were deployed to a depth of 120m with additional fluorescence monitors added as well as niskin bottles for the measurement of nutrients and calibration of physical data
2	1	2	Haul	B09	2 Vertical hauls were completed with the use of an N70 net being hauled from a depth 50m. These were examined for zooplankton caught in the net.
3	1	1	Deployment	H10	CTD were deployed to a depth of 400m with additional fluorescence monitors added as well as niskin bottles for the measurement of nutrients and calibration of physical data
4	1	2	Haul	B09	Vertical hauls were completed with the use of an N70 net being lowered to a depth of 50m. These were examined for zooplankton caught in the net.
5	1	1	Deployment	H10	CTD were deployed to a depth of 800m with additional fluorescence monitors added as well as niskin bottles for the measurement of nutrients and calibration of physical data
6	1	2	Haul	B09	Vertical hauls were completed with the use of an N70 net being lowered to a depth of 50m. These were examined for zooplankton caught in the net.
7	1	1	Deployment	H10	CTD were deployed to a depth of 400m with additional fluorescence monitors added as well as niskin bottles for the measurement of nutrients and calibration of physical data
8	1	2	Haul	B09	Vertical hauls were completed with the use of an N70 net being lowered to a depth of 50m. These were examined for zooplankton caught in the net.
9	1	1	Deployment	H10	CTD were deployed to a depth of 400m with additional fluorescence monitors added as well as niskin bottles for the measurement of nutrients and calibration of physical data
10	1	2	Haul	B09	Vertical hauls were completed with the use of an N70 net being lowered to a depth of 50m. These were examined for zooplankton caught in the net.
11	1	1	Deployment	H10	CTD were deployed to a depth of 400m with additional fluorescence monitors added as well as niskin bottles for the measurement of nutrients and calibration of physical data
12	1	2	Haul	B09	Vertical hauls were completed with the use of an N70 net being lowered to a depth of 50m. These were examined for zooplankton caught in the net.
13	1	1	Deployment	H10	CTD were deployed to a depth of 400m with additional fluorescence monitors added as well as niskin bottles for the measurement of nutrients and calibration of physical data
14	1	2	Haul	B09	Vertical hauls were completed with the use of an N70 net being lowered to a depth of 50m. These were examined for zooplankton caught in the net.
15	1	1	Deployment	H10	CTD were deployed to a depth of 100m with additional fluorescence monitors added as well as niskin bottles for the measurement of nutrients and calibration of physical data
16	1	2	Haul	B09	Vertical hauls were completed with the use of an N70 net being lowered to a depth of 50m. These were examined for zooplankton caught in the net.

CURATION REPORT	
Item No.	**Description**
2-16 (evens)	All samples were preserved in a solution of 5% formalin/ seawater at the time of sampling. Samples will be housed at the University of New South Wales, where the zooplankton community will be examined and special note will be taken of salps and euphausiids found in the samples. Samples will be kept for a minimum of three years.

Voyage track

GENERAL OCEAN AREA: Tasman Sea and Bass Strait.

SPECIFIC AREAS: Sampling was dictated by oceanographic features, a warm core eddy off Jervis Bay and a cold core eddy off Port Stephens.

PERSONNEL LIST

Scientific Participants

Name	Affiliation	Role
Jock Young	CSIRO CMAR	Chief Scientist
Ben Harris	UNSW	Alternate Watch leader
Natasha Henschke	UNSW	PhD Student
Ben Roennfeldt	Deakin Uni	PhD Student
Sarah Payne	UTas	Masters Student
Lauren Ooi	UNSW	Masters Student
Paloma Matis	USyd	Student
Emma Hall	UNSW	Student
Natalie Rivero	UNSW	Student
Louisa Attard	UNSW	Student
Matt Ward	UNSW	Student
Luke McPhan	UNSW	Student
Pamela Brodie	CMAR	MNF Computing support/Voyage Manager
Jeff Cordell	CMAR	MNF Electronics Support
Alicia Navidad	CMAR	MNF Hydrochemistry Support

