



THE UNIVERSITY OF  
**WESTERN  
AUSTRALIA**

Annual Report 2014

# The UWA Oceans Institute





“With over 20,000 km of coastline, the surrounding oceans are particularly important to Western Australia. We have a responsibility to improve our knowledge of these regions, protect them for future generations and determine what value can be extracted from them. Western Australia has a significant marine science research base, a scientifically fascinating environment and a major marine industry. It is, therefore, extremely well positioned to capitalise on this capability. The State Government has recognised this opportunity and identified Biodiversity and Marine Science as one of the State Government’s priority areas for science.”

PROFESSOR PETER KLINKE,  
CHIEF SCIENTIST OF  
WESTERN AUSTRALIA.

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# Objectives

## Vision

The UWA Oceans Institute is advancing research knowledge to support the delivery of Ocean Solutions by addressing ocean challenges.

Bringing together UWA's multidisciplinary research strengths, in areas such as Oceanography, Ecology, Engineering, Resource Management and Governance, the Oceans Institute continues to explore opportunities to use innovative marine research and ocean technologies to deliver Ocean Solutions in Western Australia and worldwide.

## Priorities

- Foster and promote interdisciplinary marine-related research across traditional science, engineering, social and policy boundaries.
- Provide excellence and leadership in ocean research and technology, locally and globally.
- Provide a focal point for quality training of postgraduate students in ocean research.
- Address the needs of Australian society, government and industry for safely operating in the marine environment.
- Promote innovative collaborative opportunities in marine research and technology in Western Australia.
- Articulate an evidence-based, intelligent and innovative use of marine resources to create opportunities for human and economic development.
- Generate the knowledge needed to reconcile the sustainable use of ocean resources with the conservation of its biodiversity.



“The ocean is awe-inspiring, beautiful yet mysterious and many nations, including Australia, rely heavily on the ocean. However, in the face of change, it is crucial to uncover the vulnerabilities of our marine environment in order to meet the needs of a growing human population. I believe a multidisciplinary approach incorporating science, engineering, resource management and law is vital to managing a sustainable blue economy.”

PROFESSOR SHAUN COLLIN  
UWA OCEANS INSTITUTE DEPUTY DIRECTOR  
(2015 DIRECTOR)



## Executive Summary

Welcome to the 2014 Annual Report for the UWA Oceans Institute, which summarises some of the many highlights in this, the fifth year of our operation. This year was defined by a series of activities and events aimed at strengthening links with our international and national partners, particularly in the Indian Ocean and Asia Pacific regions, and growing our infrastructure.



The Institute welcomed visitors from the Ocean College at Zhejiang University, visiting UWA to progress a number of research collaborations, student exchanges and teaching opportunities under a Memorandum of Understanding (MOU), as well as 200 international delegates from 25 countries who travelled to Perth to attend the 10th International Temperate Reefs Symposium, hosted by our own researchers.

Construction of the Indian Ocean Marine Research Centre commenced earlier in the year and the university officially marked the commencement of the Crawley building with the laying of the Foundation Stone by the Minister for Foreign Affairs, The Hon Julie Bishop MP at an official event in May.

In September, the Oceans Institute and the University of Mauritius signed an MOU to explore joint research opportunities, the co-supervision of students, staff exchange and training. In addition to initiating a new coastal engineering research area with The University of Mauritius, the Oceans Institute is now looking to set up joint research links in the areas of oceanography, tropical aquaculture, marine biotechnology, marine biology and ecology, marine governance and renewable energy.

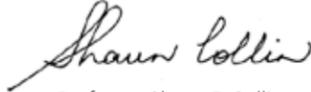
Closer to home, the Oceans Institute investigated the decommissioning landscape in Western Australia by hosting an Ocean Solutions Dialogue workshop with key

industry stakeholders, government executives, academics, fishers and non-government organisations in November. The Institute is now progressing these discussions with plans to explore research opportunities associated with the decommissioning of offshore platforms and systems.

In 2014, the Oceans Institute Futures Forum was introduced as a key mechanism for providing updated information to our members. The Futures Forum occurs quarterly and is a valuable opportunity to hear about the strategic focus of the Institute as well as providing an update on future activities and the chance to network.

Finally, I would like to thank Professor Carlos Duarte in his role as Director of the UWA Oceans Institute. Professor Duarte served the Oceans Institute for over four years and initiated a number of exciting programs as well as introducing the concept of Ocean Solutions, which is now guiding the Institute's future focus on solution-based research and training.

I look forward to working more closely with our members, adjuncts, postdocs and students and pursuing the Institute's vision as we seek new opportunities and face challenges in the year ahead.

  
Professor Shaun P. Collin  
Deputy Director

# 2014 A Snapshot

Expansion of the Oceans Institute into 4 new disciplines with 4 new Oceans Institute academic members.

Oceans Institute researchers hosted the 10th International Temperate Reefs Symposium that saw over 200 delegates from 25 countries attend in January.

The Foundation Stone was laid in May marking the commencement of construction of the new Indian Ocean Marine Research Centre Crawley site.

Dutch company Vryhof Anchors, obtain the rights to prototype the Centre for Offshore Foundation Systems' DEPLA anchor.

The Oceans Institute organised a range of academic and industry workshops and symposia

- Animal Mobility Synthesis Workshop
- Decommissioning Dialogue
- Coastal Carbon Cluster Workshop
- Pilbara Marine Conservation Partnership Symposium

Strengthened links with Indian Ocean partners and international collaborators.

Signed MOU with University of Mauritius in September.

Hosted group of delegates at IORA conference in October.

Became a Foundation member of the Indian Ocean Business Alliance in October.

Hosted visitor from Zhejiang University for a collaborative research project with Oceans Institute researchers.

Launch of the ANFOG facility at UWA in November.

Oceans Institute Artist-in-Residence initiated opportunities for ongoing school-based engagement with St Stephen's High School.

Advisory Board member Larry Madin from the Woods Hole Oceanographic Institution was the keynote speaker at Oceans Community 2014.

Oceans Institute members published more than 319 research articles and generated over \$17 million in funding opportunities from government, industry and national and international sources.

Professor Shaun P. Collin appointed new Oceans Institute Director following Carlos Duarte's departure at the end of 2014.

Enhanced community relations and awareness of Oceans Institute brand.

**160**  
Audience at  
Oceans Community

**33**  
Media releases

**14**  
Institute of Advanced  
Studies lectures

**70,000**  
Website hits

**Full house**  
at the Postgraduate Student Conference



# Ocean Solutions: The Story So Far

© Joan Costa

**The UWA Oceans Institute draws on key strengths in cross discipline research to pursue its strategy of providing Ocean Solutions to address global challenges facing the supply of food, water and energy resources from our oceans. The Ocean Solutions approach goes beyond delivering research outcomes, taking the extra step to influence decision-making and community impact through contributing knowledge to the broader public.**

Ocean Solutions seeks to approach global ocean challenges not in isolation, but with consideration to the connectivity between various aspects of the marine environment, maximising opportunities for efficient and effective outcomes.

Recent moves by Indian Ocean neighboring countries to establish ocean-based economies is a testament

to the opportunities created by finding solutions from our oceans. The Oceans Institute has been working with these countries to establish opportunities for collaborative research and teaching in this newly strengthened blue economy.

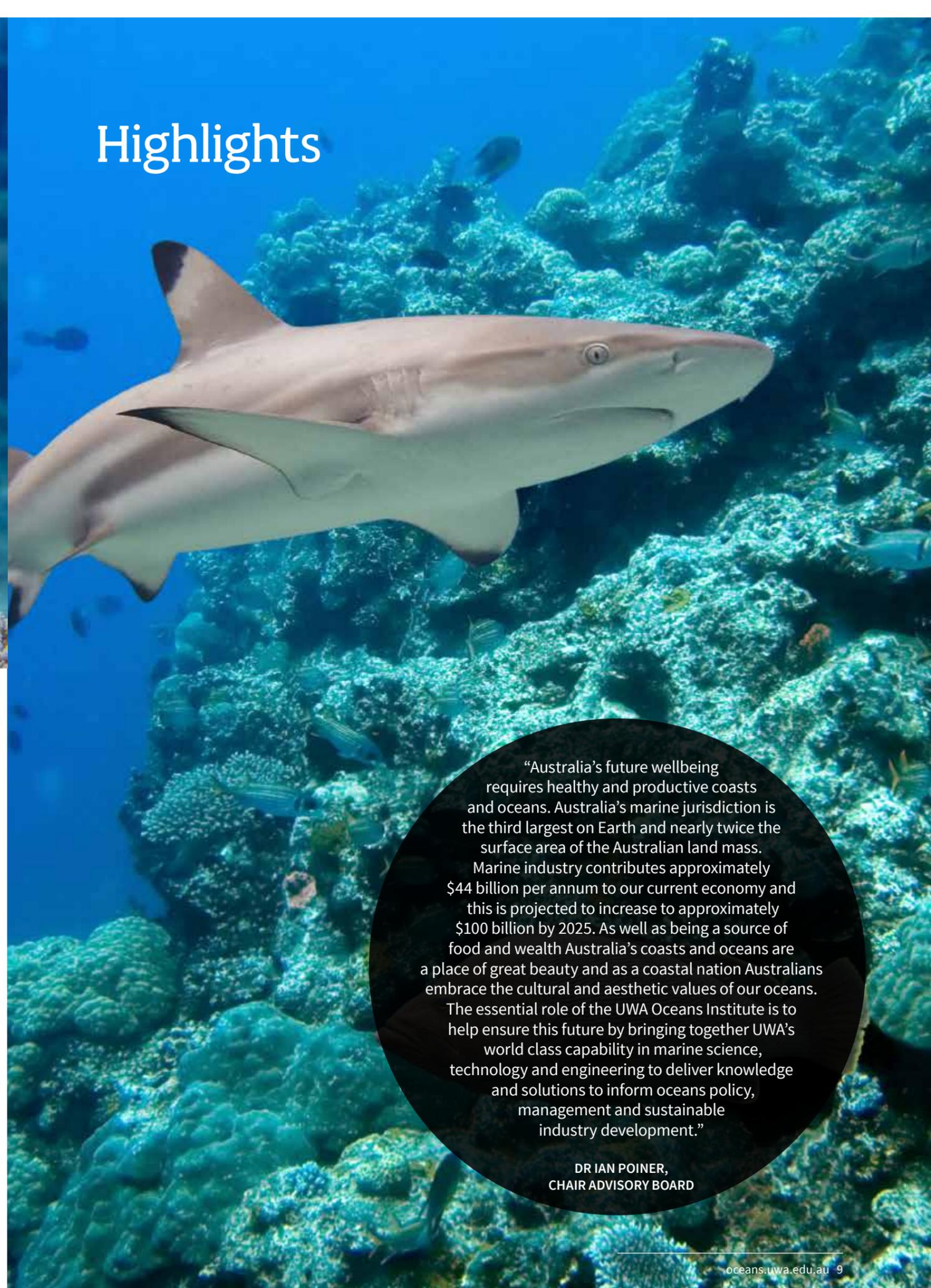
At the Oceans Institute, we seek out these opportunities through our research and outreach mechanisms and in 2014 delivered the Ocean Solutions Dialogue on Decommissioning with a discussion concentrating on the economic and environmental benefits of leaving parts of offshore structures in-situ after their commissioned life. This years' Oceans Community public lecture focused on the Deep Ocean with the keynote lecture on technological advances in deep ocean exploration delivered by the Woods Hole Oceanographic Institution. Further supporting early career research, the Oceans Institute co-funded two Emerging Leaders Synthesis projects in Marine Megafauna

Movement and Food Sustainability and Periodically Harvested Closures leading to numerous publications for both synthesis teams.

Appreciating the importance of global influence, we communicated this strategy even further by offering an Oceans Solutions massive open online course (MOOC). Internationally available via Coursera, the Ocean Solutions MOOC saw 11,205 people register for the 8-week course offered by Professor Carlos Duarte, educating students around the globe on how the ocean can play an important role in tackling global challenges.

The Oceans Institute will continue to pursue a solutions based approach to our research and community engagement.

[www.oceans.uwa.edu.au/ocean-solutions](http://www.oceans.uwa.edu.au/ocean-solutions)



## Highlights

“Australia’s future wellbeing requires healthy and productive coasts and oceans. Australia’s marine jurisdiction is the third largest on Earth and nearly twice the surface area of the Australian land mass. Marine industry contributes approximately \$44 billion per annum to our current economy and this is projected to increase to approximately \$100 billion by 2025. As well as being a source of food and wealth Australia’s coasts and oceans are a place of great beauty and as a coastal nation Australians embrace the cultural and aesthetic values of our oceans. The essential role of the UWA Oceans Institute is to help ensure this future by bringing together UWA’s world class capability in marine science, technology and engineering to deliver knowledge and solutions to inform oceans policy, management and sustainable industry development.”

**DR IAN POINER,  
CHAIR ADVISORY BOARD**

## Marine Monitoring

# Animal movement meets human mobility

In November, Dr Ana Sequeira of the UWA Oceans Institute and Dr Michele Thums, from the Australian Institute of Marine Science (AIMS), led a group of renowned national and international multidisciplinary researchers to synthesise data on the movement of marine megafauna obtained from satellite tracking devices.

Data synthesis is becoming increasingly prevalent as it commonly reveals finds a new or emerging discovery that would not be apparent by examining a single study.

Animals have been tracked with satellite transmitters since the 1980's. The intervening years and rapid uptake of this technology has amounted to massive datasets being generated. This is particularly the case for marine megafauna, which includes marine mammals, birds, reptiles and large fishes, a group of animals whose lives would be invisible without this technology.

It has been the appearance of smart-phones with geo-location capacity and the associated location data they generate that has allowed researchers to study human mobility at unprecedented spatial and temporal scales.

Dr's Sequeira and Thums received a UWA Oceans Institute Emerging Leaders Synthesis Project Grant and, with support from AIMS, conducted a workshop, attracting a group of leaders in the field of marine megafauna to combine their research and collectively synthesise the tracking data.



Key to the synthesis was the presence of two physicists, Dr Victor Eguiluz and Dr Juan Fernandez-Gracia, both experts in applying complex systems approaches to understanding the movements of human beings.

The multidisciplinary team has collated a dataset amounting to over 2.5 million locations for a range of marine vertebrate species spanning more than two decades (1993 – 2014). Together, they started using the approaches derived from human mobility studies to attempt to make significant advances into better understanding the movement of marine megafauna.

