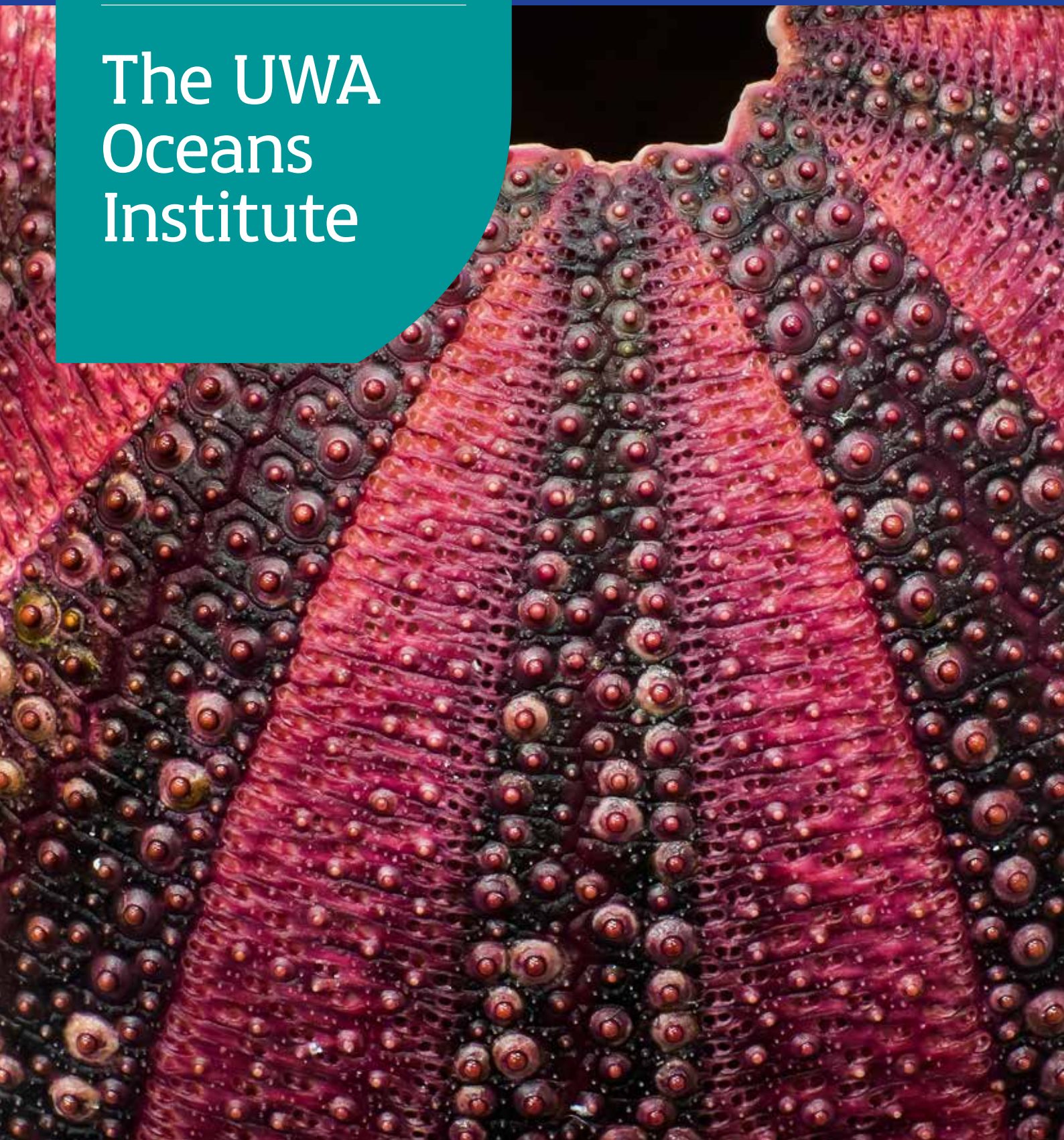
THE UNIVERSITY OF WESTERN AUSTRALIA

Annual Report 2015

The UWA Oceans Institute



“The Oceans Institute is set to play a key role in understanding our precious marine environment. Such knowledge will help protect the future for Western Australia and beyond, environmentally, economically and socially.”

PROFESSOR LYN BEAZLEY,
FORMER CHIEF SCIENTIST OF WESTERN AUSTRALIA

Cover image © Matthew Galligan

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 for innovative marine research and ocean technology, delivering Ocean Solutions in Western Australia and worldwide.

Priorities

- Further the frontiers of knowledge in ocean research and technology.
- 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 worldwide.
- Provide a focal point for quality training of post-graduate 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 a science-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.

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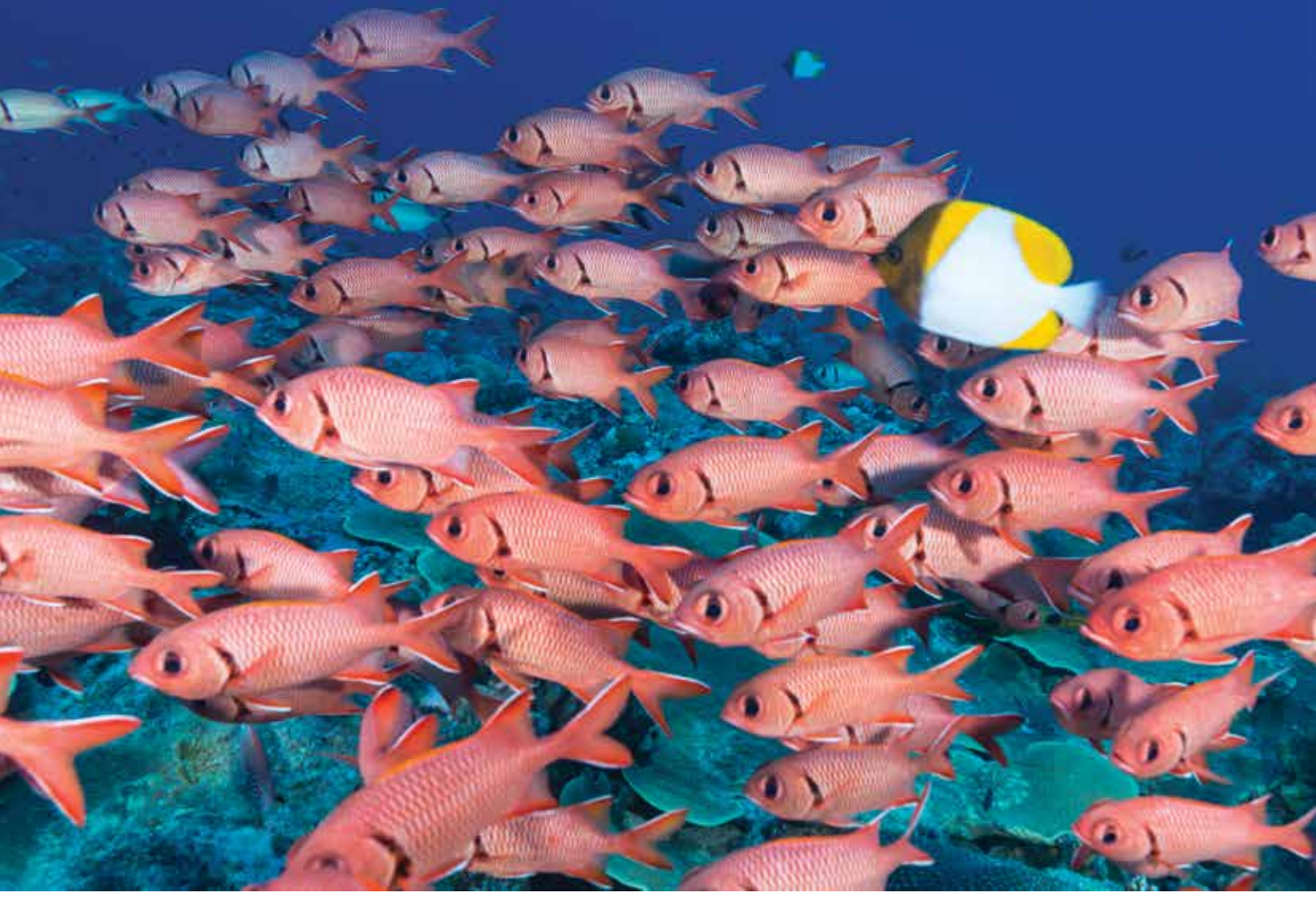
"The UWA Oceans Institute remains committed to providing research impact across a range of marine research disciplines. The key is being able to work together across organisational boundaries and realise a common vision.

Our IOMRC and WAMSI partners will be important for integrating our expertise to tackle national and global challenges. We need to be working with the best in the world to ensure research excellence."

PROFESSOR SHAUN COLLIN
UWA OCEANS INSTITUTE DIRECTOR 2015



Executive Summary

For the Oceans Institute (OI), 2015 was a year filled with exploration, discovery and preparation for the years ahead. This annual report is but a glimpse into the depths of our member's research dedicated to ocean solutions.

Our researchers unlocked the secrets of the Perth Canyon, a deep ocean gorge the size of the Grand Canyon in the USA that had previously remained poorly known and largely unexplored.

Three years of funding from the WA State Government to carry out research into shark deterrents delivered important results in 2015. These concentrated on the development of a range of novel shark deterrents that were inspired by basic research on sensory systems in these ancient predators and the testing of commercial deterrents currently on the market.

In depth analysis was also performed on Australia's 'Great Southern Reef' that is contributing more than $10 billion to the Australian economy each year.

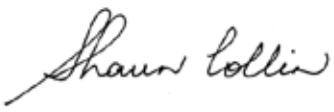
The Oceans Institute fostered a number of major collaborative initiatives this year. As part of The Indian Ocean Marine Research Centre partnership with CSIRO, AIMS and the WA Department of Fisheries or Western Australian Department of Fisheries, UWA finalised the new marine facility at Watermans Bay and oversaw the rise of the five-story IOMRC building at Crawley. In Exmouth, the first sod was turned on the site of the new Ningaloo Centre, due for completion in April 2017. These three new facilities will become flagships servicing a diverse range of research activities in WA.

We hosted many of our international neighbours from China, Mauritius, Malaysia and India, and made reciprocal visits to further our collaborative research links. Closer to home, our researchers were heavily involved in state and national initiatives to boost marine science through the National Marine Science Plan, the CSIRO Carbon Cluster, and the formation of the Blueprint for Marine Science 2050 guided by the Western Australian Marine Science Institution (WAMSI).

With the able assistance of a new leadership team, our staff and students came together to redefine our activities with respect to our research impact and how we communicate our findings to the public. This resulted in a fresh look to our website.

As in previous years, our PhD students continue to break new ground, sharing their results with their peers, the general public and enlisting the help of many citizen scientists.

I predict 2016 will be another big year for the Oceans Institute as the IOMRC facilities at Crawley, Watermans Bay and the Ningaloo Centre in Exmouth should all be finalised. The excitement of moving into new state-of-the-art facilities, the formation of new research hubs and new collaborative opportunities to work more closely with industry all signal a successful year ahead.



Professor Shaun P. Collin
OI Director 2015

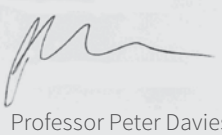
As the 2016 Interim Director of the UWA Oceans Institute, I would like to warmly thank Professor Shaun Collin for his commitment and passion as Oceans Institute Director throughout 2015.

Heading the UWA Neuroecology Group, his team's research into Shark Deterrents is paving the way towards a better understanding and appreciation of these ocean creatures, that will, in turn, keep both us and them safe in the water.

As Director of the Oceans Institute, Professor Collin initiated and oversaw numerous beneficial collaborations with overseas universities as well as key industry partners, ensuring marine research at UWA extends as far as possible.

I am pleased that as Deputy Director, Professor Collin will continue to serve as a key member of the Oceans Institute team throughout 2016.

My sincere thanks also goes to Dr Scott Draper, who throughout 2015 took on the role of Deputy Director for the Oceans Institute. As COFS stream leader (Offshore Engineering Science), Dr Draper brought a welcome link to the marine engineering research that is so needed when solving our current marine challenges.



Professor Peter Davies
Interim Director, Oceans Institute
Pro Vice-Chancellor (Research)

2015 A Snapshot

18 new Oceans Institute academic members.

The Coastal Carbon Cluster wrapped-up, research outputs were published in top scientific journals, and received broad attention by media across the nation.

PhD students networked and were addressed by a panel of influential industry partners at the OI PhD Symposium.

Supported the national science and innovation agenda through extensive contribution to the Integrated Marine Observing System, the National Marine Science Plan and the DFAT Innovation Exchange program.

During the 12-day Perth Canyon cruise, 13 blogs were posted, 11 dives were live streamed and watched by people in 10 countries globally, 32 news stories were generated, which included 6 television news items, 21 web and print news stories, and 7 radio interviews were given.

Members were acknowledged for their research excellence: Professor David White was elected as a Fellow of the Royal Academy of Engineers; Professor Mark Cassidy was awarded Scientist of the Year at the WA Premier's Science Awards.

UWA Oceans Institute members were awarded $9 million in funding to form an ARC Industrial Transformational Research Hub, linking industry and researchers for 5 years.

Saw the completion of the Indian Ocean Marine Research Centre at Watermans Bay; as well as the turning of the first sod for the new Ningaloo Centre in Exmouth.

Organised 20 workshops and symposia focussed on forming closer links between academia and industry and explore funding opportunities for our membership.

Strengthened links with Indian Ocean partners and international collaborators, particularly with Zhejiang University, where multiple visits were made to China and a workshop delivered at UWA.

Oceans Institute members were part of an outreach documentary focused on seagrass restoration and carbon sequestration involving students at South Fremantle Senior High School.

Oceans Institute members published more than 356 research articles and generated over $13 million in funding from government, industry and national and international sources.

Enhanced community relations and awareness of the Oceans Institute.

6
Public lectures

30
Media releases

55,231
Website hits

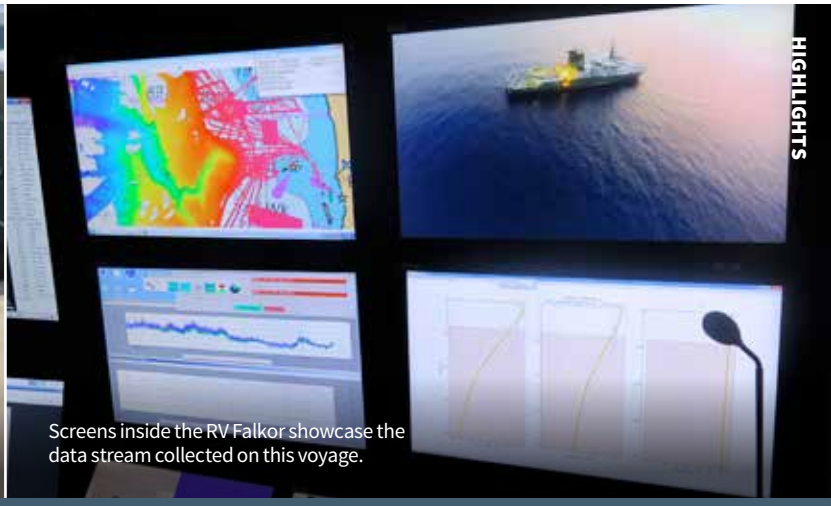
© Joan Costa

"The Blueprint for Marine Science 2050 is a well-developed starting point to drive collaboration. The UWA Oceans Institute has been instrumental in the consultation process and will be invaluable in the Blueprint's future implementation."

PATRICK SEARES,
CEO WEST AUSTRALIAN
MARINE SCIENCE INSTITUTION

Highlights

Professor Malcolm McCulloch speaks to media before the Perth Canyon expedition on the RV Falkor.


Screens inside the RV Falkor showcase the data stream collected on this voyage.

Perth Canyon research expedition uncovers secrets of the deep

In early March 2015, researchers from the UWA Oceans Institute (OI) completed a successful two-week mission unlocking the secrets of Perth Canyon, a deep ocean gorge the size of the USA's Grand Canyon that had previously remained poorly known and largely unexplored.

OI member and ARC Laureate Fellow, Professor Malcolm McCulloch led a team of researchers from the OI, CSIRO, WA Museum and the Institute of Marine Sciences in Italy on the research expedition to discover what lies in an area where few others had gone before.

