THE UNIVERSITY OF WESTERN AUSTRALIA

Oceans Institute
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In this issue

Five oceanic plastic garbage patches, but where is the missing plastic?

A recent paper published in the prestigious journal *Proceedings of the National Academy of Sciences* has reported on the initial estimate of the amount of plastic litter floating in the open ocean. This estimate was derived from the global Malaspina Circumnavigation Expedition led by UWA Oceans Institute's Director, Winthrop Professor Carlos M. Duarte.

General circulation models predict that plastic particles should accumulate in the central areas of the oceans, known as the subtropical gyres of the ocean. While there are five subtropical gyres across the entire ocean, only two of these in the northern hemisphere (the North Pacific and the North Atlantic), had been sampled for plastic litter before.

The Malaspina expedition found plastic litter to be scattered across the open ocean, with 88% of the samples collected containing plastic debris. This confirmed the belief that all five subtropical gyres accumulate similar concentrations of plastic litter, with the largest degree in the South Atlantic subtropical gyre.

Supporting plastic litter loads of about 200 to 600 grams per kilometre square, globally, these subtropical gyres represent an estimated load bracketed at between 6 and 35 thousand tons of plastic debris across the entire open ocean.

These results were surprising as the expected load[1] was 1 million tons, 100 times larger than the global load of plastic debris that was found in the open ocean.

This means that we cannot account for the fate of 99% of the plastic litter entering the open ocean, a disturbing realisation. UWA Oceans Institute researchers are now busy, with their partners, to find out the whereabouts of the missing plastic.

[1] *Based on the calculation that 0.1% of the global production of plastic reaches the ocean, half of which is buoyant and 2/3 of which reaches the open ocean.*

Director's welcome

The development of the Indian Ocean Marine Research Center (IOMRC) has broken ground with the commencement of two simultaneous construction projects that will form the foundations of the IOMRC. The IOMRC brings together the UWA Oceans Institute, AIMS, CSIRO and the Department of Fisheries, Western Australia to conduct marine research in the Indian Ocean, with a particular focus in generating the knowledge required to sustainably derive wealth from our oceans.

The development of the Indian Ocean Marine Research Center (IOMRC) has broken ground with the commencement of two simultaneous construction projects that will form the foundations of collaborative cross-disciplinary marine research. IOMRC brings together the UWA Oceans Institute, AIMS, CSIRO and the Western Australian Department of Fisheries to conduct marine research in the Indian Ocean, with a particular focus in generating the knowledge required to sustainably derive wealth from our oceans.

The IOMRC comprises of a six storey building on The University of Western Australia's Crawley campus hosting up to 240 researchers and the refurbishment of the Watermans Bay Marine Laboratory. This former headquarters of the WA Department of Fisheries is situated about 30 minutes north of the UWA campus and will be a state-of-the-art experimental facility designed to integrate scientific endeavour locally, nationally and internationally. In parallel to the physical construction of the IOMRC, the formation of a governance committee has activated the development of key strategic objectives for research. We also see these exciting developments in marine science as contributing to many of the State-based initiatives such as the development of local partnerships through the Western Australian Marine Science Institution (WAMSI).

As the IOMRC emerges as a globally significant contributor to marine research, our international network of collaborators continues to spread worldwide, particularly in the Indian Ocean rim countries and throughout Asia. The UWA Oceans Institute has forged strong partnerships in China, Malaysia, Saudi Arabia, and the US (particularly with Stanford University and the Woods Hole Oceanographic Institute) and discussions to provide expertise and help build capacity in Myanmar and Mauritius are ongoing. The global focus of the Oceans Institute is further actioned through partnership with AIMS, as secretariat for the upcoming biological component of the Global Ocean Observing System (GOOS) of the International Oceanographic Commission of the United Nations (IOC).

Through these actions, the UWA Oceans Institute is consolidating its national and international network of strategic partners and collaborators to share its vision of Ocean Solutions for Humanity's Grand Challenges.

New members

The OI is pleased to welcome the appointment of five new members to the Oceans Institute.

- **Zachary Aman**, Assistant Professor with the Faculty of Engineering, Computing and Mathematics
- **Dianne McLean**, Research Assistant Professor with the Oceans Institute and the School of Plant Biology
- **Sarah Percy**, Professor of Political Science and International Relations
- **Ming-Hao Zheng**, Associate Dean (International) with the Faculty of Medicine, Winthrop Professor and Director of Centre for Translational Orthopaedic Research at Sir Charles Gardner Hospital
- **Abbie Rogers**, Research Assistant with the School of Agricultural and Resource Economics

These new members will contribute to OI programs and initiatives through interdisciplinary marine-related research across traditional science, engineering, social and policy boundaries.


