



Lady Potter opens the Ian Potter Research Aquarium

New South Wales now has a world-class research aquarium located on the shores of Sydney Harbour at the Sydney Institute of Marine Science (SIMS) at Chowder Bay, following its official opening on 3rd August by Lady Potter AC, Life Governor of The Ian Potter Foundation.

In recognition of the support received from the Foundation, the aquarium will be called the Ian Potter Research Aquarium.

The aquarium will support research and research training at SIMS. It includes facilities to experimentally manipulate the temperature and carbon dioxide concentration of seawater enabling SIMS' scientists to directly test hypotheses regarding the impact of climate change on marine organisms.

The facility also has one of only two protected (PC2) running seawater systems in Australia. This capability will allow for sophisticated biological experiments in near natural marine conditions when it is commissioned in the near future.

This is a major contribution to the expansion of SIMS' research facilities and we are grateful to Lady Potter and The Ian Potter Foundation for their generous support. "Their early support for SIMS greatly encouraged further strong support from both the NSW and Commonwealth governments," Dr. John Keniry AM, Chairman of SIMS said.

Thirty guests, including representatives of the NSW Government and other major supporters of SIMS and SIMS Foundation attended the opening ceremony, followed by lunch on the verandah of SIMS' new conference centre.



Lady Potter and Prof. Peter Steinberg unveil the plaque to commemorate the official opening of the Ian Potter Research Aquarium.

Volunteers needed

SIMS Harbour Hike needs volunteers now to help with staffing checkpoints and crowd marshalling on Sunday 4th September. It's a great way to support SIMS and will only take between 4-6 hours of your time.

Please contact the Harbour Hike volunteer coordinator, Linda McFadden on volunteers@simS.org.au or phone SIMS on 9969 2664.



Harbour Hike 4th September

Sunday 4th September will see the staging of the inaugural SIMS Harbour Hike.

This is a new annual community event on the Northside. You can take dad, your family and friends on one of the best walks in the world past majestic Federation homes, beautiful bays, classic boats, bountiful bushland and spectacular views of the city all the while having fun understanding more about Sydney Harbour's unique marine environment and history.

The course commences at Kirribilli, under the Harbour Bridge and is an easy to moderate 11km walk to the Clifton Gardens Reserve, Chowder Bay, Mosman, home of SIMS.

10 checkpoints along the way will have questions about the Harbour and its history and prizes will be

awarded for the teams with the best answers. Information and hints about checkpoint questions will be found in the Sydney Morning Herald leading up to the event.

All funds raised by the Harbour Hike will benefit SIMS, the premier marine research institute in South-East Australia.

A marine-themed festival at Clifton Gardens Reserve will await hikers at the completion of the walk, with live entertainment, a sustainable seafood BBQ, children's activities and displays and information about Sydney Harbour. SIMS' scientists will be on hand to describe their work and answer questions.

Register now via the Harbour Hike web site if you wish to join us. Numbers are limited.

Father of the year our first Harbour Hike Ambassador



SIMS Foundation Board member and current ‘Father of the Year’, Guy Cooper has agreed to become an Ambassador for SIMS Harbour Hike to be held for the first time on Father’s Day, Sunday 4 September, 2011. Guy, who was for 11 years Chief Executive of Taronga Conservation Society, is also the father of five daughters.

“I’m thrilled to be part of Harbour Hike raising funds for SIMS and the Shepherd Centre. There’s nothing I enjoy more than a good walk around Sydney Harbour and the Harbour Hike takes in all the best locations from the Harbour Bridge, Cremorne Point, Mosman Bay and of course Sirius Cove and the foreshore around Taronga Zoo,” Guy said.

“I’ll be out there on the day with four of my grandchildren and other family members and can’t wait to celebrate Father’s Day at the Marine Festival at Clifton Gardens Reserve after the walk,” Guy said.

SIMS Harbour Hike is supported by the Sydney Morning Herald, Mosman and North Sydney Councils, NPWS and Destination NSW. Additional support has come from Lands Edge, Asics, Over Forty Fitness and the Sydney Harbour Federation Trust.