The team surveyed life in the canyon and conducted baseline studies of deep corals to help determine the likely future impacts of a warming sea and ocean acidification. They discovered unusual deep-sea communities as well as an autonomous ocean glider that was lost for two years.

Perth Canyon cuts deeply into Australia's continental slope, beginning about 60 kilometers west of the city of Perth. Roughly 15 kilometers wide, its depths range from 200 to 4,500 meters and have been mapped in high resolution for the first time. This revealed jaw-dropping features such as steep cliffs, a gigantic amphitheater and evidence of an ancient waterfall 12 times higher than the world-famous Niagara Falls.

Researchers already suspected that the canyon is a productive area from the large congregations of pygmy whales, blue whales, and sharks that migrate there seasonally to feed.

Using advanced ROV technology, the team was able to film the amazing diversity of life in the Perth Canyon and to collect newly discovered species as well as deep-sea corals. The skeletons of these slow-growing, long-lived corals will be analysed geochemically to reconstruct climate and environmental conditions over the past decades or even centuries and to understand how calcifying marine organisms may be able to cope with climate change.

The OI worked with the Schmidt Ocean Institute (owners of the Research Vessel Falkor) based in Hawaii, and outreach officers on board the ship, Verena Schoepf and Claire Ross, implemented an outreach program that connected audiences worldwide.

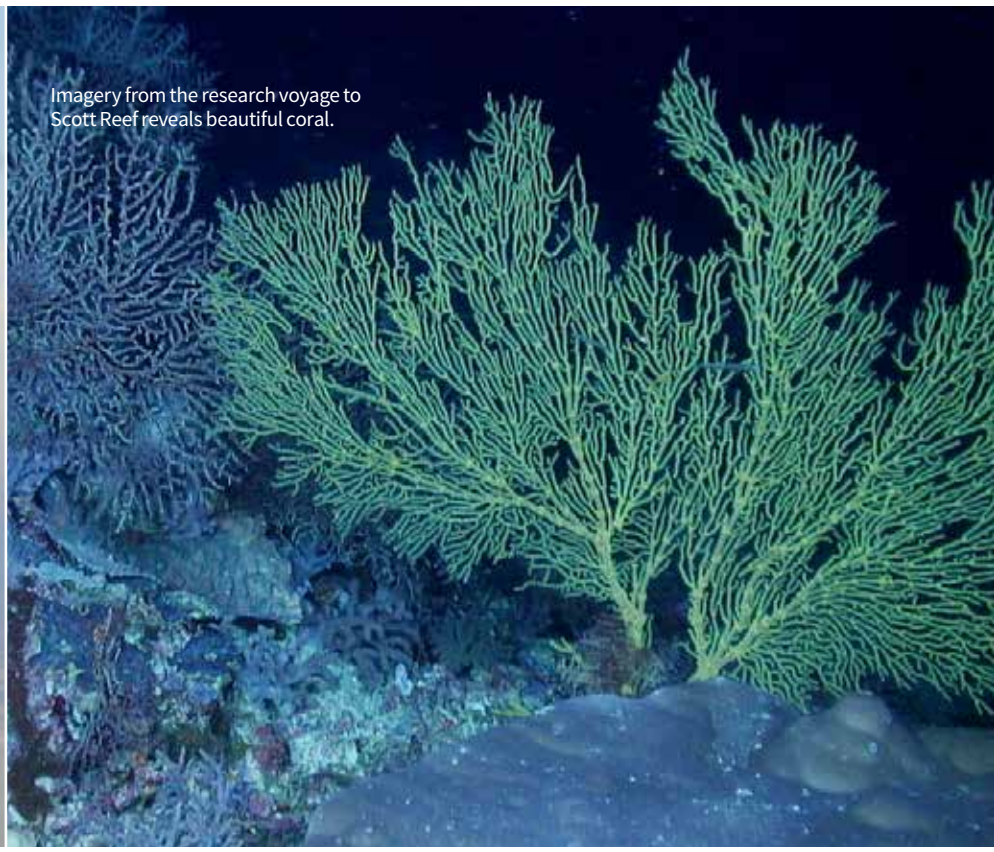
During the 12 day cruise, 13 blogs were posted, 11 dives were live streamed and watched by people in over 10 countries, and 32 news stories were generated, which included 6 television news items, 21 web and print news stories, and 7 radio interviews.

A range of community events were organised, including outreach to a local high school and livestream to Albany. The host organisation's website received unprecedented social media outreach.

The research team also established key reference sites in the canyon that they can return to in the coming years to track changing conditions and help improve our understanding of the likely threats to other deep ecosystems in the region.

Professor McCulloch said "By using a modern ship, with modern ROVs we could make fundamental discoveries. There are new parts of our environment we really haven't investigated. The deep ocean is the least explored area in our solar system. This is the first time this modern technology has been applied to research in this region."

The RV Falkor en route to Scott Reef.


Imagery from the research voyage to Scott Reef reveals beautiful coral.

Scott Reef research trip brings a host of new data to light

UWA Oceans Institute (OI) researchers, led by Chief Scientist Professor Greg Ivey and Cruise co-leaders Professor Ryan Lowe from OI and Dr Andrew Heyward from AIMS, embarked on a month long expedition to Scott Reef and nearby submerged oceanic shoals offshore from the Kimberley coast in April on board the US-based Schmidt Ocean Institute's research vessel *Falkor*.

The team explored the relationships between the regional ocean circulation, habitat patterns and benthic biodiversity that shape the reef communities and determine their ability to respond to natural and anthropogenic disturbances.

This research brought together staff and students from The University of Western Australia, The Australian Institute of Marine Science (AIMS), Stanford University and Griffith University.

Professor Ivey, said "This collaborative work produced results, which will help to underpin management of this region through improved understanding of the key biophysical processes."

Dr Andrew Heyward, chief AIMS scientist on board *Falkor*, had made observations of some of the deep water coral areas in previous years. These sites were revisited along with numerous new sites, and examined with the advanced mapping and imaging equipment the *Falkor* was able to bring to the project.

The team used fixed moorings and a full suite of oceanographic sensors to map the ocean circulation, ocean mixing and seabed environment in fine detail. The team also measured the structure and productivity of the overlying water column to see how this information linked to patterns of habitats observed on the seabed in the lagoonal systems at Scott Reef.

The seafloor and bottom coral communities were mapped using the *Falkor*'s Remotely Operated Vehicle (ROV), that allowed them to send real time high definition video to the Falkor's Science Control Room. Using a live video feed, the ROV carried multiple cameras recording both forward and downward views, with the location of every image meticulously recorded. This allowed the team to create detailed maps of the major habitats, like those dominated by deeper water corals, and understand the linkage to the local ocean circulation and turbulent mixing.

The cruise coincided with coral spawning, where different species of corals in the shallow and deep areas of the reefs released their eggs into the ocean after sunset. While scientists know little about the reproduction of deeper water corals, the team was in an excellent position to film the event for the first time ever.

Value of Australia's Great Southern Reef pinpointed

In 2015, UWA Oceans Institute (OI) researchers recognised that Australia has a connected 'Great Southern Reef' and it is contributing more than $10 billion to the Australian economy each year.

Marine biologists Dr Scott Bennett and Associate Professor Thomas Wernberg, from the OI and the UWA School of Plant Biology, said while everyone had heard of the Great Barrier Reef, its lesser known southern counterpart was equally unique, beautiful and a biological powerhouse.

The Great Southern Reef (GSR) covers 71,000 km^2 and straddles five states across the southern coastline of the Australian continent, running from Brisbane to Perth. Its kelp forests, containing unique and diverse marine life, are globally recognised.

"Australia's southern coastline is fringed by rocky reefs dominated by kelp forests, which are highly productive and structurally complex communities of large brown seaweeds," Associate Professor Wernberg said.

"These rocky reefs are connected by oceanographic, ecological and evolutionary processes and their kelp forests are the biological engine of the southern reef, producing as much as 65 tonnes of biomass per hectare per year, more than 16 times the yield from Australia's most fertile wheat fields".

The nutrient-rich reef is a global biodiversity hotspot for seaweeds, sponges, crustaceans, chordates, bryozoans, echinoderms and molluscs, where as much as 30 to 80 per cent of the species cannot be found elsewhere.

The research found that in regional coastal communities along the Great Southern Reef, total tourism expenditure including significant reef-related tourism such as fishing, scuba diving, surfing and whale watching, is estimated at around $9.8 billion per year.

In areas such as Victoria's Phillip Island, the Tasmanian west coast and South Australia's Kangaroo Island, the GSR contributes 15 per cent to the total local economy.

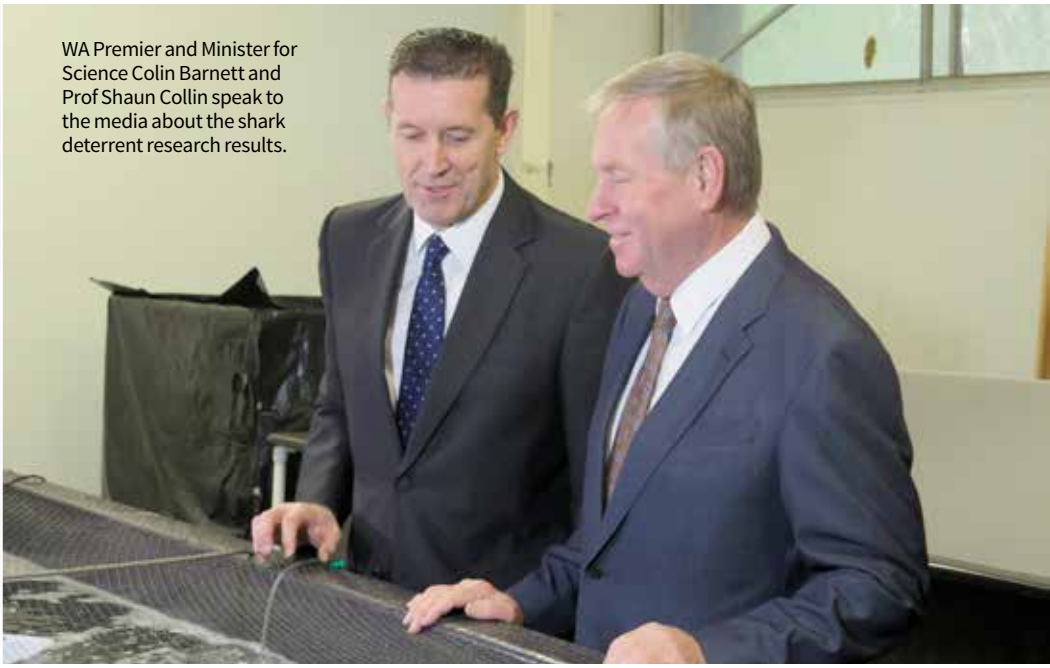
In terms of its health and longevity, Associate Professor Wernberg said most parts of this significant natural resource is still relatively healthy but warned it was under growing pressure from climate change, population growth and urban development, with some areas also heavily degraded.

This research was carried out by a UWA-led team of scientists across southern Australia and was published in CSIRO's international journal *Marine and Freshwater Research* and *The Conversation*.

Field work on the Great Southern Reef sees Dr Mads Thomsen (UWA and University of Canterbury) surrounded by silver drummers and seaweeds.

Shark deterrent research provides valuable results

Mock-seal floats were created to accurately test the efficacy of shark deterrent systems.



WA Premier and Minister for Science Colin Barnett and Prof Shaun Collin speak to the media about the shark deterrent research results.

The UWA Oceans Institute continues to be at the forefront of seminal shark deterrent research, as three years of WA State Government-funded research delivered results.

The research team led by OI's Director, Professor Shaun Collin included Associate Professor Nathan Hart and OI member Dr Ryan Kempster, from the Neuroecology Group within the School of Animal Biology. They set out to test the effectiveness of a range of novel deterrents based on their long standing research on the sensory systems of sharks and the environmental cues that drive their behaviour. They were also funded to test the effectiveness of existing deterrents currently on the market.

News of research results was met with much media and public attention. "This research will allow for future development of an effective non-lethal and non-invasive shark deterrent that will, in turn, help to reduce negative interactions with sharks and increase public confidence when entering the ocean," said Professor Collin.

The novel deterrents tested included strobe lights, sounds and bubble barriers, with varying degrees of success. Two commercial deterrents were also trialed (the Shark Shield™ and an electric anklet device), which revealed clear differences in their effectiveness. The team discovered the following key findings:

- Bright flashing (strobe) lights can be effective as shark deterrents and do deter sharks from biting. However, the effectiveness of strobe lights appears to be restricted to strongly nocturnal and/or benthic bottom-dwelling shark species.

- Loud underwater sounds (both artificial sounds and natural orca calls) were not effective at deterring small sharks in the laboratory and had only a limited deterrent effect on larger sharks in the wild.

- Some bubble curtain arrays were effective in deterring sharks, but only for a very short time, after which sharks became used to the bubbles and did not hesitate to cross the bubble barrier. However, it was found that altering the presentation of the bubbles resulted in improved effectiveness in deterring sharks, but further investigation is needed.

- The Shark Shield™, an electrical device, which can be attached to an ankle, surfboard or kayak, had a significant effect in deterring a range of shark species, including tiger sharks and white sharks, although further testing is still required to be statistically confident in the species-specific effects.

The results on the effectiveness of the Shark Shield to deter great white sharks is now published in PLOS ONE.

Blue shark © Marco Fraschetti.

An example of automatic shark detection from aerial imaging.

© Channing Egeberg

Dr Ryan Kempster holding Port Jackson Shark.

Dr Ryan Kempster Photographing White Shark.

© Channing Egeberg

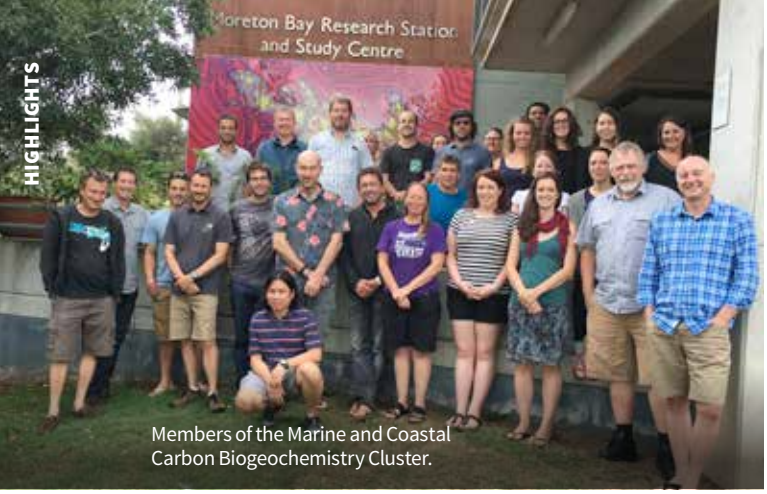
In April, a team, led by OI member Dr Ryan Kempster asked for the public's help to identify and record shark sightings from around the world, using their new Citizen Science project, SharkBase (www.shark-base.org).

SharkBase is a new global shark encounter database established to assist in the process of mapping the distribution of sharks worldwide through the help of Citizen Scientists. Without even encountering a shark in the wild, it is still possible to contribute to SharkBase by submitting sightings seen in the news or on the internet.

Dr Kempster said researchers spend countless hours and dollars trying to find and study sharks, but with advances in modern technology almost everyone now has access to a camera phone that they can use to record wildlife encounters.

OI member Professor Mohammed Bennamoun's team from UWA's School of Computer Science and Software Engineering developed advanced computer algorithms that allow for the automatic detection, identification and tracking of sharks from aerial videos.

The system is powerful enough to distinguish sharks from other marine objects such as swimmers, boats and dolphins. The system also allows shark detection and tracking under challenging imaging conditions such as low light, strong sun reflections, poor contrast and fog.



Members of the Marine and Coastal Carbon Biogeochemistry Cluster.

Carbon Cluster research comes to a close

Over the past three years, the UWA Oceans Institute (OI) has been involved in CSIRO's Marine and Coastal Carbon Biogeochemistry Cluster, a collaboration between CSIRO and eight Australian universities and research organisations.