PHOTO: JOAN COSTA 2013

UWA teams with Stanford University to find global ocean solutions

Marine and water scientists are working with their counterparts at Stanford University under a new partnership between the institutions.

And the big winner out of the collaborations will be the environment.

Peter Davies, Pro Vice-Chancellor (Research) said he hoped the partnership would move toward answering some of the big sustainability questions around fresh and marine water.

"As one of the world's top 10 universities, we look to Stanford in a lot of ways: to see what they are doing that we could do. And they have learnt that the more you collaborate, the better linked you are and the higher ranking you will achieve," Winthrop Professor Davies said.

"With our goal to be a top 50 university by 2050, we can learn how they do things and share that real desire to collaborate outside our own country."

Five projects have been co-funded by the two institutions under the new Memorandum of Understanding. They involve nearly 20 UWA academics, including early career researchers, and almost the same number of PhD scholars, and slightly more researchers and students from Stanford.

The scheme is to build research partnerships that focus on finding solutions to freshwater and marine sustainability issues globally, but also to provide a stimulating international environment for the early career researchers and graduate students.

"Stanford is a similar size as us, with about 2,000 staff and 20,000 students," Professor Davies said. "So it makes an ideal partner for us."

At least one UWA staff member from each project will go to Stanford, and one from Stanford will come here.

"Like us, they are asking global questions and, through UWA, Stanford researchers get access to very different study sites from their own, including the Indian Ocean, one of the least studied oceans in the world," he said.

"The initial agreement with Stanford is for three years but Professor Davies hopes it becomes an ongoing partnership.

The first of the current projects is a study of ocean reef interaction and connectivity, involving a big UWA team that includes Winthrop Professor Greg Ivey from Civil, Environmental and Mining Engineering, and Winthrop Professor Malcolm McCulloch and Professor Ryan Lowe from the Oceans Institute (OI) and Earth and Environment.

Associate Professors Alex Gardner from the Law School and Anas Ghadouani, Director of the CRC for Water Sensitive Cities, are leading the UWA team in research into regional resilience in management of water resources and services in the face of climate change.

Professor Ghadouani is also involved in looking at managing the emerging threat of algal toxins from harmful algal blooms.

An ocean observation project the will develop a concept for monitoring a global network of marine protected areas is led by Professor Jessica Meeuwig from the OI and Animal Biology.

And Professor Alistair Paterson in Archaeology is collaborating in a case study in Mauritius to help safeguard fragile lagoons.

The projects are underway for a total of just under $145,000.

UWA KELP RESEARCHERS THOMAS AND THIBAUT WITH THE FRENCH DIVE TEAM (FROM LEFT TO RIGHT): LAURENT LÉVÊQUE, THOMAS WERNBERG, MATHIEU CAMUSAT, YANN FONTANA, JEAN-CHARLES LECLERC AND THIBAUT DE BETTIGNIES (PHOTO BY DOMINIQUE DAVOULT). IN THE BACKGROUND ARE TWO COMMERCIAL KELP TRAWLERS.

Oceans Institute LINKs with Europe for kelp research

OI researchers recently returned from three months in Western Europe, leading a new campaign connecting research on kelp ecophysiology across continents. Associate Professor Thomas Wernberg and Dr Thibaut de Bettignies have taken on a field campaign, investigating the impacts of climate change on kelp across the northern and southern hemispheres. Fostering strong links with their European counterparts, Professor Wernberg and Dr de Bettignies explored links in kelp research between world leading marine research institutions.

In Australia and Europe, kelps (large brown seaweeds) are ecologically and economically important. They sustain vast biodiversity and commercial fisheries and are often harvested for human use. However, kelps are highly temperature-sensitive and declines in local kelp populations have already been linked to increasing seawater temperatures in both hemispheres.

Professor Wernberg and Dr de Bettignies, from UWA's School of Plant Biology, have taken on this field campaign in Europe to LINK (Latitudinal and Inter-hemispherical Network in Kelp ecophysiology) research into kelps and climate change across the continents.

The trip was a three month immersion into kelp forest physiology, ecology and biogeography in close collaboration with experts from CIIMAR (University of Porto, Portugal), the Marine Biological Station at Roscoff (University Paris VI, France) and the Norwegian Water Research Institute (Norway).

Thomas and Thibaut performed numerous dives to undertake experiments in the cold-temperate European waters. With water temperatures as low as 5°C, the use of dry-suits was an absolute necessity. Not only did Thomas and Thibaut have a successful trip with great research outcomes, they also established strong professional friendships within their colleagues in Europe.

"This trip has been incredibly fun and rewarding, but we have also learnt a lot about similarities and differences between European and Australian kelp forests, and this experience has only raised more questions we now want to pursue with our new collaborators," said Thibaut.

This collaboration was supported by a UWA Research Collaboration Award, the France-Australia Science Innovation Collaboration (FASIC) 2014 program and the Australian Research Council.