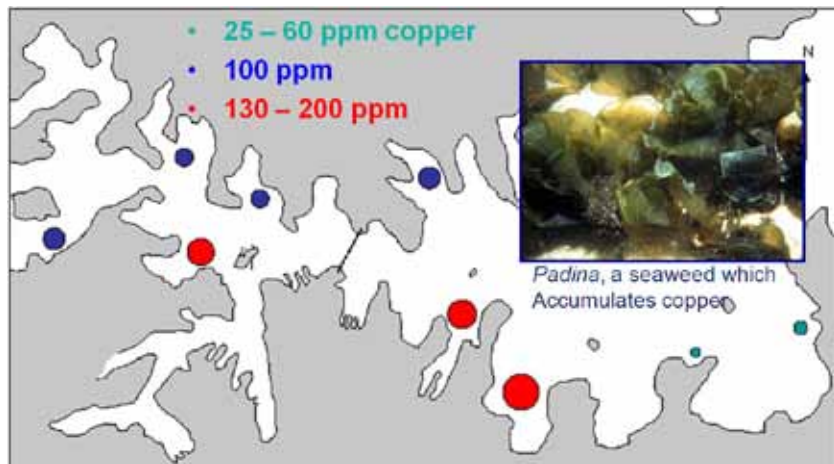
Stormwater

Widespread flooding earlier this year and the heavy rain in July (the wettest July in many decades) make us think about Sydney Harbour and the possible effects of very high rainfall.

The general wisdom is that Sydney Harbour’s water quality is improving, seagrass beds are re-establishing in some areas, fishing is good, and the water looks clearer. Some of this is the result of the on-going efforts to reduce the number and severity of sewer overflows. Some is the result of increased regulation of various discharges into the Harbour, e.g. ending dumping of industrial wastes and requiring anti-fouling paints to be applied to boats on dry-docks fitted with waste-collection devices.

But not all of the news is good. Problems remain, and one result is that it is still not safe to eat fish caught above the Harbour Bridge and only limited amounts on the seaward side. Broadly speaking, the contaminants in the Harbour fall into two categories: the “legacy” pollutants from past industrial dumping and those that come from both past and current stormwater runoff.

There are thousands of small stormwater drains around the Harbour and some larger collector canals as well. The drains are generally owned and managed by the Councils around the Harbour. About 20% of the stormwater collected winds up in trunk mains owned by Sydney Water. It is clear from research done by SIMS expert, Gavin Birch of the University of Sydney and others, that sediments at the mouths of the larger stormwater drains are contaminated with an assortment of heavy metals and organic chemicals. Industrial dumping may have stopped, but our roads and lawns are the source of



Some seaweeds in Sydney Harbour accumulate copper & other heavy metals
Source: Roberts, Johnston & Poore (2008) Graphic: Dr. Dave Roberts

petrochemical residues, heavy metals from tires, herbicides, pesticides and fertilizers and the assortment of trash and waste that accumulates on our sidewalks and roadways as well as silt and sand.

What can be done? Dredging of contaminated sediments at stormwater outfalls is not considered to be feasible until the sources of pollution are controlled. Reducing the contaminants in the stormwater must come first; then environmental clean-up can follow.

The NSW Government has had programs to encourage stormwater management by councils and also tries to reach home owners with campaigns about not dumping wastes in sewers and handling household chemicals with care. In the longer run, reducing the pollution in our stormwater drains will help to maintain the water quality in the Harbour. The flooding we see around us raises the question and reminds us that the most important problem to address is that of the pollution we all cause, every day, that each rainfall carries into our Harbour.

Our thanks to Caroline Hoisington for contributing this article.

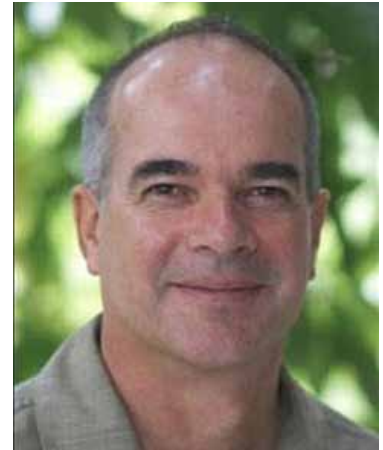
Prof. Philip Munday

Is ocean acidification a threat to marine fishes?

Professor Philip Munday delivered this talk at the new SIMS Lecture Theatre on 3rd August, 2011.

