marinematters

IMOS

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Integrated **Marine Observing** System

IMOS News

Chinese State Oceanic Administration (SOA) Delegation visit IMOS

In October, IMOS hosted a visit from a delegation from the State Oceanic Administration (SOA), China. The University of Tasmania signed a Memorandum of Understanding with their counterparts from China, leading to cooperation in gaining a greater knowledge of ocean processes in the Southern, Indian and Pacific Oceans. SOA is the Chinese government agency in charge of national ocean affairs and is looking to develop a Chinese Ocean Climate Observing System (COCOS). IMOS director Professor Gary Meyers said IMOS was a world leader in establishing a national body, as other countries tended to form more regional systems. As a result of its national status, IMOS was an attractive partner for China.

"I think we've done pretty well in attracting international recognition," Prof Meyers said.

As part of their visit, the SOA delegation toured the IMOS facilities, particularly those involved in data collection. There will also be a display on how the data is supporting research. The two organisations also signed the Memorandum of Understanding – the first for IMOS – to show their intent to work together to monitor the ocean and, in the future, to coordinate research on the Southern and tropical Indian and Pacific Oceans. Chinese and Australian researchers already collaborate on a body of water between Australia and Indonesia, monitoring the Indonesian Through Flow.

SOA Delegation and the IMOS staff: Mr Yafeng Yang, Ms Ping Qi, Mr Fei Wang, Prof Gary Meyers, Mr Simon Allen, Mr Deyi Ma, Dr Marian McGowen and Dr Weidong Yu

"We've been working with the Chinese for quite some time, but this formalises our commitment to share resources and knowledge toward building a greater understanding of our oceans as we try to measure climate change," Prof Meyers said.

"The Memorandum of Understanding is about, over time, enhancing the research we do together."

New ARC Discovery and Linkage Projects for IMOS staff

Congratulations to IMOS Facility and Node Leaders who have been successful in the recent round of Australian Research Council (ARC) funding.

SEAMOS Node leader Professor Iain Suthers, AUV Facility leader Dr Stefan Williams, SAIMOS Node leader Dr Laurent Seuront and WAIMOS Node leader Professor Chari Pattiaratchi along with their colleagues will be leading oceanography or marine monitoring projects.

IMOS to be featured in upcoming BBC series

'Oceans – exploring the secrets of our underwater world'

The Oceans team, led by Paul Rose, began a series of underwater scientific expeditions to build a global picture of our seas. The series includes voyages to the Arctic, Southern and Indian Oceans, the Atlantic, the Red Sea, the Sea of Cortez and the Mediterranean.

The team ventured into some of the planet's most challenging environments with the help of scientists and dive teams, and the results are shown in the eight part series, which seeks to provide a better understanding of the state of our oceans today, their role in the past, present and future and their significance in global terms.

One of the episodes focuses on the Southern Ocean and was filmed in waters surrounding Tasmania. In particular, the Ocean team investigate how ocean gliders are being used to study the East Australian Current.

The web site for the series is **www.bbc.co.uk/oceans**

newfaces in IMOS

There have been a number of new appointments in several of the IMOS facilities. The IMOS office would like to welcome the following new staff:

IMOS office:

Katy Hill – IMOS Development Officer

Wenneke ten Hout – IMOS Office Assistant

eMII:

Roger Proctor – eMII Director

Jacqui Hope – eMII Executive Officer

Steve Cameron – eMII Data Programmer

Phillip Bohm – eMII Support Programmer

Brendan Ward – eMII Applications Developer

Craig Jones – eMII Infrastructure Programmer

Sebastien Mancini – eMII Project Officer

Radar:

Robyn Nickalls – Administrative Officer

Moorings:

Carlos Teixeira – SA Moorings Technician

Remote Sensing:

George Paltoglou – IMOS Scientific Programmer for Satellite Sea Surface Temperature products

Congratulations also to Moorings sub-facility leader Moninya Roughan and husband Tim on the safe arrival of their son Lachlan!

AUV deployed in Tasmania and South Australia

Dr Neville Barrett, from the Tasmanian Aquaculture and Fisheries Institute, along with other scientists used the Autonomous Underwater Vehicle (AUV) in October to investigate deep temperate reef biodiversity. Dr Barrett and his team are using the AUV to describe, understand and predict patterns of biodiversity in offshore marine habitats in an Australian context and to utilise this for prediction of impacts of climate change. They deployed the AUV to examine shelf reef habitats in water between 50 and 150 m in eastern Tasmania. The data gathered will form a baseline at or near the time of protection for these areas, by which changes related to protection, time and climate change may be assessed through time.

In June, the AUV was used by the Department of Environment and Heritage (DEH) South Australia to survey a number of sites around the Sir Joseph Banks Island group in the Spencer Gulf, SA. This area is being considered for inclusion in a new Marine Park. The surveys will be combined with sidescan sonar surveys to facilitate the identification of benthic habitats characterising the area.

The AUV team then travelled to Whyalla, SA to participate in the study of giant cuttlefish. An aggregation of many hundreds of thousands of cuttlefish occurs there each year in a relatively small area of the foreshore. In collaboration with Professor Roger Hanlon of the Marine Biological Laboratories in Woods Hole we secured funding from National Geographic to use the AUV to study the nocturnal camouflage behaviour of these animals. Previous work has suggested that these animals are able to camouflage themselves at night in spite of there being little light with which to see the background against which they are hiding. The AUV was used to conduct night time surveys to document their nocturnal behaviour.

