OI scientists play a key role in Malaspina Expedition

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UWA Oceans Institute scientists are playing a key role one of the world’s largest scientific collaborations.

The Malaspina Circumnavigation Expedition is the $23 million (€17 million) world-wide ocean research project involving more than 400 scientists from 10 countries, including researchers from UWA Oceans Institute and the CSIRO.

Scientists involved in the voyage arrived in Fremantle in March on board the Spanish naval vessel Hesperides. The vessel had sailed from Cape Town as part of its voyage investigating global change and ocean biodiversity.

The researchers announced the findings of the Indian Ocean leg of their voyage at a media conference aboard the Hesperides arranged by UWA Oceans Institute.

Professor Carlos Duarte, the head of the Malaspina expedition and the newly appointed Director of the UWA Oceans Institute (see Page 2), and colleagues announced the findings arising from the Indian Ocean leg of the voyage.

He said monitoring had showed that the Indian Ocean has the ability to absorb three times as much atmospheric nitrogen as the Atlantic Ocean does and, as a result, can play a crucial climate role as a huge, offshore carbon sink.

While crossing the Indian Ocean, the Malaspina scientists collected around 4,000 ocean samples, from as deep as 4,000 metres. Their work involved:

- Recording greenhouse gas concentrations in the water
- Investigating the levels of persistent organic pollutants

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Appointment puts OI ‘at forefront of global oceans research’

The University of Western Australia has appointed renowned oceans researcher Professor Carlos Duarte as Director of the Oceans Institute.

Professor Duarte is currently leading the Malaspina 2010 Expedition, a Spanish circumnavigation expedition that is sailing the world’s oceans to examine the impacts of global change on ocean ecosystems and explore their biodiversity.

Professor Duarte is one of the world’s foremost oceans researchers. He is currently the head of the Department of Global Change Research at the Mediterranean Institute for Advanced Studies (IMEDEA) in Mallorca, Spain.

His research focuses on understanding the effects of global change in aquatic ecosystems, both marine and freshwater. He has conducted research across Europe, South-East Asia, Cuba, México, USA, Australia, the Amazonia, the Arctic, and the Southern, Atlantic, Indian and Pacific oceans.

Professor Alan Robson, Vice-Chancellor of The University of Western Australia, said Professor Duarte’s academic excellence and renown would help to place the Oceans Institute at the forefront of global oceans research.

“The state of our oceans is fundamental to human survival and holds many of the key indicators of the impact of climate change. Our Oceans Institute has a wealth of research expertise that will ensure UWA plays a crucial role in measuring and communicating ocean impacts worldwide, but particularly within the Indian Ocean region. The Institute’s work also influences the development of marine and maritime policy.”

As well as the Malaspina expedition, Professor Duarte is also involved in several other international research projects.

He is co-leader of a large EU-funded project on Arctic Tipping Points. He is also working closely with the United Nations (the United Nations Environment Programme and FAO) and the World Bank to develop strategies to increase the sustainable production of marine aquaculture, as well as the restoration and conservation of coastal habitats to mitigate climate change and protect coastlines.

‘We must take the extra step’

I am excited to write my first welcome for OI newsletter readers as Director of the UWA Oceans Institute. I would like to use this opportunity to highlight the vision of the Institute, which is ‘to deliver ocean solutions for humanity’s grand challenges’.

As outlined on Page 4, these challenges derive from the depletion of natural resources, including water, land, food, energy and minerals, as the world’s population is expected to soar to 9,000 million by the year 2050. The massive use of resources by humans is impacting upon the fundamental processes that govern the functioning of the biosphere and, therefore, compromising the planet’s capacity to continue to deliver these resources on which our quality of life so closely depends.

Raising awareness on these bleak prospects is necessary, but it is certainly not sufficient. We must take the extra step to generate the knowledge necessary to provide solutions that will help build a brighter future for humanity.

At the UWA Oceans Institute, we seek to provide ocean-based solutions for humanity’s grand challenges. We will do so by integrating knowledge across a team that encompasses a broad range of expertise from marine sciences and technology to social sciences and governance.