Marine Crew

Name	Role
Mike Watson	Master
John Barr	1st Mate
Tom Watson	2nd Mate
Robert Cave	Chief Engineer
Bill Bourn	1st Engineer
Jason Searle	2nd Engineer
John Howard	Bosun
Kel Lewis	I.R
Ben McLucas	I.R
Rose Croasdale	I.R
Rod Langham	I.R
Kate Gould	Steward
Geri Byrne	Chief Cook
Robert Dittko	2nd Cook

Acknowledgements

We thank the Master of the RV *Southern Surveyor*, Mike Watson, and his crew for their seamanship

and enthusiasm, and also the dedication of the Marine National Facility staff who made the science possible. Also a special thanks to the Master and the mates for their understanding of the mobility of this research under the conditions, lack of satellite telemetry and for having the patience of to cope with a young watch leader. A special thanks to the Sydney Institute of Marine Science (SIMS) for financing the students victualling aboard the *Southern Surveyor* and to Iain Suthers for his help and support through this voyage and all of its processes. A further acknowledgement to Jock Young, Chief scientist for his help and support throughout the voyage. It was of great comfort to have his support and experience available throughout the trip. Final acknowledgment must go to the Marine National Facility overall for their support and providing the transit opportunity which was well accepted by all the students.

Ben Harris
Alternate watch leader

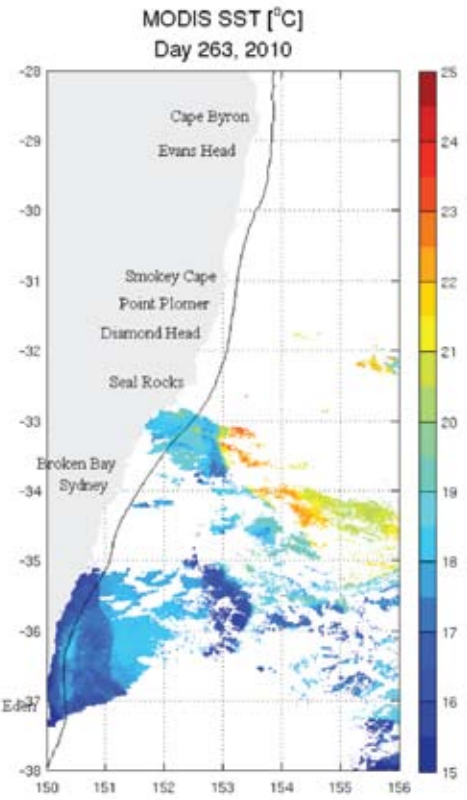


Fig 1: Combined altimetry map from before voyage (15 Sept), revealing our two targets, the warm core eddy of Jervis Bay (34-37 degr S), and the cold core eddy off Port Stephens (33-35 degr. S). This was our main method of scientific navigation due to cloud cover.

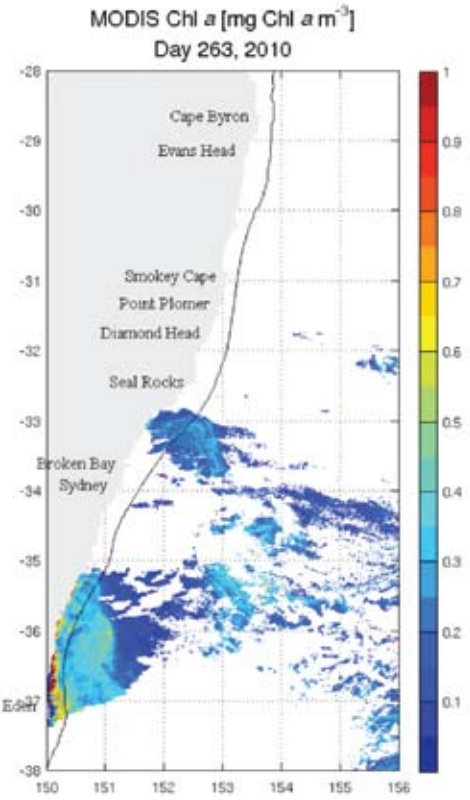


Fig 2: A typical MODIS SST and ocean colour image for Day 263, showing the cloud cover.

Appendix 1 – Student Reports

Attard, L.