UTAS to host a National Climate Change Adaptation Research Network

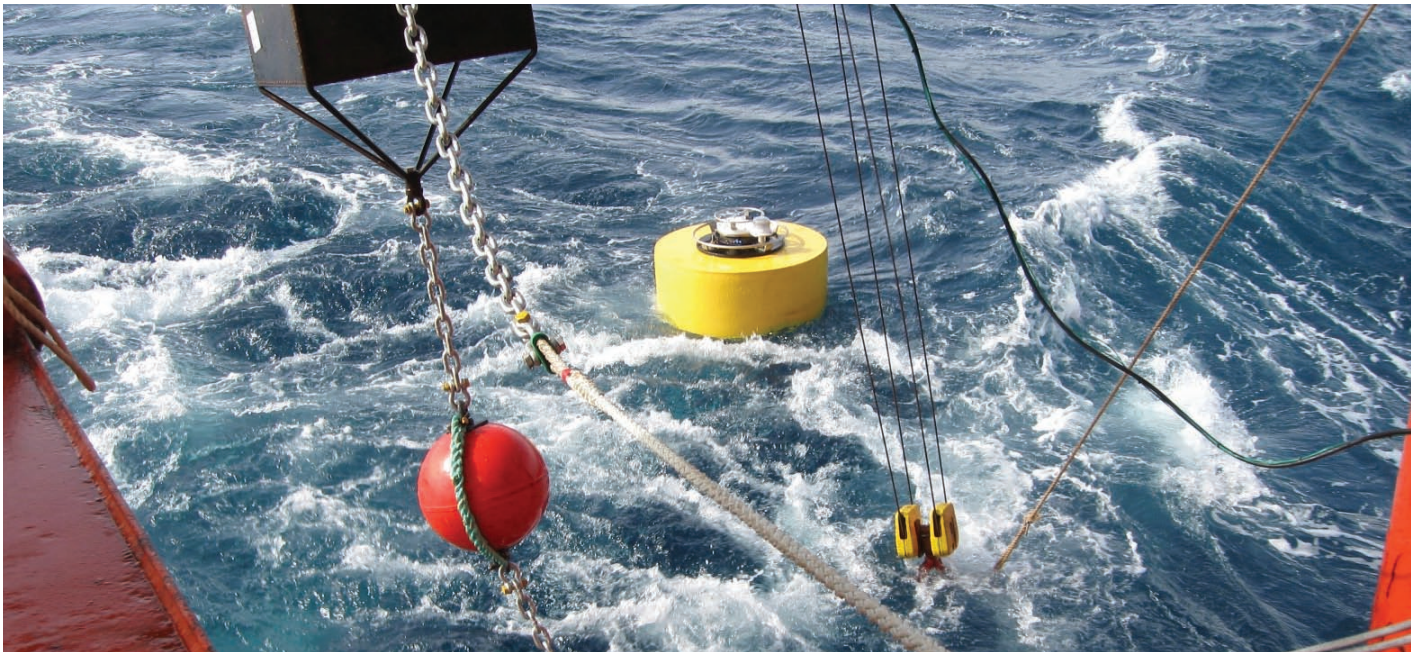
Minister for Climate Change and Water, Senator Penny Wong, announced in late October that the Rudd Government will provide $10 million over four years to establish research networks investigating the effects of climate change on areas including water resources, human health, emergency services, infrastructure and biodiversity. The adaptation research networks will foster critical research into the effects of climate change. The University of Tasmania (UTAS) will host the National Climate Change Adaptation Research Network for Marine Biodiversity and Resources.

The network will bring together researchers and stakeholders concerned with helping Australia's marine environment and those who depend on it. Fostering a collaborative and interdisciplinary research environment will inform the development of appropriate climate change adaptation responses by policy-makers and managers. The UTAS hosted network will work closely with the National Climate Change Adaptation Research Facility located at Griffith University.

Associate Professor Neil Holbrook from the UTAS School of Geography and Environmental Studies led the successful bid and said that the network would be open to all marine researchers, stakeholders and end-users. The IMOS office intends to actively participate in the network, with a view towards identifying where the IMOS data streams will be useful for climate change adaptation research by the participants.

SOTS pulse mooring deployment a success

The early October deployment from the Aurora Australis of two test designs for Pulse went well despite the usual rough weather in the Southern Ocean.



Important elements of the Pulse mooring. Photo courtesy of Dave Hughes.

The aim of these deployments is to test and learn about the mooring dynamics, stresses and efficacy of our current designs. The Pulse project requires long deployments in the deep ocean in one of the roughest environments in the global ocean, and presents a number of design challenges.

The big yellow foam doughnut is the surface float which supplies plenty of buoyancy to ensure that the top of the mooring stays on the surface, even during rough weather. This modular float system, designed by Danny McLaughlan, will be used for many of the IMOS moorings. In the centre of the yellow doughnut is a stainless steel can that holds batteries and electronics including a telemetry/logging system developed by Matt Sherlock and Dave Hughes. The Iridium satellite antennas are protected from the slamming of the waves by transmitting right through the plastic lid of the can. Over 60 days after deployment, we are successfully receiving GPS locations and, for the first time, getting a subset of mooring tension and surface motion data. This should lead to a great leap forward in our understanding of Pulse mooring dynamics even if the mooring fails.

The black steel object with the red ball attached is a mock up of the cage that will hold the water sampler and biogeochemical sensors when the fully instrumented Pulse mooring is deployed. This mock up is a stand in for the real payload of the Pulse mooring.

On the lower right of the photo you can see two strands of rubber. These are the rubber elements that isolate the water sampler sensor/sensor package from some of the jarring due to wave action on the surface float. The design challenge for Pulse is not only to create a surface mooring that can endure the Southern Ocean but one that dampens the accelerations the surface float experiences enough so that the water sampler and biogeochemical sensors can function and survive long deployments.

AusCPR team attend phytoplankton taxonomy workshop with Prof Gustaaf Hallegraeff

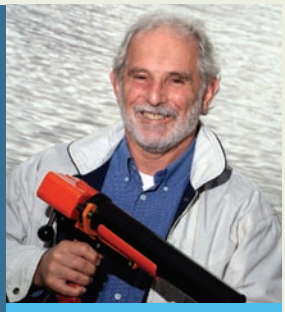
The Australian Continuous Plankton Recorder team expanded their phytoplankton taxonomy skills at a intensive 3 day workshop in Hobart in September. The workshop was held by Professor Gustaaf Hallegraeff at the University of Tasmania.

Gustaaf has spent 30 years studying microorganisms in the sea and heads the Harmful Algal Blooms Research Group at UTAS. Gustaaf is a world leader in phytoplankton and his research interests range from limnological and oceanographic field surveys of phytoplankton populations, taxonomy by light, scanning and transmission electron microscopy, to biochemistry of microalgal pigments, lipids and toxins, micropaleontological studies of cysts in sediment cores and molecular genetics of cultured algal strains.

2008 IMOS Mid-term Review

IMOS is presently conducting an internal review. The review will consist of two parts: a re-focus on priorities for final two years of IMOS, and developing IMOS post July 2011. The review panel will be meeting in early December and their report will be approved by the IMOS Advisory Board before the outcomes of the review are announced in January 2009. For more information please visit http://imos.org.au/imosrev.html

director's corner



Dr Gary Meyers

Several weeks ago I had the opportunity to catch up with ocean observing in the USA and Canada by visiting the NOAA head quarters in Washington DC, a couple of the regional observing systems and attending the international Ocean Innovation Conference in St Johns Labrador. Innovation this year was focussed on ocean observing.