Our vision and interdisciplinary approach will best allow us to align our capacity with the needs of government and industry to use groundbreaking research to help solve the problems that society experiences.

Professor Carlos M. Duarte
Director
With funding arrangements confirmed and the project architect appointed, the Indian Ocean Marine Research Centre (IOMRC) is moving into the design phase, with staff playing a key role in having input into the project.

There are two elements to this $63 million project – the $52 million development of the IOMRC on the UWA Crawley Campus and the $11 million upgrade to the Watermans Marine Research Facility at Watermans Bay.

The Centre will link the key partners – UWA, CSIRO, AIMS and the Department of Fisheries WA – with other bodies including the Federal funding partner the Department of Innovation, Science, Industry and Research; Stanford University; and The University of Southampton.

At a briefing on March 28, Pro Vice-Chancellor Professor Alistar Robertson outlined the vision to make the Centre a global marine research resource. Members of the IOMRC project design group also facilitated a discussion of the project’s functional requirements such as equipment and storage facilities.

The intention is that the design of the laboratories should be as flexible in use as possible; that staff will generally be grouped by discipline rather than organisation; that there will be as much shared space as possible for meeting, seminar and tea rooms; and that most postdoctoral staff and postgraduate students will be accommodated in open-plan settings.

A central aspect of the IOMRC project is that staff provide input addressing how the Centre can operate most effectively in order to fulfill all of its visions for the future.

To keep up to date with the project, visit:

www.uwa.edu.au/campusplanning/projects and
UWA Oceans Institute is poised to play a role in helping provide solutions to some of the world’s most pressing problems, including how to feed the nine billion people estimated to be on the planet by 2050.

That was one of the points raised at an industry forum organised by the Institute in early March.

The forum gave the newly-appointed Director of UWA Oceans Institute, Professor Carlos Duarte, an opportunity to outline his vision for the Oceans Institute.

“The motto of UWA Oceans Institute is that we want to provide oceans solutions for humanity’s grand challenges,” Professor Duarte said.

“The main goal of this industry forum today is to see how we can best align this vision with the needs of industry and the needs of the society of Western Australia and even beyond in the Indian Ocean,”

Professor Duarte said some of the grand challenges facing humanity include:

• Food and water security
• Clean energy
• Healthy ecosystems delivering services and goods
• Developing systems of ocean governance and space planning, and
• Capacity building.

To emphasise the enormity of such challenges, he quoted a recent report by The Economist magazine which posed the ‘nine billion people question’: how to feed the world’s population which was estimated to grow to more than nine billion people by 2050.

He pointed out that the magazine, like many people, did not realise the role our oceans could play in providing solutions.

“This is the only planet that is largely covered by an ocean, and we live our lives with our backs to the ocean. We do not ‘see’ the ocean even though it is really in front of us,” Prof. Duarte said.

“We have huge resources on land, but the oceans have the potential to deliver resources to supply the needs of these estimated nine billion people – if we are intelligent in the ways we can use the oceans to deliver these resources and we do not commit the same mistakes that we’ve made in extracting resources from land, and that have brought us largely to the situation we have today in facing famine in different parts of the world, water insecurity and insecurity in food supply.”

Professor Duarte said his vision for the Oceans Institute involved using its...
Seagrass research sheds light on Shark Bay’s food web

Professor James Fourqurean has studied marine systems half a world away – in the waters of southern Florida and the Caribbean, Bermuda and the Mediterranean.

But his current research brings him to the Oceans Institute and the vast seagrass meadows of Shark Bay.

Professor Fourqurean is a biogeochemist and marine ecologist from Florida International University (FIU).

Along with Dr Michael Heithaus, also from FIU, he is investigating how a fear of sharks can affect where turtles and other herbivores choose to feed and how these decisions, in turn, affect the seagrass community.

“We know that when sharks are in the bay, turtles avoid the high quality seagrass beds where they’d like to be feeding,” Prof. Fourqurean says.

“The sharks are in fact protecting seagrasses from these herbivores.”

