Centre for Biodiversity and Conservation Science

CBCS NEWS

The University Of Queensland
AUSTRALIA
CREATE CHANGE

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EDITORIAL

Research supporting a healthy Moreton Bay

Associate Professor Carissa Klein
CBCS Deputy Director – Advancement

Quandamooka (Moreton Bay) is not just one of my favourite places on the planet, it is a globally significant seascape, with outstanding social, cultural and natural values. Millions of people regularly engage with the Bay and its catchment for work, pleasure or culture – including Quandamooka and Kabi Kabi Traditional Owners, whose 25,000+ year relationship with the land and waters makes this a region of high cultural significance. An abundance of native animal species, many threatened, live in Moreton Bay (e.g., dugongs, marine turtles) or rely on its diverse habitats during migration (e.g., grey nurse sharks, wader birds).

Moreton Bay is also one of Australia's fastest growing population centres, with a 50% population increase across Brisbane and the Gold Coast expected by 2041, and the region will change rapidly as Brisbane prepares to host the 2032 Olympic Games.

The University of Queensland has a longstanding history of research in Moreton Bay, which is home to the region's premier research facility: The Moreton Bay Research Station. In 2021–23, UQ's Vice Chancellor made a strategic investment of $1,300,000 in a collaborative venture – *Sustainable Urban Seascapes, Moreton Bay* – that I co-led with Professors Catherine Lovelock, Cynthia Riginos and John Pandolfi. Our aim was to harness and coordinate scientific expertise to support the sustainable management of Moreton Bay. We convened four meetings with Traditional Owners, industry, government, and academia to identify research priorities for Moreton Bay. This newsletter features a selection of the many research projects that we supported in addition to other CBCS research in Moreton Bay.

Importantly, UQ's *Sustainable Urban Seascapes, Moreton Bay* laid the foundation for the Faculty of Science's Healthy Moreton Bay Research Initiative, a $20M+ fundraising endeavour to support an ecologically, economically and socially thriving Moreton Bay by 2032.

We hope you enjoy reading this special issue about our diverse research in Moreton Bay, which covers everything from seahorses to sewage to social values.

Images (top to bottom) Carissa Klein at Moreton Bay. Credit: Stevie Klein. Aerial view of Woody Point and Margate on the Redcliffe peninsula. Credit: Martin Valigursky.

National Science Week

Species survival on Quandamooka Country

The Centre for Biodiversity and Conservation Science (CBCS) and the Moreton Bay Research Station (MBRS) have been awarded a National Science Week grant from the Australian Government Department of Industry, Science and Resources.

Dr Brooke Williams led the grant application with the support of Associate Professors Carissa Klein, Karen Cheney, and Laura Sonter, and the project entitled "Species survival on Quandamooka Country" will be carried out by the CBCS Management Committee in collaboration with The University of Queensland's MBRS during National Science Week, 10–18 August 2024. This initiative is poised to shine a light on the intricate ecosystems of Quandamooka (Moreton Bay), particularly focusing on threatened species on Quandamooka Country.

The event aims to ignite a passion for conservation and scientific inquiry.

Moreton Bay Research Station open day

There's a lot happening in August on Minjerribah (North Stradbroke Island). The MBRS will showcase the research and teaching that is done there by hosting the National Science Week Open Day on Saturday 10 August. This collaborative event, undertaken by the MBRS in partnership with CBCS, promises to be a beacon of celebration, knowledge-sharing and community engagement.

The involvement of CBCS will bring a biodiversity focus to this annual event, with an emphasis on "species survival in Moreton Bay". From interactive exhibits to nature walks, attendees of all ages will be invited to explore Moreton Bay's diverse ecosystems. With contributions from the Quandamooka First Nation community and esteemed scientists alike, including Professor Hugh Possingham, the event aims to ignite a passion for conservation and scientific inquiry. Held against the backdrop of Quandamooka Country, this collaboration promises to offer a unique blend of cultural appreciation and environmental stewardship.