Let's talk about St Johns first (I'll get to the conference later); it's a great place to visit. Its maritime culture is even thicker than Hobart's. They have an excellent school of marine science and technology called simply Marine Institute. The Executive Director, Glenn Blackwood, emphasizes that it is a student-focussed school, which goes along nicely with the friendly people about town. You soon find they like to get together in the pubs, of which there are a few. The town's favourite son-author is Farley Mowat who has written about the sea, wildlife and the people who go to sea or live on the rugged coast. One of the local postcards shows an iceberg floating in the harbour, which apparently happens from time to time. They will hold the Ocean Innovation Conference at St Johns again in two years. I'd recommend it to anyone for the visit and for an excellent conference.

One of my stops was at the NOAA Office of Climate Observation (OCO), developed and headed by Mike Johnson. OCO leads the development of blue water, basin-scale observing in the USA. I was fascinated by the system for tracking the global, real time activity of climate observing, particularly the oceanic part. See http://osmc.noaa.gov/Monitor/OSMC/OSMC.html if you want to get a picture of what has been observed in the ocean for the past day, or the past year or back to 2004. Sitting in front of a bank of monitors, you can track the real-time and past activity as ships and platforms move across the oceans. Having heard my talk on IMOS, and while we were watching the monitors for the past year, Mike asked, "Where are the IMOS observations? Why aren't they showing up?" It turns out that as soon as we get the IMOS data streams on the near real-time Global Telecommunication System (GTS) our data will also be flashing up on Mike's monitors. eMII and the Bureau of Meteorology are working on the protocols that will stream our data into the GTS. While this does not provide access to data, it does show that we are part of the international endeavour to develop the Global Ocean Observing System.

I also visited Zdenka Willis, Director of NOAA's Integrated Ocean Observing System (IOOS) Program Office. IOOS has many similarities with IMOS, and some differences. They are setting up 11 regional observing systems that are much like the IMOS Nodes, in the sense that they are using the same equipment: moorings, gliders, radar, acoustic tracking, sensor networks etc deployed within a defined region to address a set of regional goals. A difference is that societal and economic challenges are the principal drivers of IOOS while research is the driver for IMOS, at least under the original NCRIS roadmap. I have the impression that governance and management is not as centralized in IOOS as it is in IMOS. Much of the IOOS effort is drawing together pre-existing monitoring done by a variety of agencies and research institutions that have been operating for some time, using different funding sources. IMOS was fortunate to have access to a new stream of funding from NCRIS. The impact is that we are able to develop a centrally managed core of regional observing focussed on a research goal of national scope. Having the opportunity to develop the national core is a great advantage of IMOS

I met Jeff de La Beaujardiere who is leading IOOS' Data Integration Framework. This activity is addressing many of the same challenges as our eMII. Jeff provided a recent report on their initial implementation, which I have passed on to Roger Proctor. Roger and Jeff will co-author a white paper on data management at the OceanObs2009 Conference next year.

While in the USA I took the opportunity to visit two of IOOS' regional observing systems—the Mid-Atlantic Coastal Ocean Observing Regional Association (MACOORA) with HQ at Rutgers University and the Central California Ocean Observing System (CenCOOS) with HQ at MBARI. Both of these places are leading centres of research, and have a long experience in ocean observing, for example 16 years at Rutgers. The research activities have cross-cuts with the more operationally oriented IOOS. I detected however a disconnect between the science-goals of these research centres and the operational activity of IOOS.

I was pleased to find out that many of the people leading our Nodes and Facilities are known to these seasoned ocean observers. Exchange of ideas and technology transfer has already begun and should increase as we go forward. My hosts for these visits were Josh Kohut and John Wilkin (Rutgers) and Francisco Chavez and Jeff Paduan (MBARI). Seeing the activity at these places made it clear to me that they have more engineering support for a similar level of activity than we do. This is something that needs correction.

Well, I'm out of space and I haven't even got to the conference. Experiences at the conference will have to come later. As I reflect on this travel there are important lessons for IMOS, now and as we go forward to IMOS-2. They have to do with the challenge of combining research and operational activity, benefit to science and benefit to society all of which will have to be balanced in IMOS-2.

Mike Johnson operating the OCO tracking system for climate observations.

Facility Feature Article #6

Written by Marian McGowen

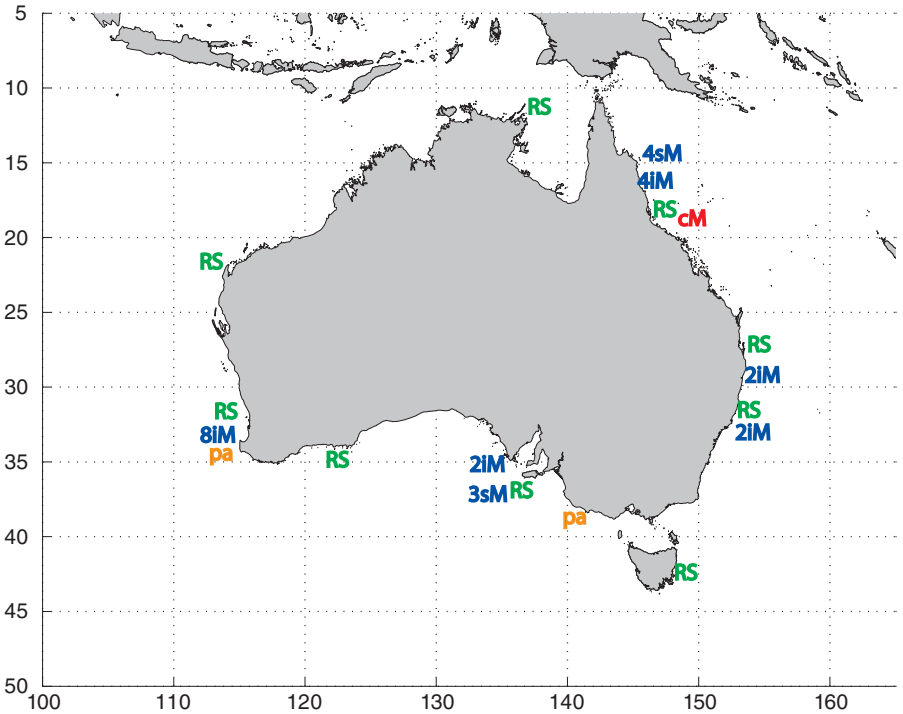
Australian National Mooring Network – Mr Simon Allen

Australia is a continent dominated by strong boundary currents that flow southwards along both the east and west coasts transporting heat and marine organisms to more southern waters.