The synthesis group is now collectively working on two research papers, including a cross-taxa classification of the types of movement exhibited by each species group and a review paper of the opportunities for using a complex systems approach to make new discoveries in the area of animal movement ecology.

## Marine Ecology

# Exploring the big blue

PhD student Phil Bouchet deploying mid-water cameras



**Our planet is blue. Pelagic, open water ecosystems occupy about 71% of the world's surface with the 'big blue', home to some of the planet's most commercially important species such as the tunas, and threatened predators such as billfish and oceanic sharks.**

In the last 50 years, we have observed exponential declines in many pelagic species on a global scale, with significant concern in relation to the inability of national and international fisheries management to prevent or reverse these declines. In response, there is a growing move towards the establishment of very large marine protected areas (MPAs).

Fundamental to assessing the benefits of these very large MPAs is determining the current status of pelagic shark and fish assemblages within and outside their boundaries. Since 2012, UWA Oceans Institute researchers, Professor Jessica Meeuwig, Research Associate Dr Tom Letessier and their team have pioneered the development of mid-water baited remote underwater video systems (mid-water BRUVS).

Like their seabed counterparts, mid-water BRUVS allow researchers to quantitatively document the diversity, abundance and size of fish assemblages. Importantly, the technique is non-destructive, a critical attribute given the threatened status of many of the observed species and the need to deploy them in no-take sanctuaries.

National and international collaborations have supported the team in deploying mid-water BRUVS across the Indian and Pacific oceans, with stereo imagery collected at over 1000 stations. Applications have included understanding how pelagic assemblages vary with proximity to seabed features in the Timor Sea and the Perth Canyon, supported by the National Environmental Research Program's Marine Biodiversity Hub

and in collaboration with AIMS and Geoscience Australia. Baselines in proposed or MPAs are also being established in Australia, the British Indian Ocean Territory and in New Caledonia. The desire to understand the composition of relatively intact pelagic ecosystems has driven further work in 2014 in Palau and Rapa (through the National Geographic's Pristine Seas program).

A synthesis of these samples is now underway with a focus on understanding how assemblages vary with habitat and environmental conditions. These analyses are also feeding into spatial planning processes such as the review of the Commonwealth Marine Reserve network and other MPA assessment efforts.

# Shark forum highlights cutting edge deterrent research



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The unfortunate spate of shark-related fatalities in Western Australia in recent years has highlighted the need for mitigation solutions to ensure the public as a whole are safe and confident in the water for a range of activities.

In 2014, the UWA Neuroecology Group, led by WA Premier's Fellow and UWA Oceans Institute Deputy Director Professor Shaun Collin, continued to lead the way in the testing and development of non-lethal shark mitigation solutions to protect ocean users. Their research into the innovative use of bubble curtains, strobe lights, electric fields and sub aquatic sounds was the focus of an Institute of Advanced Studies public forum held at UWA in September. The Shark Science Forum gave the public the opportunity to engage directly with the research team, including Associate Professor Nathan Hart and Dr Ryan Kempster, to hear all about their latest findings, which included the viewing of exclusive never-before-seen footage of the team's shark deterrents in action.

Since being awarded funding by the WA State Government 2012, the team has worked tirelessly to better understand the sensory biology of sharks to find the most effective solutions to protect ocean users. Their research focuses on a range of novel and existing deterrents that target multiple sensory systems such as vision, smell, the electrosense and the lateral line. To test their deterrents, the team has travelled throughout Western Australia in search of sharks and even as far as South Africa to find the most infamous species of all, the white shark.

The team is hopeful that the development of an effective non-lethal and non-invasive shark deterrent will help to reduce negative interactions with sharks and increase the confidence of the public to enter the ocean. The researchers have also set out to increase public awareness and understanding of sharks through communication of their findings in a number of high profile international documentaries.



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# Launch of Engineering for Remote Operations

For many years the Faculty of Engineering, Computing and Mathematics (ECM) has been a world leader in activities spanning offshore foundations, coastal and physical oceanography, fluid science for offshore oil and gas production and remote sensing and data analysis. To build and expand on these strengths, and grow the transdisciplinary links between them, ECM is now focussing its research efforts under the banner of Engineering for Remote Operations (ERO), forming several multidisciplinary research groups charged with addressing the diverse challenges in ERO.

Key groups active in ocean related research include: big data processing and mining, engineering communities and environment, engineering system health, and offshore facilities and ocean systems. A primary aim of the research groups is to build a critical mass of active researches in key multidisciplinary areas.

Despite only being established recently, the launch of these ERO research groups is already proving to be highly successful. In 2014, the

ERO group on Offshore Facilities and Ocean Systems developed a successful proposal to host a prestigious ARC Research Hub for Offshore Floating Facilities at UWA, spearheaded by David White, the Shell EMI Professor in Offshore Engineering. The ARC Research Hub is a \$5 million 5 year research with a collective matching contribution from industry partners Shell, Woodside, Bureau Veritas and The Lloyd's Register. The Hub will address the critical engineering challenges associated with Australia's next generation of offshore oil and gas projects, which will require innovative floating facilities such as floating liquefied natural gas (FLNG).

The Offshore Facilities and Ocean Systems (OFOS) is a multidisciplinary group led by Oceans Institute members, with expertise in metocean dynamics and ocean forecasting, offshore geotechnical engineering, offshore fixed and floating structural engineering, hydrodynamics and structure interaction, gas processing, and asset management. Members involved in the research group include Professors Mark Cassidy, Scott Draper, Christophe Gaudin, Greg Ivey, Nicole Jones, Ryan Lowe, Chari Pattiaratchi and David White. The group has capabilities in offshore

oil and gas, floating liquefied natural gas (FLNG), offshore and coastal renewable energy, offshore mining, marine aquaculture and ocean management. This enables a unified and comprehensive approach to offshore ocean facilities, ranging from core understanding of regional ocean dynamics and forcing, to structural and system design, to operation, to maintenance, and to de-commissioning and closure.

Drawing on world-leading multi-disciplinary expertise at UWA across metocean, hydrodynamic, geotechnical and reliability engineering, the Research Hub will develop and deploy the new technologies and analysis methods that are required for safe and efficient projects, spanning wave and current forecasting, vessel motion and offloading analysis, riser and mooring longevity and novel anchoring and subsea foundations. This research will blend experiments and numerical simulations, validated by field observations from offshore.

More detail on each of the ERO groups is available at [www.ecm.uwa.edu.au/research](http://www.ecm.uwa.edu.au/research).

## Marine Management

# Spatial modelling determines optimal marine zoning

UWA Oceans Institute researchers, Professor David Pannell and PhD candidate Katrina Davis from UWA School of Agriculture and Resource Economics, are examining spatial optimisation models, helping to determine the most appropriate allocation of marine areas to support management of marine resources worldwide.

Figure 1. Spatial distribution of annual enforcement costs across a study area in the central marine region of Chile.



One of the biggest threats to the sustainability of the world's oceans is the over-exploitation of marine resources. To manage this threat, which is largely a product of over-fishing and other extractive activities, governments restrict which activities can occur in marine areas, for example, through regulating fishing effort or creating no-take zones.

Spatial models help identify the optimal allocation of area amongst activities that will maximise conservation or economic value while meeting some objective, for example a conservation target or economic constraint. Different activities incur different opportunity and management costs and produce different levels of ecological or economic benefit. Data on the spatial distribution of these costs and benefits can be incorporated into spatial optimisation models.

Ms Davis and Professor Pannell undertook a detailed analysis, collecting data on management costs and species' abundance levels specific to different activities or zones. Basing the study on the central marine region of Chile (Figure 1.), a marine area where enforcement is required to deter poachers, the researchers modelled the spatial distribution of enforcement costs, combining it with abundance data for five commercially exploited fish species to generate a spatial optimisation model for the region.

This model determines the optimal allocation of the study area across different management zones: no-take, fishing zones and open access. Professor Pannell and Ms Davis incorporated key conservation objectives into the model using fixed species' abundance targets to determine how the inclusion of enforcement and opportunity costs affects optimal marine zoning allocation. The final model minimised the opportunity costs to fisher communities of meeting these goals by maximising fisher revenue.

The results showed that there were net benefits from enforcing marine areas – fisher revenue was higher when fishing areas were enforced to prevent poaching – suggesting investment in management could be justified by greater economic returns for fishers. Their results further highlight the importance of accounting for both the benefits and costs of enforcement in marine conservation, particularly when incurred by fishers.

Improving our understanding of what influences fishers' decisions to enforce their fishing management areas is identified as a high research priority for the future.



Decommissioning Dialogue stakeholders

## Marine Management

## Decommissioning Dialogue: Exploration of converting oil rigs into artificial reefs

The UWA Oceans Institute hosted an *Ocean Solutions Decommissioning Dialogue* in November 2014, as part of an ongoing series of workshops where academia, governments, industry and relevant society stakeholders contribute their collective intellectual capital, talent and power to take on opportunities to explore ocean-based solutions to relevant problems.

The decommissioning event generated much interest and was attended by academics, industry specialists, government regulators and other stakeholders. Legal, financial and scientific issues were examined and possible future actions and activities discussed. Beyond the event itself the *Dialogue* catalysed further research in various disciplines.

Two attendees at the decommissioning event, Professors Erika Techera and John Chandler from the UWA Faculty of Law explored the current legal frameworks in place to regulate decommissioning of oil rigs and associated infrastructure. This included a review of current

international law and the state of play in Australia compared with that in the US and UK. The offshore oil and gas industry is facing the prospect of decommissioning thousands of installations in the coming decades and in some other parts of the world the issue is already pressing. The financial cost of complete removal is significant, and therefore the prospect of leaving part of the installation *in situ* is attractive. At present, however, there are no legal frameworks in Australia which would facilitate the conversion of rigs to reefs. The value of such infrastructure as artificial reefs has been highlighted, particularly in the US, but in Australia the way forward is not clear. Despite the success of

rigs-to-reef projects in the US it is uncertain whether such initiatives are transferable to other contexts given very different physical and jurisdictional contexts.

Professors Techera and Chandler have also developed their research, making tentative recommendations for future law and policy developments in this area. Their article on this topic – 'Off-shore installations, decommissioning and artificial reefs: Do current legal frameworks best serve the marine environment?' – has been accepted for publication in the journal *Marine Policy* in 2015.

The Oceans Institute is continuing to investigate the decommissioning landscape in Australia, building on the momentum created, and stakeholder relations commitment.

## Marine Ecology

# Leading WAMSI research uncovers seagrass sensitivity

UWA Oceans Institute researchers are investigating the vulnerability of tropical seagrasses to dredging off the northwest coast, uncovering new information that may impact on how the region is managed.

The Western Australian Marine Science Institution (WAMSI) is delivering one of the largest marine research programs in Australia, addressing key areas of uncertainty in our understanding of how dredging activities affect the marine environment.

The WAMSI Dredging Science Node project has brought together a number of Oceans Institute researchers, including Professors Gary Kendrick, Ryan Lowe, Marco Ghiasalberti and Drs John Statton and Dianne McLean, together with other partner institutions, who are investigating nine integrated research themes to help improve the planning and regulation of major dredging operations in the marine environment. Further highlighting the importance of this local partnership, WAMSI also co-funds three Oceans Institute PhD students, working on projects under the WAMSI Dredging Science Node.

The seagrasses off Western Australia are among the most extensive and diverse of any region in the world and their requirement for light means they may be highly susceptible to nearby dredging activities.

Dr Statton measured the effects of light reduction and sediment burial from dredging to determine how fragile some of the tropical seagrasses are. Using the experimental *Seagrass Growth Facilities* at UWA, these factors



Professor Gary Kendrick

were being measured under controlled conditions on three commonly co-occurring northern Australian tropical seagrass species.

The plants were monitored under different light intensities for several weeks and the results indicated that the plants at low light intensities had lower photosynthetic rates and growth rates than unshaded plants. Under extreme conditions plants died.

During the second stage of the research, the plants were subjected to fine sediment burial at a depth of between 4mm and 70mm. Initial findings suggested that seagrasses are able to adapt to sediment burial, growing vertically to the surface of the sediments before spreading.

This research is continuing under the extended WAMSI Dredging Science Node project. Next, the research team will investigate when these two stressors (sediment burial and light interaction) are combined.

The Oceans Institute recognises the importance of local partnerships, linking with the Western Australian Marine Science Institution (WAMSI) and its scientific partners to support marine research that is focused on the pressing needs of Western Australia.



## Marine Ecology

## UWA Oceans Institute hosts the 10th International Temperate Reefs Symposium

Australia's vast temperate coastline is home to some of the most unique marine biodiversity on the planet, and contributes substantially to the total value of Australia's marine ecosystems. However, despite most Australians living close to temperate coasts these productive ecosystems are not well understood.

The International Temperate Reefs Symposium (ITRS) is the premier conference for marine ecologists with a focus on temperate hard-bottom habitats, including natural rocky reefs, man-made structures, and biogenic surfaces.

In January 2014, Oceans Institute researchers, Associate Professor Thomas Wernberg (conference chair) and Professor Gary Kendrick, hosted the 10th ITRS at the University of Western Australia (UWA). A total of 192 delegates from 24 different countries descended on UWA to discuss temperate reefs in the context of *'Ecological Transitions'*, the overarching theme of the meeting.

The scientific program over the five days of the conference offered 6 plenary talks, 10 theme keynotes, 129 oral presentations and 49 posters, covering a broad range of topics from global change ecology to human impacts, citizen science and remote sensing. The very high quality of all presentations was impressive. In addition to the scientific program, the conference also offered a free public forum on the *'Forgotten coast: the state and future of Australia's temperate reefs'*. A panel of temperate reef experts from across Australia discussed the threats to temperate reef ecosystems, drawing attention to their beauty, uniqueness and importance to society in general. The forum was recorded and reached a broader community when it subsequently aired on ABC Radio National as part of their *'Big Ideas'* program.

Despite the high-powered scientific program, the atmosphere was relaxed and clearly highly conducive to scientific discussions – a very successful event which put Western Australia on the global map of temperate reef science. <http://10itrs.org/>

## Oceanography and Climate Change

## Rising sea levels leave coasts under pressure

Research into rising sea levels was under investigation in 2014 and this was the focus of a highly cited paper published by UWA Oceans Institute researchers Drs Ivan Haigh, Sarath Wijeratne, and Professor Chari Pattiaratchi that estimated, for the first-time, present day extreme water level exceedance probabilities around Australia's coastline.