KELP FOREST OF *LAMINARIA HYPERBOREA* NEAR THE ISLAND OF FINNØY ON THE WEST COAST OF NORWAY.

Coral's durability to acidification examined

ScienceNetwork
WESTERN AUSTRALIA

By Geoff Vivian

An international team of coral biologists has been examining coral's ability to colonise new substrates and repair damaged reefs as oceans become more acidic.

UWA post-doctoral fellow Michael Holcomb says it would tend to be more difficult for new larvae to establish themselves, fragments of coral to bond to new substrates, and damaged coral to regrow.

"It's important to understand how they control their internal environment where calcification actually occurs," he says.

"The study was intended to evaluate how well they are able to control the internal pH in different locations where they calcify."

They studied the branching coral Stylophora pistillata which is endemic to the Indian and west Pacific Oceans.

Dr Holcomb says they examined several locations within the coral itself, from its outer edge as it grows over new substrate to its apical growing region.

They found the coral, once established, is able to control its own pH levels. "Where there's a thick tissue layer, the coral's better able to control the pH in that environment and also the calcification rate is less affected by acidification," he says.

"Whereas in the new growth forming over substrate they are less able to control the pH in this environment, it's more strongly affected by the external environment and calcification responds similarly."

pH levels based on proton pumping

He says coral's ability to regulate pH levels is thought to be based on proton pumping.

"They're pumping protons out of the calcifying environment to elevate the pH… in that internal environment," he says. The team grew corals at the Centre Scientifique de Monaco, where Dr Holcomb had previously worked.

"They were grown for a few months on glass slides under a range of CO_2 levels ranging from ambient conditions to about 10 times ambient CO_2 levels," he says.

"Then we sampled the skeleton, a couple different sites, and then estimated pH by using a technique based on boron measurements."

Dr Holcomb says using the facilities of both institutions enabled them to subject the same samples to boron measurement at UWA and physiological measurement at the Monaco-based centre. He says increasing oceanic acidity, concurrent with rising atmospheric CO_2 levels, could prove challenging for corals.

"There are certain stages of growth which are likely more sensitive to acidification—namely things like the larvae and their initial colonisation of the substrate," he says.

"It's going to affect more their ability to compete with other organisms if they're less able to isolate that substrate."

Notes: The paper Coral calcifying fluid pH dictates response to ocean acidification has been joint project of The UWA Oceans Institute and School of Earth and Environment, ARC Centre of Excellence in Coral Reef Studies, and Centre Scientifique de Monaco.

Australian Coastal Ocean Radar Network

The University of Western Australia has recently expanded its Australian Coastal Ocean Radar Network with a High Frequency (HF) Radar System.

The Australian Coastal Ocean Radar Network, also part of IMOS, is responsible for the operation and maintenance of shore based HF Radar Systems for near-real time mapping of surface currents, waves and wind direction at six sites around Australia. These include locations at the Great Barrier Reef, Coffs Harbour, the Bonnie Coast Kangaroo Island, and the Rottnest Shelf and Turquoise Coast in Western Australia. The stations include two main types of ocean surface radars that are being used around the world: the Phased Array genre (WERA), and the Amplitude Direction Finding genre (CODAR SeaSonde).

HF Radar Systems use shore based high frequency radio waves (between 4 and 50 MHz) to measure the surface currents in the coastal ocean. Radar antennas, which are typically in pairs, are positioned on the shore and measure surface currents (the top 1-2 m of the water column) up to 200 kilometres away with resolutions ranging from 4 to 6 kilometres.

The HF Radar is the only system that can provide synoptic measurements of surface currents providing information required to undertake scientific research, operational environmental monitoring, vessel traffic and harbour management. It can also be a tool for emergency services such as search and rescue and oil spill monitoring.

Dutch company takes on board UWA-designed anchor

An innovative offshore anchor designed by researchers at UWA has already been snapped up by Dutch anchor specialists Vryhof Anchors.

The Dynamically Embedded Plate Anchor (DEPLA) was developed by Associate Professor Conleth O'Loughlin, from UWA's Centre for Offshore Foundation Systems (COFS), and Dr Mark Richardson, a former PhD student at COFS.

The new anchor design, aimed at mobile drilling units and floating production systems in deep and ultra-deep water, would reduce installation time, costs and materials, Associate Professor O'Loughlin said.

Associate Professor O'Loughlin, who has been researching dynamically installed anchors for the past 10 years, said the anchor was a hybrid system able to sustain significant vertical load and required no external energy source or mechanical operation for installation.

"The anchor resembles a dart, and is installed using gravity, similar to other dynamically installed anchors such as the torpedo pile," he said.