The East Australian Current (EAC) which originates in the Great Barrier Reef (GBR), reaches speeds of up to 2ms-1 off the north coast of New South Wales (NSW), then turns toward New Zealand near Sydney. Downstream of the EAC separation zone (at 31°S) the eddy field drives temperature variability along the coast, influences nutrient upwelling and subsequent algal blooms. On the other side of Australia the Leeuwin Current (LC) runs along the West Australian Coast transporting warm water southward at speeds of up to 1.5ms-1 with the associated eddy fields. Water quality data has been collected regularly since the 1940's from three coastal sites in Australia: Sydney (NSW), Rottnest Island (WA) and Maria Island (Tasmania). These three sites represent the only long term data sets of physical and chemical properties of the water column around Australia, and provide evidence that the two major boundary currents are changing. The EAC normally transports salty subtropical water southward. It is getting warmer and saltier, implying the current is getting stronger. The LC normally transports low salinity water from the tropics southward. The Rottnest measurement indicate less salty water, implying a weakening of the Leeuwin Current. These changes are likely to have profound effects on fisheries, marine resources and the conservation of biodiversity in the oceans surrounding Australia. The Australian National Mooring Network is led by Simon Allen of CSIRO and is one of the most widespread of the 11 IMOS facilities, and when completed will consist of nine national reference stations on the inner shelf, as well as over 25 regional moorings on the outer shelf and slope, passive acoustic observatories and a satellite ocean colour calibration station.

The moorings network collects a variety of data, from the physical and chemical properties of the water, to the sound of fish choruses and ice breaking in Antarctica. The national reference stations build on the three existing sites, increasing the number of long term time series observations both in terms of variables recorded, temporal distribution and geographical extent. The Lucinda sugar export jetty in Queensland will be instrumented to provide satellite operators and data users with access to reliable calibration and validation data for the coastal and ocean colour satellite mission data sets. Passive acoustic listening station arrays will be located in three regions. These stations will provide baseline data on ambient oceanic noise, detection of fish and mammal vocalizations and detection of underwater events. The regional moorings provide data to monitor and increase our understanding of the interaction between boundary currents and shelf water masses and their consequent impact upon ocean productivity (e.g. Perth Canyon Upwelling; Kangaroo Island Upwelling) and ecosystem distribution and resilience (e.g. Coral Sea interaction with the Great Barrier Reef). Operation of the mooring network is distributed between several research organisations including Australian Institute of Marine Science, CSIRO, Curtin University of Technology, South Australian Research and Development Institute, and the Sydney Institute of Marine Science, but will be coordinated nationally.

Australian National Mooring Network Deployment Plan



National Mooring Network:

RS	National Reference Station	sM	Slope Mooring
iM	Inshore Mooring	pa	Passive Accoustic
cM	Colour Mooring		

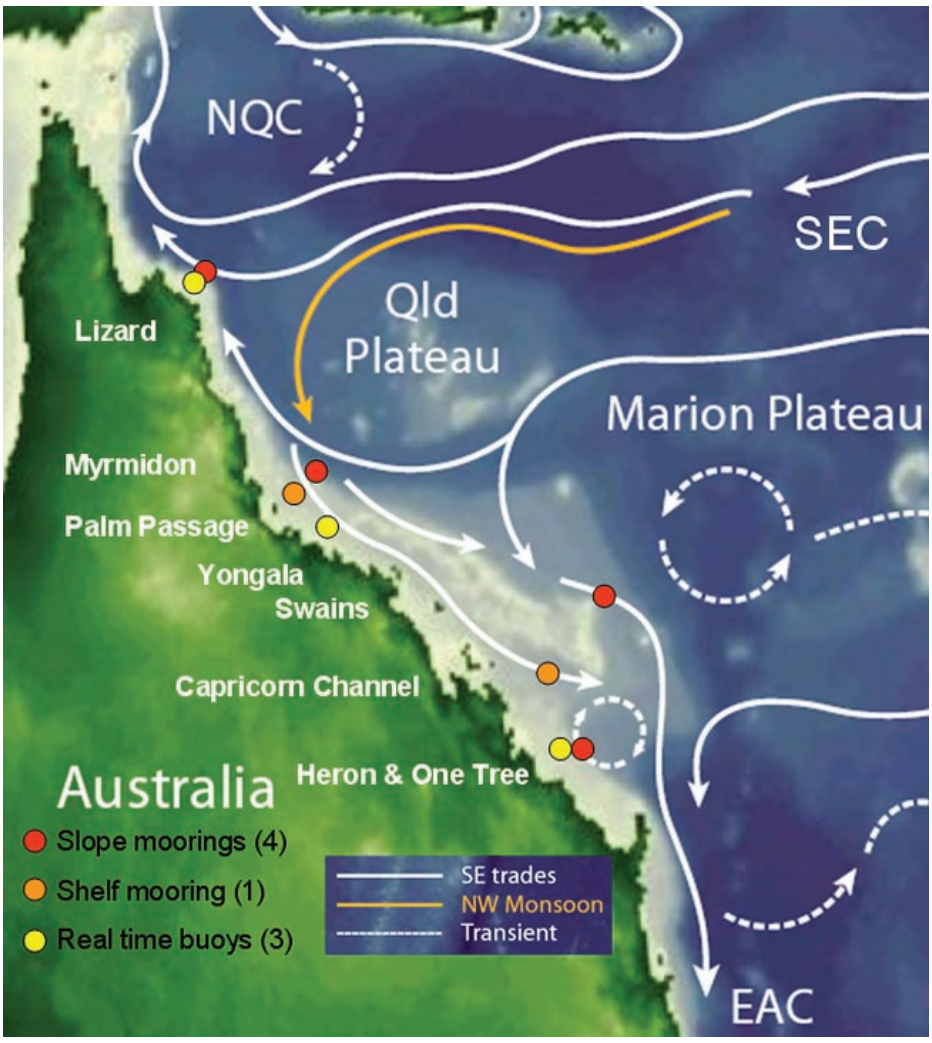
Australian National Mooring Network sub facilities

Queensland and Northern Australia

Craig Steinberg of AIMS heads up the Queensland and Northern Australia mooring sub facility consisting of four pairs of moorings located north to south along the Great Barrier Reef (GBR) and two National Reference Stations. Each pair has an outer mooring sitting on the continental slope (slope mooring) in water greater than 200m deep and an on-shelf mooring sitting on the continental shelf (shelf mooring) in shallower water around 30-70m deep.

The moorings hold a range of instrumentation including an Acoustic Doppler Current Profiler (ADCP), WetLabs Water Quality Meters that measure dissolved oxygen, fluorescence, turbidity, pressure (depth) in addition to conductivity, temperature, and depth. Three of the four shelf moorings are also planned to have a surface buoy to measure meteorological and radiation observations in real-time.