Prof. Munday has broad interests in the biology and ecology of marine fishes. His current research program focuses on understanding and predicting the impacts of climate change on populations and communities of coral reef fishes, both directly through changes in the physical environment and indirectly through effects on coral reef habitat. Using a range of laboratory and field experiments he is investigating the effects of increased temperature and ocean acidification on reef fish populations and testing their capacity for acclimation and adaptation to a rapidly changing environment.

He has published over 100 papers in coral reef ecology, including reviews and research papers on the impacts of climate change. He is an Australian Research Council QEII Fellow at the ARC Centre of Excellence for Coral Reef Studies, and the School of Marine and Tropical Biology, at James Cook University.



Ocean acidification, caused by uptake of additional CO₂ from the atmosphere, is a significant threat to marine organisms that form calcified shells and external skeletons, such as corals and many molluscs. In contrast, fishes are thought to be relatively tolerant to increased CO₂ and reduced pH because they have well developed physiological mechanisms for pH compensation. Adults of some marine fishes can tolerate increased CO₂ concentrations several orders of magnitude greater than predicted to occur under climate change scenarios.

The possible effects of rising CO₂ levels on larval and juvenile fishes have only recently started to be investigated. The studies conducted to date have found no evidence for negative impacts of elevated CO₂ on fish early life history traits. Fertilization rate, hatching success, and larval growth and development do not appear to be negatively affected by levels of CO₂ that could occur by the end of this century. Similarly, otolith (earbone) development does not appear to be affected below 1,000ppm CO₂.

In contrast, recent studies have demonstrated dramatic effects of elevated CO₂ on the sensory ability and behavioral attributes of reef fish larvae. Larval fish exposed to near-future CO₂ concentrations exhibit impaired ability to identify chemical cues that help them locate suitable adult habitat and avoid predators at the end of their pelagic (open ocean) phase. Juvenile fish also exhibit riskier behavior in natural coral-reef habitat, leading to markedly higher rates of mortality. Changes to larval behavior and impairment of their sensory systems by elevated CO₂ could have significant effects on population replenishment and connectivity patterns of marine species.

Prof. Munday reviewed current knowledge and identified important areas for future research to improve our understanding of the likely impacts of ocean acidification on marine fishes.



Experiments in the aquarium at the Australian Museum's Lizard Island Research Station where Prof. Munday was the 1997 Lizard Island Doctoral Fellow. Here, Dr. Guillermo Diaz-Pulido has many tanks containing live specimens. Each tank can have its water temperature and pH varied to simulate possible future conditions in the ocean.

Photo: Anne Hoggett & Lyle Vail

Tony Roach Prize

Dr. Tony Roach was a highly esteemed senior environmental scientist with the NSW Government. He completed his PhD in marine biology in 1996. Very sadly, he died suddenly in May 2011.

Tony's research niche and internationally recognised area of expertise was contaminants - the effects of these contaminants and how animals living in estuaries interacted with contaminants in sediments and food.

SIMS is pleased to announce the annual Tony Roach Prize in Marine Environmental Science. Such was Tony's high esteem amongst his colleagues, that the NSW Office of Environment & Heritage is funding the award of this prize.

The award will be for the best paper done in NSW on marine or estuarine environmental science by a person within three years of their award of a PhD. The first recipient of this prize will be announced in April 2012 for papers published in 2011.

Doctoral fellowship awards 2011

Four new doctoral fellowships were awarded in a ceremony at SIMS on 10th May 2011.
Details of the new recipients and the subjects of their PhDs follow:

Rebecca Neumann - Thyne Reid Doctoral Fellowship at SIMS.

Over the last few decades, the negative impact of environmental stress on marine systems, such as global climate change and environmental pollution, has become more prevalent. These impacts are particularly important when habitat-forming species, such as the large seaweeds called kelp, are affected. Near Sydney, coastal development and urbanisation, and rising ocean surface temperatures can cause potential stress to surrounding marine life.

Rebecca will test whether environmental stressors (changes in temperature, pollutants) will affect chemical defence and microbial communities on kelp, leading to a greater incidence of disease. She will further examine the effects of any resulting disease on the health and performance of seaweeds, using the habitat-forming kelp *Ecklonia radiata* as a model species. *E. radiata* is the most abundant seaweed on subtidal rocky reefs of Australia and New Zealand where it forms highly productive and species-rich ecosystems.