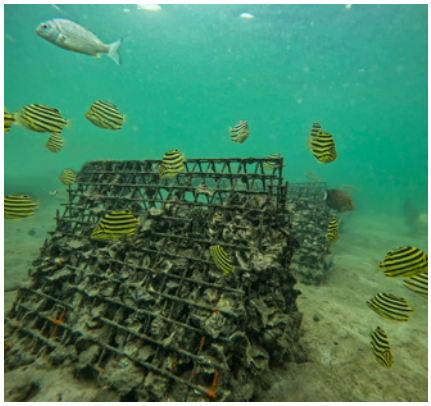
Brewing for biodiversity

The science celebrations will continue with a CBCS-run "Brewery Science" event on Sunday 18 August from 2:30pm. The afternoon will include a panel discussion at the Straddie Brewing Co in Dunwich, Minjerribah, with CBCS researchers, including Professors Richard Fuller and Cath Lovelock.

Come along to this event and try a beer brewed especially for CBCS and learn more about some of Moreton Bay's amazing biodiversity, from leopard sharks to eastern curlews. Our special edition beer will be available for purchase and proceeds will raise money for biodiversity conservation in Moreton Bay.

See you there!

Images (top to bottom) Moreton Bay Research Station on Minjerribah. Credit: Frankie Cho. Coral reefs in Moreton Bay. Credit Gal Eyal.



Shellfish and seahorses: projects from the Bay

Associate Professor Karen Cheney
CBCS Affiliated Researcher

The Moreton Bay Research Station continues to support several projects related to the conservation, biodiversity and habitat restoration of the Bay. These currently include shellfish reef restoration and protection of White's seahorse.

Shellfish reef restoration

In Moreton Bay, at least 96% of oyster reefs have been lost since European colonisation. The demise of oyster reefs has resulted in the collapse of critical ecosystem services such as water filtration (decreasing sedimentation, improving turbidity, reducing phytoplankton); habitat for fish and invertebrates; carbon sequestration; stabilisation of habitats and shorelines; diversification of landscape and ecosystems; commercial and recreational oyster production, and cultural services for First Nations peoples.

As part of a Faculty of Science BIRRST grant, awarded to Karen Cheney, Ben Mos and Ian Tibbetts, a partnership between The University of Queensland, the University of the Sunshine Coast, OzFish and Minjerribah Moorgumpin Elders in Council has been established to enable an in-depth evaluation of the direct and indirect ecosystems services provided by varying modular oyster reef structures being constructed by OzFish under a range of environmental conditions.

Images (clockwise from top left) Modular oyster reef structures deployed in Moreton Bay (pictures 1 and 2). Credit: Robbie Porter. White's seahorse, *Hippocampus whitei*. Credit: David Harasti.

White's seahorse, *Hippocampus whitei*

White's seahorse was listed as Endangered in 2020 by the International Union for Conservation of Nature (IUCN) because of population declines across its restricted range (the species is endemic from central Queensland to New South Wales), attributed to loss of essential habitats.

This project was awarded a Queensland Threatened Species Research Grant to the team of HDR student Rowan Carew, and Associate Professors Karen Cheney and Chris Roelfsema.

The aims of this project are to:

1. understand the abundance and distribution of *H. whitei* populations in south-east Queensland;
2. examine the genetic relatedness of south-east Queensland individuals to New South Wales populations;
3. investigate behavioural trials to examine habitat preferences; and
4. conduct seagrass and benthic habitat mapping to identify key sites and contemporary changes to habitats, which may threaten the abundance and distribution of this species.

Study reveals flood mud burden on Moreton Bay

Sampling by The University of Queensland during and after the February 2022 Brisbane River flood has sounded a warning about the future of Moreton Bay, with climate change predicted to bring more extreme weather.

Dr Alistair Grinham, formerly of the UQ School of Civil Engineering, said recent floods deposited mud across 98% of the Bay, compromising its remaining areas of clean sand and hastening the growth of a muddy "dead zone".

"In 1970, Moreton Bay had about 400 km² of clean sand, and now it has just 30 km²", Dr Grinham said.

"Clean sand is defined as having less than 1% of mud content, so some areas may look lovely and white, but the flood sediment is insidiously changing the nature of the seabed and affecting water chemistry.

"Sand in inert, flood sediment contains clay, organic matter and nutrients from rural and suburban areas which microbes break down to release nitrogen.

"This process is a background stressor across the whole Bay, contributing more and more nutrients to the water."

Changing the biome in the Bay

Dr Grinham said the levels of nitrogen measured in the water during the study indicated that Moreton Bay already had a big problem.