The objective is to observe the cross-shelf exchange of water between the Coral Sea and the GBR. The mooring design allows water moving along and onto the GBR to be measured by monitoring the southward flowing East Australian Current (EAC) and the northward Hiri western boundary current. Moorings in the southern GBR monitor the strength of currents related to upwelling events detectable on the Capricorn-Bunker Shelf, a supply of deep nutrient rich water to the reef. Craig summarises the current status as follows: "All mooring locations are populated with a subset of the final instrumentation, the challenge now is to complete the instrumentation packages and real-time delivery over the next few mooring deployment cruises."



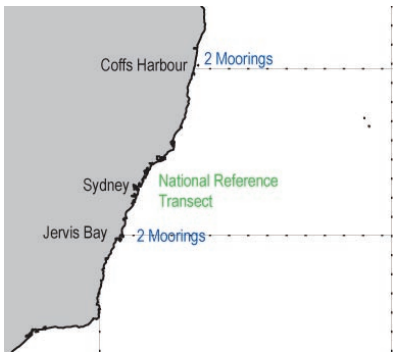
Moorings to be deployed in the Great Barrier Reef

This sub-facility has installed one National Reference Mooring at the Yongala wreck, near Townsville and will install one in the near future off Darwin.

New South Wales

The New South Wales sub-facility, under the leadership of Moninya Roughan of University of NSW has established a national reference transect of oceanographic moorings and measurements off Sydney, and will soon deploy two moorings off Coffs Harbour in the north, and two moorings in southern NSW waters (Jervis Bay or Eden).

The reference transect consists of three moorings off Bondi and five sampling stations off Port Hacking. This area is usually downstream of EAC separation and is often influenced by EAC eddies. The moorings will support research on the marine ecosystems associated with eddies. As this is the most populated area of the NSW coastline, issues such as water quality, waste disposal, shipping hazards, harmful algal blooms and recreation are interrelated. The moorings at Coffs Harbour and southern NSW will enhance the coverage along the coast of south-eastern Australia and also provide long term monitoring of the continental shelf region both upstream and downstream of the EAC separation point.



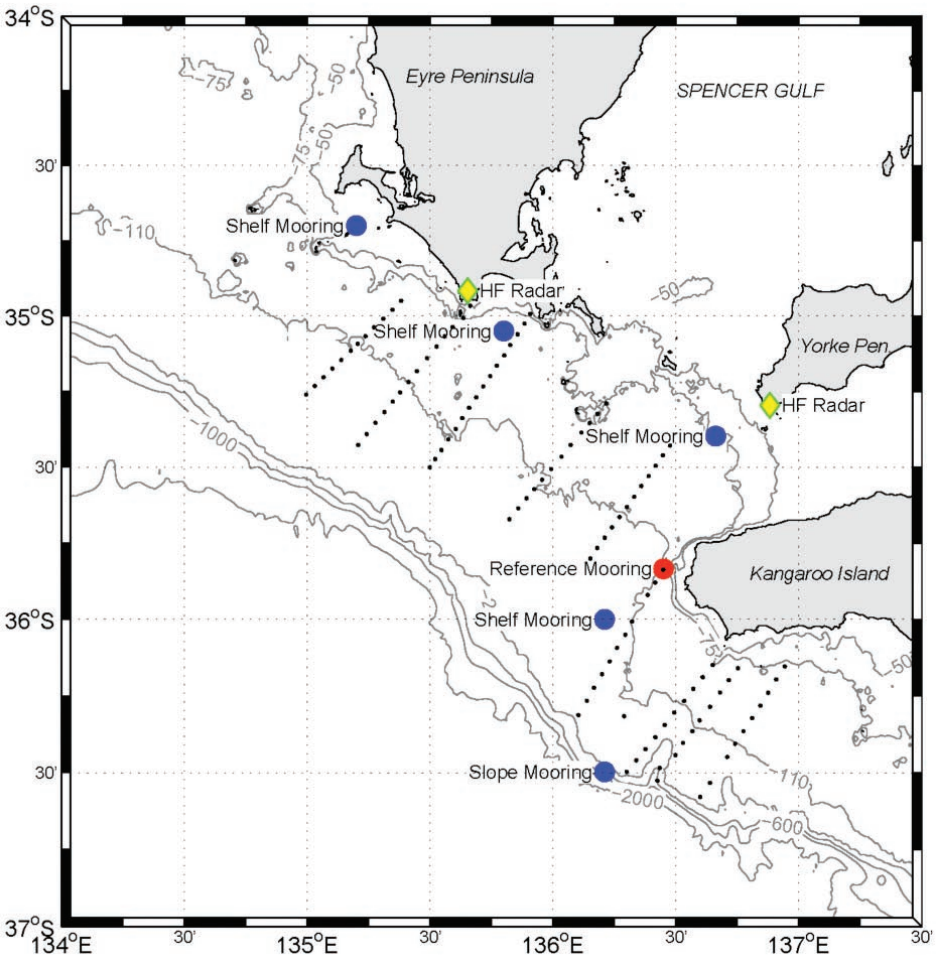
Moorings to be deployed in New South Wales.

South Australia

The South Australian array, when complete, will consist of six moorings to continuously monitor the physical and biological properties of the shelf waters off the Eyre Peninsula and Kangaroo Island region. The moorings have been located along the path of the large seasonal coastal upwelling of water that occurs along the shelf during summer. The sub-facility leader, John Middleton of SARDI, emphasises the integrated nature of the array as part of the SAIMOS node – the moorings will provide time-series data to support intermittent surveys with the SARDI research vessel.

The mooring array will consist of;

- Slope mooring at the 600m isobath - this mooring will measure the Flinders Current and possible eddy velocities that is thought to have a maximum core between 600 and 400 m,
- Outer shelf mooring - is designed to examine possible outflows of saline rich water from the Gulfs during winter (June to August) as well as possible enhanced upwelling from du Couedic canyon,
- Shelf moorings – Three moorings will be located in the path of both the upwelled/downwelled exchange to allow measurement of the alongshore currents and exchange, and the alongshore evolution of the planktonic systems as it evolves towards the Gulfs and Eyre Peninsula.
- National Reference Station - the reference station is located at a choke or convergence point of isobaths and will be able to monitor upwelling/outflow events as well as long-term variations in the strength of the coastal current.



Moorings to be deployed in South Australia. The blue dots are the locations of the shelf and slope moorings, the red dot is the National Reference Station.