The Cluster brought together a large national team of experts to provide vital scientific knowledge, in support of our low-carbon economy, by quantifying the relevance of coastal vegetated ecosystems – mangrove forests, seagrass meadows and tidal salt marshes – as carbon dioxide pollution filters and sinks.

OI members Dr Oscar Serrano, Professor Carlos Duarte, Dr Ylva Olsen, Dr Lara Garcia and Professor Gary Kendrick conducted studies that addressed the value of carbon storage in Australian coastal vegetated ecosystems, and provided a risk assessment of carbon dioxide emissions after disturbance.

As the project came to a close in 2015, research outputs were published in top scientific journals, and received broad attention by the media, including the ABC, Channel 9 and a range of newspapers across the nation.

The findings that have emerged from the Cluster research are contributing greatly to the broader understanding of carbon flow in Australian coastal ecosystems, while providing data for improved models to evaluate carbon fluxes in the marine environment.

Dr Serrano said these achievements would not have been possible without the expertise and collaborative approach of all Cluster members.

"Knowledge advancement and innovation for sustainability requires collaboration. This Cluster has exemplified such collaboration, strengthening research networks between UWA and national and international institutions. The increased knowledge of carbon flow in Australian coastal ecosystems will go on to inform the Department of the Environment's future sustainable planning, policy development and coastal resource management," he said.


Oceans Institute students listen in at the Postgraduate Student Conference.

Industry, Government and academia come together to inform the next generation

In October, a panel of distinguished experts from research, government, industry and academia gave a thought provoking address about the grand challenges facing our marine scientists over the next decade to the Ocean Institute's postgraduate students.

Dr Rick Fletcher, Executive Director of Research from the WA Department of Fisheries, spoke of the recently launched National Marine Science Plan that draws together the knowledge and experience of more than 23 marine research organisations, including the OI.

He observed that food security and resource allocation were particularly challenging areas in marine science, noting successful fisheries management policy involves both science and social engagement.

Panel member Mr Jock Clough, Chairman of Australia's largest abalone fishery and a long-term investor in abalone aquaculture, encouraged young scientists to be brave; to reach out to the commercial sector to understand their needs, and to turn industrial problems into exciting new research ideas.

The Western Australian Marine Science Institution's (WAMSI) CEO Mr Patrick Seares, drew parallels between the National Marine Science plan and WAMSI's Blueprint for Marine Science 2050, which focuses research priorities for industry and government to manage WA's marine estate. He emphasized the importance of bringing people from different backgrounds together to identify opportunities and needs in marine science and to turn ideas into action.

The National Offshore Petroleum Safety and Environmental Management Authority's (NOPSEMA) Environment Manager, Dr Christine Lamont, brought an industry perspective to the discussion. She stressed that NOPSEMA relies on scientific evidence underpinned by excellent research for its evidence-based decision making.

Closing the discussion, Emeritus Professor Alistar Robertson and former Pro Vice Chancellor for Research at UWA told the postgraduate audience that the opportunities in marine science are vast.

Supporting the national agenda

In August 2015, the federal government launched its National Marine Science Plan. The agenda identified that innovation and science are critical for Australia to deliver new sources of growth, maintain high-wage jobs and seize the next wave of economic prosperity; it focussed primarily on increasing collaboration and scientific knowledge, talent and skills.

The Oceans Institute supported this national agenda throughout 2015 in the following ways:

Infrastructure: The Oceans Institute was at the forefront of collaborations that saw specialised marine infrastructure rise-up in 2015: The 5-storey Indian Ocean Marine Research Centre at UWA's Crawley Campus; the redeveloped Indian Ocean Marine Research Centre at Watermans Bay; and the Ningaloo Centre in Exmouth all began to take shape in 2015.

Collaborations: In 2015, The Oceans Institute fostered numerous beneficial collaborations both nationally and internationally. These collaborations saw a focus on industry partnerships. The Oceans Institute contributed to the National Marine Science Plan, as well as the Blueprint for Marine Science 2050 in WA.

As part of the Ningaloo Alliance, the Oceans Institute drove the consultation process for the development of the new Ningaloo Centre and its research capability. As a major partner within the Indian Ocean Marine Research Centre collaboration, the Oceans Institute continued to focus on research and development solutions for the complex issues facing the sustainable management of marine habitats and resources in the coastal and offshore regions of northwest Australia.

Research: The Oceans Institute fostered the research and development of 116 PhD students throughout 2015, and our members produced 356 published research articles that added to the repository of marine science knowledge. Research conducted also focused on providing solutions to challenges faced in industry, society and the sustainable use of our marine resources.

Innovation: The Oceans Institute worked with the Department of Foreign Affairs and Trade to explore Innovation for the Blue Economy as part of their InnovationXchange Program.

A workshop in August 2015, focused on the Indian Ocean, which brought together a group of diverse Blue Economy experts from around Australia. The workshop aimed to uncover highly innovative, market-ready solutions that promote development across the Blue Economy (economic revenue opportunities for developing countries – particularly small island states – using ocean assets) and culminated in a series of recommendations for InnovationXchange to adopt as investment and policy priorities.

"The Blue Economy is of particular importance to the UWA Oceans Institute and deserves widespread focus," Professor Shaun Collin said. "We will continue to work with DFAT to deliver Ocean Solutions research that align with the values of the Australian economy."

Outreach: The Oceans Institute is committed to sharing research knowledge, connecting with citizen scientists and the next generation of researchers. In 2015, member events connected the research community and PhD students with local and national industries to further the need for ocean solutions research that provides answers to environmental, and economic challenges.

A number of social media and online initiatives connected researchers and interested citizen scientists to the field research being undertaken, the most notable of these being the deep-sea expedition to explore the Perth Canyon.

Outreach to local schools provided a way to encourage the next generation of scientists to engage with current research and set their own path towards innovative future research initiatives.

Professor Shaun Collin and Ms. Stephanie Kimber at the DFAT Innovation Exchange.

WA Premier's Science Awards finalists: Professor Shaun Collin; Professor Mark Cassidy; and Dr Kar-Chaun, who was representing Professor Richard Oliver, stand with the Honourable Donna Faragher MLC, representing the WA Premier, and Professor Peter Klinken, Chief Scientist of WA .

An award-winning year in science research

In 2015, we saw the UWA Oceans Institute's (OI) excellence in marine science research highly recognised, particularly at the Western Australian Premier's Science Awards in August, where a number of OI members won prestigious awards.

The top honour of 2015 Scientist of the Year was taken out by ARC Laureate Fellow, Professor Mark Cassidy, a highly distinguished civil engineer from UWA, Director of the Centre for Offshore Foundation Systems, and OI member, whose advice has been incorporated into the design of platform and pipeline infrastructure currently being constructed off the coast of WA.

WA Premier and Minister for Science Colin Barnett said Professor Cassidy's work was contributing to the State's capabilities in the safe and economic construction of oil and gas platforms in the oceans.

"Professor Cassidy's research has identified solutions to unlock the vast reserves of stranded gas in our remote and deep oceans. It is the application of this science that will allow the State to harness opportunities and become a world leader in operating and maintaining this technology," Mr Barnett said.

OI Director and Professor in the School of Animal Biology, Shaun P Collin, was a finalist for the Scientist of the Year title. Meanwhile Senior Lecturer, School of Civil, Environmental and Mining Engineering and the Centre for Offshore Foundation Systems, and OI Deputy Director, Dr Scott Draper was a finalist for the Woodside Early Career Scientists of the Year.

Professor David White

A royal contribution to engineering research

Described by the Royal Academy of Engineering as the 'world's most eminent expert on geotechnical design of subsea pipelines', UWA Oceans Institute member and Centre for Offshore Foundation Systems Shell EMI Chair Professor David White, was elected to a Fellowship of the UK's prestigious Academy representing leaders of the engineering profession.

Election to the Academy was by invitation only, with fifty new Fellows elected in September 2015, through a peer review process made by existing Fellows.

"The Award recognises the work of a large UWA research team, as well as important contributions from colleagues and PhD alumni working in industry, who bring the research to life in everyday design practice, realising the true benefits of what we do," he said.

Professor White's dedication to innovative engineering has also led to spin-off outcomes including novel research techniques such as advanced image analysis tools for deformation measurement and geotechnical centrifuge modelling concepts.

Particle Image Velocimetry (PIV) analysis software developed by Professor White and Dr Sam Stanier of UWA, in collaboration with Dr Andy Take (Queens University, Canada), is used at more than 150 research institutes worldwide and has had a significant impact on geotechnical centrifuge modelling practice.

Engineering Foundations for the Future

Professor Susan Gourvenec, Centre for Offshore Foundation Systems, ARC Research Hub for Offshore Floating Facilities

In 2015, $5 million was awarded to the UWA led ARC Research Hub for Offshore Floating Facilities, in order to research critical engineering challenges for offshore oil and gas projects in remote deep water locations by creating improved designs and operating procedures. The project aims to lead to safer and more economic projects and grow WA as an oil and gas centre of excellence. Matched funding was also be provided by industry partners, Shell, Woodside, Bureau Veritas and Lloyds Register.

As part of this group, Oceans Institute member, Professor Susan Gourvenec's research focusses on developing seabed engineering solutions for offshore geotechnical infrastructure, responding to industry's needs to push the geographical and technical frontiers of offshore development. The goal is to develop technologies to enable energy to be harnessed from the ocean that is currently not economically or technically feasible. Her research leads to efficiencies in the design of offshore facilities, through smaller and lighter foundations that are easier and cheaper to install for developments of the future.

Research outcomes over the last year have assisted engineers in predicting the capacity of offshore foundations under multi-directional loading; shown that capacity of subsea foundations can increase over the life of a field due to the combined effects of remoulding and reconsolidation of the seabed; and challenged the traditional paradigm that foundations should remain stationary during operation through the concept of tolerably mobile subsea foundations.

Looking to the future, end of life engineering is increasingly important with much existing offshore infrastructure across south-east Asia, Australasia and the North Sea ageing and due for decommissioning in the next decade.

"Working with Oceans Institute colleagues at the Centre for Offshore Foundation Systems, marine science and law, we are developing a multi-disciplinary research agenda to address decommissioning through either removal and disposal or *in situ* decommissioning – engineering solutions for the afterlife of offshore and subsea structures. Our immediate focus is decommissioning for Australia so the seabed engineering work includes a focus on carbonate sediments, which is an issue for other frontier regions including East Africa and the South China Sea," Professor Gourvenec said.

"UWA's Oceans Institute is recognised nationally and internationally for the role it plays in Australia's marine science and engineering, providing outstanding contributions in oceanography, geotechnical engineering, marine environment conservation, and understanding our marine megafauna. Our contributions to Australia's marine data, through the leadership of the nation's glider and radar capabilities, is essential to our national infrastructure capabilities, while our positioning on the edge of the Indian Ocean provides Australia with an internationally strategic scientific base for one of the world's least explored areas.

Strong industry engagement with the Oceans Institute demonstrates the value of fundamental science applied to problems of social and commercial interest, enhancing UWA's reputation as a leader in oceans science and engineering."

ROBYN OWENS,
UWA DEPUTY VICE-CHANCELLOR (RESEARCH)

New Research Themes

Delivering ocean solutions for humanity's grand challenges

The ocean is a vital source of key resources. The capacity to deliver these resources in a safe and sustainable manner will determine our success in providing healthy lives to the 9 billion people that will populate the planet by the year 2050.

The research profile of the Oceans Institute brings together UWA's multidisciplinary research strengths in areas such as oceanography, ecology, engineering, resource management and governance to deliver ocean solutions research that addresses key ocean challenges.

Our proven excellence in marine research and technology provides an integrated approach to the challenges of sustainable ocean resources, resilient ecosystems, informed marine governance and ocean exploration Our output is impact-based and provides a clear and measurable focus for targeted, collaborative marine research.

We are committed to engaging and working together with State and Federal government bodies, a range of industries, businesses and research institutions, and the community at local, national and international levels.

We have four major research areas:

1. Safeguarding our Resources

We are researching solutions for governments, industries, non-government organisations and the community to make decisions that protect and sustain the ocean's resources for current and future generations, with a strong focus on offshore energy.

Our researchers are exploring the safeguarding of our ocean resources across the following areas:

- Engineering offshore energy
- Stabilising oil and gas platforms
- Extreme events and hazard mitigation
- Oceanographic forecasting

2. Building Resilience

We work to boost resilience by building knowledge and taking a long-term approach to understanding the risks facing our oceans and their ability to recover. We are investigating how our oceans will respond to the threats of ocean warming and acidification, overfishing, sea level rise and climate-related impacts to protect marine biodiversity.

Our researchers are exploring resilience across the following areas:

- Fisheries and food security
- Conservation of marine habitats
- Understanding our dynamic coasts
- Impacts of climate variability
- Ecosystem health and biosecurity

3. Influencing Governance and Policy

We are concerned with understanding the way key sectors use our oceans' resources to provide decision makers such as government and non-government organisations, regulators and users with tools for managing and protecting our oceans. Our research considers current approaches and issues in marine management and conservation in areas such as marine planning, economics, governance, sovereignty and law to provide targeted, informed responses to management issues.

Our researchers are supporting marine governance and influencing policy by undertaking research across the following areas:

- Regulation and safety
- Securing our coastline
- Marine environmental governance

© Joan Costa

- Marine policy and economics
- Spatial planning

4. Exploration and Discovery

We are uncovering the oceans' secrets and learning about the enormous biodiversity of our oceans from the shallows to the deep-sea floor. As the blue economy moves ever further offshore, scientific investigation must go hand in hand, although the challenges of ocean exploration can be formidable. We are developing new and innovative technologies to investigate the furthest reaches of our deepest oceans to understand, wisely utilize and protect our resources.

Our researchers are undertaking exploration and discovery across the following areas:

- Conserving biodiversity
- Understanding iconic species
- Exploring new frontiers
- Developing new technologies

"The Department of Fisheries values the collaboration of scientists from Oceans Institute in meeting the important challenges of facing marine research in Western Australia.

The marine heat wave in the summer of 2010/11 and the long-term increases in water temperatures have had some major effects on the marine ecosystem and have highlighted the need for marine scientists to collaborate to assess these changes and identify adaptation options to deal with them."

DR NICK CAPUTI,
SCIENTIST, WA DEPARTMENT OF FISHERIES
CHAIR, IOMRC RESEARCH COMMITTEE

Collaboration

Furthering international relations

Following the signing of an MOU in 2013, the collaborative partnership between UWA's Oceans Institute (OI) and Zhejiang University's Ocean College (ZJU) grew substantially throughout 2015.

Setting the standard for the level of activity was the 3rd annual workshop between the two Universities, this year hosted by the OI. The workshop explored opportunities for joint projects between our two institutions, engaging many of our Oceans Institute members across the campus. The delegation was also able to enjoy a tour of the Indian Ocean Marine Research Centre facilities under construction (at Waterman's Bay and on the Crawley campus) as well as experience an Australian barbecue with a view of the Swan River.

Assoc Prof Thomas Wernberg and Dr Thibaut de Bettignies from the OI visited Prof Jaiping Wu and Dr Xiao Xi at ZJU in May to participate in a workshop on seaweed farms and bioremediation as part of a research grant funded by the Ministry of Science and Technology. During the visit, they also undertook seaweed related fieldwork around Dongtou Island.

Later, in December, several OI members co-authored a study led by Dr Xiao from ZJU on the sensitivity of seaweeds to warming and UV light. The study was published in the international journal PLOS ONE and was an outcome of Dr Xiao's ten-month visit to Assoc. Prof. Wernberg's group at UWA the previous year.

OI members Drs Yinghui Tian, John Morton and Conleth O'Loughlin visited ZJU's Ocean College in September to view their geotechnical centrifuge facilities and the ZJU floating test-bed facility, Huajiachi, with a view towards collaboration on offshore field experiments using the Huajiachi in Chinese waters in 2016.

Drs Tian and O'Loughlin also presented seminars on developments in offshore anchoring systems in September to ZJU Ocean College faculty and students.

In October, OI members Professor Ryan Lowe, Dr Jeff Hansen and Dr Mark Buckley attended the second Workshop on Sediment Dynamics of Muddy Coasts and Estuaries sponsored by ZJU's Ocean College, where Professor Lowe was invited to give a keynote address. The workshop was attended by over 80 leading coastal and estuary researchers from across China and focused on the challenges and opportunities for future research in China's coastal and estuarine waters.