"We estimate the amount of ammonium the sediment is contributing to the Bay's water to be equivalent to 180 years of sewage plant discharges", he said.

"When you load a system with nutrients and mud like this, phytoplankton thrive and block sunlight from reaching the seabed, which is already being smothered by mud, and these factors change what can live there.

"It is a process already underway in Moreton Bay."

50 years of mud sampling

The study collected and analysed sediment from 47 sites around Moreton Bay three days after the flood peak and then at more than 200 sites throughout 2022.

Core samples of mud pulled from the seabed across the Bay were also collected and the results compared to previous studies done in 1970, 2015 and 2019.

"Over the past 50 years, 300 million cubic metres of mud has been washed into Moreton Bay – that's enough to fill 300 Suncorp stadiums", Dr Grinham said.

"A lot of the mud has collected in the central Bay, where the water is deeper and wind and tidal currents can't disperse it.

"This is where a big mud zone is growing and puts at risk the great habitat wealth of Moreton Bay.

Flood sediment is insidiously changing the nature of the seabed.

Image Brisbane River flood plume March 2022. Credit: Planet Labs.

"With climate change meaning we will see more extreme weather events and floods in the future, we desperately need restoration work along the Brisbane River catchment and especially in the Lockyer Valley and Bremer River sub-catchments that flow into the Bay.

"Without restoration work, eventually Moreton Bay will not be able to bounce back from a flood event", Dr Grinham said.

The research is part of a long-term collaboration between UQ, Urban Utilities and the Port of Brisbane.

The research found no evidence to suggest there was a health risk associated with swimming in the waters of Moreton Bay when an algal bloom was not present.

The research paper is published in *Science of the Total Environment*.

Read it here:
sciencedirect.com/science/article/pii/S004896972400785X?via%3Dihub

A growing mud zone is putting at risk the great habitat wealth of Moreton Bay.

Images (left to right) Collecting a mud sample raised from the seabed of Moreton Bay. Dr Alistair Grinham at work on Moreton Bay. Credit: UQ News

Plastic pollution in Moreton Bay

Helen Bostock
School of the Environment

A growing body of evidence is revealing plastic pollution in the marine environment. Most of this plastic pollution is washed into waterways and delivered to the coast by rivers, especially during floods or large rainfall events, where it is primarily trapped nearshore in estuaries and coastal ecosystems, with some making it offshore into the open ocean.

While the sight of plastic bottles, straws and bags is distressing, these larger plastics degrade and break down to form microplastics, which are pieces of plastic less than 5 mm in size, and nanoplastics, which are smaller than 1 mm. Due to their small size, the presence and impact of these micro- and nanoplastics go largely unnoticed in the environment. However, these tiny plastic particles can be ingested by microscopic organisms and find their way into commonly consumed seafood. The plastics also leach harmful chemicals into the environment.

We estimate that the total mass of plastic stored within the surface sediment of Moreton Bay to be 7000 tonnes.

Sources and fate of plastics in Moreton Bay

Images (left to right) Study lead author Elvis Okoffo investigating plastic pollution in Moreton Bay. Credit: Elvis Okoffo. Dr Elvis Okoffo in lab. Credit: The University of Queensland.

In Australia, knowledge is limited about the amount and type of plastic pollution in marine and coastal environments. To manage the problem of plastic pollution in the marine environment, first we must understand the scale of the problem. In our paper led by Elvis Okoffo and published in *Science of the Total Environment* (see link details below), we focused on the semi-enclosed coastal embayment of Moreton Bay.

Our method

Part of the reason for this lack of knowledge is that current methods for measuring microplastics are time-consuming and semi-quantitative. We used a new quantitative method, Pyr-GCMS, to measure the concentration of seven common plastic polymer types (i.e., polystyrene (PS), polycarbonate (PC), poly-(methyl methacrylate) (PMMA), polypropylene (PP), polyethylene terephthalate (PET), polyethylene (PE) and polyvinyl chloride (PVC)). This method involves dissolving the plastic in dichloromethane and then pyrolising (heating up) the sample to vaporise the plastic from the samples. The vapour is then analysed in a gas chromatograph mass spectrometer to determine the types of plastic. The advantage of this method is that we can quantitatively measure plastic concentrations of any size range.