"However the main part of the 'dart', which we call the follower, is removed after the anchor is embedded in the seabed and re-used for the next installation. This leaves the anchor flukes in the seabed, which then become the plate anchor."

Associate Professor O'Loughlin said global energy company Petrobras had been using a gravity-embedded design since the mid-1990s.

"But the rest of the world has been slow to follow," he said. "However, one of the limitations of the Petrobras design is that it is not the most efficient – it doesn't have a lot of capacity relative to its weight.

"The DEPLA boasts all the installation advantages of the torpedo pile, but is much more efficient at resisting load, meaning that much smaller and cheaper units can be used for mooring offshore facilities. Being able to re-use the follower is a significant bonus."

Vryhof project director Senol Ozmutlu said results indicated the DEPLA exhibited similar behaviour to other dynamically installed anchors during installation, but with much higher capacities and predictability than other dynamically installed anchors that resisted load in friction.

The DEPLA has been tested at model scale in the geotechnical centrifuge facilities at COFS. In these experiments, soil samples are spun at up to 200 times Earth's gravity, creating stress conditions in the centrifuge sample that are equivalent to tens of metres of the seabed.

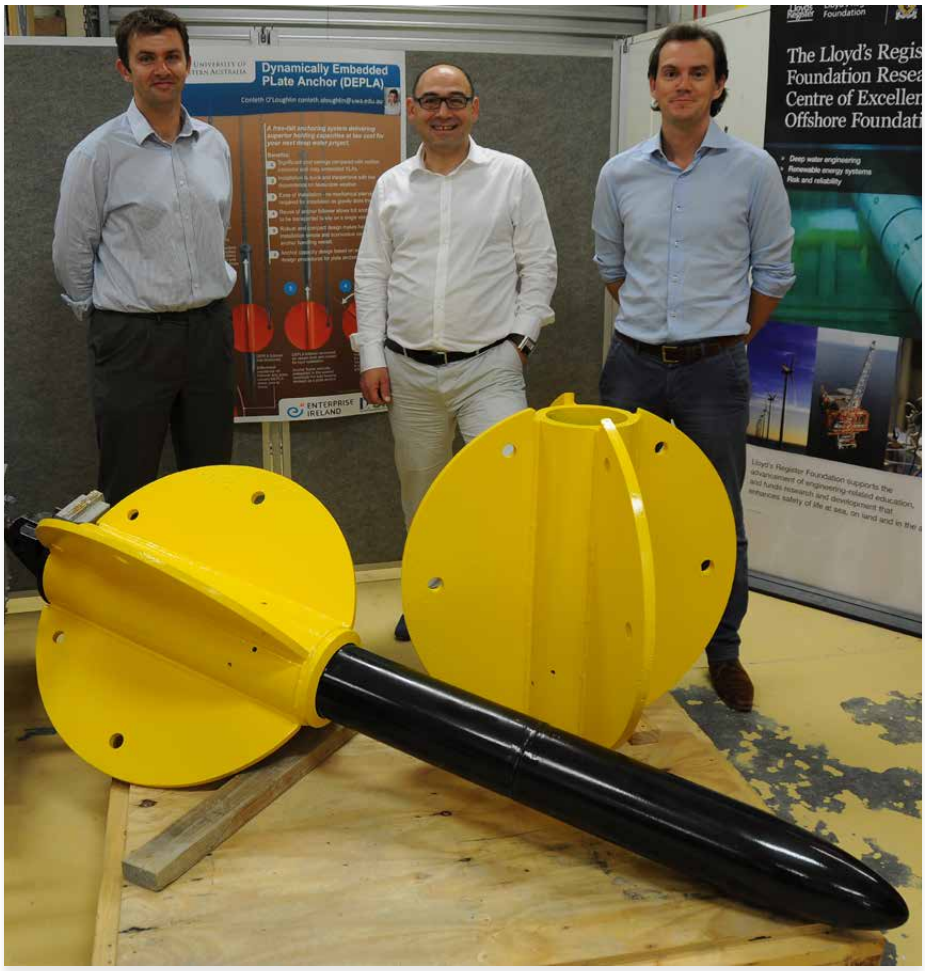
The DEPLA was put through its paces in these tests, with the centrifuge data playing a pivotal role in informing the final design concept. This is now a well-accepted approach for obtaining performance data of geotechnical systems and COFS is a world leader, with both beam and drum centrifuge facilities that are heavily utilised by the offshore industry worldwide.

Vryhof's Business Development Director Leo Bello said the company was extremely happy with the new anchor.

"It will give us a reliable product for ultra-deep water uses that will help our clients reduce their overall mooring cost," Mr Bello said. "The DEPLA combines the advantages of dynamically installed anchors and vertically loaded anchors and is fully patented."

The DEPLA has been extensively tested at a quarter scale and it will be now Vryhof's task to engineer and test a full-scale prototype.