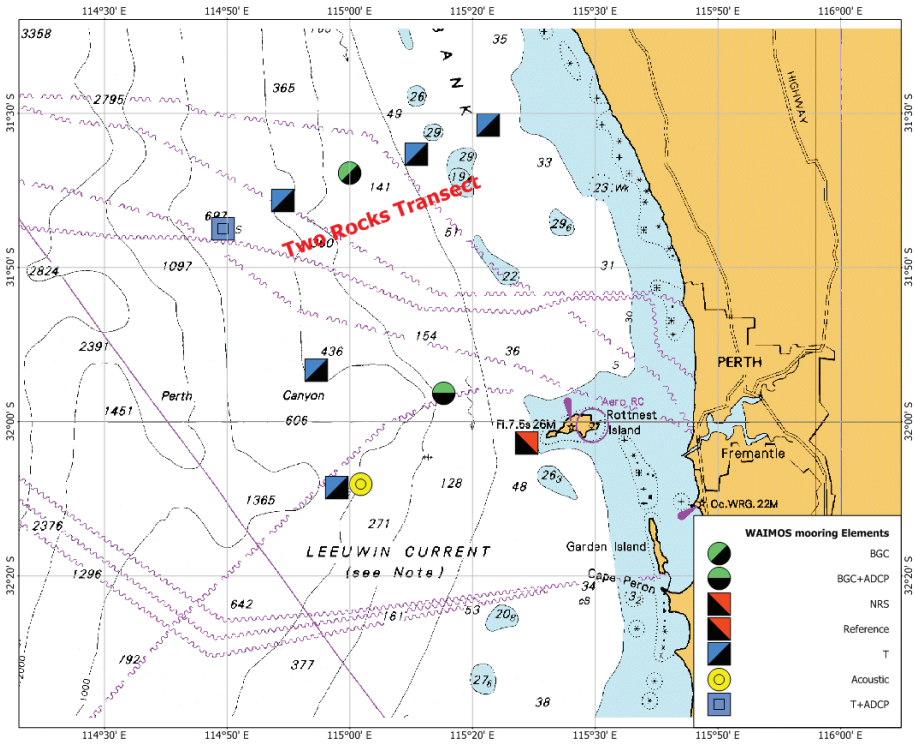
Western Australia

The moorings that will be deployed around Perth will help local researchers investigate the variability in the Leeuwin Current and continental shelf currents both in-terms of alongshore and cross-shore variability as well as processes within the Perth canyon. These regions have been the focus for many research groups including the CSIRO, Department of Fisheries (WA) and the WA Universities. Thus, time series monitoring of physical and biological parameters in this region would supplement the past and current research activity in this region. Tim Lynch of CSIRO, the sub facility leader comments that, "In WA the challenges lay not only in the huge distances involved but also in designing moorings that are both light enough to be deployed by cost effective day boats and of sufficient mass to withstand strong currents"

Ideally, the moorings will be deployed in the region between Shark Bay and Cape Peron. The original plan was:

- Five moorings along the 'Two Rocks' transect to the 500m isobath.
- 1 mooring to be moored near the head of Perth canyon in 200m depth.
- 2 thermistor chains around Perth canyon

However, ship time for such an extensive array may be too expensive, in which case the moorings will be clustered near Perth Canyon and the Two-Rocks Line surveyed by CSIRO in the past. Western Australia will also support three National Reference Stations located at Ningaloo, Esperance and Rottnest. The latter two are scheduled for deployment in November 2008.



Moorings to be deployed in Western Australia.
BGC..... Biogeochemical mooring
ADCP... Acoustic Doppler Current Profiler
NRS..... National Reference Station
T ..... Thermistor mooring

National Reference Station Network

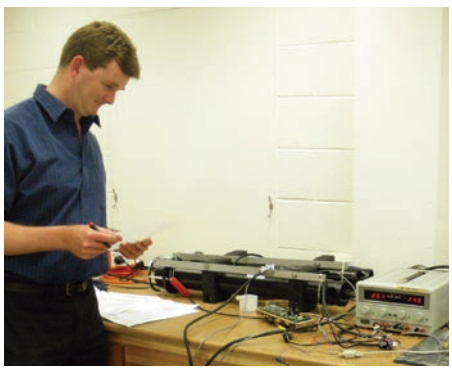
The National Reference Stations (NRS) consist of nine sites located in shallow depths (< 100m) on the Australian continental shelf. Coordinated by Tim Lynch of CSIRO, the NRS network aims to provide a comprehensive physical, chemical and biological description of regional water masses, and to document their variability, especially in the context of climate change. The nine stations build on three existing sites where monthly water quality data have been collected since the 1940s. Scientific papers based on the existing stations demonstrate the extremely high value of multi-decadal time-series for understanding climate change in the marine environment. Prior to IMOS, the existing stations had no permanent moorings, simply being waypoints where water samples were taken. The inclusion of moored instrumentation and monthly biological sampling at each NRS is a significant upgrade to the three historical sites. With the addition of six new sites, this provides a national monitoring network, that is somewhat sparse, but nationally cohesive. Investment in moored instrumentation allows fine scale temporal investigation of variability in physics, chemistry, turbidity and fluorescence and provides the context to interpret the monthly biological (plankton) sampling. Ultimately, the NRS will provide a baseline to assess the impact of natural and human caused changes to the marine environment to help policy makers ensure the sustainability of Australian coastal ecosystems and related fisheries.

Underwater Sound Recorders that will be used in the Acoustic moorings. Photo courtesy of Rob McCauley.