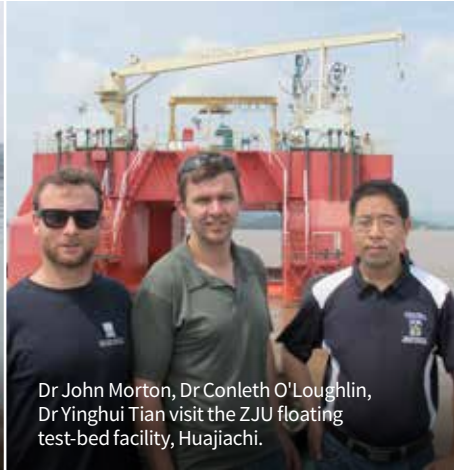
Professor Lowe was invited to be a Guest Editor for a Special Issue in the journal Estuarine, Coastal and Shelf Research to be published in 2016, which will synthesize collective research outputs from the workshop.

"The workshop was a tremendous opportunity to learn about the impressive scale of coastal research activities throughout China and presented many opportunities for UWA to collaborate," Professor Lowe said.

Following the workshop, visiting OI members spent a week at Ocean College's new Zhoushan Island campus and toured its new, state-of-the-art research facilities. A focus of the visit was to develop new joint research projects within its world-class facilities, including its large-scale experimental wave flumes and basins.

New PhD students based at both ZJU and UWA have since been recruited to work on research projects across the two institutions in coming years.

Collaborative research in China, as the field team prepares for departure to sample seaweeds during a visit to Zhejiang University. From right to left: Dr Xiao Xi, Professor Jain Ping Wu, Dr Thibaut de Bettignies, Dr Thomas Wernberg and local students.



Dr John Morton, Dr Conleth O'Loughlin, Dr Yinghui Tian visit the ZJU floating test-bed facility, Huajiachi.

Boosting WA's marine research infrastructure

The newly refurbished Indian Ocean Marine Research Centre at Watermans Bay.

This year saw tremendous growth in marine research infrastructure along the WA coastline. Together with our collaborative research partners and industry links, UWA's Oceans Institute played a major role in advancing a number of large-scale projects.

Very close to home, situated on UWA's main campus, the Indian Ocean Marine Research Centre in Crawley rose up five stories during 2015. This purpose-built Centre, due for completion in late 2016, will boost marine science capacity in Australia and the southern hemisphere.

The building is a tangible sign of the close collaboration between Australia's leading Indian Ocean marine research organisations: the Australian Institute of Marine Science (AIMS), CSIRO, Department of Fisheries WA, and UWA's Oceans Institute.

With the vision to improve our knowledge of the Indian Ocean marine environment and its sustainable management, the Indian Ocean Marine Research Centre will be a leading marine science partnership in the Southern Hemisphere and will constitute the largest marine research capability in the Indian Ocean rim.

The Centre will bring together more than 300 researchers working across a broad range of fields from oceanography to marine ecology, to fisheries, geochemistry, governance, marine technologies and engineering. It will include offices and workstations for researchers, technicians and post-graduate students, flexible wet and dry laboratories with PC2 capability, flexible collaborative spaces, and a ground level multi-purpose lecture theatre linked to a large interaction space with an external courtyard.

A unique inclusion on the Crawley site will be the Centre for Offshore Foundation Systems. The Centre will install a new centrifuge and operate the National Geotechnical Centrifuge Facility.

Along the coast of Western Australia, the Indian Ocean Marine Research Centre partnership also fostered the refurbishment of the Watermans Bay Marine Centre, now known as the Indian Ocean Marine Research Centre, Watermans Bay. This detailed upgrade was completed in 2015 and has revitalised the Indian Ocean's first seawater facility for marine research. Significant refurbishment included upgrades to the internal laboratories, offices and marine aquarium facilities with direct access to high quality sea water.

A key feature of this facility is the new Waterman's Bay Nearshore

Inside the newly-constructed Indian Ocean Marine Research Centre at UWA Crawley Campus.

Outside the newly-constructed Indian Ocean Marine Research Centre at UWA Crawley Campus.

Regional Development Minister Terry Redman turned the first sod to mark the start of construction works on the Ningaloo Centre.

Observatory, which, in addition to providing data relevant to individual scientists, will supply information needed to make decisions relating to marine safety, coastal zone management, and marine resource management, as well as providing data to the public for recreational and educational purposes. A key element of the observatory is that all data (in real-time and archived) will be made available free online.

Phase 1 of this project was to equip the Centre's roof with a weather station and seaward-directed video camera to provide continuous images of sea state and hourly georeferenced shorelines of the adjacent beach. These observations will be coupled with wave, water level and temperature measurements collected by a submerged sensor about 150 metres off the beach connected by a cable running into the building. This phase was completed in 2015.

Phase 2, is subject to funding, and will include the installation of an eight kilometre fibre optic and power cable that will extend out from the facility to a depth of 25 metres that will support more than 100 underwater instruments in addition to a directional wave buoy that will provide real time observations of sea state.

As a collaborative member of the Ningaloo Alliance, the Oceans Institute is also leading efforts to develop a marine research facility within the Ningaloo Centre - a multi-use community, training and research facility in Exmouth, WA.

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 major stakeholder, the Oceans Institute is specifically coordinating the final designs for educational outreach, the aquarium facilities and the wet and dry research laboratories in the Centre.

In December 2015, Regional Development Minister Terry Redman turned the first sod to mark the start of construction works on the Ningaloo Centre, which is due for completion in early 2017.

Regional Collaboration

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.

1. Zhejiang

This year saw many Oceans Institute members visiting and connecting with colleagues at Zhejiang University. Workshops and lectures were delivered and members also visited the Huajiachi research vessel, the spectacular semi-submersible platform belonging to Zhejiang University. The research vessel visit paved the way for joint novel offshore field testing.

2. Seychelles

In August 2015, the Blue Economy Research Institute of the University of Seychelles signed an MOU with the Oceans Institute designed to focus on developing academic and cultural interchange in teaching, research, training and other activities.

The two universities have cooperated in a number of shared areas of interest, including enhancing research and training capability on the oceans and blue economy, providing policy and managerial support to achieve common marine conservation objectives, providing expertise and technical support in marine environmental monitoring and exploring collaborative opportunities in ocean engineering, ocean forecasting, aquaculture and coral reef health.

3. Mauritius

The UWA Oceans Institute continues to support the recently signed MOU with the University of Mauritius. In 2015, these activities were focused on supporting the development of courses, to link training and industry, in Integrated Coastal Zone Management.

4. Indonesia

OI Director Professor Shaun Collin joined a UWA delegation to Indonesia for an Alumni panel discussion and to visit key Ministries and agencies in Jakarta. The delegation discussed further collaboration and exchange with the Ministry of Marine Affairs and Fisheries, the Indonesian Institute of Sciences, the Ministry of National Development Planning (BAPPENAS) and the Indonesian Endowment Fund for Education.

5. Indian Ocean Region

In 2015, the Oceans Institute at UWA joined the newly formed Global Ocean Observing System (GOOS) Biology and Ecosystems Panel. The Panel has proposed nine biological and Ecological Essential Ocean Variables (EOVs) for implementation in a sustained, global observing system. These EOVs address societal needs, as identified on international agreements and conventions, and scientific feasibility.

The Oceans Institute hosts two of the National facilities as part of the Australian Integrated Marine Observing System (IMOS). Concentrating on observations of the coastal ocean, the Ocean Glider and HF Radar facilities known as the Australian National Facility for Ocean Gliders (ANFOG) and the Australian Coastal Ocean Radar Network (ACORN) deploy marine infrastructure across Australia. ANFOG have completed more than 200 successful ocean glider missions across Australia to-date.

WA Premier and Minister for Science Colin Barnett at the launch of the Blueprint initiative.

A blueprint for the future

In April 2015, the Premier and Science Minister Colin Barnett launched the Blueprint for Marine Science 2050 – providing the strategic direction to focus on research programs that will result in real improvements to the development and management of WA's marine industries and environment.

The Blueprint was commissioned by the Western Australian Marine Science Institution (WAMSI) and developed by an independent steering group led by OI's Emeritus Professor Alistar Robertson.

More than 170 stakeholders from industry, government and the research sector were consulted during the process. UWA's Oceans Institute was also heavily involved in the development of the Blueprint through interviews and workshop participation.

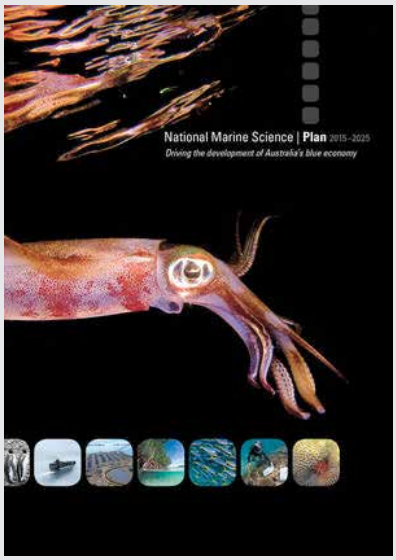
More than 100 priority areas of research have been identified in the Blueprint across the fisheries, oil and gas, coastal development, transport and environmental protection sectors.

Key programs underpinning all marine science and sector activities are also highlighted, along with dedicated programs to support upcoming decisions on major issues such as decommissioning offshore infrastructure.

OI's Professor Shaun Collin was a member on the Premier's Roundtable discussions that followed to build the Blueprint Implementation Strategy.

The Implementation Strategy, the third stage of the end-user led process, has since been launched to guide the foundation of long-term resourcing and collaboration between all sectors operating in our marine environment.

Solving grand challenges: National Marine Science Plan is launched



In August 2015, the Industry and Science Minister, the Honourable Ian Macfarlane, launched a ten-year plan for the investment and research needed to grow and manage Australia's blue economy.

The National Marine Science Plan focuses on seven key challenges and provides a template for balancing the need to realise the economic potential of Australia's marine environment and the need to safeguard its longer-term health.

These challenges range from:

- Energy and food security
- National sovereignty and safety
- Understanding the roles of the oceans in climate change and developing effective adaptation strategies
- Protecting unique marine ecosystems and biodiversity and
- Ensuring that industry, government and the community have the tools to make good decisions about sustainable development of our marine estate and the blue economy.

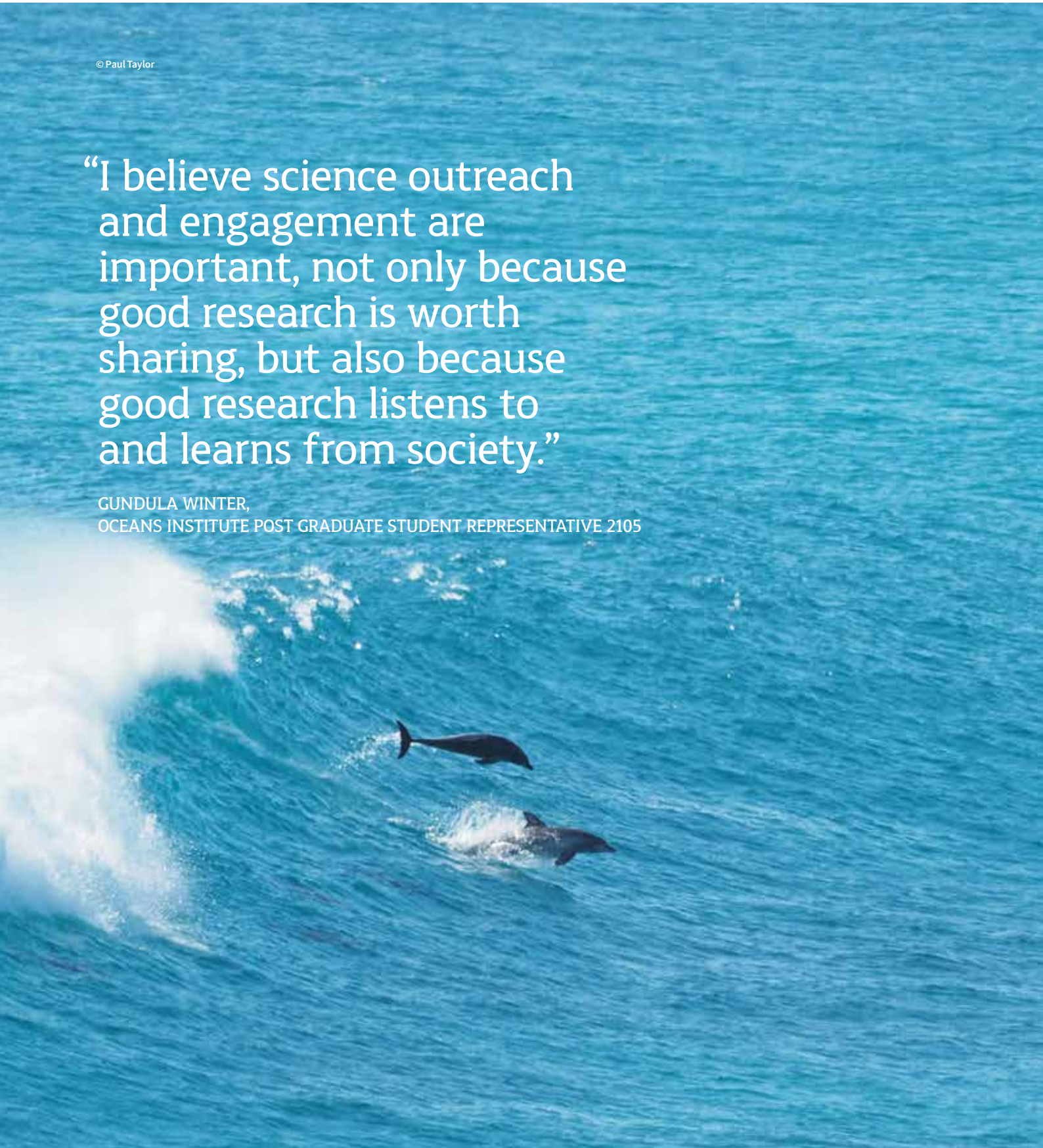
The blue economy is projected to grow three times faster than Australia's Gross Domestic Product over the next decade, more than doubling its current contribution of $47.2 billion a year.

The UWA Oceans Institute is one of 23 marine research organisations and government departments that provided a set of recommendations that will be at the heart of addressing these challenges.

"As Australians, we are intrinsically tied to the ocean – it is part of our history, our future and our culture. It is vital that we work together to solve the ocean challenges we are currently facing, if we want to ensure a sustainable ecological and economic future." – Professor Shaun Collin.

The Plan's Recommendations are:

1. Create an explicit focus on the blue economy throughout the marine science system.
2. Establish and support National Marine Baselines and Long-term Monitoring Programs, to develop a comprehensive assessment of our estate, and to help manage Commonwealth and State Marine Reserves.
3. Facilitate coordinated national studies on marine system processes and resilience to enable an understanding of climate change impacts on our marine estate.
4. Create a National Oceanographic Modeling System to supply accurate, detailed knowledge and predictions of ocean state that Defence, Industry and Government need.
5. Develop a dedicated and coordinated science program to support decision-making by policymakers and marine industries.
6. Sustain and expand the Integrated Marine Observing System to support critical climate change and coastal systems research, including coverage of key estuarine systems.
7. Develop marine science research training that is more quantitative, cross-disciplinary and congruent with the needs of industry and government.
8. Fund national research vessels for full use. Australia's marine territories remain largely a mystery, despite the fact that 85% of Australians live within 50 kms of the sea.



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"I believe science outreach and engagement are important, not only because good research is worth sharing, but also because good research listens to and learns from society."

GUNDULA WINTER,
OCEANS INSTITUTE POST GRADUATE STUDENT REPRESENTATIVE 2105

Media and Outreach

The Institute of Advanced Studies at UWA.

Sharing our discoveries with the public

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 master classes and symposia to share knowledge and research, and to engage community discussion on contemporary issues.