There is growing concern about rising sea levels and over the last 150 years, global sea levels have risen, on average, by 25 cm with predictions this rise will accelerate over the twenty-first century.

Extreme water levels arise as a combination of three main factors, including astronomical tide, storm surge and mean sea level and Australia's northern coastline can be prone to tropical cyclone-induced surges creating a need to better understand the probability of extreme events and advise design conditions for flood defences and other coastal and offshore structures.

Using a high-resolution depth-averaged hydrodynamic model, Drs Haigh and Wijeratne and Professor Pattiaratchi analysed data from several tide gauge sites along the coast to generate a 61-year time series of water levels around Australia.

The model was configured for the Australian shelf region and informed by a global tidal model and meteorological fields, and outputs from this model were validated against measurements from the 30 tide sites along the long and complex Australian coastline. At each site, a value was fitted to the available time series of data and combined with annual highest water levels to generate a multi-decadal hindcast.

The hindcast was used to estimate present day extreme water level probabilities around the entire coastline. There is great potential for this new dataset for Australia to be widely used in the future, while the multi-decadal system could be applied to a variety of other research and practical applications.



“NOPSEMA’s focus is on environmental management compliance and ensuring an ecologically sustainable future for Australia’s offshore petroleum industry. NOPSEMA encourages collaborative marine research that is targeted towards addressing the environmental management needs of end-users and which assists industry to continuously improve its environmental management.”

STUART SMITH,  
CEO NOPSEMA

# Collaborations



Indian Ocean Region Alliance delegates with the Hon Julie Bishop and UWA senior executives.

## An international perspective

**In 2014, the UWA Oceans Institute strengthened its international links, promoting Indian Ocean research to support the development of an ocean-based economy.**

In September, the Oceans Institute’s Deputy Director Professor Shaun Collin and General Manager Ms Tracy Parker travelled to Mauritius to attend an Oceans Economy event. During their visit, a Memorandum of Understanding was signed between UWA and the University of Mauritius for the development of joint research and training opportunities between the two institutions. Present to witness the signing was The Honourable Julie Bishop MP, Foreign Minister of Australia, in her role as Representative of Australia as Chair of the Indian Ocean Rim Association (IORA).

The Oceans Institute was again in the international spotlight when the Hon Julie Bishop later welcomed foreign dignitaries and other ministers to UWA during the Indian Ocean Rim Association conference in October.

The conference saw the launch of the Indian Ocean Business Alliance (IOBA), of which the UWA Oceans Institute is a founding member. The alliance is formed by UWA and seven other not-for-profit partners working collaboratively to support developments and explore opportunities in the Blue Economy.

IOBA is an important platform to facilitate Australia’s shared interests in the region and, as a member, the Oceans Institute will seek opportunities for integrated research and development in the Indian Ocean in emerging areas such as aquaculture, ocean energy and food security.

The formation of the IOBA recognises the wide scope of business in the Indian Ocean region and the need for a common voice from industry.

The Oceans Institute will continue to strengthen collaborations with its Indian Ocean partners, particularly with the Faculty of Ocean Studies at the University of Mauritius, to develop joint research opportunities in the areas of Marine Energy, Ocean Engineering,

Aquaculture, Ocean Forecasting and Marine Ecology.

Similar agreements will be extended to neighbouring countries who are members of the Indian Ocean Rim Association, all working to develop a strong ocean-based economy, including the Seychelles.

[www.ioba.org.au](http://www.ioba.org.au)



The Hon Julie Bishop

# Indian Ocean Marine Research Centre, Crawley

## Progress in 2014

The University of Western Australia will be the home for a new, purpose-built marine research facility and will bring together around 330 researchers working across a broad range of fields, extending from oceanography to marine ecology, to fisheries, geochemistry, governance, marine technologies and engineering.

The Indian Ocean Marine Research Centre is a collaboration between project partners, the Australian Institute of Marine Science (AIMS), The CSIRO, The University of Western Australia and the Department of Fisheries, Western Australia. It is being supported by a \$34 million grant by the Australian Government and contributions from the partner organisations.

Construction of the Indian Ocean Marine Research Centre (IOMRC) Crawley commenced in April 2014. On 30 May, the start of construction was marked by a special event to thank those involved, which was officiated

by The Hon Julie Bishop MP, Minister for Foreign Affairs and Federal Member for Curtin, who unveiled the building's foundation stone.

Construction continued throughout the year and in December, the first floor slab pour took place. In addition, the pouring of the chamber for a new centrifuge was completed during the final month of 2014. The centrifuge is currently being tested under stringent conditions in France and is due for delivery to site mid-2016. The centrifuge once installed, will spin soils to increase gravitational forces and will replicate the stresses that soils experience in the ocean.

A science and research strategy for the Indian Ocean and Marine Research Centre is being developed between all of the collaborating partners. The focus of the strategy will be on facilitating research on the most important drivers of innovation in the marine sector.

The new facility at UWA's campus is progressing well and is on-track for its expected completion in mid-2016. The refurbishment works on Watermans Bay Marine Centre also commenced in 2014. It is anticipated the centre will be fully operational late 2015.

[www.oceans.uwa.edu.au/iomrc](http://www.oceans.uwa.edu.au/iomrc)

Below: Indian Ocean Marine Research Centre, Crawley



# The Ningaloo Alliance

The Oceans Institute has many local partnerships, all of which are essential in facilitating collaborative research and lending support in our efforts to understand and conserve the Western Australian marine environment.

The UWA Oceans Institute is a member of the Ningaloo Alliance, a collaborative partnership established to share the outcomes of research on the World Heritage Listed Ningaloo Reef with the Exmouth community.

The partners are all working with the Shire of Exmouth towards developing a marine research facility within the Ningaloo Centre, a multi-use community and research building to be constructed in Exmouth. The Ningaloo Centre will enable the member organisations to have a base in Exmouth to conduct their research and promote their findings as a component of the reef to range exhibits.

As a key partner, the Oceans Institute is helping to coordinate the final designs for educational outreach, the aquarium facilities and the wet and dry research laboratories in the Centre.

The Oceans Institute will collaborate with the Alliance members, which include research institutions, state and local government departments and local organisations, to increase the capacity for marine research in Exmouth and the Ningaloo Marine Park.

The Ningaloo Centre is due for completion in early 2017.



IMOS glider

## IMOS observes our oceans

**Vast areas of Australia's oceans are being better monitored and understood thanks to an observing system operating from UWA.**

The Integrated Marine Observing System (IMOS) ocean radar facility uses high frequency radar systems, located on the coastline, to map the real-time sea-surface currents. Established at James Cook University in 2006, this IMOS facility relocated to UWA in October 2014. The UWA Deputy Vice-Chancellor of Research, Professor Robyn Owens, then relaunched the IMOS Coastal Ocean Radar Facility at UWA at a well-attended workshop event in November.

The Australian Coastal Ocean Radar Network (ACORN) joins UWA's fleet of ocean gliders in the Australian National Facility for Ocean Gliders (ANFOG) – all part of the national research infrastructure of IMOS.

In WA, radar systems cover the Turquoise Coast – from Lancelin to Green Head – and the ocean beyond Rottnest between Guilderton and Fremantle. The data will be useful for search and rescue operations, shipping, boating, fisheries, coastal and offshore engineering and many other marine-based activities and industries.

IMOS helps scientists and researchers to better understand ocean change, climate variability and extreme weather, ocean processes, and marine ecosystems in Australia.

[www.imos.org.au](http://www.imos.org.au)

The Oceans Institute continues to support the work of IMOS by leading research utilising state-of-the-art IMOS facilities. Providing strong capabilities for ocean and coastal modelling, IMOS delivers a wide range of opportunities in ocean science and technology.

## Coastal Carbon Cluster CO<sub>2</sub> emissions workshop

CSIRO's Coastal Carbon Cluster is fostering vital scientific research to strengthen our low carbon economy and prevent future excessive greenhouse gas emissions. The Coastal Carbon Cluster combines the research capabilities of CSIRO's Oceans and Atmosphere Flagship with those of the UWA Oceans Institute, and other research partners, to improve methods in estimating how much carbon is stored in coastal areas.

In November, UWA Oceans Institute members Professors Carlos Duarte and Gary Kendrick, and Dr Oscar Serrano Gras participated in a two-day workshop held at UWA to discuss CO<sub>2</sub> emissions associated with degradation of blue carbon habitats and possible enhanced CO<sub>2</sub> sequestration associated with restoration of these habitats. The workshop focused on an analysis of the uncertainties around CO<sub>2</sub> emissions with degradation of blue carbon habitat, where participants examined the emerging evidence for sediment carbon losses.

Across the two days, participants identified where the greatest risks for CO<sub>2</sub> emission might occur and developed a risk analysis

framework. A key outcome was an understanding that the final fate of lost sediment carbon, whether redeposited or remineralised to CO<sub>2</sub>, was dependent on a wide range of environmental factors, which the group recorded in order to reduce uncertainties and to focus future work. The outputs of the workshop will be documented in a manuscript that is currently in preparation.

In its final year of operation, the CSIRO Coastal Carbon Cluster is on track to meet all deliverables.

[www.csiro.au/en/Research/OandA/Areas/Coastal-management/Coastal-Carbon-Cluster](http://www.csiro.au/en/Research/OandA/Areas/Coastal-management/Coastal-Carbon-Cluster)

© Karina Inostroza

© Karina Inostroza

Disturbances of mangrove habitat in Western Australia

## Investigating the vulnerability of Kimberley seabirds to oil spills

The UWA Oceans Institute and the School of Animal Biology have partnered with the Australian Institute of Marine Science (AIMS) to gather baseline information on the foraging and breeding behaviour of several species of seabirds on the Lacepede Islands in the Kimberley.

Oceans Institute researcher Dr Belinda Cannell and UWA Associate Professor Amanda Ridley are leading the project, harnessing the expertise in avian ecology at the university. The objectives of the project are to determine breeding parameters, foraging behaviour and diet of seabirds on the Lacepede Islands and their variability between years. Such information will allow them to evaluate the vulnerability of key seabird species to spill events and their ability to recover following a spill.

Funded by Shell and INPEX, this is one of several projects to develop comprehensive environmental baselines to monitor the health of the waters off north-Western Australia, and represents collaboration between industry, government agencies and universities.

Fourteen species of seabirds breed on the Lacepede Islands, including the largest colony of breeding brown boobies in the world. However, very little is known about the ecology of the seabirds in this region. Consequently it is currently difficult to assess the vulnerability of seabird species in this area to an oil spill.

The main target species are Crested Terns, Brown Boobies and Lesser Frigatebirds, representing short (within 40 km), medium (within 100 km) and long range (>200 km) foragers from the breeding colony. Drs Cannell and Ridley also hope to understand the relationship between diet composition and foraging areas with various environmental variables such as sea surface temperatures and chlorophyll a concentrations (a measure of



Seabirds at the Lacepede Islands

productivity in the food web). Within each group of seabirds, it is also important to identify differences in foraging habitats between the sexes, as these differences will impact overall conclusions about the impact of an oil spill.

The research team successfully completed their first two field trips to the Lacepede Islands in 2014, with two more trips scheduled in both 2015 and 2016.



© Dr Belinda Cannell

# Collaborations

The UWA Oceans Institute has a growing list of partners from academics and research institutions to government and industry stakeholders, locally and abroad. These alliances provide opportunities for sharing knowledge, facilities and innovation, leading to collaborative research and new ocean-based initiatives.

## USA

Advisory Board member, Dr Larry Madin from the Woods Hole Oceanographic Institution visited the Oceans Institute and was keynote speaker at the 2014 Oceans Community.

Stanford University worked with Oceans Institute researchers to find global ocean solutions.

UWA researchers collaborate with the Schmidt Ocean Institute to plan two research expeditions in Western Australia for 2015.

## Africa and the Middle East

Director Carlos Duarte departed the Oceans Institute at the end of 2014 to head up the Red Sea Ecology Division at the King Abdullah University of Science and Technology in Saudi Arabia.

Collaborative research projects were initiated in fields of Plant Biology, Animal Biology and Law and Governance with partner institutions in South Africa.

## Europe

Researchers led a significant international collaboration, involving field expeditions to three European countries and collaboration with four universities.

## Asia Pacific region

Hosted a delegation from Zhejiang University in China to further develop research programs and teaching opportunities under the new MOU.

Signed MOU to explore a joint research centre and welcomed Dr Xiao Xi to the Oceans Institute for a 6-month collaborative research project.

Keynote presentation by Oceans Institute researcher at the International Joint workshop on Coral Reef Environmental Earth sciences in Japan.

## Local

Hosted the 10th International Temperate Reefs Symposium attended by 192 delegates from 24 countries.

WAMSI Dredging Science Node Project continues to improve scientific understanding on how dredging activities affect the marine environment.

Construction commenced on the IOMRC building marked by the laying of the Foundation stone at an event with the Hon Julie Bishop.

WA Scientist of the Year for 2013, Professor Mark Randolph, appointed inaugural Fugro Chair in Geotechnics by UWA's Centre for Offshore Foundation Systems (COFS).

Research into pipeline stability on mobile seabeds using the O-tube was distilled into new design guidelines as part of the STABLEPIPE Joint Industry Project (through WA:ERA – Woodside).

## Indian Ocean region

Signed MOU with University of Mauritius to develop joint research and training opportunities in the areas of Marine Energy, Ocean Engineering, Aquaculture, Ocean Forecasting and Marine Ecology.

Member of Indian Ocean Business Alliance working collaboratively to support developments and explore opportunities in the Blue Economy.

# Pilbara Marine Science Symposium

The 2014 Pilbara Marine Science Symposium attracted over 100 participants, speakers and sponsors from over 27 organisations, showcasing the work completed to date towards undertaking the first regional-scale assessment of the West Pilbara marine environment between northern Ningaloo and the Dampier Archipelago.



Professor Shaun P. Collin and Dr Caroline Ochieng-Erftemeijer

The Pilbara Marine Conservation Partnership (PMCP) is a partnership between the UWA Oceans Institute and CSIRO working in the remote Pilbara region of northwestern Australia. The partnership is creating a baseline assessment of dynamics and rates of recovery of the reef ecosystem and the near-coast areas across the west Pilbara.