"Vryhof was the ideal industry partner to continue development of the DEPLA and we look forward to assisting them in making it a real prospect for the offshore industry," Associate Professor O'Loughlin said.



CONLETH O'LOUGHLIN (COFS), SENOL ÖZMUTLU (VRYHOF) AND JORIS ROOZEN (VRYHOF) WITH THE DEPLA ANCHOR.

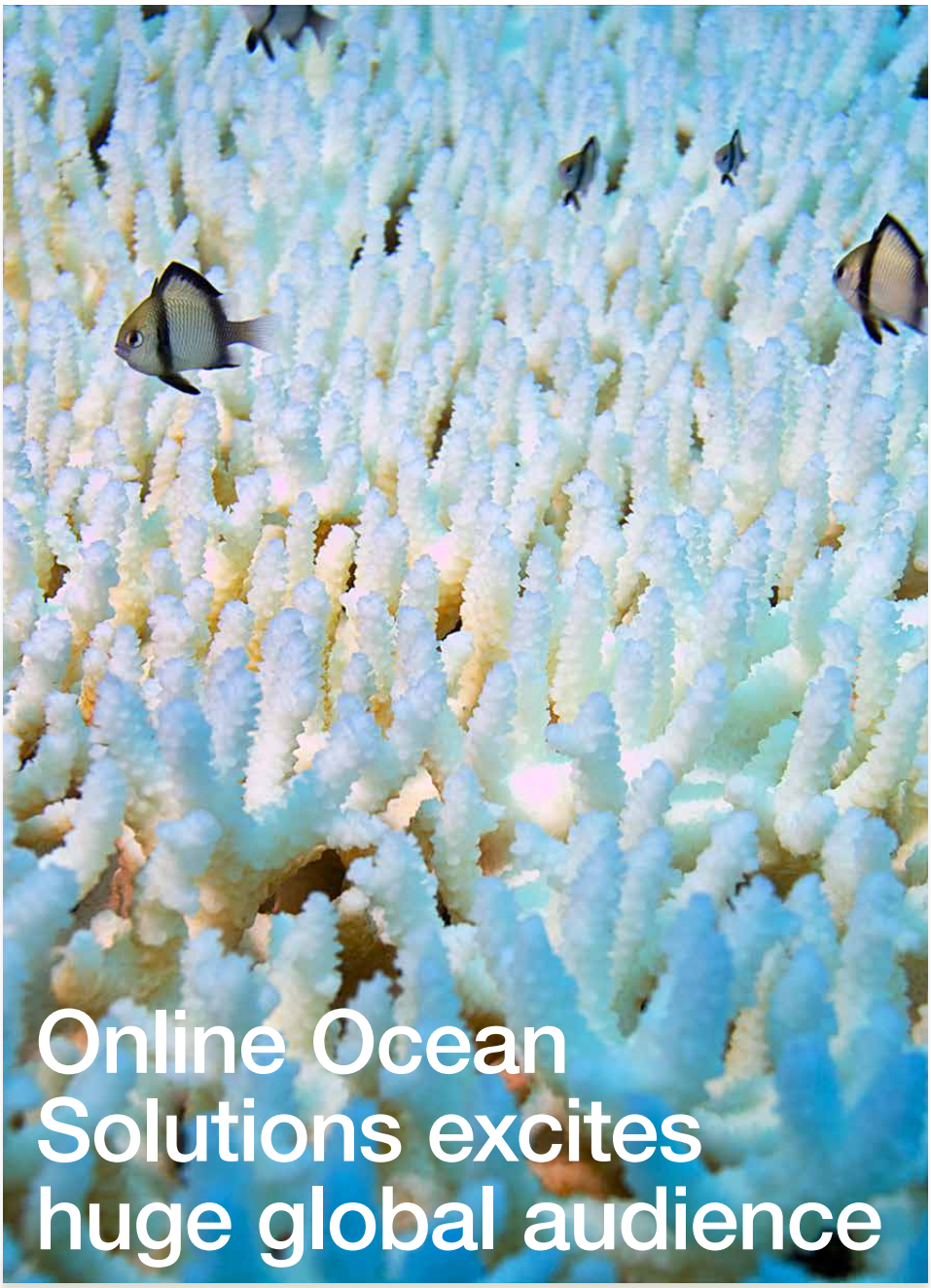
Law, Policy and Multi-Disciplinarity in Shark Conservation and Management

Winthrop Professor Erika Techera, Dean of the UWA Faculty of Law and OI member, has recently returned from the *Sharks International* conference in Durban, South Africa, where she presented on shark conservation and management, highlighting the need to harmonise governance approaches.

Presenting on the need for more sophisticated legal frameworks that address gaps and inconsistencies in the law, Professor Techera called for input from a greater range of disciplines in developing new laws and policies. In particular, Professor Techera drew attention to the ways in which science informs law and policy, and how technology can be utilised to greater effect.