Prof. Fourqurean is also involved in the UN-sanctioned Blue Carbon initiative which is investigating the use of marine locations as carbon sinks.

“We’re looking at the viability of a market for carbon stored in coastal zones like mangroves, seagrass beds and saltmarshes,” he says.

In late March, Prof. Fourqurean put his Blue Carbon expertise to use in a ‘Caring for our Country’ project at Shark Bay that involves the CSIRO and Winthrop Professors Gary Kendrick and Di Walker.

“We’re interested in climate change and how it’s going to affect the World Heritage values of the Shark Bay region,” he explains.

Prof. Fourqurean is visiting the Oceans Institute through UWA’s Gledden Fellowship and as a 2011 Australian National Network in Marine Science Visiting Scholar.

expertise to work with industry and other stakeholders to come up with innovative and sustainable solutions.

“What we need to do is move from excellence in ocean science and technology, which is something UWA already has, to take this extra step from international excellence to delivering solutions,” he said.

“We cannot really do that by working in isolation on marine technology, or marine sciences, or the laws of the sea. We have to integrate and connect all of these. And this is what the Oceans Institute is designed to do.”

He said potential solutions to be worked on could include:

- Marine energy sources (such as wind, thermal and wave power) and ‘blue’ bio-diesel
- Aquaculture and marine food production
- Marine-based solutions to climate change and mitigation
- The use of marine resources to offset the climate impacts of carbon dioxide
- More sustainable desalination technologies
- Marine genetic bio-resources for food, bio-medical and energy purposes.

The forum also heard from two Oceans Institute scientists who gave briefings on some of the work undertaken by the Institute.

Professor Anya Waite spoke about ocean currents and surface temperatures in the North-West of WA and related it to work involving the life cycle of the western rock lobster and implications for aquaculture.

And Winthrop Professor Mark Cassidy, the Director of Centre for Offshore Foundation Systems, outlined the Centre’s role in modeling underwater structures for engineers that could withstand pressures of some 300 gravities.

Colin Beckett, Chevron’s General Manager of the Greater Gorgon Area, gave an industry response in which he outlined environmental safeguards undertaken as part of dredging operations at Barrow Island for the Gorgon LNG project.
Camden Sound in the Kimberley is probably one of the most dramatic – and least known – parts of Australia. Its remoteness, its huge 10-metre tides, and the hundreds of square kilometres of reef that vanish daily make it unique for ocean researchers.

Added to that is its significance as the breeding ground for humpback whales. Which are all some of the reasons UWA Oceans Institute scientists undertook a three-week field trip to the region in January. The aim of the trip was to investigate ocean circulation and its influence on the ecology of Camden Sound.

The OI researchers sailed to Camden Sound with scientists from the Australian Institute of Marine Science aboard its 35-metre research vessel Solander.

The Camden Sound area is characterised by extensive island archipelagos, a complex series of coastal headlands, and extremely large tides of 10 metres and more. It also features the little-explored Montgomery Reef, a submerged reef.
covering hundreds of square kilometres that dramatically emerges from the sea at low tide.

“This project will result in significant advances in our understanding of the circulation of the Camden Sound region,” said principal research scientist, Assistant Professor Nicole Jones.

“The principal aim of the expedition was to conduct the first detailed hydrodynamic study of the regional circulation and mixing processes along the central Kimberley coastal region.”

The Australian Research Council funded the field trip. Researchers employed a combination of field measurements, laboratory observations and numerical modelling to quantify – for the first time – the influence of the complex topography on circulation, ocean mixing and hence the exchange and flushing of material (such as nutrients, contaminants, sediments and larvae) throughout the region.

Other research activities included collecting plankton, sponges, corals and algae to build an understanding of the biodiversity of this unique environment.

“Research to underpin management of the area will be especially important as the region is one of the world’s last frontiers for basic scientific research, where our fundamental knowledge is lacking,” said Winthrop Professor Gary Kendrick who also took part on the field trip.

Work undertaken on the voyage will eventually help clarify the influence of the series of islands, reefs and headlands on the circulation and mixing along the Kimberley coast.