The PMCP organised the first Pilbara Marine Science Symposium in November 2014. Researchers from the PMCP and those from WA Department of Parks and Wildlife (DPaW) all presented their current research being carried out in the Pilbara. A discussion of ways in which to build synergies and integrate the range of projects to achieve better outcomes across the region followed.

The momentum established at the symposium is spearheading closer collaboration between DPaW, industry and the PMCP researchers. Researchers are now planning collaborative field trips, cooperating in site selection, aligning sampling methods and sharing ship time for cost-effectiveness.

The Pilbara Marine Conservation Partnership has two years remaining, ending in June 2017.

[www.csiro.au/en/Research/OandA/Areas/Coastal-management/Pilbara-Marine-Conservation-Partnership](http://www.csiro.au/en/Research/OandA/Areas/Coastal-management/Pilbara-Marine-Conservation-Partnership)

## 2014 Collaborations

### International



In 2014, the Oceans Institute focused on strengthening its international links, creating new alliances in major global zones, including promoting Indian Ocean research to support the development of an ocean-based economy.

### Local and National



Local and national industry and government connections were vital to the UWA Oceans Institute, supporting productive, multi-dimensional relationships and leading to collaborative research and new ocean-based initiatives.

**5**  
Memoranda of Understanding

**4**  
New Oceans Institute members

**4**  
New research disciplines

**233**  
Scientific publications

**158**  
International collaborators

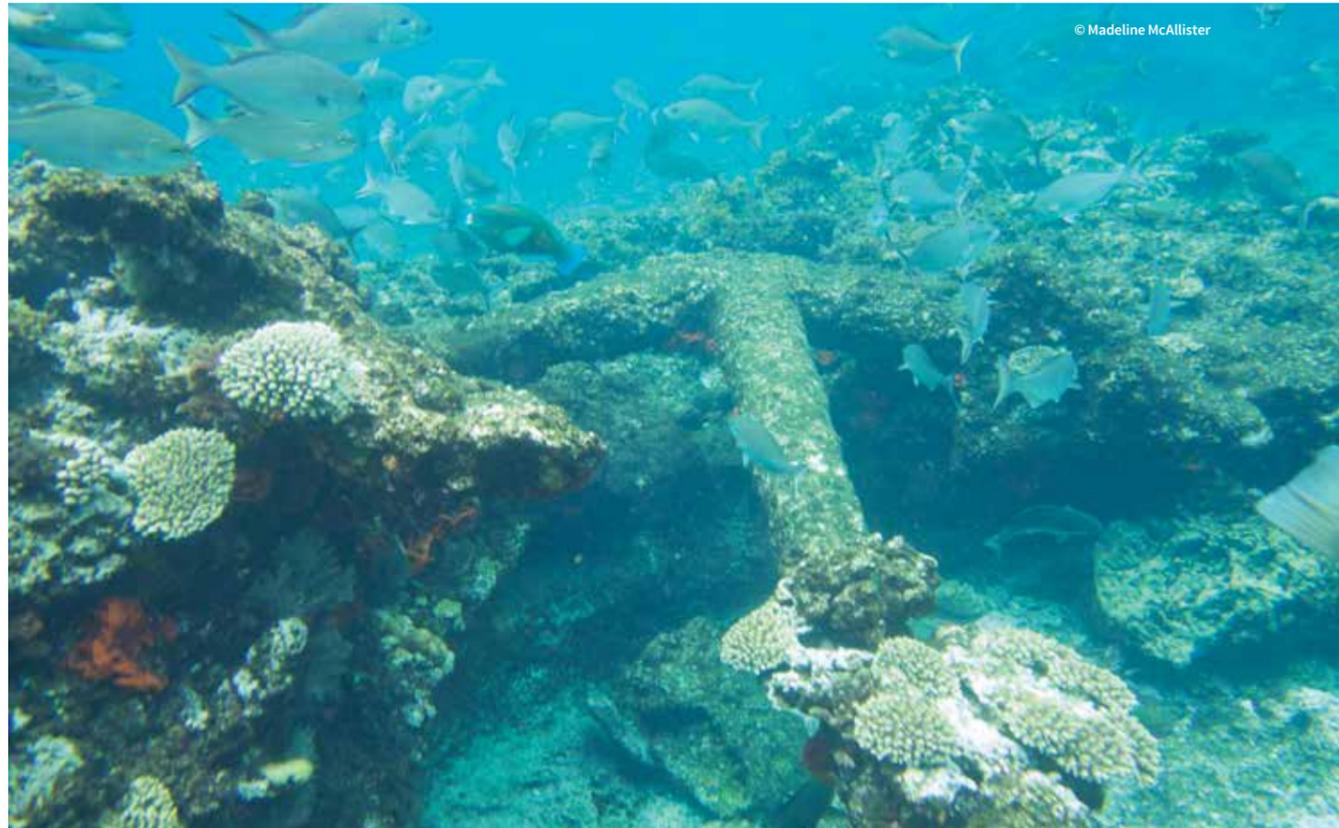
**39**  
Countries

“Science communication is essential both for inspiring the next generation of scientists and to engage and inform the community. If we are to have scientists in the future, children must be exposed to the idea that a career in the sciences is a lifetime adventure of exploration and discovery. This will be achieved when scientists and communicators work together to communicate this important message.”

ANGELA ROSSEN,  
UWA OCEANS INSTITUTE  
ARTIST IN RESIDENCE

## Media and Outreach

# Exploring the Deep Ocean at Oceans Community 2014



© Madeline McAllister

Henrietta's Anchor

'Deep Ocean' was the hot topic at the UWA Oceans Institute's Oceans Community 2014, an event created together with the UWA Institute of Advanced Studies and designed for the wider community to better understand marine issues in Western Australia.

Set in the iconic WA Maritime Museum in Fremantle, the 2014 Oceans Community event attracted over 160 members of the public.

Researchers from the Oceans Institute discussed their exploration of the deep ocean off Western Australia. PhD student Madeline McAllister enthused audiences with her talk about the 3D modeling of shipwrecks while Anton Kuhar gave us an insight into the vision

of deep dwelling species. Next, Oceans Institute Professor Julian Partridge emphasised the importance of exploring the largest habitat on earth, with a captivating description about life in the deep-sea.

Keynote speaker, Dr Larry Madin, Executive Vice President and Director of Research, from the Woods Hole Oceanographic Institution, USA spoke about the importance of exploring the deeper ocean, particularly at a time when climate change is resulting in rapid changes to ocean characteristics.

Dr Madin discussed some of the tools and techniques for modern exploration that have been developed at the Woods Hole Oceanographic Institution. Some impressive video footage enthralled audience members, the highlight being

a recent expedition to the deep ocean trenches using new robotic technology. Dr Madin also touched on the risks of exploring the Hadal Zone. In May 2014, one such robot 'Neveus' attempted a deep-sea expedition, diving to over 10,000 kilometres before imploding, an explosion equal to 64 pounds of TNT.

Rounding off the afternoon, the Southseas Oceans Hero Award was presented to Albany seagrass champion, Geoff Bastyan for his work restoring degraded seagrass habitat in Oyster Harbour.

Oceans Community continues to be an important way of helping the community understand the importance of our oceans and the research that is taking place, here in Western Australia and globally.



Postgraduate student representatives: Maria J. Gonzalez-Bernat and Eric Raes

## Showcasing our postgraduate student's research

The extent of marine research being undertaken by PhD students at the Oceans Institute was on display at the 2nd UWA Oceans Institute Postgraduate Student Conference held in October.

Conference presenters spanned nine schools and four faculties, with topics ranging from the tropics to the subtropics, from the ecology of the Swan River to marine archaeology and from offshore engineering to plastic pollution in the deep-sea.

The scope of marine studies across all of the Oceans Institute key research areas gave students an appreciation for the range of research products being undertaken across UWA, as well as opportunities to network and learn from several of our leading researchers.

UWA research and testing facilities were also on show with presentations from the WA Biogeochemistry Centre, CMCA and iVEC highlighting the capabilities available for researchers on campus, such as the potential of molecular isotope probing.

Participants were able to quiz senior UWA researchers and postdocs at the 'Speed Networking' session, and took part in a debate facilitated by Professor Alan Dench on 'Advocating for Science'.

PhD candidate, Jordan Goetze was presented with the Best Student Presentation Award that won him a trip to Rottnest Island. Jordan's presentation captivated the audience and deepened the audience's understanding about the management and the effectiveness of periodically harvested fisheries closures in Fiji. Runner up, PhD candidate Eduardo Garza-Gisholt's presentation focused on the retinal adaptations of sharks and their relatives to the light conditions where these animals live. IMOS also awarded a gift voucher to PhD candidate Moritz Wanders, who emphasised his use of IMOS data to validate his model outputs and gain insights in the hydrodynamic processes along the south-west Australian shelf.

Maria J. Gonzalez-Bernat, an Oceans Institute PhD student representative and conference coordinator, said that it was really exciting to see so many experts from so many schools sharing their expertise and passion for their own research.



Institute of Advanced Studies

## Feeding inquiring minds

The Institute of Advanced Studies (IAS) at The University of Western Australia (UWA) is committed to improving society through learning and discovery, supporting the wide dissemination of ideas and research at UWA. As part of their annual program, IAS hosts public lectures, postgraduate masterclasses and symposia to share knowledge and research, and to engage community discussion on contemporary issues.

IAS continues to support the research of the UWA Oceans Institute and the two institutes are working together to explore opportunities for early career researcher development, masterclasses, visitors and public events.

In 2014, the following events took place in partnership with IAS.

- *Living up to our Promise: Re-visioning field stations, marine laboratories, and research centers to address global environmental change*; Peggy Fiedler, Director of the Natural Reserve System at the University of California
- *Coral reefs in a stressed world: synergies, resilience and refugia*; Emily Darling, the David H Smith Conservation Research Postdoctoral Fellow, University of North Carolina

- *Making marine protected areas more cost effective: resilience through diversity*; Dr Peter Jones, University College London
- WAMSI Blueprint for Marine Science 2050; panel discussion
- *Living and working underwater: The Aquarius Reef Base underwater laboratory and residence*; James W. Fourqurean, Director, Marine Education and Research Initiative at Florida International University, and 2014 IAS Professor-at-Large
- *Blue Carbon: Carbon storage in coastal marine ecosystems and its importance in climate change mitigation schemes*; Masterclass with James Fourqurean
- Survival Skills for Science, Medicine and Engineering Workshop
- *'On the Edge' Event: Shark Science: exploring the neurobiological basis of behaviour*; Professor Shaun Collin, Associate Professor Nathan Hart, Dr Ryan Kempster

- *The impacts of the Fukushima nuclear accident in the ocean*; Gladden Fellowship Professor Pere Masque, Universitat Autonoma de Barcelona
- *Impacts of enhanced UV-B radiation on the oceans ecosystems*; Professor Susana Agusti
- Oceans Community 2014
- *Ecophysiology of Seagrasses*; Masterclass with Ole Pedersen, University of Copenhagen (2014 IAS Professor-at-Large)
- *A decade of developments in tsunami science and warning systems since the 2004 Sumatra event*; Professor Chari Pattiaratchi
- *Industrial Hazards to our Oceans*; Masterclass; Professor Pere Masque

ias.uwa.edu.au  
Twitter @IAS\_UWA



Dr Ryan Kempster and Channing Egeberg with Year 5 students from St Stephens

## Shaping the next generation of marine scientists

Marine science continues to inspire most of us and it is vital to communicate our research to encourage a whole new generation of researchers. The UWA Oceans Institute has forged links with St Stephen's School to identify opportunities to share its knowledge and appreciation of the marine world with the next generation.

In 2014, Artist-in-Residence Angela Rossen started a dialogue between the Oceans Institute and St Stephens School in Duncairn. St Stephen's is exploring the development of a new Science building with a central focus on the Indian Ocean.

The school then approached the Oceans Institute to establish a key partnership through the development of a Memorandum of Understanding between the two institutions. The Oceans Institute is now exploring key opportunities to engage the school's 2700 students and 450 staff, particularly in the research activities planned for the nearby Watermans Indian Ocean Marine Research Centre (IOMRC).

Angela Rossen continued to play a meaningful role in connecting the school with Oceans Institute members during the year and began an initiative to encourage researchers to share their projects with children in schools.

In August, marine neuroecologists, Dr Ryan Kempster and Ms Channing Egeberg, took up the opportunity to share their thoughts on shark research and conservation at a presentation to a group of St Stephen's students.

It is the first step at exploring opportunities under the emerging MOU and helping to connect a new generation with research in marine science.