Acoustic Observatories

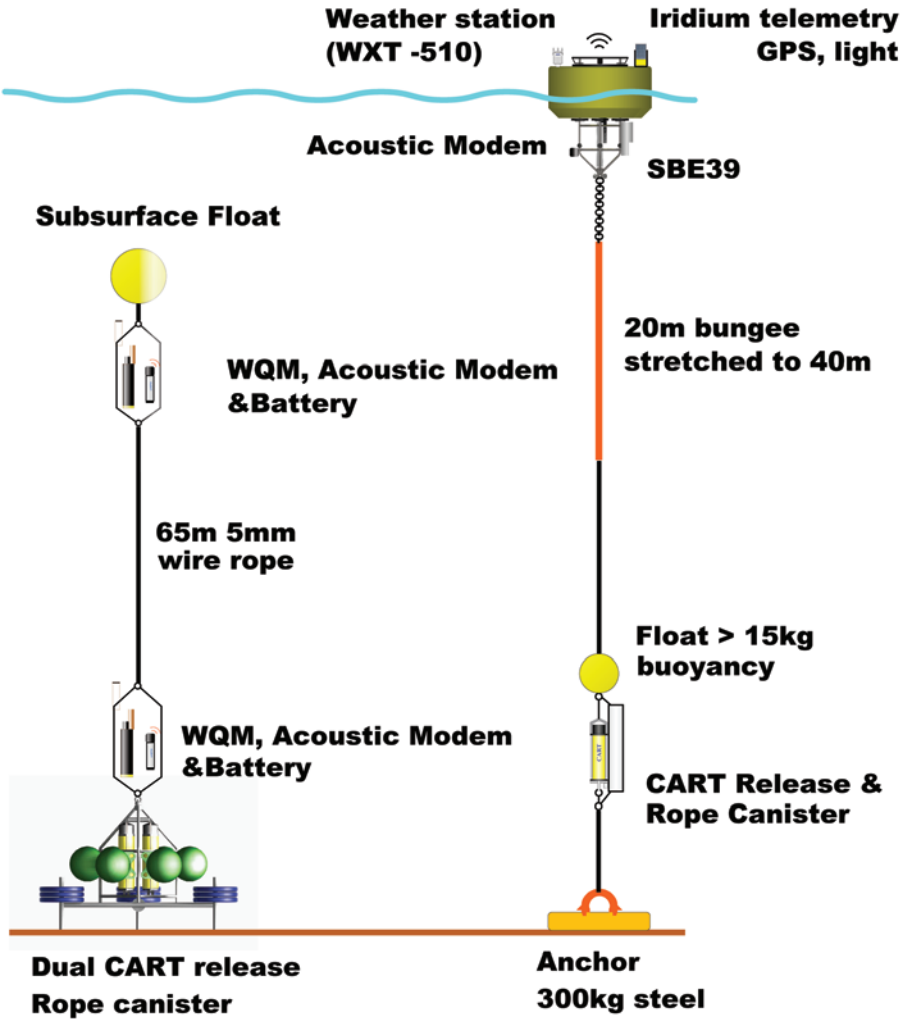
Passive acoustic sea noise loggers record sound emitted by natural processes in the ocean and underwater noise sources of biological origin, such as marine mammals, crustaceans and fish, which have unique acoustic signatures. Through an analysis of these signals, it is possible to discriminate and identify different species and to assess the number of animals present within the range of acoustic observation. Big animals can also be located by a horizontal array of sea noise loggers constituting a passive acoustic observatory.

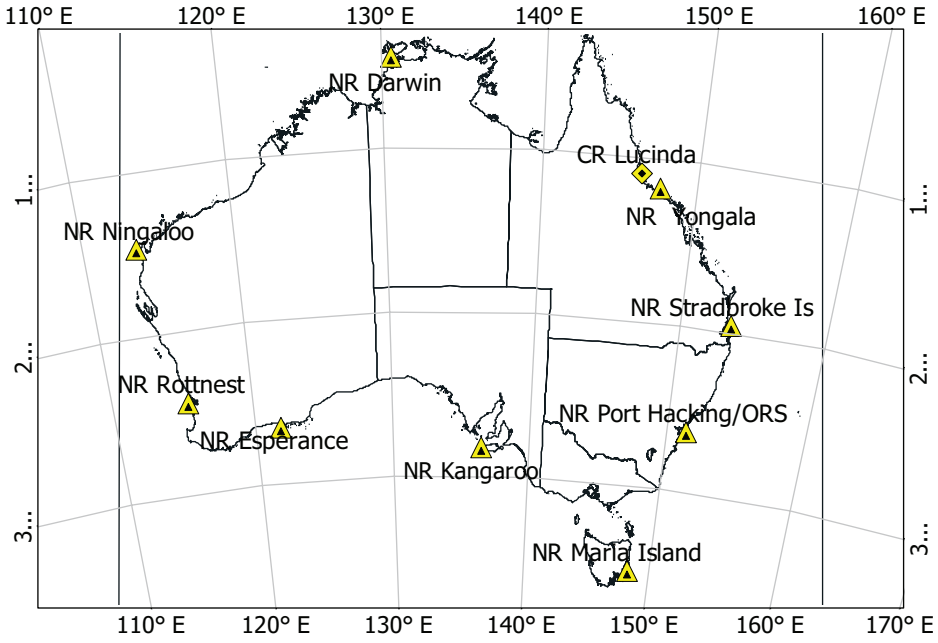
The acoustic observatory has been installed in the Perth Canyon, with the complete array of four acoustic receivers in the observatory being installed in December. The station will provide baseline data on ambient oceanic noise, detection of fish and mammal vocalizations linked to ocean productivity and whale migration patterns and detection of underwater events. Rob McCauley, the sub-facility leader, plans to have both the Perth Canyon and the Portland, South Australia loggers in before Christmas this year.



David Hughes tests the real time communications for the National Reference Stations.

Diagram of a National Reference Station. At each site there will be two moorings. The subsurface mooring will have two Water Quality Meters (WQM). WQM's measure temperature, depth, conductivity, oxygen, fluorescence of chlorophyll a and turbidity.
The other mooring will reach the surface of the water and will have a weather station that will measure surface temperature, humidity and wind speed and direction. The Seabird temperature meter (SBE39) will also measure water temperature, and when combined with the WQM data will allow the temperature stratification of the water to be determined.
Both moorings have Coastal Acoustic Release Transponders (CARTs) attached to the base. When the moorings need to be serviced it can be released via an acoustic command through the water from a deck mounted transducer. The mooring then floats to the surface attached to the rest of the gear by a rope deployed from a drum. The entire system can then be hauled on board.





Locations of the National Reference Station Moorings. NR = National Reference; CR = Colour Reference

Satellite Ocean Colour Calibration/Validation

This sub-facility will set up the Lucinda Jetty Coastal Observatory in Northern Queensland and is led by Vittorio Brando of CSIRO Land & Water. The observatory aims to provide valuable data in tropical Queensland coastal waters to unravel the inaccuracies in remotely-sensed satellite ocean colour products due to the optical complexity in coastal waters and the overlying atmosphere. The observatory will become the preeminent source of measurements for the validation of coastal-ocean colour radiometric products applied to biogeochemistry and climate studies in Australia. It will merge two different data streams: the above water measurements of the water radiance and the in water measurement of the optical properties.

Conclusion

The Australian National Mooring Network has developed the capability for long-term monitoring of many key physical, biological and acoustic properties of the ocean at key locations around Australia. Importantly, the data collected will allow researchers to investigate changes in the physical & chemical properties such as temperature and salinity of the ocean, and their associated biological responses. The continuous time series data produced by the moorings will be critical for the understanding of observational variability and separating natural variability from human induced change in the oceans and marine ecosystems surrounding Australia.

