Careers in Marine Science

School of Geosciences, Faculty of Science

THE UNIVERSITY OF
SYDNEY

Careers in Marine Science

What career opportunities are available?

Marine scientists observe, measure and experiment in marine and coastal environments. During your studies you will gain multidisciplinary knowledge in Marine Biology and Marine Geosciences that will make you a highly desirable employee in coastal and marine management and planning.

Our degree includes state-of-the-art skills such as data analysis, image processing, and numerical modelling, using big data like satellite imagery and Geographic information Science (GIS). You will go to the field and will work in the lab and with computers. You will be learning marine science in a variety of scales, from oceans to coasts, from tropical coral reefs to temperate areas.

Climate change is here, and the coast and the oceans are major hotspots for change. The effects of climate change range from sea level variations, to changes in storm direction and intensity, and these and other processes are triggering major ecological changes such as coral bleaching and the tropicalisation of temperate coasts.

Many of our Marine Science graduates work in government agencies, federal, state and local, and in consulting companies that seek coastal and marine specialists. Some of our Marine Science graduates use their STEMM skills to successfully pursue careers in other areas.

Our graduates make positive impacts for the future of the planet!

From left to right: snorkelling in the Maldives deploying wave sensors, vibro-coring in One Tree Island Research Station, mangrove sediment sampling. Credit all photos: GeoCoastal Research Group

Bachelor of Science: Marine Science Major					
Year 1		Year 2		Year 3	
Life and Evolution or Earth Environment and Society	From molecules to Ecosystems or Introduction to Geology	Ocean, Coasts and Climate Change	Biology Experimental Design and Analysis	Coastal Environmental Design and Analysis	Marine Biology
OLE	Elective	Elective	Elective	Interdisciplinary project	Selective ^
Mathematics	Mathematics	OLE	Elective	Major2/Elective	Major2/Elective
Major 2 / Minor	Major 2 / Minor	Major 2 / Minor	Major 2 / Minor	Major 2 / Minor	Major 2 / Minor

^Selective units: GIS in Coastal Management, Marine Field Ecology, Coral Reef Biology, Aquaculture

Our graduates in Marine Science have the following knowledge and skills:

- Broad knowledge of marine processes and habitats, including their importance in sustaining biodiversity and life on the planet.
- Multidisciplinary understanding of the complex interlinkages between biology and geosciences that shape and influence marine and coastal environments.
- Understanding of the geological and biophysical processes that shape and influence marine and coastal environments.
- Skills to collect, analyse and visualise data using state-of-the-art technology such as big data, numerical modelling and Geographic Information Science.
- Skills to source, synthesise and critically evaluate marine and coastal information, data and observations from a range of relevant sources.
- Proficiency to communicate concepts and analyses in marine science to diverse audiences from a range of backgrounds through a variety of modes, using robust evidence-based arguments.
- Ability to work effectively, responsibly and ethically in individual and peer or team contexts and be independent, self-directed learners.

What do Marine Scientists do?

Marine Scientists investigate all kinds of issues and problems on ocean and coasts. Here are some typical areas of concern.

- Coastal erosion in response to storms, human impact, and climate change. Coasts represent some of the most dynamic environments on Earth, they are constantly adapting to the environmental conditions, including storms and human effects.
    - Marine Scientists evaluate how urban development has changed the geomorphology and the ecology of the coasts.
    - Storms are changing with climate change, Changes in direction, intensity and frequency of storms are already happening and Marine Scientists need to understand the processes to prepare for the future.
    - Marine Scientists use data analysis and machine learning to forecast coastal evolution.

- Some of the largest cities in the world have been developed near estuaries, some examples are Sydney, San Francisco and Shanghai to name a few. Urban sprawl has modified these estuaries, sometimes beyond recognition.
    - Human influence has wiped out complete ecosystems like, for example, oyster reefs in most of NSW. Marine Scientists are working to restore these ecosystems.
    - Marine Scientists study how we can maximise Blue Carbon in estuaries to reduce global warming.

- The large open ocean is also changing due to human impacts.
    - Marine Scientists assess how overfishing has led to a reduction of worldwide stocks of certain fish species.
    - Marine Scientists are trying to find solutions to clean the large garbage patches in the oceans.

- Pollution and contaminations affect the open ocean, the coasts, the reefs. Marine Scientists determine ways to reduce their impact.
    - Oil spills wreak long-term destruction on local ecosystem and biodiversity.
    - The use of pesticides and artificial fertilisers in farming has serious consequences on food chains, for example 'gender bending'.
    - Plastic pollution has huge implications for biodiversity, ecosystems and threats to food security.