The 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, master classes, visitors and public events. In 2015, the following events took place in partnership with IAS:

Advanced Time Series Analysis for Ocean Research
Masterclass with Jeffrey Book, US Naval Research Laboratory and 2015 IAS International Distinguished Visiting Fellow.
Friday 29 May 2015

No-take marine reserves provide benefits to biodiversity, science and education: Can they also optimise yield for fisheries in data poor situations?
Tim Langlois and Jordan Goetze, UWA Oceans Institute
Monday 21 September 2015

Three topics in computer vision and pattern recognition
A Masterclass with Robert Fisher, Dean of Research, Science and Engineering, University of Edinburgh and 2015 IAS Distinguished Visiting Fellow
Friday 9 October 2015

How Do You Restore Seagrass Meadows? A Guide to Seagrass Restoration
Public Lecture by John Statton and Gary Kendrick, UWA Oceans Institute
Wednesday 14 October

Applying Computer Vision Methods to Ecological Problems
Public Lecture by Robert Fisher, Dean of Research, Science and Engineering, University of Edinburgh and 2015 IAS Distinguished Visiting Fellow
Monday 19 October 2015

Giant Waves on the Open Sea: Mariners' tall tales or alarming fact?
Public Lecture by Paul H Taylor, Professor of Engineering Science, University of Oxford
Tuesday 27 October 2015

Reaching out to the next generation of scientists

The Oceans Institute engaged with hundreds of school students throughout 2015. From coastal biodiversity artistic projects, to seagrass restoration and a popular food web app, these projects connected young citizen scientists to the ocean-solution research being undertaken at the Institute.

ABOVE: Project restoration: (a) Location of Jervoise Bay within Cockburn Sound (arrow), (b) Jervoise Bay located near a marina and (c) arrows indicating the two seagrass transplanting sites; bare sand and remnant seagrass matte (fibrous material left behind after seagrass dieback).

South Fremantle Senior High School seagrass restoration

Oceans Institute researcher Dr John Statton delivered a successful underwater carbon farming project with South Fremantle Senior High School (SHS) teacher Julie Miller and her students.

The high school grabbed Australia's attention in 2007 when they announced they had successfully implemented a Carbon Neutral Project, and subsequently became the first 'carbon neutral' school in Australia.

Recent research suggests that seagrasses are one of the most important carbon capturing and storing habitats. Globally, we have lost over one quarter of seagrass coverage and therefore we have lost a substantial capacity to sequester carbon from the atmosphere. One method to regain this carbon sequestration capacity is to re-plant or re-seed seagrasses back into denuded areas – a form of underwater carbon farming.

The Year 11 SHS students, who were all Rescue SCUBA-diver qualified, re-planted seagrasses at Jervoise Bay in three meters water depth. They learned how to identify, collect and process the seagrass Posidonia australis or strap-weed, and plant shoots within two contrasting habitat types; bare sand and remnant seagrass matte (fibrous material left behind after seagrass dieback). One year on from the initial planting, some of the shoots were present.

"The underwater carbon farming project provided the students with a sense of achievement once the planting was completed and fostered the appeal of underwater research and its potential for helping humanity," Dr Stratton said.

A short documentary was subsequently created by UWA's SPICE team to showcase the success of this project.

OI Artist in Residence Angela Rossen places some finishing touches on the mural.

Artistic biodiversity project brought to life

Artist in Residence with the Oceans Institute, Ms Angela Rossen, works with schools and community groups throughout WA on coastal biodiversity surveys.

In 2015, she delivered the Geraldton Community Coastal Biodiversity Project, which included a survey of coastal biota, a series of workshops with community and school groups.

The project culminated in an exhibition at the Geraldton Museum of paintings, drawings and photographs of the coastal flora and fauna from the dunes out to the fringing reefs.

Whilst the exhibition was underway, a public lecture evening took place with two distinguished local biologists who spoke on coastal biodiversity. All events drew record attendances and the exhibition also attracted school groups who enjoyed completing the activity worksheets.

"Art is a great way to get people involved with really observing and recording the biota of our near shore marine and coastal environments. These workshops provide forums for thoughtful discussion about the use of shared open spaces, marine research, sustainability, conservation and action for climate change. For children, the biological sciences can be a doorway to curiosity about science and a lifelong love of nature," Ms Rossen said.

Oceans Institute Artist in Residence, Angela Rossen.

2015 Media and Outreach

The UWA Oceans Institute (OI) facilitates timely, relevant and effective media engagement to communicate members' research, as well as the Institute's broader activities and initiatives, to the general public.

Media

Media engagement was a key priority for the Oceans Institute in 2015, further developing our reputation as a central source of research and innovation within the marine environment. This year, the OI released 30 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 spanned print, online, television and radio media, at local, national and international levels, confirming that our research is in constant demand.

High impact media stories included research on surviving coral bleaching, ocean acidification, Fremantle's meteotsunamis, the Great Southern Reef, shark deterrents, discovery of the Perth Canyon, plastic pollution, fishing sustainability, and climate change, resulting in more than 250,000 media outputs demonstrating the extent of the Oceans Institute's global reach.

Oceans Institute researchers featured in a number of television documentaries including:

- Screening of Prospero/Sea Life Productions, The Real Jaws, PBS Nova Science (in the USA), and on Channel 9 (Australia).
- Windfall Productions (UK) The conflict between sharks and humans, PBS Channel 4, Film and SBS (Australia)
- ABC Australia, Sharks and Shark Attacks. National/ International Documentary, Film (Channel 2 Australia)
- Plimsoll Productions Ltd UK featured research on deep-sea biology in their 'Deep' program within the series 'Life at the Extremes with Davina MacCall'

Researchers also participated in over 25 television interviews.

More locally, our researchers were interviewed for 19 stories published on the *Science Network of Western Australia's* website with some of the Institute's PhD candidates and members authoring three well-received *Perspectives* pieces on an aspect of their research. Independent news website, *The Conversation,* published 15 of our researcher's articles on marine park management, Perth Canyon, the Great Southern Reef, ocean plastics, marine heat waves, WA's super corals, wave energy, and climate change.

Marketing and Communications

In 2015, the Oceans Institute redeveloped a range of communications and marketing products based on a growing number of stakeholders interacting with the Institute across electronic media.

Newsletter

The Oceans Institute Newsletter remains an important communication channel, where 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. In 2015, the newsletter was redeveloped and launched in electronic format as the new Oceans Online eNewsletter. Oceans Online was issued 5 times and represented one of the key tools to engage and enhance the Institute's strong connection with its stakeholders.

Website: oceans.uwa.edu.au

The website is the first stop for information on research and development and to communicate the strategic focus and objectives for the Oceans Institute. The website is updated with information about upcoming news and events and links to other relevant webpages, enabling visitors to explore the activities of the Oceans Institute in more depth. The website had over 55,000 webpage views at relatively consistent levels throughout the year.

In 2015, the Oceans Institute launched its website redevelopment project. A new 'About Us' page was launched, and intensive work was undertaken with members to update the 'Research Areas' pages. These updates signal a move towards more impact-based research themes that showcase the OI's strengths and how our research is targeted at finding solutions to ocean challenges.

In 2016, these new research areas will be launched on the website:

- Safeguarding our Resources
- Influencing Governance and Policy
- Building Resilience
- Exploration and Discovery

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 continued to perform well as a social media tool and the number of people engaged and sharing our posts increased, with over 2500 followers and an increased reach and engagement of more than 3,500 in 2015.

@uwaoceans

The Oceans Institute posts regularly on its Twitter account and saw a steady increase in the number of followers to over 1,000 through 2015. Followers include a broad range of international and national research institutions, media, NGOs, community groups and individuals.

Outreach

In 2015, 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. Over 25 events were held throughout 2015.

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

30 Media Releases

15 Articles for The Conversation

22 Science Network Articles

2,553 Facebook Page Likes

1,053 Twitter Followers

55,000 Website Hits

6 IAS Lectures

Over **28** Research Engagement Events

Popular App engages

Downloaded by over 200,000 people, the popular Food Webs app was created by OI members Associate Professor Julian Partridge, and postgrads Daniel Van Hees, Charlotte Birkmanis and Gundula Winter.

Developed for the SPICE program at UWA, the Food Webs App lets users play with feeding relationships between unique plants and animals found in Western Australia.

The App covers Herdsman's Lake, the Kimberley and Cottesloe Reef, and has proved a successful tool for school children to learn about food webs.

The goal is to create a complete food web using sets of organisms that represent producers, herbivores and carnivores in an ecosystem. Users can also use the App to learn more about each species and to introduce destructive species to see the threat they present to the food web created.

School educators have praised the App as being 'great for introducing the idea of changing an ecosystem with an invasive species.'

The App can be downloaded for free from the Apple iTunes App Store.

Riding the wave of collaborative research

Professor Paul Taylor from the University of Oxford visited UWA three times during 2015, including a visit in October funded by the UWA Oceans Institute Visitor Program.

During his visit Professor Taylor continued his collaborative research with OI members Drs. Wenhua Zhao, Hugh Wolgamot and Scott Draper on research in wave-structure interaction. This included interpretation of experimental data on coupling between sloshing and roll motion for a Liquefied Natural Gas (LNG) carrier, and experimental data on the phenomenon of resonance in free surface motions between two vessels orientated in a side-by-side arrangement. These areas of research are leading to better predictions of the relative motions of an LNG carrier as it is moored in a side-by-side arrangement to a Floating LNG (FLNG) facility. This research was also undertaken in collaboration with Shell who are developing the world's first FLNG facility called Prelude. Prelude is set to be the largest offshore facility ever constructed.

During his visit Professor Taylor also collaborated on fundamental fluid mechanics concerning motion trapping of surface waves, the interaction of shear flow with geometrically porous structures and the (non-linear) evolution of large waves in the open ocean. This work, in combination with the FLNG project, has resulted in 3 collaborative journal publications as well as two conference papers. These publications have been well received by industry partners, and have helped to strengthen industry-academic collaboration.

In addition to research collaboration, Professor Taylor delivered a number of popular seminars during his visits. These covered topics from mathematical modeling of waves to the Victorian engineering behind tubular box girder bridges. He also gave a public lecture to a packed audience on "Giant waves on the open sea: mariners' tall tales or alarming fact?" organised jointly by the OI and the Institute of Advanced Study at UWA.

Looking to the future, Professor Taylor's visit further strengthened an existing collaboration between UWA and the University of Oxford in offshore engineering, and it has paved the way for further exciting interactions between UWA, the OI and Professor Taylor.

Visiting Professor Paul Taylor presents his research to members of the Oceans Institute.

© Joan Costa

"The UWA Oceans Institute, as a multidisciplinary marine research organisation, brings together professors from related institutions to provide ocean solutions by addressing ocean challenges successfully.

OI also becomes an ideal platform for every person who makes their dream come true in the fields of marine science and engineering, which helps both the Institute and the University make great achievements."

DEAN CHENYING,
OCEAN COLLEGE, ZHEJIANG UNIVERSITY

Management and Governance

Governance Structure

UWA Oceans Institute Advisory Board

Dr Ian Poiner
Advisory Board Chair

Professor Lyn Beazley, AO
Previous Chief Scientist of Western Australia, Sir Walter Murdoch Distinguished Professor at Murdoch University and Distinguished Fellow of the Institute of Advanced Studies at UWA.

Dr Tom Hatton
Chair Environmental Protection Authority, Western Australia

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

Ms Andrea Gleeson
Director, WA State Office, Department of Foreign Affairs and Trade

Professor Shaun Collin
UWA Oceans Institute Director

Dr Scott Draper
UWA Oceans Institute Deputy Director

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

UWA Oceans Institute Executive Board

Professor Robyn Owens
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Pro Vice-Chancellor, Research

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UWA Oceans Institute Director

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Professor John Dell
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Professor Erika Techera
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Dr Scott Draper
UWA Oceans Institute Deputy Director

Ms Tracy Parker
UWA Oceans Institute General Manager

Ms Gundula Winter
PhD Student Representative

Mr Daniel Van Hees
PhD Student Representative

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UWA Oceans Institute Director

Dr Scott Draper
UWA Oceans Institute Deputy Director

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UWA Oceans Institute General Manager

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UWA Oceans Institute Accounts Officer

Welcoming the Leadership Team

In 2015, a new Leadership Team was formed. This active group of senior Oceans Institute members represents the breadth of expertise and interests from across the university. The Leadership Team met fortnightly to scope out opportunities for research and engagement to help guide the OI through an important phase of transition. The Leadership Team has played a critical role in supporting the OI's activities and in decision-making.

OI 2015 Leadership Team

Professor Shaun Collin – Director of the Oceans Institute and Professor in the School of Animal Biology
Professor Collin, a former WA Research Fellow, is a world leader in how animals perceive and process their sensory world under different environmental conditions. He uses innovative techniques in anatomy, electrophysiology, bioimaging, molecular biology and behaviour to understand the evolution and mechanisms of neural processing for a range of senses including vision, hearing, olfaction and electroreception. Professor Collin's research is being incorporated into shark mitigation technologies, improving aquaculture industries, identifying the effects of anthropogenic disturbances such as underwater noise and dredging activities, with the ultimate aim of informing management strategies to conserve Australia's unique biodiversity.

Dr Scott Draper – OI Deputy Director, Senior Lecturer, Civil, Environmental and Mining Engineering, and Centre for Offshore Foundation Systems
Scott's research focuses on offshore fluid mechanics, applied to both the oil and gas and marine renewable energy industries. This includes work on the stability and scour of subsea infrastructure; the optimum arrangement of marine renewable energy devices; and, most recently, the hydrodynamics of floating bodies. Scott's research, together with colleagues at UWA, is supported by the Australian Research Council in combination with industry partners Woodside, Shell, Bureau Veritas, Lloyds Register Group and Carnegie Wave Energy. Scott has also undertaken industry research projects with Subcon, Fugro AG, Technip, Arup and Bombora Wave Energy. His work has been presented in > 60 peer reviewed publications.

Professor Christophe Gaudin – Deputy Director, Centre for Offshore Foundation Systems
Christophe is a Professorial Research Fellow at the University of Western Australia, the Director of the National Geotechnical Centrifuge Facility (NGCF) and the Deputy Director of the Centre for Offshore Foundations Systems (COFS), which he joined in 2003. He holds a PhD in geotechnical engineering, which he obtained in 2002 working on the large beam centrifuge at IFSTTAR in Nantes (France). Since then his passion for centrifuges has remained and his whole career has revolved around physical modeling. He managed the centrifuge facilities at the Centre for Offshore Foundations for the period 2003-2012. He is the former Chair of the Technical Committee on Physical Modeling in Geotechnics of the International Society of Soil Mechanics and Geotechnical Engineering (2010-14), an Editor of the International Journal of Physical Modeling in Geotechnics, and was the Chair of the 8th International Conference on Physical Modeling in Geotechnics. Christophe actively promotes the use of centrifuge modeling to academics and industry worldwide and has a long track record of collaborations with industry working on a diversity of designs and research projects. His research interests include anchoring

systems for offshore structures, shallow foundations, spudcans and offshore renewable energy. He has also a keen interest in the development of innovative and ground breaking technology for centrifuge modeling that opens new areas of investigation.

Professor Ryan Lowe – School of Earth and Environment and ARC Centre of Excellence for Coral Reef Studies

Associate Professor Lowe received his PhD in Civil and Environmental Engineering from Stanford University, and has a background in physical oceanography and coastal engineering. His research involves the study of the circulation and wave dynamics within a broad range of coastal systems (e.g., coral reefs, rocky coastlines and beaches), including assessing the links between hydrodynamics and other key processes such as sediment transport and coastal water quality. Lowe is an ARC Future Fellow, the Editor for the *Journal of Geophysical Research – Oceans*, and serves on the Expert Group in Physical Oceanography for the Australian Meteorological and Oceanographic Society.

Professor Jessica Meeuwig – Director, Centre for Marine Futures

Professor Jessica Meeuwig is the Director of the Centre for Marine Futures and a member of The UWA Oceans Institute and School of Animal Biology. Her lab primarily documents the structure of reef and open water fish communities using innovative video techniques to understand how these communities respond to climate change, overfishing and other human impacts. Professor Meeuwig's team has a particular focus on the role of marine protected areas in supporting ocean resilience. She is a Conservation Fellow of the Zoological Society of London.