# A decade on and what have we learnt

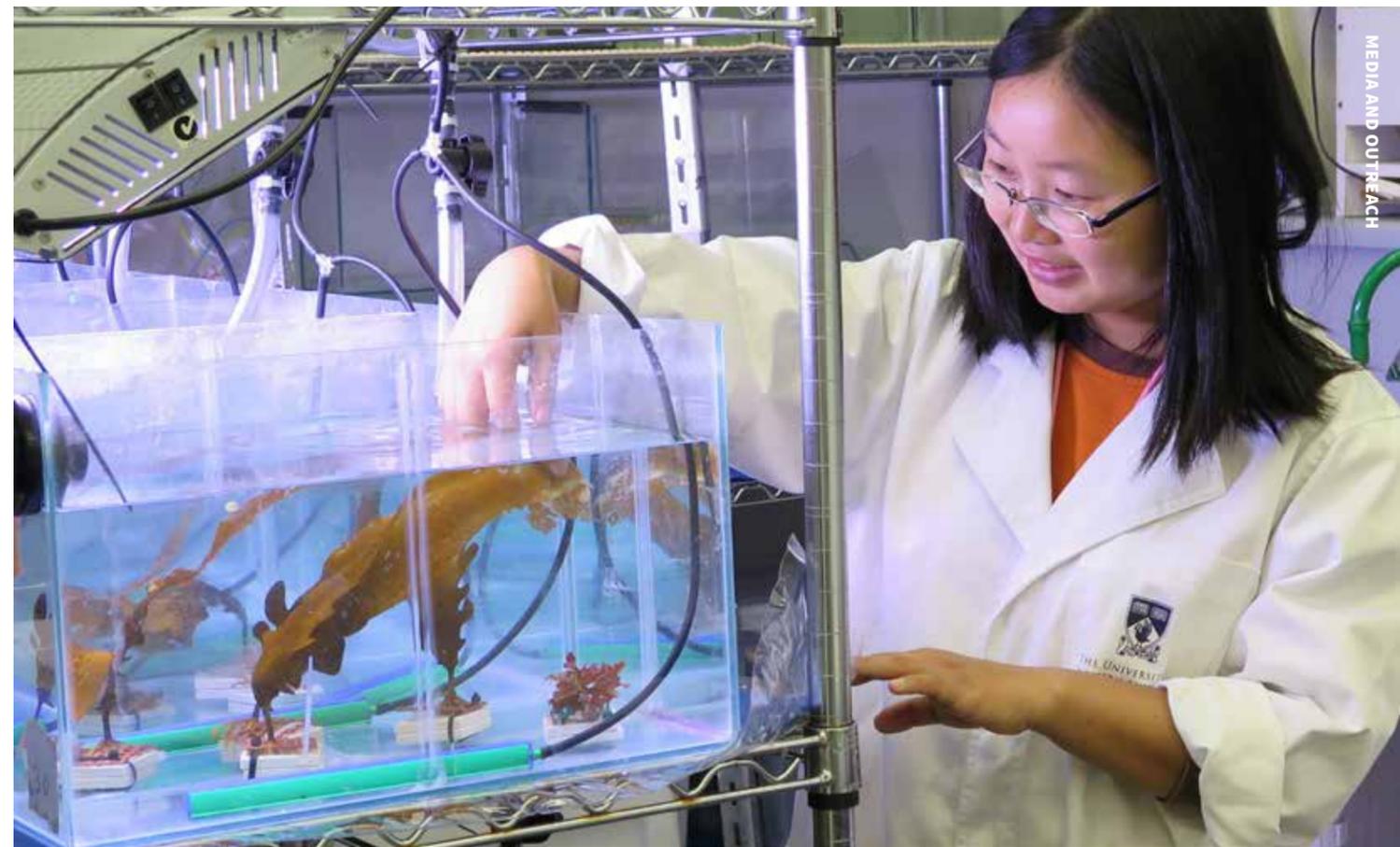
December marked the 10-year anniversary of the unprecedented 2004 Indian Ocean Tsunami, one of the world's most devastating natural disasters. The University of Western Australia's Oceans Institute Professor Chari Pattiaratchi acknowledged the event by giving a public lecture on the advances in tsunami science and lessons learnt.

Professor Pattiaratchi experienced first-hand the effects of the tsunami on a beach in Sri Lanka and subsequently became chair of the working group on Tsunami modelling as part of the Indian Ocean Tsunami Warning System.

The 10 year anniversary of the 2004 Indian Ocean Tsunami marks a decade of new understanding in tsunami science with improved observations and computer modeling. In his lecture, Professor Pattiaratchi discussed the establishment of the Indian Ocean Tsunami Warning System, which helps to more accurately predict when a tsunami is generated. The warning

system provides an early warning to authorities to help mitigate the effects of the tsunami on vulnerable coastlines.

Professor Pattiaratchi highlighted the presence of tsunami-like waves generated by meteorological effects ('meteo-tsunamis') that have been a regular occurrence along the WA coastline. Meteo-tsunamis are responsible for events such as the flooding that forced the closure of Perth's Riverside Drive in 2012, and more recently, the cargo ship ripped from its moorings that struck the Fremantle rail bridge in August.



Dr Xiao Xi

# Visiting scholars

The Visitors Program works to enhance the international reputation of the Oceans Institute by providing opportunities for members and marine specialists to collaborate and share knowledge. In the third year of the Visitor's Program the Institute awarded four visitor's grants to visiting researchers from across the globe.

## Dr Xiao Xi

In July, the Oceans Institute welcomed Dr Xiao Xi from partner institution, Zhejiang University in China.

Dr Xi spent six months at the Oceans Institute, working with Professor Carlos Duarte, Professor Susana Agusti, Associate Professor Thomas Wernberg and Dr Ylva Olsen on a project investigating the joint impacts of UV radiation and temperature on southwest Australian seaweed species vulnerable to climate change.

A complex aquarium system was created for this project that investigated the physiological responses of seaweed to different temperature gradients and UV radiations.

Dr Xi is the first researcher from Zhejiang to visit the Oceans Institute for an extended research stay which heralds a long-term collaboration between the two universities on a joint, large-scale seaweed farm project that will attempt to remove nutrients and fixed carbon dioxide from the air to restore the coastal environment.

## Professor Pere Masque

Department of Physics and the Institute of Environmental Science and Technology at the Universitat Autònoma de Barcelona (Spain) – 2014 Gladden Visiting Fellow

## Dr Peter Jones

Department of Geography at University College London

## Professor James W. Fourqurean

Director of the Marine Education and Research Initiative at Florida International University



# Media and Outreach

The UWA Oceans Institute facilitates timely, relevant and effective media engagement as a key approach to communicating members' research, as well as the Institute's broader outreach activities and initiatives, to the general public.

## Media

Media engagement was a key priority for the Oceans Institute in 2014, further developing our reputation as a central source of information about research and innovation in the marine environment. This year, the Oceans Institute released 33 media releases on a broad range of multidisciplinary research projects and activities, including international accomplishments, awarded researchers and highly regarded research papers.

Coverage of the Institute's research ranged across print, online, television and radio media at local, national and international levels confirming our research is in constant demand.

High impact media stories included research on sharks, meteo tsunamis, oceanography and engineering, resulting in nearly 200,000 media mentions across international, national, state and local news media and demonstrating the extent of the Oceans Institute's global reach.

Oceans Institute researchers featured in a number of television documentaries including PBS International's 'The Real Jaws' and 'Operation Maneater' and a program on French television 'des racines et des ailes' based on inter-continental research on kelps and climate change. Researchers also participated in several television interviews, locally and more broadly.

The disappearance of Malaysian Airlines flight, MH370 also generated an unprecedented level of media coverage by Professor Chari Pattiaratchi who gave 49 television and 24 radio interviews about the oceanographic conditions of the search area, producing over 100,000 media references.

More locally, our researchers were interviewed for 17 stories published on the Science Network of Western Australia's (SNWA) website with a some of the Institute's PhD candidates and members authoring 4 well received Perspectives pieces on an aspect of their research. Independent news website, The Conversation, published 11 of our researchers articles on extreme weather events, plastic pollution and climate change while Director Professor Carlos Duarte posted 4 stories on his own column, The Blue Marble.

## Marketing and Communications

In 2014, the Oceans Institute developed a range of communications and marketing products over a range of electronic and print formats based on a growing number of stakeholders who are interacting with the Institute across these mediums.

### Newsletter

The Oceans Institute Newsletter is an important channel through which the Institute promotes its activities, research and collaborations as well as the achievements of its students and staff to members, alumni, industry, funding bodies and research institutions.

The Newsletter was published three times in 2014 and represented one of the key tools to engage and enhance the Institute's strong connection with its stakeholders. In 2015, the Oceans Institute is trialing an online version of the newsletter with the purpose of more regularly showcasing the Institute's research highlights and activities as they occur.

### Social Media

Social media remains a central tool to promote the Institute's research and engage global audiences. The Oceans Institute posts social media content via its Facebook and Twitter pages daily.

### facebook.com/UWAOceansInstitute

Facebook continues to perform well as a social media tool and the number of people engaged and sharing our posts has increased, with over 2000 followers in 2014, while the number of people engaged in conversations and talking about the Oceans Institute on Facebook doubled since 2013.

### @uwoceans

The Oceans Institute posts regular feeds on its Twitter account and the Institute saw a steady increase in the number of followers through 2014 (up to 700) that included a broad range of international and national research institutions, media, NGOs, community groups and individuals.

## Outreach

Community based activities can bring people to science and the Oceans Institute is dedicated to engaging with the community through a range of public and targeted outreach activities aimed at increasing awareness about marine issues and research. In 2014, the Oceans Institute organised a range of academic and industry workshops and forums, focused on the broad range of multidisciplinary research underway and involving the Institute's many key stakeholders and partners.

Oceans Community, an event designed for the wider public, generated great public interest and saw a crowd of 160 guests attend who were keen to learn more about the deep ocean, the largest, unexplored frontier on earth.

Oceans Institute Artist-in-Residence Angela Rossen (www.angelarossen.com), has played a significant role facilitating outreach opportunities with the wider community. In 2014, Angela initiated several community environmental science art workshops and worked with these school groups and local communities inspiring families and community groups to engage with their natural world. Observing and recording nature in a methodical way opens the doors for discussion about the part individuals can play in coastal and marine conservation based on good science and Angela continued to share her passion for science communication throughout the year.

The Oceans Institute Postgraduate student representatives play an important role in facilitating outreach opportunities for the Institute's 126 PhD students. A key focus for 2014 was the organisation of the Postgraduate Student Conference that showcased the scope of marine studies across all of the Oceans Institute key research areas and provided students with opportunities to network and learn from several of our leading researchers.

Internally, the Institute continues to partner with the Institute of Advanced studies to facilitate oceans-based public lectures and postgraduate masterclasses while continuing to support global visitors to the Institute.

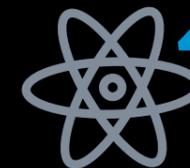


**33**  
Media Releases

**11**



Articles for  
The Conversation



**21**

Science Network  
Articles

**2,215**



Facebook Page Likes

**@938**

Twitter Followers

**70,000**



Website Hits



**14**

IAS Lectures

**160**



Attend Oceans  
Community



Postgraduate  
Student Conference  
presentations **27**

“As a student representative, I became a voice for the postgraduate students at the Oceans Institute. The organisation of the Postgraduate Conference gave me great insight in conference planning and scientific outreach to the broader community.”

ERIC RAES, 2014 POSTGRADUATE STUDENT REPRESENTATIVE

## Management and Governance

## Governance Structure

### UWA Oceans Institute Advisory Board

**Dr Ian Poiner**  
Advisory Board Chair

**Professor Lyn Beazley, AO**  
Former Chief Scientist of Western Australia

**Dr Tom Hatton, PSM**  
Principal, Thomas Hatton Environmental Consulting

**Dr Larry Madin**  
Executive Vice President and Director of Research, Woods Hole Oceanographic Institution

**Mr Michael Wood**  
Director, WA Office of the Department of Foreign Affairs and Trade

**Professor Carlos Duarte**  
UWA Oceans Institute Director

**Professor Shaun Collin**  
UWA Oceans Institute Deputy Director

**Ms Tracy Parker**  
UWA Oceans Institute General Manager (Executive Officer)

### UWA Oceans Institute Executive Board

**Professor Robyn Owens**  
Deputy Vice-Chancellor, Research (Chair)

**Professor Peter Davies**  
Pro Vice-Chancellor, Research

**Professor Carlos Duarte**  
UWA Oceans Institute Director

**Professor Shaun Collin**  
UWA Oceans Institute Deputy Director

**Professor Tony O'Donnell**  
Dean of Science

**Professor John Dell**  
Dean of Engineering, Computing and Mathematics

**Professor Erika Techera**  
Dean of Law

**Ms Tracy Parker**  
UWA Oceans Institute General Manager

**Ms Maria-Jose Gonzalez Bernat**  
**Mr Eric Raes**  
PhD Student Representatives

### Business Team

**Professor Carlos Duarte**  
UWA Oceans Institute Director

**Professor Shaun Collin**  
UWA Oceans Institute Deputy Director

**Ms Tracy Parker**  
UWA Oceans Institute General Manager

**Ms Lesley McCann**  
**Ms Jennifer Gilbert**  
UWA Oceans Institute Executive Assistants

**Ms Guiomar Duarte**  
**Ms Anna-Lee Harry**  
UWA Oceans Institute Marketing and Communications Officers

**Ms Clare Peter**  
UWA Oceans Institute Administration Officer

**Ms Kim Wee**  
UWA Oceans Institute Accounts Officer



MANAGEMENT AND GOVERNANCE

### UWA Oceans Institute farewells influential Director

At the end of 2014, the UWA Oceans Institute farewelled its Director, Professor Carlos Duarte, on his departure from the University, following four years of exemplary service.

Professor Duarte commenced at UWA as the Oceans Institute Director in March 2011 and his visionary approach to seeking ocean solutions to address humanity's grand challenges has been paramount to advancing the reputation and contribution of the Institute, locally and worldwide.

Developing a foundation for co-operative, multidisciplinary marine research, Professor Duarte launched a range of collaborative programs and outreach initiatives at the Institute, while driving international and national partnerships, most notably, the Indian Ocean Marine Research Centre partnership with AIMS, CSIRO and the WA Department of Fisheries.

Professor Duarte is confident the vision of the UWA Oceans Institute will continue to advance through its commitment to world-leading marine research, collaborative focus and strong leadership.

Professor Duarte will maintain a position as Adjunct Professor with UWA.

# External Advisory Board

## Dr Ian Poiner (Chair)

Dr Ian Poiner's scientific expertise focuses on research into tropical marine systems especially understanding how they are influenced by human activities. Of particular interest are the development of indicators of ocean health and their use in observing networks, and the application of marine science to support policy, management and the sustainable development of marine industries. Dr Poiner has significant experience in the strategic development and planning of science, both as a practising scientist and at the organisational level. Until the end of 2011, Dr Poiner was the Chief Executive Officer of the Australian Institute of Marine Science (AIMS) and is now appointed as an AIMS Associate. Dr Poiner currently chairs the Gladstone Healthy Harbour Partnership Independent Science Panel, the Board of the Reef and Rainforest Research Centre Ltd, the Steering Committee of the Marine National Facility and the Advisory Board of the Integrated Marine Observing System.

## Professor Lyn Beazley, AO

After graduating from Oxford and Edinburgh Universities, Professor Beazley built an internationally renowned research team in Neuroscience that focused on recovery from brain damage. Currently she is the Sir Walter Murdoch Professor of Science at Murdoch University.

As Chief Scientist of Western Australia from 2006 to 2013, Professor Beazley advised the WA Government on science, innovation and technology as well as fulfilling the role of science

ambassador, locally and worldwide. In 2009, Professor Beazley was awarded Officer of the Order of Australia and was elected a Fellow of the Australian Academy of Technological Sciences and Engineering.

More recently, Professor Beazley was inducted into the inaugural Western Australian Women's Hall of Fame and in 2012, Professor Beazley became the second recipient of the Governor's Award for Giving, in recognition of her enthusiastic philanthropy through her outreach activities promoting Science, Technology, Engineering and Mathematics in the WA community. In 2013, Professor Beazley was honoured to be inducted into the WA Science Hall of Fame and, most recently, was delighted to be named the WA Australian of the Year for 2015.