Day 1, 2 &3:

Our departure was delayed until day 2 due to the rough seas. The first two days of our journey from Hobart consisted of battling through the rough seas in the Bass Strait. We were unable to do any sampling due to the rough conditions and most of the scientists being rather unwell. We did however deploy an Argo Float on day 2, which sends information every few days about temperature, depth, salinity, pressure and currents.

Day 4:

On the 4th day the seas were a lot calmer and were able to being our sampling. We started off the day with a talk from the Captain about al the safety issues involved with the ship and the sampling equipment. Our first round of sampling was conducted at a spot just outside the warm core eddy at 35º31,126S, 150º43,084E. First we deployed the CTD with niskin bottles attached to measure the conductivity, temperature and depth throughout the water column. One bottle trapped a sample of water every 50m, right down to 1000m. Once the bottles had been lowered and then brought back up, we took out a sample from each niskin bottle and stored them for later analysis when dissolved oxygen, nutrients and salinity levels will be measured. This was repeated two more times, once more in the middle of the warm core eddy and again on the other side of the eddy. We also deployed the N70 net three times to a depth of 50m and brought it back in at 1m per second to collect samples of organisms present in the water column. Within the samples we found salps, krill, copepods and other zooplankton. Our next task was to set up the EZ which was to be lowered to take sampled from different depths; 150-100m, 100-75m, 75-50m, 50-25m, 25m-surface. However, hydraulics issues meant this sampling had to be postponed.

Day 5:

Today the CTD and N70 net were deployed at three different locations; just outside, the edge and then centre of the cold core eddy. Once again we observed numerous salps and plankton in our N70 samples as well as some jelly fish and some luminescent copepods. Being our last night on board we all gathered to hear some talks by the post-grad students and Jock Young about the research projects they were currently involved in.

Henschke, N.

I arrived onboard the RV *Southern Surveyor* on the 15th September. I arrived a day earlier than the original date of departure in order to help set up the ship for the voyage. We aimed to leave on the 16th, however this was delayed by 12 hours due to poor weather conditions. The first two days of the voyage were unproductive as we encountered massive swells. On the 19th, we reached a warm core eddy out of Jervis Bay and sampled both the centre and edge with the CTD and N70 net. Similarly on the 20th, we sampled both the centre and edge of a cold core eddy, north of the warm core eddy with the CTD and N70 net.

Live salps (T. *democratica*) were caught in an extra tow of the N70 net for use in onboard experiments. These experiments were used as a pilot study to prepare for the next voyage I would be participating in on, ss2010-v08. Four tanks were set up, two with one aggregate salp per tank, and two with one solitary salp per tank. The salps were monitored over the course of 24 hours in order to note down times taken for either 1) release of aggregate buds from the solitary tanks, or 2) birth of an aggregate embryo from the aggregate tanks. This will serve useful when designating times for future experimental design.

On the last night of the voyage I gave a presentation of my honours work to the students. I also heard presentations from other PhD students and the chief scientist Jock Young. This night was very informative as I saw recent and interesting marine research which is being conducted across Australia.

Overall, participation on the transit proved very useful as I was able to work with scientists and students which I had not previously worked with. I learnt a great deal about the other marine science that is occurring as well as the importance the Marine National Facility plays in Australia's marine science field.

Matis, P.

Day 1:

Today we all arrived in Hobart and boarded the *Southern Surveyor* outside CMAR headquarters. Our voyage consists of crew, scientists (including Jock Young the chief scientist), and Marine National Facility Support staff (including Pamela the voyage manager), post-grad and undergrad students from UNSW, a master's student from UTAS, a post-grad from Deakin University and me, the token USYD student. The aim of the Next Wave voyage is to teach us about what it is like to be a scientist at sea, learning about the different sampling techniques involved and providing opportunity for students to carry out marine research. We were allocated our cabins and had a tour around the different areas of the ship including the wet lab, fish lab, mess, bridge and the operations room. We were due to set sail at 4pm but the huge swell and rough conditions has pushed this back until the next morning.

Day 2:

We set sail around 8am this morning. Conditions were still quite rough and we were off to a very rocky start. Many of us ended up lying in the op's room at mid ship where it was the least rocky for the morning. Sea sickness got hold of a few of us and unfortunately conditions meant the only thing we could do today was deploy an Argo Float which sends information every few days about temperature, depth, salinity, pressure and currents.