Sampling in Moreton Bay

We measured the plastic stored in around 50 surface sediment samples from across Moreton Bay, from a range of different Bay ecosystems, including mangroves, seagrass and mud from its main tidal channels. Most plastic is denser than water, and the majority of plastic particles sink to the sea floor. Ecosystems like mangroves and seagrass are very effective at trapping sediment in coastal ecosystems and have also been found in other regions of the world to have high concentrations of microplastics.

We found that plastics are pervasive across the Bay and were present in all the sediment samples, although they displayed a wide range of concentrations from 3.3 to 2194.2 µg/g. There was no clear pattern in the plastic concentration, suggesting a wide range of sources of plastics to the Bay that transport down waterways such as the Brisbane River, and it is likely that the plastics are transported within the Bay by tidal currents. Using the average concentration of the plastics in different regions and ecosystems within the Bay, we estimate that the total mass of plastic stored within the surface sediment (the top 10 cm) of the 1500 km² of Moreton Bay to be 7000 tonnes. This level of plastic contamination is equivalent to three Olympic swimming pools full of plastic, or 1.5 million single-use plastic bags.

Among the seven polymers analysed, PE and PVC were found at the highest concentrations. These were the most commonly used plastics in Australia in 2019–20, suggesting a direct link between the consumption of plastics in Australia and their prominence in the coastal environment. PE is one of the cheapest types of plastic and is widely used for single-use plastic items such as food wrappings, plastic bags and plastic bottles. PVC is used in wastewater treatment plant pipes, building materials, electronics and clothing. Knowledge of these main plastic types polluting our coastal environments is critical to inform the management strategies for reducing future plastic pollution in the coastal environment.

We are currently investigating how plastic has changed over time in Moreton Bay from sediment cores from the centre of the Bay, and we will be looking at the level of plastic contamination in organisms that live there.

The research paper was published in *Science of the Total Environment*.

Read it here:
pubmed.ncbi.nlm.nih.gov/38365023/

Nanoplastics are ingested by microscopic organisms and find their way into seafood.

Image Our snorkel team, Kirsten Golding, Sofia Palmer, Dr Katharine Prata and Dr Hannah Markham, on board the Sea World Foundation's *Sea World 2*, excited for a day of surveying. Credit: Kirsten Golding.

Moreton Bay rapid coral bleaching assessment trip with the Sea World Foundation

Kirsten Golding
Marine Paleoecology Lab,
School of the Environment

On Wednesday 20 March this year, I led a team of coral researchers from The University of Queensland on a visit to Quandamooka Sea Country (Moreton Bay) with the Sea World Foundation.

Our aim was to conduct a rapid assessment of coral bleaching on the reefs inside Moreton Bay, in response to the prolonged high sea surface temperatures recorded within the Bay over the summer period. We successfully surveyed five sites – Myora Reef, Goat Island East and West, and Peel Island Southeast and Northeast. The majority of coral colonies across different genera were healthy and did not exhibit signs of thermal stress, that is, coral bleaching.

However, at all sites visited, at least half of the *Goniopora* colonies, a boulder coral with long fleshy polyps, were bleached, with some colonies producing bright fluorescent pigments. We also observed a few instances of recent mortality of this coral genus.

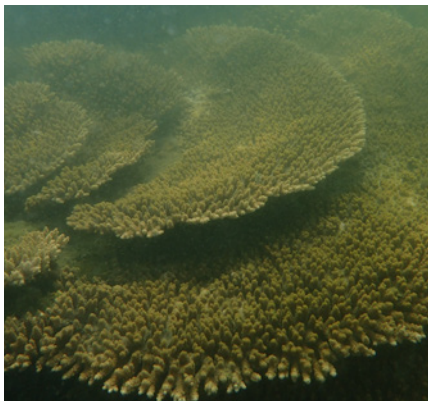
At Goat Island East, *Goniopora* is a dominant component of the hard coral community remaining at this site, but we found that 80% of *Goniopora* colonies were bleached or fluorescing.