It’s expected this will ultimately provide insights into other similar systems with complex coastal topography and provide the framework to understand the various physical processes that drive the marine ecology of the region.

Top: The AIMS research vessel Solander anchors in Sampson Inlet. Photo by David McKinnon.

Middle right: Dr Richard Brinkman and Asst. Prof. Nicole Jones recover a mooring. Photo by Janett Voigt.

Bottom right: Associate Professor Ryan Lowe deploys a drifter – a floating device that provides real-time information about ocean circulation. Photo by Richard Brinkman.
Michele Thums applies seal-tracking technology to other species

In the past, Dr Michele Thums used electronic tags to understand the foraging strategies of the southern elephant seal, an apex predator of the Southern Ocean.

Now she brings her expertise as a behavioural ecologist to the Oceans Institute, with the aim of applying state of the art tracking technology – originally developed for seals – to sharks and turtles.

Known as CTD Satellite Relay Data Loggers, these tags not only record an animal’s location and diving behaviour, they also collect valuable oceanographic data.

“The really great thing about this technology is that we can track how the animals are responding to their environment as they experience it,” Michele says.

Michele will use the tags to investigate factors that influence movement behaviour in five species found along WA's North West Shelf: the whale shark, tiger shark, and flat-back, hawksbill and green turtle.

“We can infer what the animals are doing – foraging, searching or migrating – and hence identify important areas that should be targeted for protection.”

Michele is the first postdoctoral researcher to be appointed to the Oceans Institute as part of an agreement between UWA, CSIRO and AIMS to address a number of thematic areas, one of which is the ‘role, significance and management of top-order predators in reef systems’.

Michele’s collaborators include Dr Mark Meekan of AIMS, Winthrop Professor Chari Pattiaratchi from the Oceans Institute, and linkage partner Apache Energy.

Oil and gas industries operating on the North-West Shelf will be able to use Michele’s findings to minimise their impact on these ecologically important species.

Malaspina Expedition

• Detecting particularly high zooplankton levels, and
• Releasing buoys to validate salinity measurements from space as part of a satellite mission of the European Space Agency.

Dr Susana Agusti, a research professor with UWA Oceans Institute, joined the Hesperides in Fremantle. She then sailed with the vessel as Chief Scientist on the Perth-Honolulu leg of the voyage.

From Sydney, the Hesperides will sail on to Auckland, Hawaii, the Panama Canal and then back to Cadiz.

While in Fremantle, the Hesperides conducted several educational tours for high school students, postgrad students and scientists.

(The Malaspina Expedition is a Consolider-Ingenio 2010 project funded by the Spanish Ministry of Science and Innovation, with the support of the Spanish Navy, the BBVA Foundation, and the Spanish and international scientific community in marine sciences.)
UWA researcher aids marine conservation in the Seychelles

Marine conservation efforts in the Seychelles have been boosted by a marine biodiversity study involving The Oceans Institute.

According to one of the principal investigators, Dr Dan Smale, from the Oceans Institute, the work will help pave the way for future protection zones to safeguard the islands’ unique marine wildlife.

The six-year study recorded the diversity of life in six marine parks in the Seychelles and documented more than 350 species, including two possibly new species.

Leeuwin current hots up in ‘La Nina’ year

The La Nina phenomenon responsible for the devastating Queensland floods in late December and early January is also affecting Western Australia, and will continue to do so until at least middle of 2011, according to Winthrop Professor Chari Pattiaratchi from the Oceans Institute.

The source waters of the Leeuwin Current are already several degrees warmer than normal, said Professor Pattiaratchi.

Grants foster global collaboration on kelp research

Research grants from the Worldwide Universities Network (WUN) and The UWA Research Collaboration Awards will help to form an ‘Algal Research Coalition’ with partners from around the world.

The project will bring together leading seaweed scientists, and their research students, from UWA’s Oceans Institute, The University of Cape Town (South Africa) and The University of Bergen (Norway).
Kevin Rudd tours glider lab

Foreign Minister Kevin Rudd visited The UWA Oceans Institute and took a tour of the Australian National Facility for Ocean Gliders (ANFOG) on March 30.