"The IMOS Australian National Mooring Network has built new ocean observation capability around Australia and is bringing new levels of rigour to the delivery of the observed multidisciplinary data into the global scientific community. The infrastructure developed in terms of skills and people has lowered the barrier to higher intensity process studies set within the overall Integrated Marine Observing System. IMOS is not the end in itself, but the beginning," reflects Simon Allen, the ANMN Facility Leader.

Progress to date has been extraordinary, with a proposed 30 of 49 mooring locations populated by Christmas 2008 and the remainder to be in the water during 2009. This has occurred despite equipment failures and the overheads associated with building capability on a continent with low unemployment.

Major challenges to developing the infrastructure are the high current velocities off the southeast and west coasts and the large seas and swell conditions that are encountered with tropical cyclones in the north and with intense storms in the more temperate southern regions. Other environmental challenges include fast rates of bio-fouling, and mooring damage from fish bites, fish hooks and boat strike. Finally, and probably the greatest challenge, is the sheer size of Australia itself.

Internationally the ANMN is unique, as it includes a co-ordinated network of National Reference Stations the development of which has involved the entire Australian marine community. This gives us the benefit of a well integrated program with associated cost rationalisations. ANMN provides critical baseline data that Australia needs to examine the impact of climate change on our marine ecosystems.

The Lucinda Jetty in Northern Queensland is 5.6km long, the Ocean colour calibration observatory will be located towards the end of the jetty. IMOS acknowledges Queensland Sugar for the use of the jetty for the Lucinda Jetty Coastal Observatory.

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IMOS PhD **Student Profile**

Students using IMOS data for their PhD research

Conrad Speed

Charles Darwin University / Australian Institute of Marine Science

Project: My PhD project is a collaboration between Charles Darwin University and the Australian Institute of Marine Science (AIMS) and examines the movement patterns and feeding ecology of reef sharks. I focus on the movement patterns of black tip (*Carcharhinus melanopterus*), white tip (*Triaenodon obesus*) and gray reef sharks (*Carcharhinus amblyrhynchos*), but am also monitoring juvenile lemon sharks (*Negaprion acutidens*) and nervous sharks (*Carcharhinus cautus*).

Movement patterns are monitored using acoustic transmitters, also known as 'pingers', and a series of receivers that make up the Ningaloo Reef Ecosystem Tracking Array (NRETA). Pingers can either be implanted internally or externally tag-mounted. The receivers in NRETA are supplied and serviced by the Australian Acoustic Tagging and Monitoring System (AATAMS), a facility of IMOS. There are currently 3 curtains (Tantabiddi, Point Cloates & Point Maud), as well as 3 arrays (Mangrove Bay, Stanley Pool and Coral Bay) that are downloaded every 3-6 months by AATAMS in collaboration with AIMS and CSIRO, and uploaded to the electronic Marine Information Infrastructure (eMII). The information from NRETA will provide long-term, broad-scale movements of tagged sharks that will help answer questions relating to aggregation patterns, residency times and habitat partitioning, as well as the value of marine protected areas as a management tool.

I will also observe fine-scale shark movement by actively tracking a number of tagged sharks using an underwater hydrophone, which has also been supplied by AATAMS. This part of my study will provide information relating to habitat use and home-range size, as well as confirm the broad-scale patterns observed with the NRETA.

Finally, I will describe the feeding habits of reef sharks using fatty acid profiles and stable isotope ratios to examine diet and establish the trophic role of these sharks within the reef community.

Shark tagging at Mangrove Bay, Ningaloo Reef

For more information about IMOS please visit the website

www.imos.org.au

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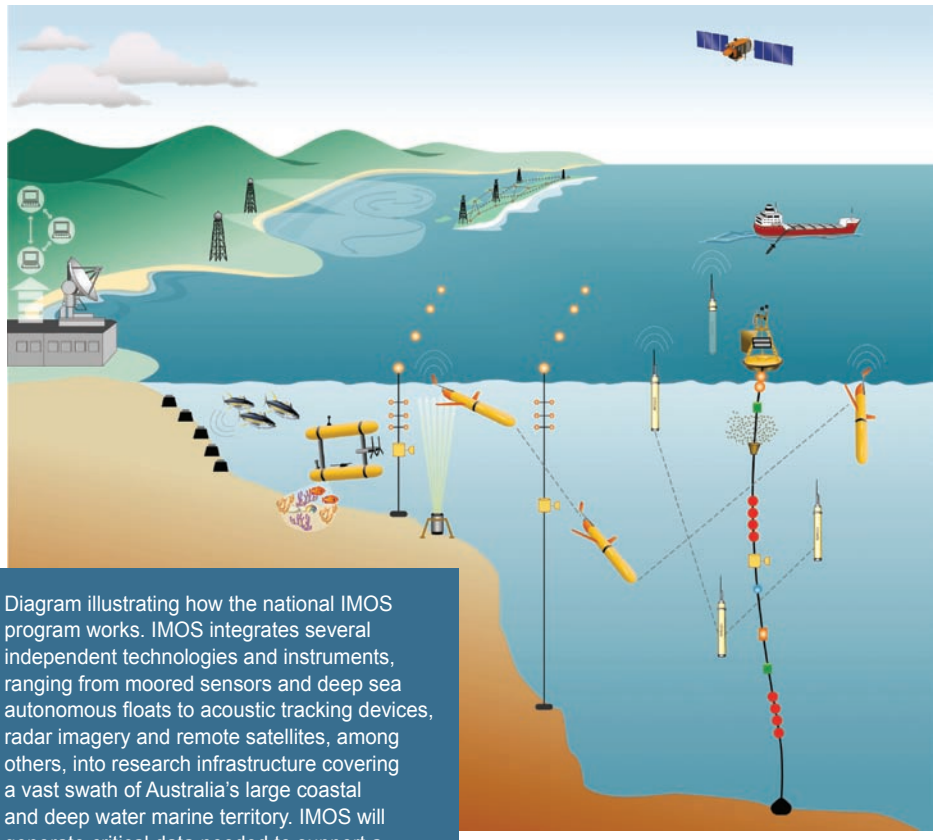

Diagram illustrating how the national IMOS program works. IMOS integrates several independent technologies and instruments, ranging from moored sensors and deep sea autonomous floats to acoustic tracking devices, radar imagery and remote satellites, among others, into research infrastructure covering a vast swath of Australia's large coastal and deep water marine territory. IMOS will generate critical data needed to support a diverse range of marine research projects.

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IMOS is an initiative of the Australian Government being conducted as part of the National Collaborative Research Infrastructure Strategy
www.ncris.dest.gov.au/capabilities/integrated_marine_observing_system.htm

This issue of marine matters has been compiled by Dr Marian McGowen.