Professor David Pannell – Director, Centre for Environmental Economics and Policy (CEEP)

David Pannell is Professor and Head of School of Agricultural and Resource Economics, The University of Western Australia, Director Centre for Environmental Economics and Policy, ARC Federation Fellow (2007-2012), Distinguished Fellow and past president of the Australian Agricultural and Resource Economics Society, Fellow of the Academy of Social Sciences in Australia, and a Director of Natural Decisions Pty Ltd. His research includes the economics of land and water conservation, environmental policy, farmer adoption of conservation practices, risk, and economics of farming systems. David has won awards for his research in the USA, Australia, Canada and the UK, including the 2009 Eureka Prize for Interdisciplinary Research.

Ms Tracy Parker – General Manager, UWA Oceans Institute

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

Associate Professor and Principal Research Fellow Julian Partridge – School of Animal Biology and UWA Oceans Institute

Associate Professor Partridge studied Zoology at the University of Bristol (UoB), receiving his PhD in 1986. He continued to work at the UoB for 30 years, becoming Professor of Zoology and leading the School of Biological Sciences' internationally recognised Ecology of Vision research group. His research has always been centred on sensory ecology, especially the relationship between environment and animal vision, and has maintained an emphasis on marine environments and aquatic animals. His work in deep-sea biology has entailed many months at sea, as well as the use of international research ships and submersibles, and the development of deep-sea benthic landers. He joined the UWA in 2014 where he now teaches Science Communication, Deep-Sea biology, and Marine Neuroecology at undergraduate and postgraduate levels. His current UWA research includes work on fiddler crab vision, conducted with colleagues in the School of Animal Biology, and research into animal polarisation vision combined with the construction of novel biologically-inspired polarisation cameras for underwater imaging. Both these elements have links to robotics research, including the development of a robotic fiddler crab ("RoboCrab"), funded by the ARC, and the construction of novel polarisation imaging systems that have the potential to enhance underwater survey methods and AUV imagers. In addition, he has a major role as Business Development Manager in the UWA School of Animal Biology, and is Node Leader for the West Australian Integrated Marine Observing System (WAIMOS).

Professor Charitha Pattiaratchi – School of Civil Environmental and Mining Engineering

Professor Charitha Pattiaratchi is the leader of the coastal oceanography Group at UWA's School of Civil, Environmental and Mining Engineering. His research interests are in coastal physical oceanography and coastal sediment transport, with an emphasis on field experiments and numerical modeling. He has particular interest in ocean observation systems using ocean gliders, and is Facility leader of the Australian National Facility for Ocean Gliders (ANFOG).

Professor Erika Techera – Dean and Head of School, Faculty of Law

Erika Techera is Professor and Dean of Law at The University of Western Australia. Her area of research interest is international and comparative environmental law with a particular emphasis on marine governance. Her research explores international law related to sharks, Pacific and Indian Ocean marine environmental law, as well as legal frameworks to support marine protected areas and marine spatial planning. Her most recent project explores the intersection of piracy, IUU fishing and human rights. She is the author of *Marine Environmental Governance: from international law to local practice* (Routledge, 2012) and co-editor of the *Routledge Handbook of International Environmental Law* (2013) as well as over 50 other publications. Erika is a Fellow of the *Australian Academy of Law*, and member of the *Ocean Science Council of Australia.*

Associate Professor Thomas Wernberg – ARC Future Fellow, School of Plant Biology

Associate Professor Thomas Wernberg is an ARC Future Fellow at the UWA Oceans Institute and the School of Plant Biology. His research addresses impacts of climate and human pressure on marine communities and their resilience to stress and disturbance. His approach bridges biogeography, ecology and physiology, and aims to provide support strategies needed to ameliorate the impacts of humans in nature now and in the future. A current priority is understanding the ecological and ecophysiological limitations of kelp forest persistence in environmentally marginal habitats.

Professor David White – Centre for Offshore Foundation Systems

Professor David White holds the Shell EMI Chair in Offshore Engineering and is Director of the ARC Research Hub for Offshore Floating Facilities, hosted at UWA. He has been a Professor at UWA since 2007 and is a Fellow of the Royal Academy of Engineering. David has over 15 years of research experience in offshore engineering, focused on pipelines, foundations and anchoring systems. His work has led to 250 publications, 8 industry awards, 7 publication prizes and design methods that have been adopted in international design guidelines produced by the API, ISO and DNV organisations.

Oceans Institute Membership

Members

Assoc/Prof Zachary Aman
School of Mechanical and Chemical Engineering

Prof Mohammed Bennamoun
School of Computer Science and Software Engineering

Assist/Prof Bryan Boruff
School of Earth and Environment

Research Assoc Philippe Bouchet
School of Animal Biology

Dr Anne Brearley
School of Plant Biology

Assoc/Prof Michael Burton
School of Agricultural and Resource Economics

Dr Marion Cambridge
School of Plant Biology

Research Fellow Belinda Cannell
School of Animal Biology

Australian Laureate Fellow Mark Cassidy
Centre for Offshore Foundation Systems

Assist/Prof Julian Clifton
School of Earth and Environment

Assoc/Prof Peta Clode
Centre for Microscopy, Characterisation and Analysis

Prof Shaun Collin
School of Animal Biology

Research Fellow Steeve Comeau
School of Earth and Environment

Research Assoc Juan Pablo D'Olivo Cordero
School of Earth and Environment

Research Fellow Christopher Cornwall
School of Earth and Environment

Dr Lara Garcia-Corral
School of Plant Biology

Future Fellow Wayne Davies
School of Animal Biology

Dr Thibaut de Bettignies
School of Plant Biology

Assist/Prof Scott Draper
Centre for Offshore Foundation Systems

Research Asst/Prof Jim Falter
School of Earth and Environment

Professorial Fellow Christophe Gaudin
Centre for Offshore Foundation Systems

Prof Andrea Gaynor
Centre for Western Australian History

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

Prof Susan Gourvenec
Centre for Offshore Foundation Systems

Sen/Lect Pauline Grierson
School of Plant Biology

Assoc/Prof Atakelty Hailu
School of Agricultural and Resource Economics

Lect Jeffrey Hansen
School of Earth and Environment

Future Fellow Jan Hemmi
School of Animal Biology

Research Fellow Yasha Hetzel
School of Civil, Environmental and Mining Engineering

Assoc/Prof Matthew Hipsey
School of Earth and Environment

Research Assoc/Prof Muhammad Hossain
Centre for Offshore Foundation Systems

Lect Renae Hovey
School of Plant Biology

Prof David Hunt
School of Animal Biology

Prof Greg Ivey
School of Civil, Environmental and Mining Engineering

Research Asst/Prof Ivica Janekovic
School of Civil, Environmental and Mining Engineering

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

Dr Ryan Kempster
School of Animal Biology

Prof Gary Kendrick
School of Plant Biology

Dr Tim Langlois
UWA Oceans Institute

Prof Ryan Lowe
School of Earth and Environment

Dr Pere Masque
School of Physics

Aust Laureate Fellow Malcolm McCulloch
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Research Fellow Dianne McLean
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Professorial Fellow Jessica Meeuwig
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Research Assoc Caroline Ochieng-Erftemeijer
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Centre for Offshore Foundation Systems

Research Assoc Ylva Olsen
School of Plant Biology

Prof David Pannell
School of Agricultural and Resource Economics

Assoc/Prof Julian Partridge
School of Animal Biology

Prof Alistar Paterson
Archaeology

Prof Chari Pattiaratchi
School of Civil, Environmental and Mining Engineering

Assist/Prof Natasha Pauli
School of Earth and Environment

Lect Jane Prince
School of Animal Biology

E/Prof Alistar Robertson
School of Plant Biology

Research Fellow Abbie Rogers
School of Agricultural and Resource Economics

Dr Leonardo Ruiz Montoya
School of Plant Biology

Dr Elizabeth Sinclair
School of Plant Biology

Research Assoc Verena Schoepf
School of Earth and Environment

Dr Ana Sequeira
School of Animal Biology

Mr Dennis Stanley
School of Environmental Systems Engineering

Research Assoc John Statton
School of Plant Biology

Assoc/Prof David Sutton
School of Pathology and Laboratory Medicine

Prof Erika Techera
Law School

Research Fellow Paul Thomson
School of Civil, Environmental and Mining Engineering

Aust Post/Doc Fellow Julie Trotter
School of Earth and Environment

Assoc/Prof Kimberly Van Niel
School of Earth and Environment

Dr Ingrid Ward
Archaeology

Future Fellow Thomas Wernberg
School of Plant Biology

Prof David White
Centre for Offshore Foundation Systems

Research Fellow Sarath Wijeratne
School of Civil, Environmental and Mining Engineering

Research Fellow Hugh Wolgamot
Centre for Offshore Foundation Systems

Assist/Prof Kara Yopak
School of Animal Biology

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

Professional and Technical

Mr Kah Kiat Hong
School of Civil, Environmental and Mining Engineering

Ms Caroline Kerr
UWA Oceans Institute

Mrs Alessandra Mantovanelli
School of Civil, Environmental and Mining Engineering

Ms Patricia Miloslavich
UWA Oceans Institute

Dr Prescilla Siji
School of Civil, Environmental and Mining Engineering

Mr Warren Starr
Safety, Health and Wellbeing

Ms Tracy Parker
UWA Oceans Institute

Adjuncts

Dr Fabio Boschetti
CSIRO

Dr Tim Cooper
BHP Billiton

Dr Martial Depczynski
AIMS

Prof Carlos Duarte
King Abdulah University of Science & Technology

Mr 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 Southhampton

Dr Nick Hardman-Mountford
CSIRO

Dr Thomas Hatton
EPA

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 Brad Norman
School of Animal Biology

Dr Ben Radford
AIMS

Dr Zoe Richards
WA Museum

Dr Christine Schonberg
AIMS

Dr Oscar Serrano Gras
UWA Oceans Institute

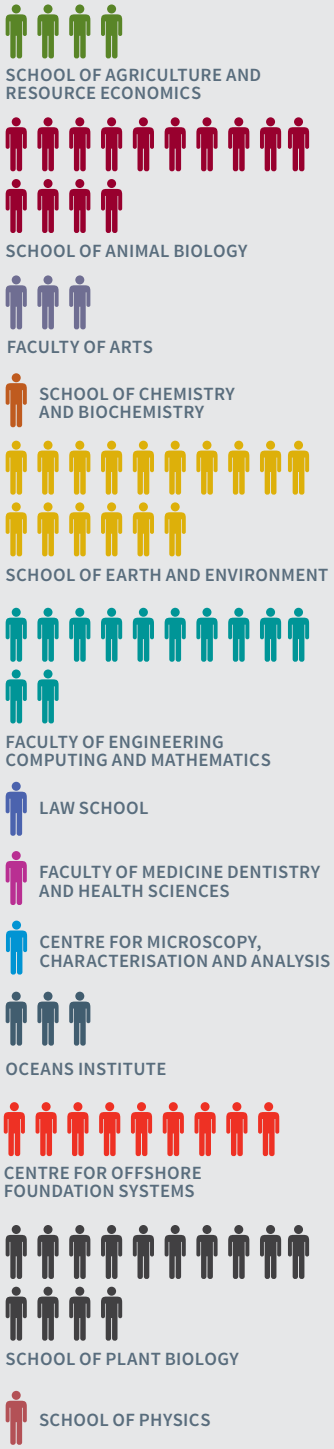
Dr Luke Smith
Woodside

Dr Michele Thums
AIMS

Dr James Underwood
AIMS

Dr Shaun Wilson
Department of Parks and Wildlife

Distribution of Oceans Institute Members



PhD Students

School of Agricultural and Resource Economics

Katrina Davies **AR**
Matthew Navarro **AH**

School of Animal Biology

Audrey Appudurai **SC**
Shanta Barley **JM**
Charlotte Birkmanis **JM**
Janelle Braithwaite **JM**
Victoria Camilieri-Asch **SC**
Luciana Cerqueira Ferreira **JM**
Lucille Chapuis **SC**
Marjorie Fernandez **JM**
Eduardo Garza Gisholt **SC**
Anton Kuhar **SC**
Jonathan Mitchell **SC**
Nicolas Nagloo **NH**
Beverly Oh **JM**
Joyce Ong **JM**
Laura Ryan **NH**
Carlos Salas **SC**
Jamie Tedeschi **NM**
Dave Tickler **JM**
Rachael Warrington **SC**
Gabriel Vianna **JM**

Centre for Microscopy, Characterisation and Analysis

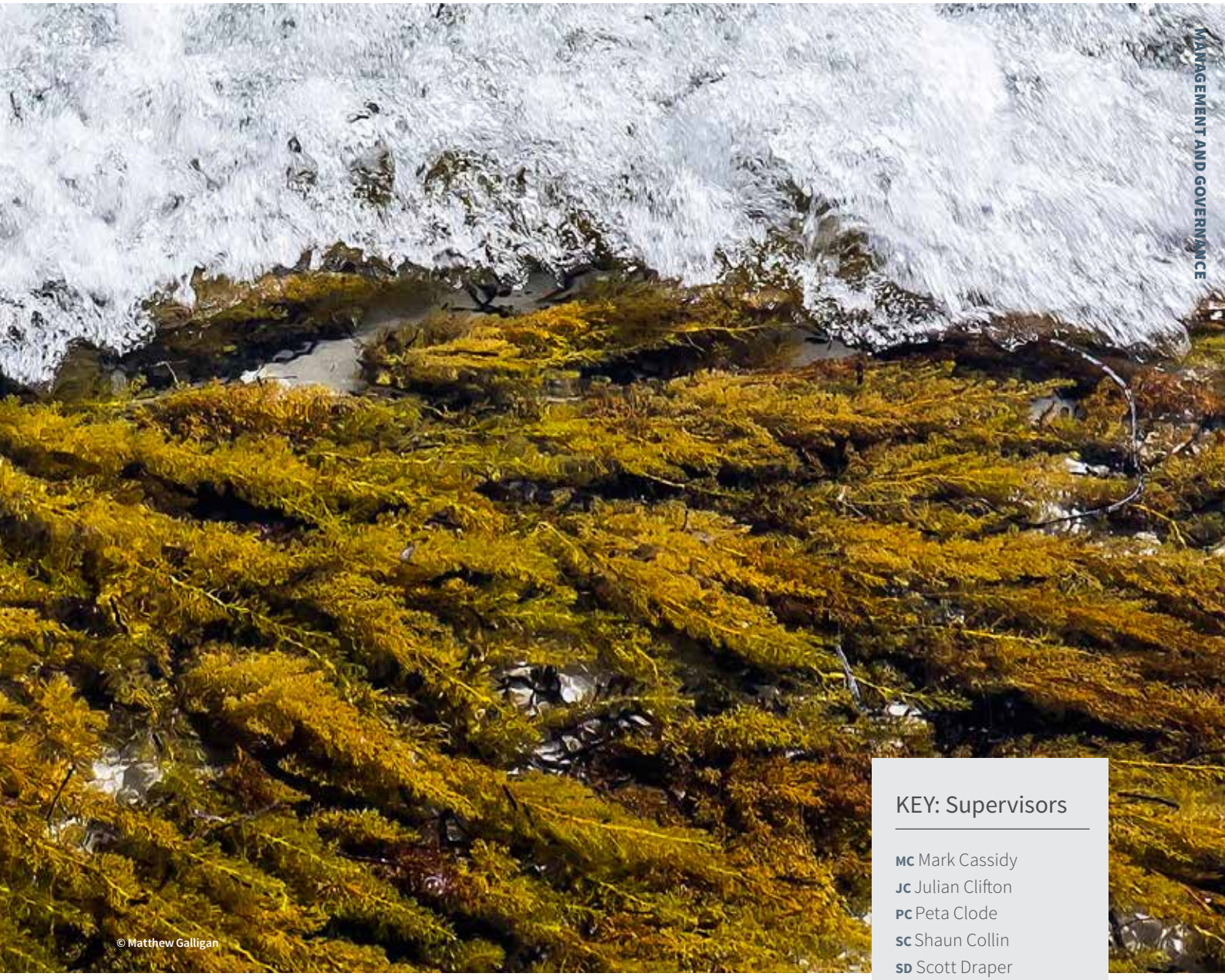
Pia Bessell-Browne **PC**
Gerard Ricardo **PC**