Hannah Lloyd - Horizon Foundation Doctoral Fellowship at SIMS.

Australia is home to one of the most diverse and unique coastal marine ecosystems on earth. The temperate east coast of Australia in particular has some of the highest numbers of endemic (found nowhere else) species in the world. However, human impacts such as climate change, pollution, habitat loss and invasive species severely threaten the future of these ecosystems. Species that form complex coastal habitats (e.g. seaweeds, mussel beds) are important drivers of biodiversity due to the large number of species that they harbour. Up to 90% of all coastal biodiversity in Australia can be found in these habitats.

Conservation and management efforts are currently hampered by a paucity of information concerning the processes that underpin biodiversity. Key gaps in our knowledge include a poor understanding of whether the influence of habitat-forming species on biodiversity changes throughout their range, how habitat-forming species respond to changing climatic conditions and what the consequences of those changes may be for associated biodiversity. It is imperative that we establish a rigorous scientific understanding of the mechanisms that facilitate biodiversity. This project will assist in the development of management strategies for protecting marine intertidal biodiversity under predicted future climate change conditions. The research will have significant applied conservation value globally, through the determination of the mechanisms by which habitat-forming species control biodiversity.

Natalie Soars - Trust Company Doctoral Fellowship at SIMS.

Many people may have the impression that the ocean is relatively silent, however it can actually be a very noisy place. Sounds from waves, ships and animals can travel over long distances and vary with location, season and weather. In addition to interfering with naval sonar operations, this ambient noise has recently been found to be used by marine animals for habitat information and is an important orientation cue for the larval stages of a variety of fish, crustaceans and coral. The abundance of sea urchins in both tropical and temperate marine habitats suggests that they are likely to be a major contributor to ambient noise in local marine waters. Sound is also an important cue for settling fish larvae and the role that sea urchins play in this key ecological process is not known.

Natalie will investigate the biological influence of ambient noise produced by sea urchins in the waters of Sydney Harbour and other sites in NSW, focussing on of the most abundant species, *Centrostephanus rodgersii*. This species is spreading south with the warmer waters of the East Australian Current and modifying the marine habitats significantly as it spreads, by eating kelp and leaving the areas barren in its wake.



Jill Reid (R) presents the award to Rebecca Neumann on behalf of the Thyne Reid Foundation.



Tracey Steggall (R) congratulating Hannah Lloyd on her award of the Horizon Foundation Doctoral Fellowship at SIMS.



Natalie Soars on the jetty at SIMS.



Hayden Beck, dressed in his work clothes and ready for action!
See page 5 for details of his project.

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CONTACT US

SIMS office:
Building 19
Chowder Bay Road,
Mosman, NSW 2088

Tel: (02) 9969-2664
foundation@sims.org.au

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Go to www.sims.org.au
and follow the prompts.

Hayden Beck - Doctoral Fellowship at SIMS (from page 4).

The East Australian Current transports tropical fish larvae from the Great Barrier Reef in Queensland to the NSW coastline throughout summer. Whilst water temperatures remain warm, these larvae develop into juvenile tropical fish that become part of NSW fish communities in rocky reefs as far south as the NSW/VIC border. Anticipated future water temperature increases due to climate change are likely to lead to greater rates of over-winter survival and establishment of tropical fish populations along the NSW coast.

Modelling of future water temperatures suggests the Tasman Sea will continue to warm at a rate greater than most other oceans in the world, and this is likely to assist tropical fish to establish viable populations along the NSW coast. Increases in abundance and diversity of tropical fish may have significant impacts on local-temperate marine communities through competition for resources such as habitat and food.

The first part of this project will involve dive surveys in reefs and estuaries along the NSW coast to determine the habitats tropical fish use, and identify potential impacts these fish may have in these systems. In an attempt to determine the increases in water temperatures required for tropical fish to begin surviving over winter and reproducing in NSW waters, impacts of water temperature on the biology and ecology of tropical fish will be explored by comparing fish from latitudes with different water temperatures, as well as using water temperature manipulation experiments at the Sydney Institute of Marine Science.