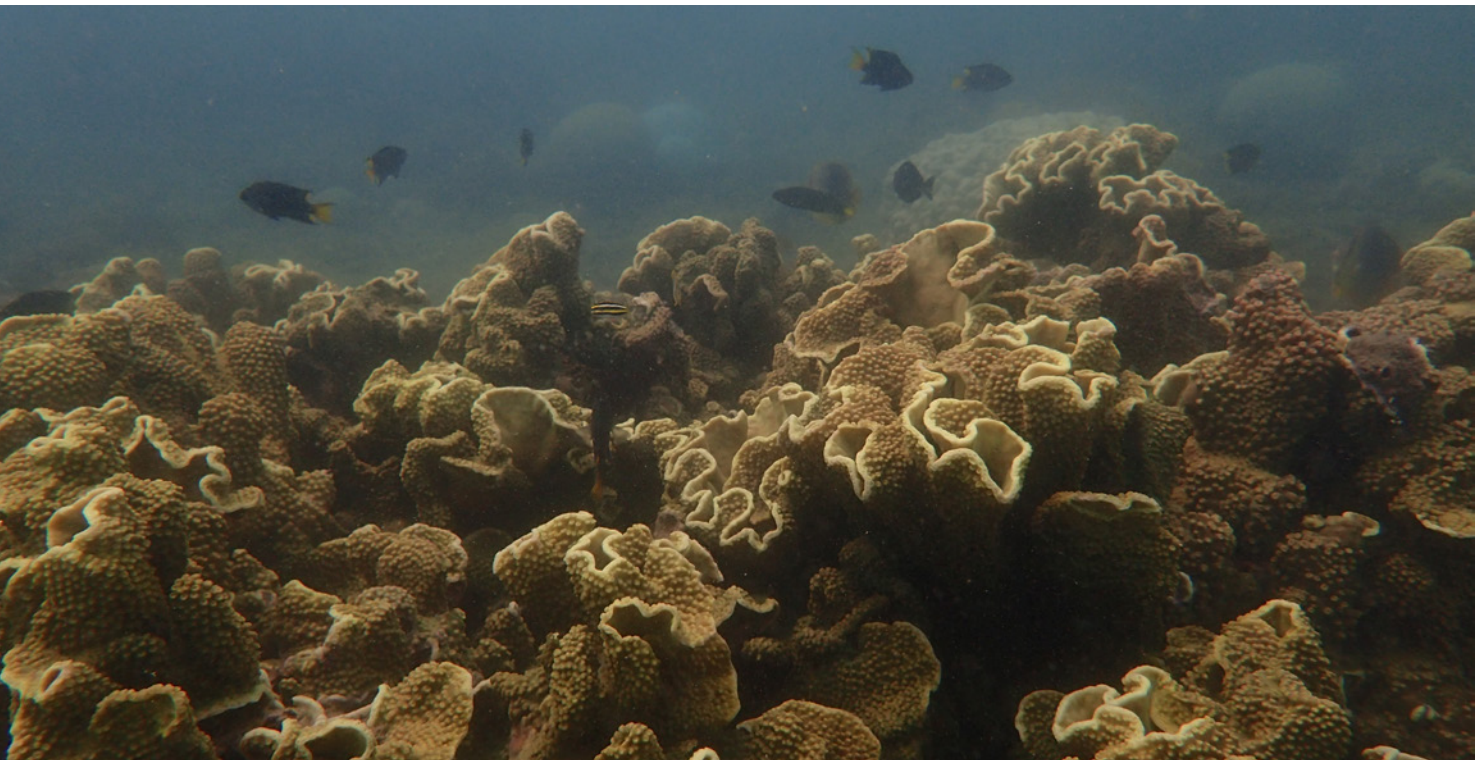
At Myora Reef, 95% of Acropora colonies, a tabulate branching coral, were healthy and not bleached but most shallow *Pocillopora* colonies – a fast-growing, branching coral – were pale. Although sea surface temperatures had begun to cool down by the time of our visit, the coral heat stress response is ongoing and we are continuing to monitor the coral bleaching.

This work would not have been possible without the support of the Sea World Foundation, who provided a boat, skipper, Andrew Mulville, and dive supervisor, Clinton Karger, for the day.

SEA WORLD FOUNDATION
Research Rescue Conservation

At all sites visited, at least half of the Goniopora colonies were bleached.