Centre for Offshore Foundation Systems

Anthony Blake **CO**
Michael Cocjin **DW**
Cathal Colreavy **CO**
Minh Tri Duong **CG**
Dengfeng Fu **CG**
Chao Han **MC**
James Hengesh **DW**
Pan Hu **MC**
Kai Xiang Koh **MUH**
Omid Kohan **MC**
Simon Leckie **DW**
Xiajun Li **CG**
Huiting Liu **SD**
Jiayue Liu **MC**
Hongliang Ma **MUH**
Jalal Mirzadehniasa **MC**
Henning Mohr **DW**
John Morton **CO**
Shah Neyamat Ullah **DW**
Colm O'Beirne **CO**
Raffaele Ragni **MC**
Amin Rismanchian **DW**
Somaye Sadeghian **DW**
Stefanus Safinus **MUH**
Zack Westgate **DW**
Beau Whitney **DW**
Fan Yang **SD**
Ehssan Zargar **SD**
Qin Zhang **SD**
Jingbin Zheng **MUH**
Tianyuan Zheng **MC**

School of Civil, Environmental and Mining Engineering

Samantha Andrzejaczek **CP**
Paul Branson **GI**
Mohammad Hadi Bahmanpour **CP**
Liah Coggins **AG**
Andrew Carruthers **AG**
Tanziha Mahjabin **CP**
Martin James McLaughlin **CP**
Jennifer Penton **CP**
Eric Raes **PG**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Julia Reisser **CP**
Alireza Salehi **CP**
Sarik Salim **CP**
Taj Sarker **RL**
Lei Tian **GI**
Moritz Wandres **CP**
Wencai Zhou **NJ**

School of Earth and Environment

Kaylee Anderson **JT**
Delkandura Arachchige **MAH**
Mercedes Belica
Mark Buckley **RL**
Napo Cayabyab **RL**
Michael Cuttler **RL**
Sana Dandan **MM**
Edwin Drost **RL**
Taryn Foster **MM**
Lucy Georgiou **MM**
Maria Gonzales-Bernat **JC**
Renee Gruber **RL**
Daniel Paraska **MAH**
Andrew Pomeroy **RL**
Liza Roger **MM**
Laura Elena 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

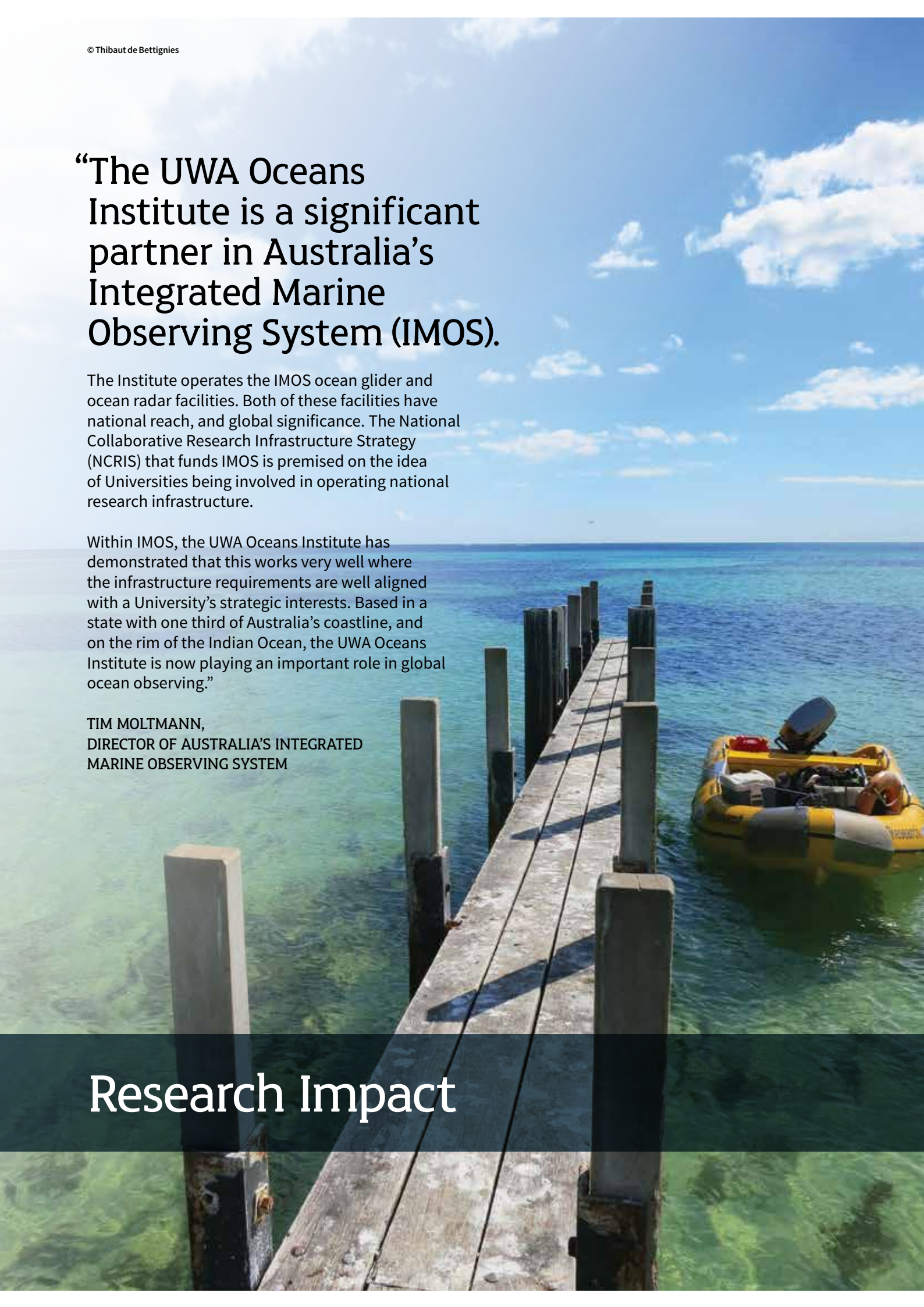
Bijo Arackal **TW**
Scott Bennett **TW**
Samantha Childs **GK**
Katherine Cure **TL**
Jean-Philippe Dumnas **TL**
Adrian Ferguson **GK**
Matthew Fraser **GK**
Julia Santana Garcon **GK**
Jordan Goetze **TL**
Belinda Martin **GK**
Camilla Piggott **TL**
Tiffany Simpson **TW**
Sandra Straub **TW**
Brian Strehlow **GK**
Luke Thomas **GK**
Chenae Tuckett **TW**
Daniel van Hees **GK**
Sam Whitehead **GK**

School of Social Sciences

Mark Polzer **AP**

KEY: Supervisors

MC Mark Cassidy
JC Julian Clifton
PC Peta Clode
SC Shaun Collin
SD Scott Draper
CG Christophe Gaudin
AG Anas Ghadouani
PG Pauline Grierson
AH Atakelty Hailu
NH Nathan Hart
MAH Matthew Hipsey
MUH Muhammad Hossain
GI Greg Ivey
NJ Nicole Jones
GK Gary Kendrick
TL Timothy Langlois
RL Ryan Lowe
MM Malcolm McCulloch
JM Jessica Meeuwig
NM Nicola Mitchell
CO Conleth O'Loughlin
CP Chari Pattiaratchi
AP Alistair Peterson
ET Erika Techera
JT Julie Trotter
TW Thomas Wernberg
DW David White



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“The UWA Oceans Institute is a significant partner in Australia’s Integrated Marine Observing System (IMOS).

The Institute operates the IMOS ocean glider and ocean radar facilities. Both of these facilities have national reach, and global significance. The National Collaborative Research Infrastructure Strategy (NCRIS) that funds IMOS is premised on the idea of Universities being involved in operating national research infrastructure.

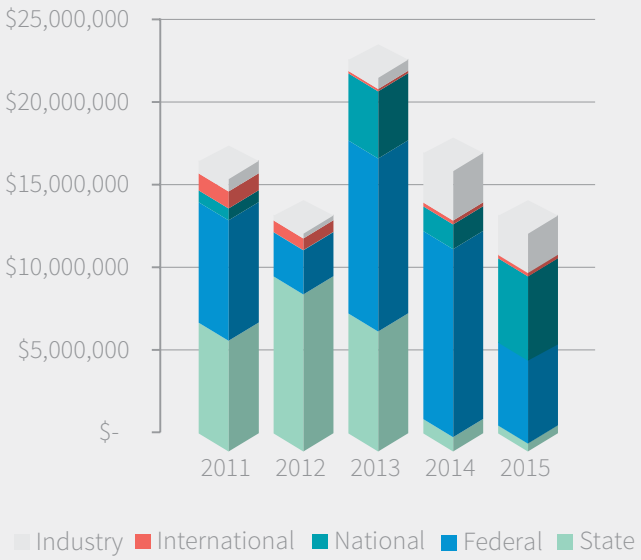
Within IMOS, the UWA Oceans Institute has demonstrated that this works very well where the infrastructure requirements are well aligned with a University’s strategic interests. Based in a state with one third of Australia’s coastline, and on the rim of the Indian Ocean, the UWA Oceans Institute is now playing an important role in global ocean observing.”

TIM MOLTMANN,
DIRECTOR OF AUSTRALIA’S INTEGRATED MARINE OBSERVING SYSTEM

Research Impact

Funding Sources

UWA Oceans Institute members generated over $13 million in funding from government, industry and national and international sources.

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Case study: research impact in 2015

The UWA Oceans Institute prides itself on its multidisciplinary capabilities and for 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.

Key research topics included the impact of climate change on coral reef ecosystems, particularly with regards to ocean warming and changing pH levels. Assessing decommissioning needs, as well as the governance of marine parks continued to be at the forefront of influential research.

The number of citations received by UWA Oceans Institute members continues to grow, providing evidence of the growing impacts of the research conducted at the Institute. In 2015, five publications involving Oceans Institute researchers, were recognised as 'Highly Cited ' papers, receiving enough citations to place them in the top of their academic field.

Graham NAJ, Jennings S, MacNeil MA, Mouillot D, **Wilson SK** (2015) Predicting climate-driven regime shifts versus rebound potential in coral reefs. *Nature* **518**(7537): 94-97

Kaiser C, Kilburn MR, **Clode PL,** Fuchslueger L, Koranda M, Cliff JB, Solaiman ZM, Murphy DV (2015) Exploring the transfer of recent plant photosynthates to soil microbes: Mycorrhizal pathway vs direct root exudation. *New Phytologist* **205**(4): 1537-1551

MacNeil MA, Graham NAJ, Cinner JE, **Wilson SK**, Williams ID, Maina J, Newman S, Friedlander AM, Jupiter S, Polunin NVC, McClanahan TR (2015) Recovery potential of the world's coral reef fishes. *Nature* **520**(7547): 341-344

Duarte CM, Borja A, Carstensen J, Elliott M, Krause-Jensen D, Marbà N (2015) Paradigms in the Recovery of Estuarine and Coastal Ecosystems. *Estuaries and Coasts* **38**(4): 1202-1212

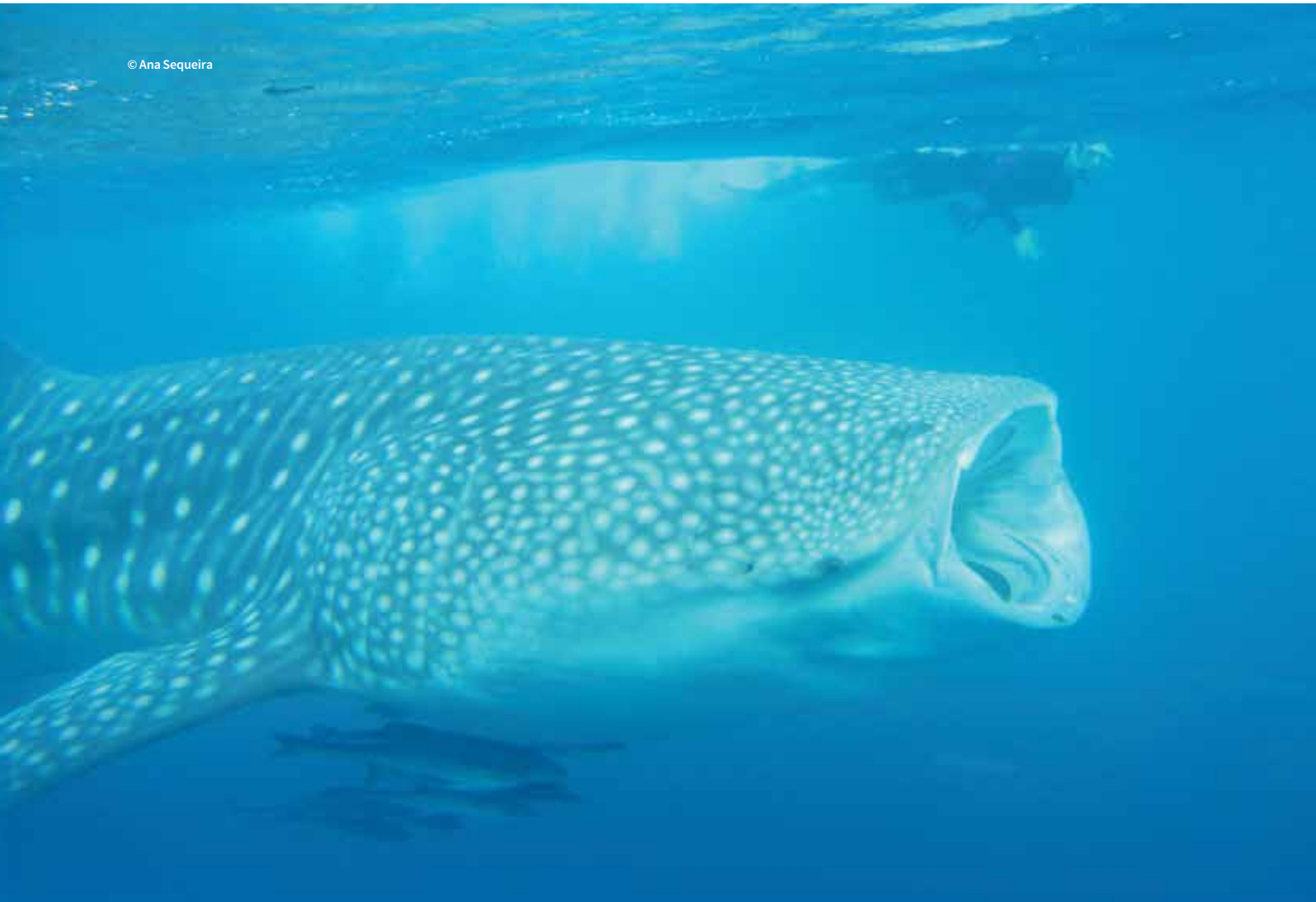
Hendriks IE, **Duarte CM**, **Olsen YS,** Steckbauer A, Ramajo L, Moore TS, **Trotter JA**, **McCulloch M** (2015) Biological mechanisms supporting adaptation to ocean acidification in coastal ecosystems. *Estuarine, Coastal and Shelf Science* **152**: A1-A8