Day 3:

Conditions worsened as we passed through the Bass Strait today so it wasn't safe enough to do any sampling. Some of us were still pretty sea sick. Hopefully tomorrow will be calm enough to do some sampling and that we find our sea legs.

Day 4:

Today was a lot calmer as we were more protected from the mainland. We've all finally found our sea legs and were excited to get into some sampling. This morning after breakfast we had our toolbox, where the Captain went through all the safety issues when using sampling equipment with us. Then we began our first round of sampling at a spot just outside the warm core eddy at 35º31,126S, 150º43,084E. First we deployed the CTD with niskin bottles attached to measure the conductivity, temperature and depth throughout the water column. After they had been lowered and then brought back up, we took out a sample from each niskin bottle and stored them for later when we plan to measure dissolved oxygen, nutrients and salinity. We deployed out the N70 net three times to a depth of 50m and brought it back in at 1m per second to collect samples of organisms present in the water column. Within the samples we found salps, krill, copepods and other zooplankton. Our next task was to set up the EZ which was to be lowered to take sampled from different depths; 150-100m, 100-75m, 75-50m, 50-25m, 25m-surface. However, hydraulics issues meant this sampling had to be postponed.

Day 5 20/09/10:

Today was a big day of sampling. The CTD and N70 net was deployed at three different locations; just outside, the edge and then centre of the cold core eddie to collect samples as we reached them at different points of the day. Once again we observed lots of salps and plankton in our N70 samples as well as some jelly fish and some cool little luminescent copepods. Once we had finished all our sampling we gathered to hear some talks by the post-grad students about the research projects they were currently involved in. We heard about the discovery of a new virus spreading among copepods, the effects of water masses on salps and krill, and the distribution of top predator fish in the EAC. Later we started packing to get ready to say our farewells as we leave tomorrow morning. Despite getting off to a rocky start, we have learnt about different sampling methods that can be used and about current research being undertaken. It's been a great experience and excellent introduction to what is involved in marine research at sea.

McPhan, L.

Day 1. Stuck in the bay

After meeting with fellow companions at Sydney airport our flight arrived in Hobart narrowly missing some nasty weather causing other planes to be diverted to Melbourne. A shuttle bus from Hobart airport conveyed us to the wharf where we met up with the other scientists on board and were given a tour around the vessel so that we had our bearings on the ship. After an explanation of rules on deck a brief tour of the operations room, the bridge, the mess and an explanation of meal times it was time for lunch. We were stuck in the harbour for the first night as it was deemed too rough to leave the bay. We were to leave the next morning.

Day 2. Not so perfect storm

After waking for breakfast we were able to be on deck for the departure of the vessel from Hobart. It was quite a cool morning and we were able to see snow on the caps of the mountains around the harbour. As the ship left the harbour we went through the muster process which was the safety protocol for the boat if anything was to happen on board the muster point was the place to meet before reaching the life rafts. By the time we had left the protection of the harbour and the ship was starting to hit some rough waters the initial excitement gradually turned to queasiness and many were found in a vegetative state in the ops room on the lower deck or clinging to chairs in the recreation room, at almost the highest point on the vessel, in an attempt to watch a movie. Sleeping that evening was a different experience to any I have had, though eventually a state of semi consciousness was achieved.

Day 3. Smooth sailing..?

After rolling into the side of the ship rather than a wake up alarm this morning it appeared that the swell was by no means calming. Most of the day was spent as low on the ship as possible being still too rough to get any gear in the water to sample. Later I would find out that we had gone through some of the largest seas on record for the bass strait region at around 18.3m swell. We hoped for more flat seas the next day.

Day 4. Flat

And our hopes were rewarded. By the fourth day we had travelled through the worst of the low pressure system and were able to begin sampling. This was a great morale booster and everyone was in high spirits as we went through the toolbox meeting on the bridge which explained the risk and safety behind the gear we would be using. We are hoping to use three pieces of gear the CTD, the EZ net, and the N70 net. After setting the EZ net and being prepared for some new samples, the net was unable to be deployed due to a hydraulic problem on the rear winch of the ship. The other sampling was performed without problems and we were able to obtain samples from the N70 vertical haul net and the CTD for an outer site, a site on the edge of a warm core eddy and at the centre of the eddy.