## Dr Tom Hatton, PSM

Tom is Principal of *Thomas Hatton, Environmental Consulting* and Adjunct Professor at UWA. He chairs the *Marine Parks and Reserves Authority*, and serves on the boards of the *Environmental Protection Authority*, the *Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development*, the *International Centre for Radio Astronomy Research* and the *Science Advisory Panel* for the Department of Water. Dr Hatton led the production of the Australian State of the Environment Report 2011, and is Chief Author for the 2016 Report. In 2014, Dr Hatton retired as CSIRO's Group Executive for Energy, where he previously directed national water and marine research programs.

## Dr Larry Madin

Dr Larry Madin is the Executive Vice President and Director of Research, and a Senior Scientist, at the Woods Hole Oceanographic Institution (WHOI) in Woods Hole, MA. Previously Dr Madin was Chair of the WHOI Biology Department, and Director of the WHOI Ocean Life Institute and has been at WHOI since 1974.

His principal research interests are in the biology of oceanic and deep-sea zooplankton and fishes, with special emphasis on medusae, siphonophores, ctenophores and pelagic tunicates. Dr Madin was among the first biologists to use SCUBA and submersibles for the in-situ study of oceanic plankton.

Holding an adjunct appointment at the Monterey Bay Aquarium Research Institute, Dr Madin is a member of AGU, ASLO, and Sigma Xi, and serves on several advisory and steering committees.

## Mr Michael Wood

Michael Wood is (former) Director of the Western Australian office of the Department of Foreign Affairs and Trade (DFAT). He leads DFAT's engagement with the WA State Government and local business. He is an experienced Australian diplomat who has worked extensively in Australia and overseas in government relations, public affairs and communications, policy development and negotiation. Between 1996 and 2012, Mr Wood held roles in Hong Kong, Singapore, Japan, and India. His broad experience in multilateral, regional and bilateral trade negotiations in particular has led to a strong understanding of business needs and motivations and he is a highly credible economic interlocutor.

# Internal Advisory Board

## Professor Carlos M. Duarte UWA Oceans Institute Director

Professor Carlos M. Duarte is Director of the UWA Oceans Institute and a Research Professor with the Spanish National Research Council (CSIC) at the Mediterranean Institute for Advanced Studies (IMEDEA) in Mallorca, Spain.

Professor Duarte's research focuses on understanding the effects of global change in aquatic ecosystems, both marine and freshwater. He is co-leader of a large EU-funded project on Arctic Tipping Points and is working closely with the United Nations to develop strategies to increase the sustainable production of marine aquaculture, as well as the restoration and conservation of coastal habitats to mitigate climate change.

Professor Duarte served as President of the American Society of Limnology and Oceanography between 2007 and 2010 and in 2009 was appointed member of the Scientific Council of the European Research Council (ERC).

*Professor Duarte will depart the UWA Oceans Institute at the end of 2014 to take up a position at the King Abdullah University of Science and Technology (KAUST) as Chair in Red Sea Ecology. Professor Duarte will maintain a position as Adjunct Professor with UWA.*

## Professor Shaun P. Collin UWA Oceans Institute Deputy Director

Professor Shaun Collin is a world leader in comparative neurobiology and vision. He heads the Neuroecology Group at UWA and investigates the neural basis of animal behaviour and its links with ecology. His research investigates the sensory systems of a range of deep-sea and shallow reef vertebrate species in the context of evolution, development and plasticity, concentrating on the influences of environmental cues such as light, odours, sound, hydrodynamic disturbances and weak electric fields.

Professor Collin has held many of the world's most prestigious fellowships in places such as the Scripps Institution of Oceanography in the United States (US); the Marine Biology Laboratory in Woods Hole in the US; The University of Tuebingen in Germany; the University of Montreal in Canada; the University of Washington (Friday Harbor) in the US; and The University of Queensland in Brisbane. Professor Collin is also a Western Australian Premier's Research Fellow.

*In 2015, Professor Collin will lead the UWA Oceans Institute as its Director.*

## Ms Tracy Parker (Executive Officer) UWA Oceans Institute General Manager

For the last 10 years, Tracy has held numerous senior management positions and provided expertise in business performance management, strategic development, continuous improvement, governance, and stakeholder management.

As the General Manager of UWA Oceans Institute, Tracy is responsible for providing strategic advice and analysis to the Director, including the development and enhancement of the strategic relationship, financial and resource management aspects of the Institute.

Tracy joined the UWA Oceans Institute from the UWA Business School where she was appointed as Strategic Analyst to the Dean and Executive Officer to the Business School Board and Ambassadorial Council.

Tracy's professional interests include alignment of strategy, business systems and organisational structure, using strategic business intelligence to enhance and support decision making and inform continuous improvement and women in business.

Tracy holds a Bachelor of Commerce in Corporate Administration and Management (Curtin) and a Master of Commerce in Strategic Value Management (UNSW).

**L-R Dr Tom Hatton, Mr Michael Wood, Dr Ian Poiner, Prof Lyn Beazley, Prof Carlos Duarte, Prof Shaun P. Collin. Absent: Dr Larry Madin, Ms Tracy Parker**



# Oceans Institute Membership

## Members

**Prof Susana Agusti**  
School of Plant Biology

**Prof Mohammed Bennamoun**  
School of Computer Science & Software Engineering

**Asst/Prof Bryan Boruff**  
School of Earth and Environment

**Dr Anne Brearley**  
School of Plant Biology

**Prof Michael Burton**  
School of Agriculture and Resource Economics

**Dr Marion Cambridge**  
School of Plant Biology

**Prof Mark Cassidy**  
Centre for Offshore Foundation Systems

**Asst/Prof Julian Clifton**  
School of Earth and Environment

**Assoc/Prof Peter Clode**  
Centre for Microscopy, Characterisation and Analysis

**Prof Shaun Collin**  
School of Animal Biology

**Assoc/Prof Wayne Davies**  
School of Animal Biology

**Prof Carlos Duarte**  
Oceans Institute

**Prof Christophe Gaudin**  
Centre for Offshore Foundation Systems

**Prof Andrea Gaynor**  
Centre for Western Australian History

**Dr Agi Gedeon**  
School of Civil, Environmental and Mining Engineering

**Assoc/Prof Anas Ghadounai**  
School of Civil, Environmental and Mining Engineering

**Dr Pauline Grierson**  
School of Plant Biology

**Assoc/Prof Atakelty Hailu**  
School of Agriculture and Resource Economics

**Assoc/Prof Nathan Hart**  
School of Animal Biology

**Assoc/Prof Jan Hemmi**  
School of Animal Biology

**Assoc/Prof Matthew Hipsey**  
School of Earth and Environment

**Asst/Prof Muhammad Hossain**  
Centre for Offshore Foundation Systems

**Prof David Hunt**  
School of Animal Biology

**Prof Greg Ivey**  
School of Civil, Environmental and Mining Engineering

**Asst/Prof Nicole Jones**  
School of Civil, Environmental and Mining Engineering

**Prof Gary Kendrick**  
School of Plant Biology

**Assoc/Prof Ryan Lowe**  
School of Earth and Environment

**Professor Pere Masque**  
School of Physics

**Prof Malcolm McCulloch**  
School of Earth and Environment

**Prof Jessica Meeuwig**  
Centre for Marine Futures

**Asst/Prof Nicola Mitchell**  
School of Animal Biology

**Prof David Pannell**  
School of Agriculture and Resource Economics

**Prof Julian Partridge**  
School of Animal Biology

**Prof Chari Pattiaratchi**  
School of Civil, Environmental and Mining Engineering

**Asst/Prof Natasha Pauli**  
School of Earth and Environment

**Prof Alistair Paterson**  
School of Archaeology

**Assoc Prof Sarah Percy**  
School of Political Science and International Relations

**Dr Jane Prince**  
School of Animal Biology

**E/Prof Alistair Robertson**  
School of Plant Biology

**Assoc/Prof Elizabeth Sinclair**  
School of Plant Biology

**Assoc/Prof David Sutton**  
School of Chemistry and Biochemistry

**Professor Erika Techera**  
Law School

**Asst/Prof Julie Trotter**  
School of Earth and Environment

**Assoc/Prof Kimberly van Niel**  
School of Earth and Environment

**Dr Ingrid Ward**  
School of Social Sciences Postdoctoral / Research

**Asst/Prof Thomas Wernberg**  
School of Plant Biology

**Dr Kara Yopak**  
School of Animal Biology

**Prof Ming-Hao Zheng**  
Faculty of Medicine, Dentistry and Health Sciences

**Post Doctoral/ Research Associate**

**Dr Zachary Aman**  
Centre for Energy, School of Mechanical and Chemical Engineering

**Dr Belinda Cannell**  
School of Animal Biology

**Asst/Prof Scott Draper**  
Centre for Offshore Foundation Systems

**Asst/Prof Jim Falter**  
School of Earth and Environment

**Dr Lara Garcia-Corral**  
School of Plant Biology

**Mr Ben Hollings**  
School of Civil, Environmental and Mining Engineering

**Dr Renae Hovey**  
Plant Biology

**Dr Tim Langlois**  
Oceans Institute

**Dr Dianne McLean**  
School of Plant Biology

**Dr Cordelia Moore**  
School of Earth and Environment

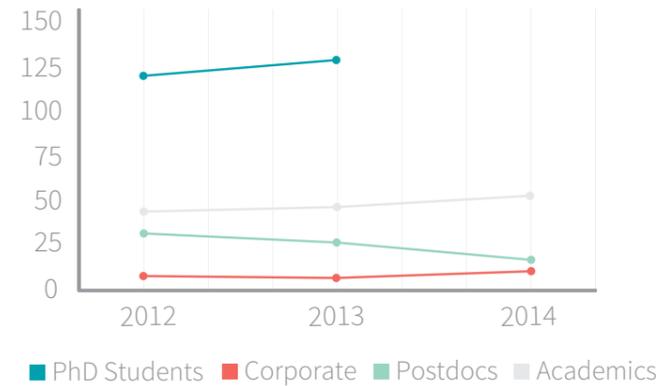
**Dr Caroline Ochieng-Erftemeijer**  
Oceans Institute

**Dr Ylva Olsen**  
School of Plant Biology

**Dr Abbie Rogers**  
Centre for Environmental Economics and Policy

**Dr Verena Schoepf**  
School of Earth and Environment

## Membership Growth



**Dr Ana Sequiera**  
School of Animal Biology

**Mr Dennis Stanley**  
School of Civil, Environmental and Mining Engineering

**Asst/Prof Michael Stat**  
Centre for Microscopy, Characterisation and Analysis

**Dr John Statton**  
School of Plant Biology

**Dr Paul Thomson**  
School of Civil, Environmental and Mining Engineering

**Dr Sarath Wijeratne**  
School of Civil, Environmental and Mining Engineering

## Adjuncts

**Dr Fabio Boschetti**  
CSIRO

**Dr Tim Cooper**  
BHP Billiton

**Dr Martial Depczynski**  
AIMS

**Dr Paul Erftemeijer**  
Jacobs

**Dr Stuart Field**  
Department of Parks and Wildlife

**Dr Rebecca Fisher**  
AIMS

**Dr Kim Friedman**  
Department of Parks and Wildlife

**Dr James Gilmour**  
AIMS

**Dr Ivan Haigh**  
University of Southampton

**Dr Nick Hardman-Mountford**  
CSIRO

**Dr Thomas Hatton**  
CSIRO

**Dr Andrew Heyward**  
AIMS

**Dr Thomas Holmes**  
Department of Parks and Wildlife

**Dr Ross Jones**  
AIMS

**Dr John Keesing**  
CSIRO

**Dr Kenneth Lee**  
CSIRO

**Dr Mark Meekan**  
AIMS

**Dr Jamie Oliver**  
AIMS

**Dr Ben Radford**  
AIMS

**Dr Zoe Richards**  
WA Museum

**Dr Tyrone Ridgeway**  
Oceanica

**Dr Stephen Rogers**  
AIMS

**Dr Michael Rule**  
Department of Parks and Wildlife

**Dr Christine Schonberg**  
AIMS

**Dr Oscar Serrano Gras**  
Oceans Institute

**Dr Luke Smith**  
Woodside

**Dr Michele Thums**  
AIMS

**Dr James Underwood**  
AIMS

**Dr Shaun Wilson**  
Department of Parks and Wildlife

## Distribution of Oceans Institute Members

SCHOOL OF PLANT BIOLOGY

SCHOOL OF EARTH AND ENVIRONMENT

OCEANS INSTITUTE

SCHOOL OF ANIMAL BIOLOGY

CENTRE FOR OFFSHORE FOUNDATION SYSTEMS

CENTRE FOR MICROSCOPY, CHARACTERISATION AND ANALYSIS

FACULTY OF ENGINEERING, COMPUTING AND MATHEMATICS

SCHOOL OF AGRICULTURE AND RESOURCE ECONOMICS

FACULTY OF ARTS, HUMANITIES AND SOCIAL SCIENCES

LAW SCHOOL

SCHOOL OF CHEMISTRY AND BIOCHEMISTRY

FACULTY OF MEDICINE, DENTISTRY AND HEALTH SCIENCES

SCHOOL OF PHYSICS

# PhD Students

## School of Animal Biology

Shanta Barley **JM**  
Charlotte Birkmanis **JM**  
Phil Bouchet **JM**  
Janelle Braithwaite **JM**  
Victoria Camilieri-Asch **sc**  
Luciana Cerqueira Ferreira **JM**  
Marjorie Fernandez **JM**  
Beverly Oh **JM**  
Joyce Ong **JM**  
Jamie Tedeschi **NM**  
Dave Tickler **JM**  
Gabriel Vianna **JM**

## School of Animal Biology – Neuroecology

Audrey Appudurai **sc**  
Lucille Chapuis **sc**  
Joao Coimbra **NH**  
Eduardo Garza Gisholt **sc**

Ryan Kempster **sc**  
Anton Kuhar **sc**  
Nicolas Nagloo **NH**  
Laura Ryan **NH**  
Carlos Salas **sc**  
Rachael Warrington **sc**

## Centre for Microscopy Characterisation and Analysis

Pia Bessell-Browne **PC**  
Gerard Ricardo **PC**

## Centre for Offshore Foundation Systems

Anthony Blake **co**  
Michael Cocjin **DW**  
Cathal Colreavy **co**  
Youkou Dong **MR**  
Minh Tri Duong **cg**  
Dengfeng Fu **cg**