- Climate change is wreaking havoc in the coral reefs of the world.
    - Marine Scientists study the effects of global warming and ocean acidification in coral reefs. They study ways to protect coral reefs to avoid coral bleaching and reduced coral cover.
    - Marine Scientists study how coral reefs in the geological past evolved under different environmental conditions.

Our Research

GeoCoastal Research Group

The GeoCoastal Research Group has strong links with **One Tree Island Research Station, on the Great Barrier Reef, one of the most pristine coral cays available to the scientific community** only. Students undertaking a major in Marine Science have opportunities to participate in field trips to One Tree Island as part of their studies.

GeoCoastal research at the University of Sydney spans the study of day-to-day change in coastal environments due to meteorological events, to improving our understanding of the longer-term links between global climatic and tectonic adjustments, and the geomorphic evolution of continental margins. The research approaches practiced by the group are accordingly varied, and include *in situ* field measurements and sampling, remote-sensing techniques, and both physical-process and systems-behaviour numerical modelling. Across the spectrum of spatio-temporal scales, research extends beyond geomorphic evolution to habitat responses, environmental change and contamination and marine territorial rights.
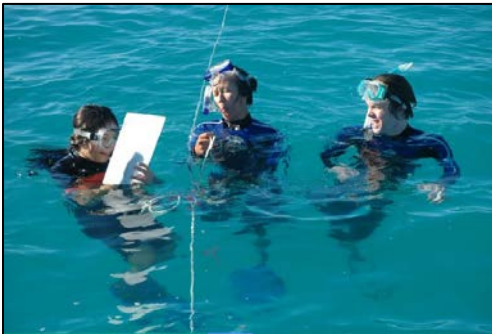
Fieldwork

An example of the fieldwork you would undertake in the School of Geosciences as a marine science major is the NSW Coast fieldtrip with Coastal Environments and Processes – GEOS3009/3909.

This fieldtrip takes our students to a location on the coast of NSW, the last few years it has been Kioloa in the South Coast but, in the past, we have also gone to Hawkes Nest in Port Stephens. Students learn a suite of techniques to measure and assess coastal processes in beach environments. Students are trained in fieldwork techniques such as keeping a field notebook, beach surveying, wave measurements, and a general understanding of the processes that dominate the NSW coast. It is a self-contained fieldtrip where students travel on a Friday and return on a Sunday during semester 1.

Fieldwork is important for Marine Scientists, although some marine scientists prefer to work with computers all the time. There are other units of study that will take you to other parts of the coast like, for example, Coral Reef Biology (BIOL3016), which is an intensive unit of study that takes our students to the Great Barrier Reef!
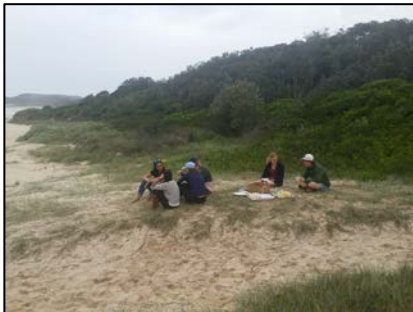
Photos from the fieldtrip to Kioloa in 2017 and 2018, clockwise from top left: students at the beach, students deploying wave sensors, students working on their data analysis and presentation, and, another kind of "students" that visit the research station at Kioloa [Photo credit Geocoastal Research Group].

Introducing Some of Our Graduates

Michael Kinsela, PhD, 2014: I commenced my PhD in the School of Geosciences after completing the Bachelor of Science (Marine Science) Honours program at The University of Sydney. My PhD research combined field data and modelling to reconstruct coastal evolution and investigate coastal processes during sea-level change over the past 100,000 years. During my candidature I enjoyed opportunities to contribute to collaborative field work within the GeoCoastal Research Group, which took me to the high seas aboard RV Southern Surveyor and to the Great Barrier Reef paradise of One Tree Island.

Towards the end of my PhD I was hired as a Coastal Risk Scientist by the NSW Government, where I have progressed to Senior Scientist (Coastal & Marine) within the Department of Planning, Industry and Environment. In these roles I have helped to shape an improved approach to coastal risk management and planning for NSW, gathering new data on coastal geomorphology and processes and developing analysis tools to evaluate the potential impacts of coastal hazards such as erosion and inundation. As a government research scientist, I focus on developing the evidence base to inform policy development and decision-making, and my work takes me out on the water routinely to map marine sediment and habitat distributions and to measure the ocean processes that drive coastal hazards. The research experience and networks that I developed at The University of Sydney continue to provide me with new opportunities to contribute to growing our understanding of coastal environments through collaborative research.