Images (left to right, top to bottom) Healthy *Acropora* coral at Myora Reef. *Goniopora* boulder coral surrounded by healthy soft corals at Goat Island East. Healthy foliose *Turbinara* coral surrounded by reef fish at Goat Island West. Conducting a CoralWatch survey on a healthy foliose *Turbinara* at Peel Island Southeast. Bleached and partly dead *Goniopora* coral at Peel Island Northeast. Bleached live polyps are seen at the top right, with dead coral at the bottom left. Credit: Kirsten Golding.

Mapping social values of Moreton Bay

The *Sustainable Urban Seascapes, Moreton Bay* project not only focused on the outstanding ecological values of the region but also had a research theme focused on social values. This theme aimed to learn more about the places in Moreton Bay that people value.

Postdoctoral fellow Dr Vicki Martin led a project focused on capturing the values of one important stakeholder group, recreational motor vessel users. The project used a combination of in-person and online survey questions within a Geographical Information System to record and map the values held by recreational boaters. A team of researchers visited popular boat ramps across the region in 2022 and received 304 valid surveys. As a result, 14 value types were mapped across the region (e.g., "therapeutic reasons", "experiencing nature", "spiritual connections"). The most popular value type was *appreciating the natural beauty*.

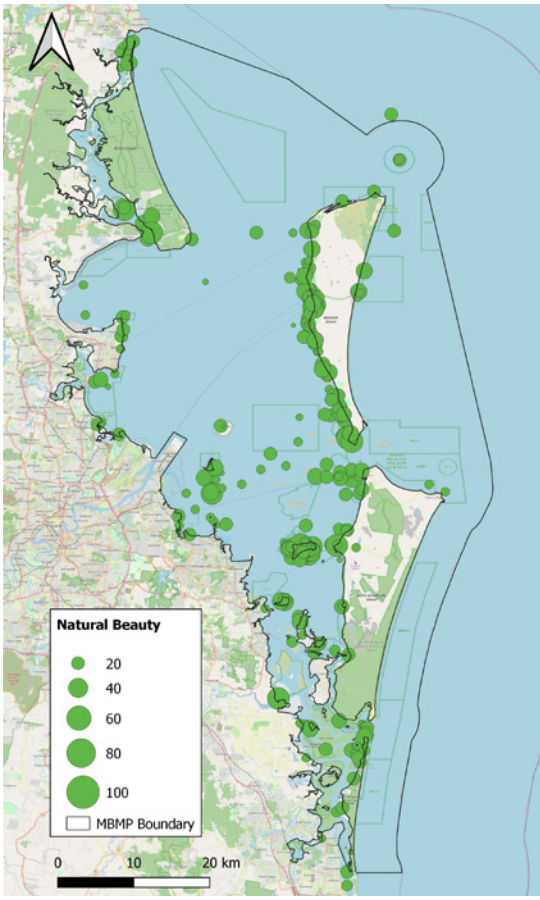
The data collected in this project are of interest to Queensland's Department of Environment, Science and Innovation for informing marine management decisions. It inspired the development of an Australian Research Council Linkage Grant, led by Associate Professor Carissa Klein. The research was also the foundation of a project currently being run by The Great Barrier Reef Marine Park Authority, for developing the Southern Great Barrier Reef Plan of Management: gbrmpa.gov.au/our-work/programs-and-projects/southern-plan-management

For more information about this and other social value projects in Moreton Bay, please contact Dr Claudia Benham, Associate Professor Carissa Klein, or Dr Vicki Martin (vicki.martin@mosaicinsights.com.au)

The research was also the foundation of a project currently being run by The Great Barrier Reef Marine Park Authority, for developing the Southern Great Barrier Reef Plan of Management.

Image Project lead Dr Vicki Martin collects data from a recreational boater, at an event organised by The Moreton Bay Foundation, a financial supporter of this project. Credit: Carissa Klein.

Map Data showing how much and where 297 survey recreational boaters appreciated natural beauty. The bigger the dot, the more that place is valued for its natural beauty. More results can be found on the project's **website**. Visit it here: **bit.ly/MoretonBayStudy**. Credit: Bridey Crowe, CBCS Masters student.



Moreton Bay Special Issue

Toondah Harbour saved: a personal reflection

Josh Wilson
CBCS PhD candidate

I've lived in Brisbane for 10 years, and I've always loved Moreton Bay. I enjoy exploring Moreton Island by 4WD and snorkelling for hours around the Tangalooma wrecks, then gorging on the delicious food grown or caught fresh in the Bay. I admire the beautiful bayside shops and houses and appreciate the convenience of having shipping ports, shopping malls, public transport and everything else here that comes with city living.