Day 5. Searching for cold

On the fifth day we were investigating the nature of cold core eddies and their tendency to be flooded by warmer water on the surface. Satellite mapping meant that we had a rough idea of where the eddy was though were not sure if it had been flooded. Eventually finding the eddy we were able to get some sampling done again on the outside of the eddy, on the edge and in the centre of the cold core. The use of the gear on board has been a great experience and has given me some valuable skills for my degree, including understanding the output from the CTD as it moves through the water column and knowing when to take measurements most effectively, and also the setup behind the EZ net, though not used I feel is an important skill to have attained along with the correct operation of an N70 net. This voyage has opened my eyes to how this aspect of sampling for marine science and life on the boat works, how to act on board, and what to expect if I were to be on board for another sampling expedition. I thoroughly enjoyed myself throughout the experience, even the first three days, and met some great people on board from different universities and CMAR; I would be back on deck in a heartbeat.

Ooi, L.

As part of the MNF Next Wave program, I was given with the opportunity to take part in a transit voyage aboard the RV *Southern Surveyor*. The ship left Hobart in high seas on September 16th and arrived in Sydney on the 21st. Our aim was to examine the abundance and distribution of plankton off the east coast by sampling along transects across a warm core eddy and a cold core eddy, between different isobaths off- and on-shelf, and at different times of the day. Over the course of the voyage, we gained a valuable insight into the processes involved in conducting marine research whilst at sea, as well as the limitations and difficulties that can arise due to rough weather and equipment malfunctioning.

I found the most enjoyable aspect of the trip was being able to work alongside MNF support staff, CMAR scientists, academics, students and the crew as part of a multidisciplinary team. We had opportunities to learn about the research being undertaken by the oceanographers, hydrochemists and biologists on board and the significance of research that is conducted on such voyages.

Whilst on board, we learnt how to set up and deploy the CTD. We were taught how to collect and process the different depth samples for salinity, temperature, nutrients, chlorophyll and dissolved oxygen for later analysis. I also learnt how to operate the CTD computer systems and liaised with the crew to deploy the equipment.

Unfortunately we were unable to deploy the EZ net for plankton tows due to issues with the equipment. Instead, horizontal and vertical nets (neuston, N70, RMT nets) were used. After these tows, we were able to sort through the samples, examine the specimens collected, and see the difference in plankton community structure between sample sites.

A couple of days of bad weather meant the equipment could not be deployed, but gave us ample time to meet the crew, sample the all-day snacks and make use of the Rec Room and DVD library. The voyage was a great opportunity for hands-on, practical research experience. I'm very glad I had the chance to take participate in the program, and think more marine science students should be encouraged to apply. A big thank you to the crew, scientists and MNF support staff who made it a fun trip!

Rivero, N.

For five days this September, I, along with students,scientists from CSIRO and MNF Support staff, participated in a transit voyage from Hobart to Sydney on the *Southern Surveyor* research vessel. As part of the Marine National Facility's Next Wave program, I was given the amazing opportunity of experiencing firsthand what marine research onboard a vessel was really like.

Originally, our plans were to depart Hobart from the CSIRO's waterfront headquarters on the 18th of September. We were to conduct a trial deployment of the sampling gear, which consisted of an N70 net, acoustics, an EZ net and CTD off the NE of Tasmania. Unfortunately, poor weather conditions delayed our departure and till the following

morning. We were introduced to the chief scientist Dr Jock Young of the CSIRO, the voyage manager Pamela, the ship's Captain Mike along with members of the crew and the other students and MNF support staff that would be participating in the voyage.

Shortly after departure from the port at 8am on the 19th of September, a safety drill was conducted and our responsibilities in an emergency were pointed out. Even with all the talk of bad weather, safety drills (and the constant reminder that sea sickness may be imminent), we were all excited for the days ahead. As our original voyage plans had fallen through, we were informed of our new schedule. We were to deploy an Argo Float later that day, and we were to sample a warm core and cold core eddy using N70 nets, EZ nets and the CTD in the days to come. A toolbox was conducted in which the procedure and safety issues associated with the Argo Float deployment was discussed, and shortly after the float was deployed to begin its role in the IMOS Argo float program.