Chao Han **mc**  
James Hengesh **DW**  
Pan Hu **mc**  
Kai Xiang Koh **SH**  
Omid Kohan **mc**  
Simon Leckie **DW**  
XiaoJun Li **cg**  
Huiting (Rachel) Liu **sd**  
Jiayue Liu **mc**  
Hongliang Ma **SH**  
Jalal Mirzadehniasa **mc**  
Hening Mohr **DW**  
John Morton **co**  
Shah Neyamat Ullah **DW**  
Colm O'Beirne **co**  
Lucile Queau **mk**  
Raffaele Ragni **bb**  
Amin Rismanchian **DW**  
Divya S.K.Mana **SH**  
Somaye Sadeghian **DW**  
Stefanus Safinus **SH**  
Beau Whitney **DW**  
Yue Yan **DW**  
Fan Yang **sd**

Ehssan Zargar **sd**  
Youhu Zhang **bb**  
Qin Zhang **sd**  
Tianyuan Zheng **mc**  
Jingbin Zheng **SH**

## School of Civil, Environmental and Mining Engineering

Olga Bondarenko **cp**  
Cyprien Bosserelle **cp**  
Paul Branson **gi**  
Liah Coggins **ag**  
Andrew Curruthers **ag**  
Asha de Vos **cp**  
Mohammed Hadi Bahmanpour **cp**  
Tanzihah Mahjabin **cp**  
Martin James McLaughlin **cp**  
Wandres Moritz **cp**  
Jennifer Penton **cp**  
Eric Raes **pg**  
Julia Reisser **cp**

Alireza Salehi **cp**  
Sarik Salim **cp**  
Taj Sarker **rl**  
Darshani Thotagamuwage **cp**  
Lei Tian **gi**  
Jiangtao Xu **gi**

## School of Earth and Environment

Kaylee Anderson **jt**  
Mark Buckley **rl**  
Napo Cayabyab **rl**  
Michael Cuttler **rl**  
Sana Dandan **mm**  
Gayana Lakendra Gunaratne Delkandura Arachchige **mh**  
Edwin Drost **rl**  
Laura Elena Segura **rl**  
Taryn Foster **mm**  
Lucy Georgiou **mm**  
Maria Gonzales-Bernat **jc**  
Renee Gruber **rl**  
Daniel Paraska **mh**

Andrew Pomeroy **rl**  
Liza Roger **mm**  
Leonardo Ruiz Montoya **rl**  
Laura Segura **rl**  
Jessie Short **mm**  
Gundula Winter **rl**

## Law School

Simon Allison **et**  
Damna Alzahrani **et**  
Caroline Coombs **et**  
Stephanie Price **et**

## School of Plant Biology

Bijo Arackal **tw**  
Scott Bennett **tw**  
Samantha Childs **gk**  
Katherine Cure **tl**  
Jean-Philippe Dumas **tl**  
Adrian Ferguson **gk**  
Ben Ford **eh**

Matthew Fraser **gk**  
Jordan Goetze **tl**  
Steve Lindfield **eh**  
Belinda Martin **gk**  
Camilla Piggott **tl**  
Julia Santana Garcon **gk**  
Tiffany Simpson **tw**  
Sandra Straub **tw**  
Brian Strehlow **gk**  
Luke Thomas **gk**  
Chenae Tuckett **tw**  
Daniel Van Hees **gk**  
Sam Whitehead **gk**

## Social Sciences

Mark Polzer **ap**

## KEY: Supervisors

**JM** Jessica Meeuwig  
**sc** Shaun Collin  
**NM** Nicola Mitchell  
**NH** Nathan Hart  
**pc** Peta Clode  
**co** Conleth O'Loughlin  
**DW** David White  
**pg** Pauline Grierson  
**MR** Mark Randolph  
**SH** Shazzad Hossai  
**mc** Mark Cassidy  
**cg** Christophe Gaudin  
**sd** Scott Draper  
**mk** Mehrdad Kimiaei  
**SH** Shazzad Hossain  
**bb** Britta Bienen  
**cp** Chari Pattiaratchi  
**gi** Greg Ivey  
**JT** Julie Trotter  
**rl** Ryan Lowe  
**ag** Anas Ghadouani  
**gi** Greg Ivey  
**mm** Malcolm McCulloch  
**mh** Matthew Hipsey  
**JC** Julian Clifton  
**ET** Erika Techera  
**tw** Thomas Wernberg  
**gk** Gary Kendrick  
**tl** Timothy Langlois  
**eh** Euan Harvey  
**tw** Thomas Wernberg  
**ap** Alistair Paterson

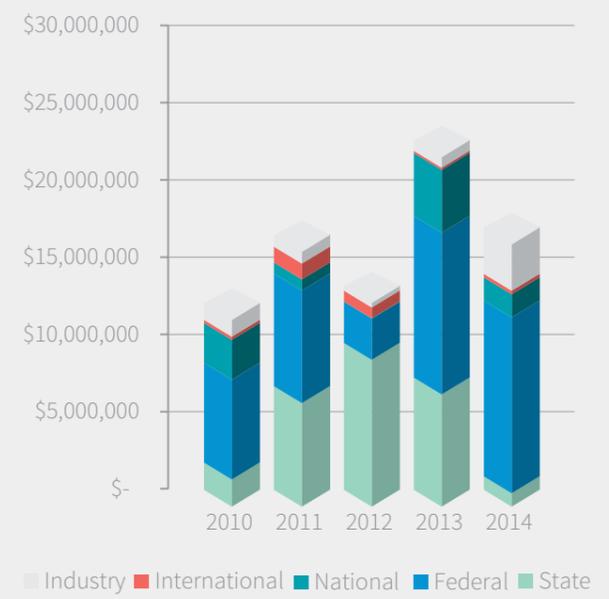
“The need to understand and protect our marine environment has never been more important. Given our increasing reliance on the ocean for leisure, trade and resources, it is our duty to manage our marine environment responsibly. The role of research and training is vital and underpins our ability to provide sound, evidence-based advice on how to assess and manage the health of our ocean ecosystem.”

PROFESSOR SHAUN COLLIN  
UWA OCEANS INSTITUTE DEPUTY DIRECTOR  
(2015 DIRECTOR)

# Research Impact

## Funding Sources

Funding for the UWA Oceans Institute members generated over \$17 million in funding opportunities from government, industry and national and international sources. While Federal funding was once again a significant source with a number of ARC research grants awarded, industry funding rose over four times making it a high contributor of research income.



## Case Study: Research Impact in 2014

The UWA Oceans Institute prides itself on its multidisciplinary capabilities and for almost six years the Institute has facilitated research programs and published highly cited scientific papers that play a significant role in impacting government policy and influencing community awareness and understanding.

Plastic pollution was an important issue worldwide following the publication of a scientific paper resulting from the global Malaspina Circumnavigation Expedition led by Professor Carlos Duarte in 2011. The research found that plastic pollution in the open ocean is widespread but less than predicted, sparking researchers to ask the question ‘where is the missing plastic?’ Former PhD student, Julie Reisser, supported by Professor Chari Pattiaratchi, was a key advocate for research into understanding the impacts of plastic pollution to better inform decision makers tasked with developing mitigation strategies for this worldwide problem.

The number of cites received by UWA Oceans Institute members continues to grow, providing evidence of the growing impacts of the research conducted at the Institute. In 2014, five publications involving Oceans Institute researchers, were recognised as ‘Highly Cited’ papers, receiving enough citations to place them in the top 1% of their academic field.

Bates AE, Pecl GT, Frusher S, Hobday AJ, **Wernberg T**, Smale DA, Sunday JM, Hill NA, Dulvy NK, Colwell RK, Holbrook NJ, Fulton EA, Slawinski D, Feng M, Edgar GJ, **Radford BT**, **Thompson PA**, Watson RA (2014) Defining and observing stages of climate-mediated range shifts in marine systems. *Global Environmental Change-Human and Policy Dimensions* **26**: 27-38

Cozar A, Echevarria F, Ignacio Gonzalez-Gordillo J, Irigoien X, Ubeda B, Hernandez-Leon S, Palma AT, Navarro S, Garcia-de-Lomas J, Ruiz A, Fernandez-de-Puelles ML, **Duarte CM** (2014) Plastic debris in the open ocean. *Proceedings of the National Academy of Sciences of the United States of America* **111**(28): 10239-10244

**Haigh ID**, Wahl T, Rohling EJ, Price RM, **Pattiaratchi CB**, Calafat FM, Dangendorf S (2014) Timescales for detecting a significant acceleration in sea level rise. *Nature Communications* **5**: 3635

**Haigh ID**, Wijeratne EMS, MacPherson LR, **Pattiaratchi CB**, Mason MS, Crompton RP, George S (2014) Estimating present day extreme water level exceedance probabilities around the coastline of Australia: tides, extra-tropical storm surges and mean sea level. *Climate Dynamics* **42**(1-2): 121-138

Irigoien X, Klevjer TA, Rostad A, Martinez U, Boyra G, Acuna JL, Bode A, Echevarria F, Gonzalez-Gordillo JI, Hernandez-Leon S, **Agusti S**, Aksnes DL, **Duarte CM**, Kaartvedt S (2014) Large mesopelagic fishes biomass and trophic efficiency in the open ocean. *Nature Communications* **5**: 3271

# Research Grants 2014

PROJECT TITLE	FUNDING PERIOD	FUNDING BODY	AMOUNT	OCEANS INSTITUTE RESEARCHER
A very high resolution mass spectrometer with high sensitivity to support proteomics and metabolomics research across the chemical, biological, environmental, and geosciences	2014	ARC Linkage Infrastructure Equipment Facilities	\$670,000	Associate Professor Peta Clode
Advanced 3D computer vision algorithms for 'find and grasp' future robots	2014	ARC Discovery Projects	\$555,100	Professor Mohammed Bennamoun
Advanced computer vision techniques for marine ecology	2014	ARC Discovery Projects	\$614,700	Professor Mohammed Bennamoun, Professor Gary Kendrick
Analysis of fish assemblage structure from baited remote underwater stereo-video systems (Stereo-BRUVs) deployed in the Timor Sea region for the AIMS strategic gap filling of banks and shoals habitat surveys in the Oceanic Shoals Bioregion	2014	Australian Institute of Marine Science (AIMS)	\$43,716	Dr Dianne McLean
Anatomical proxies for cognitive abilities in vertebrates	2014	UWA Research Collaboration Awards	\$15,000	Professor Shaun Collin
Applied Research Project 7 – Analysis of fish assemblage structure from baited remote underwater stereo-video systems (stereo-BRUVs) deployed in the Echuca and Heywood Shoals region	2014	Australian Institute of Marine Science (AIMS)	\$94,198	Dr Dianne McLean
Behaviour of suction buckets in layered soils	2014	Lloyds Register Group Ltd	\$95,550	Professor Mark Cassidy
Decision tools for managing hydrological threats to biodiversity assets – 14804	2014	WA Department of Parks and Wildlife	\$82,955	Associate Professor Matthew Hipse
Develop better predictions for extreme water levels	2014	Bushfires and Natural Hazards CRC	\$669,000	Professor Charitha Pattiaratchi, Dr Sarath Wijeratne, Dr Ivan Haigh
Distribution and predictors of benthic biodiversity	2014	Western Australian Marine Science Institute (WAMSI)	\$20,426	Associate Professor Kimberly Van Niel, Professor Gary Kendrick
Ecological impacts of hydroclimate variability in WA	2014	Teaching Relief for UWA Academic Staff	\$19,000	Dr Pauline Grierson
Ecology of picophytoplankton at IMOS national reference stations	2014	CSIRO	\$7,370	Dr Paul Thomson
Economics of natural hazards	2014	Bushfires and Natural Hazards CRC	\$693,747	Professor David Pannell
Enhancing scanning probe microscopy in Western Australia: High resolution, soft imaging and electrochemical scanning probe microscopy	2014	ARC Linkage Infrastructure Equipment Facilities	\$286,560	Associate Professor Peta Clode
Enhancing scanning probe microscopy in Western Australia: High resolution, soft imaging and electrochemical scanning probe microscopy	2014	Curtin University of Technology	\$84,962	Associate Professor Peta Clode
Estuarine model development for the Swan Estuary	2014	WA Department of Water	\$140,000	Associate Professor Matthew Hipse
Expanding cross-site synthesis through virtual lake domains within the Global Lake Ecological Observatory Network	2014	UWA Research Collaboration Awards	\$19,898	Associate Professor Matthew Hipse
Expanding the frontiers of mass spectrometry: a high resolution laser ablation multiple streaming facility for the Earth and Environmental Sciences	2014	ARC Linkage Infrastructure Equipment Facilities	\$860,000	Professor Malcolm McCulloch
Flow visualisation and measurement for a model scale Structure	2014	Subcon Technologies	\$3,900	Associate Professor Scott Draper
Fugro chair	2014	Advanced Geomechanics	\$1,730,000	Professor Mark Cassidy
Harnessing the power of oceans: anchors for floating energy devices	2014	ARC Discovery Projects	\$571,800	Professor Christophe Gaudin, Professor Mark Cassidy, Dr Conleth O'Loughlin
High precision water stable isotope analyser with 17 O capability to examine terrestrial water fluxes	2014	ARC Linkage Infrastructure Equipment Facilities	\$315,000	Professor Malcolm McCulloch
High precision water stable isotope analyser with 17 O capability to examine terrestrial water fluxes	2014	Curtin University of Technology	\$49,000	Professor Malcolm McCulloch
Hydrate risk assessment for the Greater Enfield Development	2014	Western Australian Energy Research Alliance WAERA ex Woodside R2D3	\$159,150	Associate Professor Zachary Aman
Integrated Marine Observing System IMOS Australian Coastal Ocean Radar Network ACORN	2014	University of Tasmania ex Education Investment Fund EIF	\$584,000	Professor Charitha Pattiaratchi
Investigating hybrid foundation system for Jack-up Foundation	2014	Keppel Offshore & Marine Ltd	\$24,125	Professor Christophe Gaudin