Professor Techera has also recently published an edited book with Professor Natalie Klein, Dean of Macquarie Law School, which emphasises the need for new approaches that move past traditional, disciplinary boundaries.

Sharks: Conservation, Governance and Management (Routledge 2014) draws upon a variety of fields including environmentalism, tourism, economics, social sciences, fisheries, environmental management, marine biology, and ecology and includes a chapter by two other OI members (Winthrop Professor Shaun Collin and Dr Ryan Kempster). The book is one output of an ARC Discovery Grant held by Professors Techera and Klein to explore ways in which the international governance of sharks can be enhanced.



Online Ocean Solutions excites huge global audience

'Ocean Solutions', the massive open online course (MOOC) offered by UWA, was run over eight weeks in May and June to an audience of over 10,000 Coursera learners worldwide.

The course, developed by OI Director, Winthrop Professor Carlos Duarte and co-author Aisling Fontanini, taught students about the role of the oceans in confronting humanity's grand challenges.

Each week included a lecture with Professor Duarte and interviews with guest experts discussing the sustainable use of the oceans to relieve the pressures on food, water and energy supplies, without threatening biodiversity or contributing to global climate change. Students participated in an online discussion forum and enjoyed the complementary twitter feed (#oceansolutions) while over 94% of students rated the course as 'Good' to 'Excellent' upon completion.

This marks the third occasion the Oceans Solutions MOOC has been offered, with numbers increasing substantially each series from a largely international audience.

The Oceans Institute continues to explore new opportunities to engage national and international audiences and broadly promote its research activities through teaching and training based on research outcomes.

OI Director presents to London Alumni on Ocean Solutions

OI Director, Winthrop Professor Carlos Duarte travelled to London in July to present on the role of the ocean in overcoming humanity's grand challenges.

Professor Duarte was the guest speaker at the annual Distinguished Alumni Speaker Series event, attended by prominent alumni together with academics from leading European universities.

The Distinguished Alumni Speaker series is a forum coordinated by The Friends of UWA in UK and Europe, an alumni group that started in 2007. The aim is to create a vibrant UWA alumni community in the UK, facilitating the engagement of alumni with each other and with the University.

"Professor Duarte gave an optimistic and inspiring address. He emphasised that to enable our planet to sustain its population we need to recognise the key role the ocean must play in our future and act now," said David McKinlay, Chairman of UWA's UK Alumni Association (Friends of UWA in UK and Europe).

The Oceans Institute continues to work to promote ocean-based solutions to national and international audiences.

ELIZABETH FELLS AND PROFESSOR CARLOS DUARTE

Growing our Oceans Community

The OI's 2nd Oceans Community is scheduled for late October and everyone is encouraged to attend. Set in the iconic WA Maritime Museum in Fremantle, Oceans Community is an event designed for the Perth community to better understand marine issues in Western Australia.

The inaugural Oceans Community in 2013 was a great success, attracting a large audience of over 180 people, including the Chief Scientist of WA. The event was created together with the Institute of Advanced Studies to engage with the wider community about how to contribute in some way to the marine environment.

The theme of this year's event is 'Deep Ocean', which will be explored in a range of talks, highlighting the importance of exploring the largest habitat on earth.

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

In his lecture, Dr Madin will present some of the tools and techniques for modern exploration that have been developed at the Woods Hole Oceanographic Institution, including a recent expedition to the deep ocean trenches.

He will also look ahead to the future of ocean discovery that new robotic technologies will make possible in the coming decades.

Additionally, three sharp and stimulating talks from UWA presenters will cover a range of topics relating to their research in the deep ocean, including 3D modeling of shipwrecks, deep-sea exploration and its challenges and bioluminescence and life in the deep-sea.

Oceans Community is open to anyone with an interest in the Western Australian marine environment and the 'Deep Ocean'.

Oceans Community: 'Deep Ocean'

Saturday 25 October 2014
2.00–4.00pm
WA Maritime Museum
Fremantle
RSVP required: https://oceans2014.eventbrite.com.au/

Marine protected areas lecturer shares insights

Renowned lecturer, Dr Peter Jones from University College London, was welcomed to UWA in July to deliver a public lecture on 'Making Marine Protected Areas more effective: Resilience through Diversity'.

Dr Jones has spent more than 20 years researching the governance of human uses of marine resources with a focus on marine protected areas and spatial planning.

The lecture was organised by the Institute of Advanced Studies who, together with the Oceans Institute, supported Dr Jones first visit to Perth, and saw him also deliver a seminar on natural resource governance.