In the hours that followed, most of the scientific and student contingent aboard retreated into their private sea sickness battle. Until boarding the *Southern Surveyor*, I was unaware of the healing properties a bean bag, a bottle of water, a paper bag and an iPod possessed. I am now much wiser and will treat these items with the respect they deserve.

The settling of the weather and the arrival at the first of our sampling sites happened simultaneously. We prepared the EZ net only to discover the winch that lowered the net into the water was not working. This meant the remainder of the sampling was to be conducted using the N70 net and the CTD. After spending time throughout my undergraduate degree reading in scientific papers about these sampling methods, it was surreal to be standing on the deck of a vessel such the *Southern Surveyor*, actually using the equipment. Our sampling of the various sites was successful, and by the time we arrived to our last of the sampling stations on the 20th of September, we were working like experienced crew.

Once the sampling was over, I managed to explore the ship and get to know some of the crew. A special mention needs to be made to Kel, the most entertaining crew member aboard. The fantastic (and sometimes concerning) stories about what life is like at sea were great to hear. Also, Mike the Captain entertained thousands of my questions about the ship, the equipment and let me sit in his chair for hours pretending to steer the ship. Thank you to both and also to the rest of the crew for truly making this experience worthwhile.

Another particular highlight of the trip was the presentations from the students and scientists about the research they were conducting and how this voyage was contributing to their investigations. To be part of actual marine research was a fantastic experience. The main aim of this experience for me was to determine if research at sea is something I'd like to pursue. This voyage answered that question for me. I can't wait to go back to sea.

Ward, M.

As a student involved in the MNF Next Wave program on board RV *Southern Surveyor* I was given the opportunity to engage in research along the East Australian Current alongside other undergraduates, as well as postgraduate students undertaking PhD's and Masters as well as CSIRO scientists and MNF support staff. The program aims at giving students an experience of what it is like to be a scientist at sea. The following details my experiences whilst engaged in this program.

16/9/2010 – Delayed Plans

This was the first day of the experience, it began with the journey to Hobart. Arriving by plane with several of my shipmates we were eager to begin the adventure. However rough conditions meant our grand departure would have to wait. That is what happens when there is the largest waves in recorded history across Bass Strait. We were given an induction – having a tour of the ship combined with safety procedures. We also met the Captain and the scientists and MNF Support Staff we would be working with including Jock Young the chief scientist and Alicia Navidad the hydrochemist on board with whom myself and a few of my fellow Next Wavers would be working closely with, once we finally got to do some sampling. So with a night in Hobart and a dry voyage ahead of us we did the only thing responsible university students would do, we went to the pub.

17/9/10 – Chest Bumping Davy Jones

The seas were still rough but we had delayed long enough. It was time to begin our transit, we left Hobart at 8am and I was on deck whilst we did, I would spend a lot of my free time on deck, it was probably where I felt most relaxed on the entire ship. Shortly after we had a muster to prepare us for the procedure should an emergency occur. This day began the disaster for many of my shipmates. Though feeling fine myself I had to find ways to amuse myself this was done in several ways, a rundown of the Operations Room and the systems within it by Voyage Manager Pamela Brodie, partaking in the various dvds the ship had to offer and spending a lot of time on deck. We were able to deploy an ARGOS float today. Hopefully the information it gathers will be useful for IMOS.

18/9/10 – Travelling Along the 'Strait and Narrow'

Today we travelled across Bass Strait, conditions here proved to be the rockiest. This was evidenced by the fact that both myself and my bunkmate who up til now had remained unaffected by sea sickness both lost that claim within twenty minutes of each other. Conditions were too rough for any sampling so we continued our transit towards the eddies that we would be sampling.

19/9/10 – Episode IV – A New Hope (for sampling)

We split into several groups one of which would be dropping N70 nets EZ nets to collect plankton samples, however hydraulics issues meant EZ nets could not be utilised. Another team was analysing plankton samples; these included copepods, krill and other zooplankton but were heavily dominated by salps. My team were charged with use of the CTD. We prepared the CTD for deployment and then assisted the crew in deploying it. After which most times I would head down to the operations room to watch the profiles on screen and try to get a better understanding of what we were collecting. When the CTD was retrieved we would collect samples for dissolved oxygen, nutrients, salinity and chlorophyll. We sampled at the edge partially in and centre of the warm core eddy. For the core we were thrown out of the nest and forced to fly doing all the sampling ourselves.