PROJECT TITLE	FUNDING PERIOD	FUNDING BODY	AMOUNT	OCEANS INSTITUTE RESEARCHER
Investigating the breeding and foraging parameters of seabird species in the Browse Basin to determine their vulnerability to impacts associated with potential oil spills, and their ability to recover	2014	Australian Institute of Marine Science (AIMS) ex Shell Development Australia Pty Ltd	\$1,200,000	Dr Belinda Cannell, Dr Amanda Ridley
Investigating sedimentation rates within Vasse-Wonnerup System utilising paleo-reconstruction techniques	2014	WA Department of Water	\$25,000	Dr Oscar Gras, Professor Gary Kendrick
ITRAX High resolution scanning of calcrete profiles from the Hamersley Basin for investigation of formation processes of calcrete	2014	Australian Institution of Nuclear Science & Engineering Ltd	\$15,020	Professor Malcolm McCulloch
Managing hydrate formation for viable CO <sub>2</sub> and energy transport	2014	ARC Discovery Projects	\$682,200	Associate Professor Zachary Aman
Mass cytometry: a breakthrough tool in cellular analysis for biomedical, environment, marine and systems biology in Western Australia	2014	ARC Linkage Infrastructure Equipment Facilities	\$941,489	Professor Shaun Collin
Mass cytometry: a breakthrough tool in cellular analysis for biomedical, environment, marine and systems biology in Western Australia	2014	Curtin University of Technology	\$60,000	Professor Shaun Collin
Mass cytometry: a breakthrough tool in cellular analysis for biomedical, environment, marine and systems biology in Western Australia	2014	Edith Cowan University	\$15,000	Professor Shaun Collin
Mass cytometry: a breakthrough tool in cellular analysis for biomedical, environment, marine and systems biology in Western Australia	2014	Telethon Kids Institute	\$10,000	Professor Shaun Collin
Mass cytometry: a breakthrough tool in cellular analysis for biomedical, environment, marine and systems biology in Western Australia	2014	Murdoch University	\$60,000	Professor Shaun Collin
Marine heat waves – global patterns of impacts and risks	2014	UWA Research Collaboration Awards	\$20,000	Associate Professor Thomas Wernberg
Mid West Aquaculture Development Zone	2014	BMT Oceanica ex WA Department of Fisheries	\$81,978	Associate Professor Matthew Hipse
Monitoring the environmental outcomes of Commonwealth environmental water use in the Lower Murray River during 2013-14: Transort of salt, nutrients, organic and inorganic matters – Lock 1 to Southern Ocean study	2014	South Australian Research and Development Institute	\$52,312	Associate Professor Matthew Hipse
National facility for cyclic testing of high speed rail (FCTGHSR)	2014	University of Wollongong ex ARC LIEF	\$45,000	Professor Mark Cassidy, Professor Christophe Gaudin
Nearshore dynamics of complex coastlines	2014	UWA Research Collaboration Awards	\$15,000	Professor Ryan Lowe, Dr Jeffrey Hansen
Norms and violence	2014	UWA Research Collaboration Awards	\$15,000	Professor Sarah Percy
Novel methods to quantify anti agglomerant performance	2014	Nalco Company	\$61,370	Associate Professor Zachary Aman
Numerical analysis techniques for suction caisson anchor – soil interaction	2014	Daewoo Shipbuilding and Marine Engineering Co Ltd	\$40,000	Dr Muhammad Hossain
Peel Harvey Estuary System Model Development	2014	WA Department of Water	\$40,000	Associate Professor Matthew Hipse
Predicting scour and scour-induced settlement of subsea infrastructure	2014	ARC Discovery Projects	\$414,300	Assistant Professor Ming Zhao, Associate Professor Scott Draper
Predictive capability for particle capture in aquatic ecosystems	2014	ARC Discovery Projects	\$286,100	Dr Marco Ghisalberti, Professor Gregory Ivey
Research on the impacts of tropical cyclones on offshore coral reefs and shoals in north western Australia	2014	Australian Institute of Marine Science (AIMS)	\$30,000	Professor Ryan Lowe, Associate Professor Nicole Jones, Professor Gregory Ivey
Resource recovery from wastewater	2014	CRC for Water Sensitive Cities	\$50,000	Professor Anas Ghadouani
RIGSS J IP – Offshore geotechnical engineering with remote intelligent geotechnical seabed surveys	2014	Benthic USA LLC	\$195,000	Professor David White, Dr Conleth O'Loughlin
RIGSS J IP – Offshore geotechnical engineering with remote intelligent geotechnical seabed surveys	2014	Shell Development Australia Pty Ltd	\$195,000	Professor David White, Dr Conleth O'Loughlin, Associate Professor Scott Draper
RIGSS J IP – Offshore geotechnical engineering with remote intelligent geotechnical seabed surveys	2014	UTEC Geomarine Limited	\$195,000	Professor David White, Dr Conleth O'Loughlin, Associate Professor Scott Draper

PROJECT TITLE	FUNDING PERIOD	FUNDING BODY	AMOUNT	OCEANS INSTITUTE RESEARCHER
RIGSS J IP – Offshore geotechnical engineering with remote intelligent geotechnical seabed surveys	2014	Fugro Engineers B.V.	\$195,000	Professor David White, Dr Conleth O'Loughlin, Associate Professor Scott Draper
RIGSS J IP – Offshore geotechnical engineering with remote intelligent geotechnical seabed surveys	2014	Woodside Energy Ltd	\$195,000	Professor David White, Dr Conleth O'Loughlin, Associate Professor Scott Draper
STABLEpipe JIP Phase 3: phase LOT interpretation	2014	Western Australian Energy Research Alliance WAERA ex Woodside R2D3	\$47,702	Associate Professor Scott Draper, Professor David White
STABLEpipe JIP Phase 3: support to DNV's development of method A of the design guideline	2014	Western Australian Energy Research Alliance WAERA ex Woodside R2D3	\$10,166	Associate Professor Scott Draper, Professor David White
STABLEpipe JIP Phase 3: Backfill and sedimentation time scale, including pipe soil resistance following backfill and sedimentation	2014	Western Australian Energy Research Alliance WAERA ex Woodside R2D3	\$137,396	Associate Professor Scott Draper, Professor David White
STABLEpipe JIP Phase 3: design method development	2014	Western Australian Energy Research Alliance WAERA ex Woodside R2D3	\$49,853	Associate Professor Scott Draper, Professor David White
Subtidal Benthos: towards benthic baselines in the Browse Basin – CTR7	2014	Australian Institute of Marine Science (AIMS) ex Shell Development Australia Pty Ltd	\$540,608	Professor Gary Kendrick, Professor Carlos Duarte, Dr Ylva Olsen
Systems perspectives on preventing lifestyle related chronic health problems	2014	University of Melbourne ex Sax Institute ex NHMRC Partnership Centre	\$62,750	Dr Bryan Boruff
The nonlinear evolution of the internal tide over the Tasmanian Continental Shelf	2014	UWA Research Collaboration Awards	\$19,850	Associate Professor Nicole Jones
Thermal conductivity test – Edradour Project	2014	Technip UK Limited	\$155,415	Associate Professor Scott Draper, Professor David White
Ultra-high resolution dual beam facility for 3D imaging, nanoprototyping, and site-specific characterisation in the geo-, bio-, and physical sciences, and engineering	2014	ARC Linkage Infrastructure Equipment Facilities	\$1,818,181	Professor Shaun Collin
Ultra-high resolution dual beam facility for 3D imaging, nanoprototyping, and site-specific characterisation in the geo-, bio-, and physical sciences, and engineering	2014	CSIRO	\$35,000	Professor Shaun Collin
Ultra-high resolution dual beam facility for 3D imaging, nanoprototyping, and site-specific characterisation in the geo-, bio-, and physical sciences, and engineering	2014	Murdoch University	\$50,000	Professor Shaun Collin
Ultra-high resolution dual beam facility for 3D imaging, nanoprototyping, and site-specific characterisation in the geo-, bio-, and physical sciences, and engineering	2014	Edith Cowan University	\$20,000	Professor Shaun Collin
Ultra-high resolution dual beam facility for 3D imaging, nanoprototyping, and site-specific characterisation in the geo-, bio-, and physical sciences, and engineering	2014	University of Sydney	\$60,000	Professor Shaun Collin
Ultra-high resolution dual beam facility for 3D imaging, nanoprototyping, and site-specific characterisation in the geo-, bio-, and physical sciences, and engineering	2014	Curtin University of Technology	\$260,000	Professor Shaun Collin
Vasse-Wonnerup Estuary System Model Development	2014	WA Department of Water	\$30,000	Associate Professor Matthew Hipsey
Water quality modelling for lower lakes ecological health assessment	2014	South Australian Research and Development Institute	\$75,000	Associate Professor Matthew Hipsey
Wheatstone platform scour protection design	2014	Atteris Pty Ltd	\$99,027	Associate Professor Scott Draper, Professor David White
<b>TOTAL</b>			<b>\$17,023,590</b>	

# Oceans Institute 2014 Publications

## Journal Articles

Adcock TAA, **Draper S** (2014) Power extraction from tidal channels – Multiple tidal constituents, compound tides and overtides. *Renewable Energy* **63**: 797-806

**Agusti S**, Llabrés M, Carreja B, Fernández M, **Duarte CM** (2014) Contrasting sensitivity of marine biota to UV-B radiation between southern and northern hemispheres. *Estuaries and Coasts*;10.1007/s12237-014-9790-9

**Agusti S**, Regaudie-de-Gioux A, Arrieta JM, **Duarte CM** (2014) Consequences of UV-enhanced community respiration for plankton metabolic balance. *Limnology and Oceanography* **59**(1): 223-232

Al-Aidaroos AM, El-Sherbiny MMO, Satheesh S, Mantha G, **Agusti S**, Carreja B, **Duarte CM** (2014) High mortality of Red Sea zooplankton under ambient solar radiation. *Plos One* **9**(10): e108778

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Andrews S, **Bennett S**, **Wernberg T** (2014) Reproductive seasonality and early life temperature sensitivity reflect vulnerability of a seaweed undergoing range reduction. *Marine Ecology Progress Series* **495**: 119-129

Apostolaki ET, Vizzini S, Hendriks IE, **Olsen YS** (2014) Seagrass ecosystem response to long-term high CO<sub>2</sub> in a Mediterranean volcanic vent. *Marine Environmental Research* **99**: 9-15

Aristegui J, **Duarte CM**, Reche I, Gomez-Pinchetti JL (2014) Krill excretion boosts microbial activity in the Southern Ocean. *Plos One* **9**(2): e89391

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Arnall SG, Kuchling G, **Mitchell NJ** (2014) A thermal profile of metabolic performance in the rare Australian chelid, *Pseudomydura umbrina*. *Australian Journal of Zoology* **62**(6): 448-453

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Azzarello JJ, Smale DA, **Langlois TJ**, Hakansson E (2014) Linking habitat characteristics to abundance patterns of canopy-forming macroalgae and sea urchins in southwest Australia. *Marine Biology Research* **10**(7): 682-693

Baldock J, Bancroft KP, Williams M, Shedrawi G, **Field S** (2014) Accurately estimating local water temperature from remotely sensed satellite sea surface temperature: A near real-time monitoring tool for marine protected areas. *Ocean & Coastal Management* **96**: 73-81

Barrington DJ, **Ghadouani A**, Sinang SC, **Ivey GN** (2014) Development of a new risk-based framework to guide investment in water quality monitoring. *Environmental Monitoring and Assessment* **186**(4): 2455-2464

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Bell JJ, Smith D, Hannan D, Haris A, Jompa J, **Thomas L** (2014) Resilience to disturbance despite limited dispersal and self-recruitment in tropical barrel sponges: Implications for conservation and management. *Plos One* **9**(3): e91635

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**Buergelt PT**, Paton D (2014) An ecological risk management and capacity building model. *Human Ecology* **42**(4): 591-603

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**Cassidy MJ**, **Gaudin C**, Bates L, Indraratna B, Nimbalkar S, **O'Loughlin CD**, White DJ, Sloan SW (2014) Advancing Australia's facilities for physical modelling in geotechnics. *Australian Geomechanics Journal* **49**(4): 3-12

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Cvitanovic C, Marshall NA, **Wilson SK**, Dobbs K, Hobday AJ (2014) Perceptions of Australian marine protected area managers regarding the role, importance, and achievability of adaptation for managing the risks of climate change. *Ecology and Society* **19**(4):33

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**de Busserolles F**, Fitzpatrick JL, Marshall NJ, **Collin SP** (2014) The influence of photoreceptor size and distribution on optical sensitivity in the eyes of lanternfishes (Myctophidae). *Plos One* **9**(6): e99957

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**de Busserolles F**, Marshall NJ, **Collin SP** (2014) Retinal ganglion cell distribution and spatial resolving power in deep-sea lanternfishes (Myctophidae). *Brain Behavior and Evolution* **84**(4): 262-276

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**Draper S**, Adcock TAA, Borthwick AGL, Houlsoy GT (2014) A note on the power potential of tidal currents in channels. *International Journal of Marine Energy* **6**: 1-17

**Draper S**, Nishino T (2014) Centred and staggered arrangements of tidal turbines. *Journal of Fluid Mechanics* **739**: 72-93

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**Duarte CM** (2014) Red ochre and shells: clues to human evolution. *Trends in Ecology & Evolution* **29**(10): 560-565

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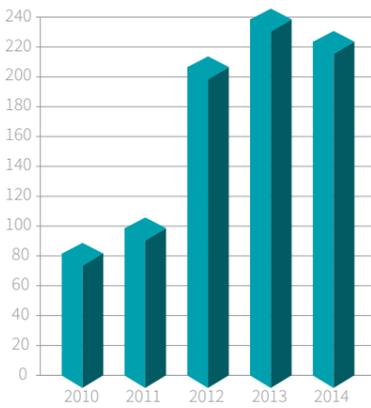
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# 2015

## Looking Forward

### Oceans Institute 2015 Strategic Priorities

- Communicate Oceans Institute's research and its Vision on Ocean Solutions
- Strengthen and spread capacity in marine research
- Invest in internationalisation
- Enhance high performance culture

### 2015 Operational Priorities

- Enhance research profile
- Advance the Oceans Institute's international development
- Engage in knowledge transfer
- Invest in international research and programs
- Develop strategic partnerships
- Increase available resources

“There is no simple solution to the challenges facing the marine environment. All disciplines have a role to play including natural and social sciences, engineering, business and humanities. Only through collaboration will we ensure the health of our oceans and marine life.”

PROFESSOR ERIKA TECHERA  
DEAN OF LAW



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