In his lecture, Dr Jones explored the results of a range of case studies on marine protected areas around the globe to examine their effectiveness in achieving conservation objectives. The results found too few marine protected areas are achieving their objectives and the key to their resilience must be diversity, both of species in ecosystems and incentives in governance systems. Dr Jones concluded with an unexpected statement. The marine protected area ranked most effective was that of Chube in Tanzania, a privately implemented reserve and also the smallest of the areas studied.

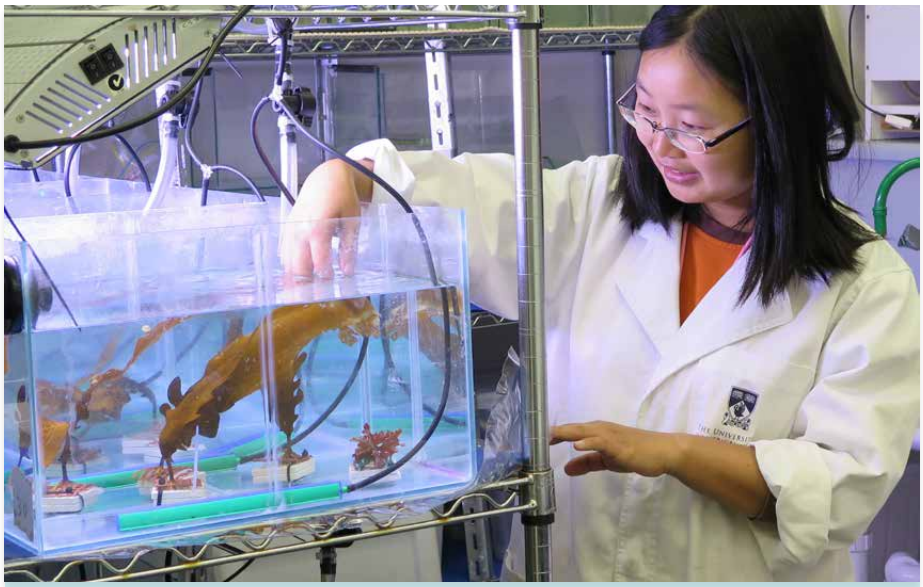
DR PETER JONES AND PROFESSOR JULIAN CLIFTON

Living and working underwater

A lecture on 'Living and Working Underwater: The Aquarius Reef Base underwater laboratory and residence' and a masterclass on 'Blue Carbon' created great interest around the Oceans Institute in August. Professor James W. Fourqurean, Director of the Marine Education and Research Initiative at Florida International University, delivered both talks at UWA to large audiences.

Professor Fourqurean described his first-hand experience working as Principal Investigator in Aquarius, the underwater laboratory made to withstand the pressure of ocean depths up to 40 meters deep. The talk provided a descriptive tour of Aquarius and her capabilities, and highlighted the research advancements and exciting training missions conducted in the past few years.

Professor Fourqurean was a 2014 Institute of Advanced Studies Professor-at-Large, whose professorship was supported by OI member and Winthrop Professor Gary Kendrick and OI Director Winthrop Professor Carlos Duarte.



DR XIAO XI

Welcome to the OI Xiao Xi

We are very pleased to welcome visiting researcher Dr Xiao Xi from Zhejiang University, China to the Oceans Institute.

Xiao is halfway through her six month visit to the Oceans Institute, working with Winthrop Professor Carlos Duarte, Professor Susana Agusti, Assistant Professor Thomas Wernberg, Dr Ylva Olsen on a project investigating the joint impacts of UV radiation and temperature on south West Australian seaweed species vulnerable to climate change.

A complex aquarium system was created for this project that can investigate the physiological responses of seaweed to different temperature gradients and UV radiations. Xiao says, "the Oceans Institute is a wonderful platform, there is now a foundation for future work using this system"

Xiao is the first researcher from Zhejiang to visit the Oceans Institute and envisages a long-term collaboration between the two universities on a joint, large-scale seaweed farm project that will attempt to remove nutrients and fixed carbon dioxide from the air to restore the coastal environment. Winthrop Professor Carlos Duarte and Professor Jiaping Wu from Zheijang University will be the Principal Investigators responsible for cultivating this collaborative research.

DR RYAN KEMPSTER AND CHANNING EGEBERG WITH YEAR 5 STUDENTS FROM ST STEPHENS

School visit inspires new generation of shark experts

Marine Neuroecologist, Dr Ryan Kempster and Channing Egeberg from the School of Animal Biology encouraged a new generation of future marine scientists in a presentation to primary students at St Stephens School, Duncraig in late August.

Ryan and Channing are one of a number of contributors from the Oceans Institute participating in the program, *Help to Grow the Next Generation of Scientists*, which communicates science to primary school students. Coordinated by OI Artist in Residence Angela Rossen, the purpose of this initiative is to engage students with marine and coastal science and conservation.