20/9/10 – The Thrilling Conclusion

Today would be another day of sampling, this time though we were looking at the cold core eddy. Once again we sampled at the edge, partially in and core of the eddy. By this stage all three teams knew what they were doing and we functioned as an efficient unit. That night we listened to talks from several of the MNF support staff, Dr Jock Young, the chief scientist and PhD students. Hearing of community dynamics of the salp *Thalia democratica* and krill, behaviour of top predators in the EAC and a virus that is currently affecting copepods. Tomorrow we could be arriving in Sydney which would be the end of our adventure. It had been a great experience where I had learnt a lot and managed to develop myself as a scientist. I would like to sincerely thank Iain Suthers and the Marine National Facility for making this possible.

CSR/ROSCOP PARAMETER CODES

M01 Upper air observations
M02 Incident radiation
M05 Occasional standard measurements
M06 Routine standard measurements
M71 Atmospheric chemistry
M90 Other meteorological measurements

PHYSICAL OCEANOGRAPHY

H71 Surface measurements underway (T,S)
H13 Bathythermograph
H09 Water bottle stations
H10 CTD stations
H11 Subsurface measurements underway (T,S)
H72 Thermistor chain
H16 Transparency (eg transmissometer)
H17 Optics (eg underwater light levels)
H73 Geochemical tracers (eg freons)
D01 Current meters
D71 Current profiler (eg ADCP)
D03 Currents measured from ship drift
D04 GEK
D05 Surface drifters/drifting buoys
D06 Neutrally buoyant floats
D09 Sea level (incl. Bottom pressure & inverted echosounder)
D72 Instrumented wave measurements
D90 Other physical oceanographic measurements

CHEMICAL OCEANOGRAPHY

H21 Oxygen
H74 Carbon dioxide
H33 Other dissolved gases
H22 Phosphate
H23 Total - P
H24 Nitrate
H25 Nitrite
H75 Total - N
H76 Ammonia
H26 Silicate
H27 Alkalinity
H28 PH
H30 Trace elements
H31 Radioactivity
H32 Isotopes
H90 Other chemical oceanographic measurements

MARINE CONTAMINANTS/POLLUTION

P01 Suspended matter
P02 Trace metals
P03 Petroleum residues
P04 Chlorinated hydrocarbons
P05 Other dissolved substances
P12 Bottom deposits
P13 Contaminants in organisms
P90 Other contaminant measurements
B01 Primary productivity
B02 Phytoplankton pigments (eg chlorophyll, fluorescence)
B71 Particulate organic matter (inc POC, PON)
B06 Dissolved organic matter (inc DOC)
B72 Biochemical measurements (eg lipids, amino acids)
B73 Sediment traps
B08 Phytoplankton
B09 Zooplankton
B03 Seston
B10 Neuston
B11 Nekton
B13 Eggs & larvae
B07 Pelagic bacteria/micro-organisms
B16 Benthic bacteria/micro-organisms
B17 Phytobenthos
B18 Zoobenthos
B25 Birds
B26 Mammals & reptiles
B14 Pelagic fish
B19 Demersal fish
B20 Molluscs
B21 Crustaceans
B28 Acoustic reflection on marine organisms
B37 Taggings
B64 Gear research
B65 Exploratory fishing
B90 Other biological/fisheries measurements

MARINE GEOLOGY/GEOPHYSICS

G01 Dredge
G02 Grab
G03 Core - rock
G04 Core - soft bottom
G08 Bottom photography
G71 In-situ seafloor measurement/sampling
G72 Geophysical measurements made at depth
G73 Single-beam echosounding
G74 Multi-beam echosounding
G24 Long/short range side scan sonar
G75 Single channel seismic reflection
G76 Multichannel seismic reflection
G26 Seismic refraction
G27 Gravity measurements
G28 Magnetic measurements
G90 Other geological/geophysical measurements