Research Grants 2015

PROJECT TITLE	FUNDING BODY	AMOUNT	OCEANS INSTITUTE RESEARCHER
Browse FLNG development Pipe soil interaction centrifuge testing	Fugro AG	$196,145	Associate Professor Christophe Gaudin, Dr Conleth O'Loughlin
From single to multiple wave energy converters: Cost reduction through location and configuration optimisation	Australian Renewable Energy Agency ARENA	$994,198	Associate Professor Christophe Gaudin, Professor Ryan Lowe, Dr Jeffrey Hansen, Dr Conleth O'Loughlin, Assistant Professor Yinghui Tian, Professor Mark Cassidy, Dr Ashkan Rafiee, Mr Jonathan Fievez
MB Hub – Project B1 – Road testing decision support tools via case study applications	University of Tasmania ex National Environmental Science Program NESP	$49,000	Associate Professor Michael Burton, Dr Fiona Gibson
Center for the Integrated Modeling and Analysis of Gulf Ecosystems II (C-IMAGE II)	University of Florida ex University of Miami	$62,700	Associate Professor Zachary Aman
Improved Prediction and Management of Hydrate Plug Formation in Long-Distance Subsea Tiebacks: Biocompatible Anti-Agglomerants	WA Energy Research Alliance WAERA ex Shell Development Australia Pty Ltd	$381,500	Associate Professor Zachary Aman, Professor Eric May
Inhibitor Requirements for Hydrates Following Subsea Separation	WA Energy Research Alliance WAERA ex Chevron	$48,000	Associate Professor Zachary Aman, Professor Eric May
Pluto Water Handling Desktop Study	Western Australian Energy Research Alliance WAERA ex Woodside R2D3	$36,450	Associate Professor Zachary Aman, Professor Eric May
Balancing estuarine and societal health in a changing environment [ARC Funds]	Murdoch University ex ARC Linkage Project	$162,005	Dr Fiona Valesini, Assoc/Prof Matthew Hipsey, Professor Bradley Eyre, Professor Paul Plummer, Dr Kieryn Kilminster, Professor Michael Elliott
Balancing estuarine and societal health in a changing environment [Partner Org Funds]	Murdoch University ex ARC Linkage Project	$155,000	Dr Fiona Valesini, Assoc/Prof Matthew Hipsey, Professor Bradley Eyre, Professor Paul Plummer, Dr Kieryn Kilminster, Professor Michael Elliott
Re-evaluating an offshore source for Eocene chert artefacts in southwestern Australia – a pilot study	Australian Institution of Nuclear Science & Engineering Ltd	$5,450	Dr Ingrid Ward
Bragg Institute NBIP – 3D visualisation of an embedded chert artefact from Barrow Island	Australian Nuclear Science & Technology Organisation (ANSTO)	$14,200	Dr Ingrid Ward
RoboCrab: An integrative approach to the natural ecology of decision making	ARC Discovery Projects	$437,500	Dr Jan Hemmi, Associate Professor Julian Partridge, Professor Barbara Webb
Northern Australian Environmental Resources Hub	Charles Darwin University ex National Environmental Science Program NESP	$2,231,531	Dr Michael Douglas, Professor Peter Davies, Professor David Pannell
Northern Australia Environmental Resources Hub – Project 1.1 – Research Plan Version 1	Charles Darwin University ex National Environmental Science Program NESP	$226,000	Dr Michael Douglas, Professor Peter Davies, Professor David Pannell
Development of an advanced numerical analysis technique for offshore foundation-soil interaction	Daewoo Shipbuilding and Marine Engineering Co Ltd	$55,000	Dr Muhammad Hossain
Prediction of Long-Term Displacements of Suction Piles for 3MW Offshore Wind Turbine and Effective Measures for Reducing Displacements	POSCO	$80,075	Dr Muhammad Hossain, Dr Dong Wang, Dr Youngho Kim, Professor Mark Randolph, Associate Professor Christophe Gaudin, Dr Conleth O'Loughlin, Professor Mark Cassidy
Australian-Korean collaboration to address geotechnical challenges in oil and gasextraction and renewable wind energy harvesting	Department of Foreign Affairs & Trade Australia Korea Foundation	$29,950	Dr Muhammad Hossain, Dr Youngho Kim, Professor Mark Cassidy, Professor Yuxia Hu
Risk, resilience and recovery: A participatory approach to integrating local and scientific knowledge for disaster preparedness of communities in flood-prone catchments in Fiji	UWA Research Collaboration Awards	$16,000	Dr Natasha Pauli, Dr Bryan Boruff, Ms Julia Horsley, Dr Andreas Neef, Dr Kellie McNeill

PROJECT TITLE	FUNDING BODY	AMOUNT	OCEANS INSTITUTE RESEARCHER
Wheatstone Manifold / PTS Scour Protection Assessment	Fugro AG	$55,013	Dr Scott Draper, Professor Liang Cheng, Dr Hongwei An, Professor David White
Genes to ecosystems: drivers of resilience in underwater marine forests	ARC Discovery Projects	$363,800	Dr Thomas Wernberg, Dr Melinda Coleman
Southern Hemisphere Ecklonia Ecosystems Network (SHEEN)	UWA Research Collaboration Awards	$18,400	Dr Thomas Wernberg, Professor Craig Johnson, Professor Peter Steinberg, Dr Adriana Verges, Professor Sean Connell, Dr Nick Shears, Professor John Bolton
Scale Inhibition Using Alginates	WA Energy Research Alliance WAERA ex Chevron	$30,000	Dr Brendan Graham, Associate Professor Zachary Aman, Professor Eric May
Commonwealth Environmental Water Long-Term Intervention Monitoring Project: Lower Murray River Selected Area 2014/15 2018/19 – Matter Transport Indicator	South Australian Research & Development Institute SARDI ex Department of Environment	$95,564	Assoc/Prof Matthew Hipsey
Investigating the RiverLab Concept	Western Australian Energy Research Alliance WAERA ex Woodside R2D3	$19,737	Dr Wenhua Zhao, Dr Hugh Wolgamot, Dr Nicole Jones, Dr Scott Draper
Increasing the resilience of frog species to climate change through strategic genetic translocations	Equity Trustees Limited Holsworth Wildlife Research Endowment	$5,000	Mrs Tabitha Rudin-Bitterli, Dr Nicola Mitchell, Associate Professor Jonathan Evans
Coastal Connections: dynamic societies of Australia's Northwest frontier	ARC Future Fellowships	$1,146,197	Professor Alistair Paterson
Collecting the West: Reimagining Western Australia from its collections	ARC Linkage Projects	$750,192	Professor Alistair Paterson, Professor Andrea Witcomb, Associate Professor Alec Coles, Professor Elizabeth Lydon, Professor Stephen Hopper, Professor Jennifer Gregory, Dr Shino Konishi, Associate Professor Jacqueline Van Gent
Assessment of sediment in critical habitat pools of the Canning River	Swan River Trust Swan Canning Research & Innovation	$10,000	Professor Anas Ghadouani, Dr Elke Reichwaldt
Development and Support of the Implementation of Remotely Operated Sludge Measurement Technology – Phase 1 – Feasibility Study, Development and Support of the Implementation	Tasmanian Water Corporation TasWater	$60,750	Professor Anas Ghadouani, Dr Elke Reichwaldt
The impact of marine wrack degradation on water quality in the Jurien Bay Boat Harbour	WA Department of Transport	$175,191	Professor Carolyn Oldham, Associate Professor Matthew Hipsey, Professor Paul Lavery, Dr Kathryn McMahon
Identifying the Potential Spread of Marine Pests Through Natural Processes	Western Australian Marine Science Institute (WAMSI)	$36,540	Professor Charitha Pattiaratchi
Gorgon Project: Coastal Hydrodynamic and Sediment Modelling	WA Energy Research Alliance WAERA ex Chevron	$189,547	Professor Charitha Pattiaratchi
Investigating Critical Biological Issues for Commercial Greenlip Abalone Sea Ranching in Flinders Bay Western Australia	Curtin University of Technology ex Fisheries Research & Development Corporation FRDC	$56,000	Professor Charitha Pattiaratchi
Request for Quotation: Port Geographe, Post Reconfiguration Coastal Modelling and Analysis	WA Department of Transport	$105,679	Professor Charitha Pattiaratchi
Threatened Species Recovery Hub	University of Queensland ex National Environmental Science Program NESP	$1,508,010	Professor David Pannell, Professor Richard Hobbs, Dr Nicola Mitchell
A Single-Molecule Super-Resolution Microscopy Facility in Western Australia	ARC Linkage Infrastructure Equipment Facilities	$850,000	Professor David Sampson, Professor Michael Berndt, Professor Shaun Collin, Dr Elin Gray, Doctor Massimiliano Massi, Associate Professor Kevin Pfleger, Doctor Jeremie Rossy, Professor Ian Small, Dr Killugudi Swaminatha Iyer, Dr Melanie Ziman

PROJECT TITLE	FUNDING BODY	AMOUNT	OCEANS INSTITUTE RESEARCHER
Seabed engineering for deepwater oil and gas	Department of Foreign Affairs & Trade Australia-India Council	$43,190	Professor David White, Associate Professor Susan Gourvenec, Assistant Professor Yinghui Tian, Professor Mark Randolph, Dr Chatterjee Santiram
Centrifuge modelling of chain-seabed interaction for the Browse development	WA Energy Research Alliance WAERA ex Shell Development Australia Pty Ltd	$90,000	Professor David White, Dr Conleth O'Loughlin
Experimental Testing – Pullout Resistance of Pipelines Buried in Rock	Technip UK Limited	$170,000	Professor David White, Dr Conleth O'Loughlin
Synergistic Hydrate Inhibition with MDEA for reduced MEG Circulation	WA Energy Research Alliance WAERA ex Chevron	$30,000	Professor Eric May, Associate Professor Zachary Aman
Improved Prediction and Management of Hydrate Plug Formation in Long-Distance Subsea Tiebacks: Probabilistic Hydrate Formation Risk	WA Energy Research Alliance WAERA ex Shell Development Australia Pty Ltd	$420,500	Professor Eric May, Associate Professor Zachary Aman
Hydrate Inhibition of a water Dominant System using Liquid Hydrocarbon Injection	WA Energy Research Alliance WAERA ex Chevron	$24,000	Professor Eric May, Associate Professor Zachary Aman
Drivers of Seagrass Decline in Cockburn and Warnbro Sounds	Department of Environment Regulation	$23,500	Professor Gary Kendrick
Circumventing demographic processes that limit seagrass restoration	ARC Linkage Projects	$370,000	Professor Gary Kendrick, Dr Kingsley Dixon, Professor Robert Orth
CMR Extension Projects Research Geographe Bay	CSIRO ex University of Tasmania ex Department of the Environment NERP	$52,300	Professor Gary Kendrick, Dr Renae Hovey
Scott Reef SUNTANS Hydrodynamic Modelling	Woodside Energy Ltd	$101,901	Professor Gregory Ivey, Dr Nicole Jones, Dr Matthew Rayson
MB Hub – Project D1 – Ecosystem Understanding to Support Sustainable Use, Management and Monitoring of Marine Assets in the North and North-west regions	University of Tasmania ex National Environmental Science Program NESP	$85,000	Professor Jessica Meeuwig, Dr Philippe Bouchet
STABLEpipe JIP Phase 3 – Scope for BMT to extract differential pressures across the pipe and bedshear for 3D runs including non-colinear cases	Western Australian Energy Research Alliance WAERA ex Woodside R2D3	$10,166	Professor Liang Cheng, Dr Scott Draper, Dr Hongwei An, Professor David White
STABLEpipe JIP Phase 3 – Collate Woodside Survey Data – Pluto Production and MEG Flowlines	Western Australian Energy Research Alliance WAERA ex Woodside R2D3	$39,491	Professor Liang Cheng, Dr Scott Draper, Dr Hongwei An, Professor David White
STABLEpipe JIP Phase 3 – Design Method Development – Method B and C	Western Australian Energy Research Alliance WAERA ex Woodside R2D3	$74,681	Professor Liang Cheng, Dr Scott Draper, Dr Hongwei An, Professor David White
STABLEpipe JIP Phase 3 – LOT Testing of Scour Initiation and Sedimentation Backfill	Western Australian Energy Research Alliance WAERA ex Woodside R2D3	$87,423	Professor Liang Cheng, Dr Scott Draper, Dr Hongwei An, Professor David White
Follow-on Funding for the Centre for Offshore Foundation Systems	Lloyds Register Group Ltd	$1,005,387	Professor Mark Cassidy, Dr Shiaohuey Chow, Dr Britta Bienen, Dr Conleth O'Loughlin, Dr Hugh Wolgamot
Validating the Isotropic Fractionator for use in Birds	University of Lethbridge	$19,012	Professor Shaun Collin
Ecosystem Change Ecology	CSIRO	$423,744	Professor Timothy Colmer, Professor Gary Kendrick
TOTAL		**$13,726,619**	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"International collaboration is vital for ensuring the sustainable use of our oceans. The UWA Oceans Institute has fostered strong partnerships with researchers from around the world, to help keep our oceans healthy for future generations."

ANDREA GLEESON, DIRECTOR WESTERN AUSTRALIA
STATE OFFICE OF THE DEPARTMENT OF FOREIGN AFFAIRS AND TRADE.

Publications

2015 Publications

Journal Articles

Adcock TAA, **Draper S** (2015) A note on the variation in shape of linear rogue waves in the ocean. *Underwater Technology* **33**(2): **75-80**

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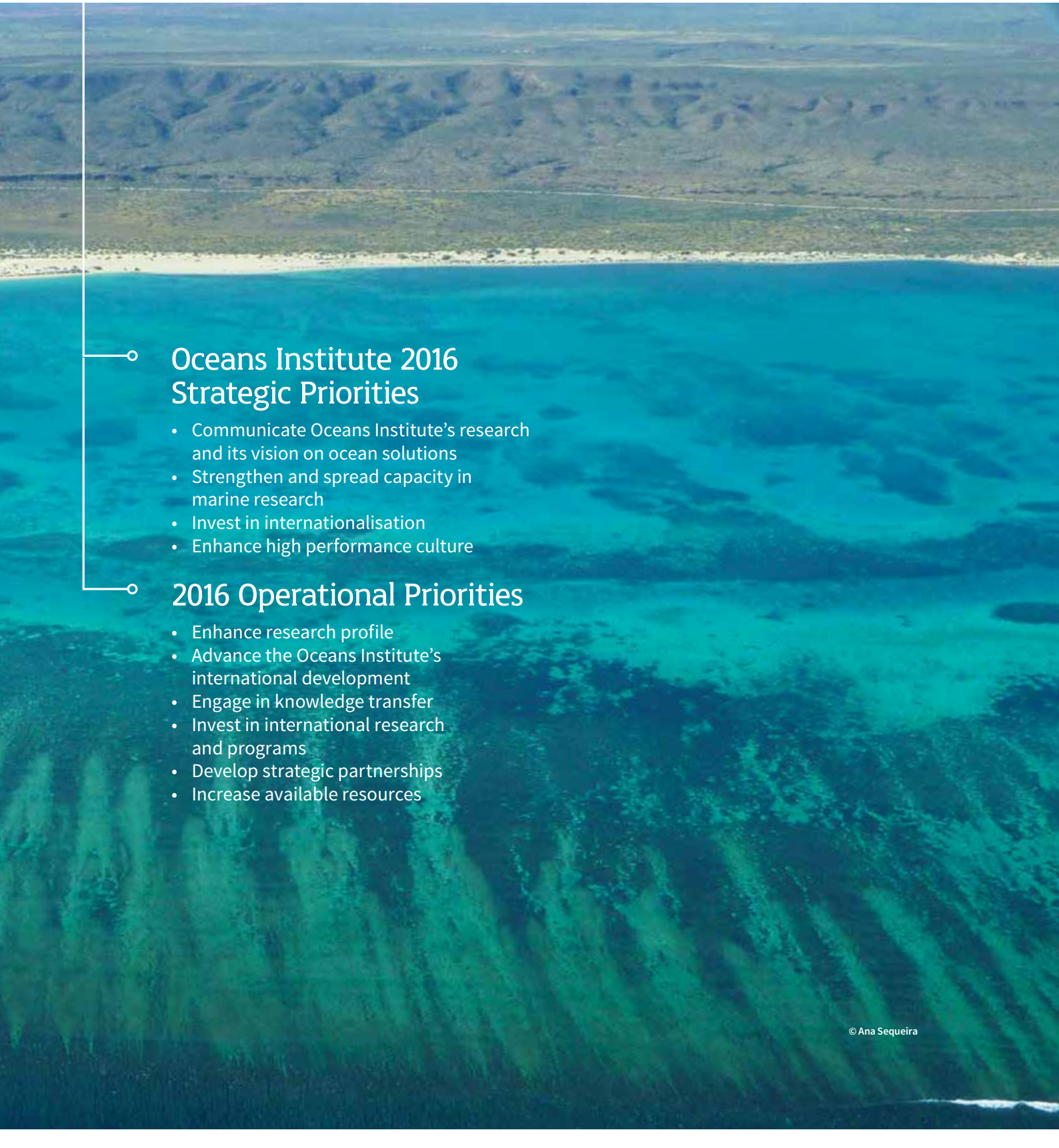
2016
Looking Forward

"Tackling the grand challenge of sustainable ocean use clearly requires a collaborative approach, where we can harness skills and expertise across a wide range of research disciplines. The IOMRC partnership, with its strong focus on the Indian Ocean, is just the collaborative model we need."

PROFESSOR PETER DAVIES,
UWA PRO VICE-CHANCELLOR (RESEARCH).



Oceans Institute 2016 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

2016 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

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