An animated presentation on shark research and conservation enthralled the year five students. Angela Rossen remarked, "Ryan and Channing gave a wonderful talk to the students at St Stephens School. The students were completely riveted by their wonderful delivery with photos and short videos. When the bell went for the end of school day no one wanted to leave and the questions just kept coming."

In late August, the first briefing session for the school outreach program was held at the OI. The briefing was well attended and saw many OI researchers express an interest in sharing their research projects with primary school students. Postgraduate students and researchers at the OI are encouraged to be part of this initiative to connect children to the methods and aims of science.

OI success in Research Collaboration Awards

Well done to OI members Winthrop Professor Shaun Collin, Associate Professor Matthew Hipsey, Assistant Professor Nicole Jones, Professor Ryan Lowe, and Associate Professor Thomas Wernberg for their successful applications in the 2015 Research Collaboration Awards.

The Research Collaboration Awards are internal to UWA and are designed to support UWA's research initiatives and expand its research collaborations. Improving linkages with other institutions, the Awards provide increased opportunities for publishing, grants, and training.

The OI members' research will range from the study of *Anatomical proxies for cognitive abilities in vertebrates* to a project examining *Marine heat waves-global patterns of impacts and risks*. Other projects from the School of Earth and Environment will investigate internal tides and complex coastlines, all characteristic of the OI's major research themes.

These projects will further expand the University's research partnerships nationally and worldwide.

PHOTO: JOAN COSTA

Poking and prodding penguins: What have we learnt?

Dr Belinda Cannell, Research Associate at the Oceans Institute and School of Animal Biology, was recently invited to speak about penguin ecology at the Clive Deverall Society Lunch, in early August. An audience of 125 guests listened to Belinda speak avidly about her research projects in a great display of community outreach.

DAVID CONSTANTINE (GENERAL MANAGER, PARMELIA HILTON PERTH), CEO SUSAN ROONEY AND PETER HOLLAND (EX TV PRESENTER).

The Clive Deverall Society Lunch is an annual event hosted by the Cancer Council, for members who have donated money to the charity.

Belinda spoke about the penguin population research projects she has been involved in over the past 24 years and the knowledge that has been gained about penguin ecology and threats to the Western Australian colonies on Penguin and Garden Islands.

The Cancer Council commented that they received a fantastic response from their members about Belinda's presentation. Forums such as these, for organisations like The Cancer Council, are an important means for UWA researchers to connect with the broader community on research outcomes.

Rising sea levels leave our coasts under pressure

OI member, Winthrop Professor Chari Pattiaratchi and OI Director Winthrop Professor Carlos Duarte, have seen their research on rising sea levels and the impacts to our coasts featured in recent weeks.

Professor Chari Pattiaratchi's new research, with a team of 27 international scientists, was published in the journal *Nature Climate Change*. The team reviewed 24 years of climate change assessments focusing on climate change and sea-level rise impacts in the coastal zone, and examined ways of how to better manage and cope with climate change.

Professor Pattiaratchi said the most important finding of the study was that to better understand climate change and its impacts, scientists needed to adopt an integrated approach into how coasts were changing. "This involves recognising other causes of change, such as constructions on the coast, population growth, economic development and changes in biodiversity," he said.

Professor Duarte recently appeared on ABC's Catalyst program predicting the rise of sea levels and the impacts this will have on Australian cities. As most Australian cities have been built in areas that were historically mangrove forests or salt marshes they are areas that can be easily flooded. Worldwide, governments need to assess the cost of moving cities and infrastructure inland, he advised.

Professor Duarte ended the Catalyst program with an ominous portrayal, "whether we are persuaded by the solid weight of scientific evidence around climate change, or whether we remain sceptical, it doesn't matter, our houses will be flooded."

The program is available to view at the ABC Catalyst website. **www.abc.net.au/catalyst/stories/4045476.htm**

PHOTO: JOAN COSTA

Marine Environmental Management Course

In October 2014 the Oceans Institute will host the inaugural Marine Environmental Management Course, a professional development program in marine studies, in Western Australia.

The course supports the needs of industries to participate in effective marine environmental management and improve understanding about the local context of the marine environment, along with its distinct social environments and governance.

Delivered by internationally recognised leaders, The Woods Hole Oceanographic Institution, and the Indian Ocean Marine Research Partners – AIMS, CSIRO, WA Department of Fisheries, and UWA Oceans Institute, the Marine Environmental Management Course is suited to government and industry professionals from a broad range of backgrounds.

The Marine Environmental Management Course will be run in two modules:

- Module 1: Marine Environments and Ecosystems of Western Australia (2 days)
- Module 2: Marine Environmental Management: Processes and Challenges (3 days)

Please see the Ocean's Institute website for registration details. **www.oceans.uwa.edu.au/jobs-and-training/marine-environmental-management-course2**

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