Mr Rudd was particularly interested in Australia’s involvement in the Indian Ocean Rim Association for Regional Cooperation (IOR-ARC), an international organisation that promotes sustainable growth and balanced development of the Indian Ocean region. Australia is currently the Vice-Chair of IOR-ARC and will be assuming the Chair for 2013-14.

During the visit, Winthrop Professor Chari Pattiaratchi described the role of ocean gliders in building our understanding of the Leeuwin Current, which influences local coastal conditions and affects climate, weather, fisheries, shipping and more.

Mr Rudd was also interested in the Indian Ocean Tsunami Warning System, a UN-sanctioned project initiated after the Christmas Day tsunami in 2004 and completed late last year.

High school students focus on ocean research careers

Three Year 12 students spent a week getting involved in UWA’s marine research as part of an industry placement program offered by the Primary Industry Centre for Science Education (PICSE) in January.

Under the mentorship of Winthrop Professor Shaun Collin from The UWA Oceans Institute, students explored the field of marine neuroecology – understanding the neural basis for behaviour in marine animals.

The students helped with research ranging from electroreception in Port Jackson sharks to retinal analysis under an electron microscope.

Belinda Pope, PICSE Science Education Officer at UWA, says the program is more than typical work experience.

“It’s not just moving boxes and filing. This is an industry placement – about giving an insight into research and getting hands on experience.”

The three students – from Perth, Albany and Mandurah – found the program to be hugely beneficial.

Brett Born of Frederick Irwin Anglican School, Mandurah, says the placement “really reiterated that marine biology is the course for me. The fact that you can get paid doing what you absolutely love is just incredible.”

Before the placement, Callum Fitzpatrick of Guildford Grammar School was unsure of which career path to take, but says, “The PICSE placement has influenced me to aim for a science course at UWA in 2012.”

“The most rewarding facet of the program,” he says, “was being able to discuss careers with people in the field, and to find out their personal tips for entering the industry and preparing yourself for it.”

The PICSE industry placements give students a head-start into launching themselves into a career and professional life, according to Tessa Caramia of Albany Senior High School.

“How many other Year 12 students could say they had helped with a PhD analysis of the electroreceptive properties of Port Jackson sharks?” she says.
### Visitors to the Oceans Institute 2011

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Blue whales are some of the planet's most awesome – and mysterious – creatures.

The blue whale is the largest animal known to have lived on earth; they can grow to some 30 metres and more than 150 tonnes; and at one stage were nearly hunted to extinction.

Which is why a Channel 7 current affairs team jumped at the chance of spending a week with Asha de Vos filming the magnificent creatures off the coast of Sri Lanka and telling the story of her research work.

Asha, of Nedlands, is a PhD student with UWA Oceans Institute and the School of Environmental Systems Engineering.

“My research focuses on understanding what the whales are doing around Sri Lanka and why they are here all year round,” says Asha.

“Typically, blue whales migrate between high latitude feeding grounds and low latitude breeding and calving areas, but the majority of these guys don’t seem to leave the Northern Indian Ocean.

“I am really keen to try to understand how the environment influences the ecology of the whale so what I do brings together the fields of physical oceanography and marine biology.

“There are just so many unknowns with this population because it’s never been the subject of a long-term research project before – so I’ve got a huge task and an even bigger responsibility.”

Filming the blue whales was a challenge, partly because of their shyness.

“During the week of shooting, the crew managed to get some of the best shots of Sri Lankan blues ever – the only footage of its kind,” says Asha.

“These creatures are unlike the humpback and right whales that approach boats when you are in their vicinity. Blue whales are elusive, almost skittery, and will spend very little time checking you out.

“Every shot is a challenge and every moment is magical!”

The resulting pictures were broadcast nationally on Channel 7’s Sunday Night program in early April and can be viewed on the program’s website at http://au.tv.yahoo.com/sunday-night

Asha’s work and that of other blue whale scientists will also be featured in the BBC program ‘Ocean Giants’ to be aired later this year.

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