But like many of us, I'm busy, caught up in my own little life, working full-time while attempting to stay healthy and maintain some semblance of a social life. So, I often forget that I share Moreton Bay. I share it with the 25,000 humpback whales that cruise past each year, and the 800 dugong that snuffle across the seagrass. I share it with the largest resident population of bottlenose dolphins in the world, and the 40,000 shorebirds that start and end their massive migrations here. I share it with over 30 threatened species, including the Critically Endangered far eastern curlew, whose population has declined by 80% in the past 30 years. And I often forget that Moreton Bay is one of the most important wetlands in the world.

We share Moreton Bay with over 30 threatened species.

Moreton Bay represents a place where we must find a balance between these values, where recreational activities, ecotourism, commercial fishing and coastal development must be considered against the needs of the wildlife that depend on the Bay.

Unique wetlands protected

On 9 April, Tanya Plibersek, Australian Minister for the Environment and Water, set out a proposed rejection (minister.dcceew.gov.au/plibersek/media-releases/proposed-decision-refuse-development-toondah-harbour) of the 1.4 billion-dollar Toondah Harbour development.

"I have made my proposed decision, which is to protect Moreton Bay from unacceptable impacts from a proposed development," said Plibersek.

"These wetlands are rare, unique and important to prevent the extinction of animals like the eastern curlew and loggerhead turtle."

Image Beautiful Toondah Harbour. Credit: Judy Leitch.

The initial intent of the project was to provide much-needed updates to the Toondah ferry terminal, a proposal generally supported by the community. But the project expanded over time and in its end form would have involved redrawing the boundaries of the internationally protected Moreton Bay Ramsar site, destroying habitat for threatened and migratory species to make way for a marina, housing and a commercial precinct (toondah.com.au).

You can view the history of the Toondah Harbour developments here (redlands2030.net/toondah-harbour-the-illustrated-history).

Many parties to the outcome

The Minister deemed the impacts of the project unacceptable, citing the removal of 58.7 hectares of internationally protected wetland that are relied on by a number of threatened species.

Plibersek's proposed decision led to the developer, Walker Corporation, withdrawing their application, meaning that the Ramsar site will remain intact.

This outcome underscores the values that we must keep front of mind here in Moreton Bay. That we can, and should, enjoy the beauty and opportunities that Moreton Bay offers, but this must not come at an unacceptable cost to the wildlife with which we share the Bay.

This outcome did not materialise out of thin air. It was brought about through sustained efforts by the Toondah Alliance, Birdlife Australia (actforbirds.org/savetoondah), Redlands 2030, representatives of the Quandamooka people, environmentalists, thousands of Redlands residents and businesses, and many other concerned individuals and organisations around Australia.

I love Moreton Bay and I appreciate the opportunities granted by developments. But the Bay is also an internationally important wetland teeming with life, serving as a bastion for countless species, from humpback whales to far eastern curlews. We must consider the welfare of these species when assessing developments. Tanya Plibersek's decision to reject the ecologically damaging Toondah Harbour development, brought about by consistent advocacy from local groups, is a brilliant example of this consideration.

Our enjoyment of the beauty and opportunities that Moreton Bay offers must not come at an unacceptable cost to its wildlife.

Images (clockwise from top)

Far eastern curlews (*Numenius madagascariensis*) are one of the fastest declining shorebird species, having lost 80% of their population over the past 30 years. A few individuals can often be seen foraging within the Toondah Harbour proposed development area and flocks of over 100 individuals occasionally roost nearby.

Pied stilts (*Himantopus leucocephalus*) are one of my favourite shorebirds. Their long vibrant pink legs dangle behind them somewhat comically as they fly. They commonly roost nearby the Toondah Harbour proposed development, and occasionally can be seen foraging at the site.

Bar-tailed godwits (*Limosa lapponica*) are the most abundant migratory shorebird in Moreton Bay, with counts regularly exceeding 10,000 birds. They also hold the record for the longest non-stop migratory flight, with one individual travelling 13,500km in 11 days from Alaska to Tasmania. If we keep destroying their foraging grounds, they may not be able to store the energy required for such massive migrations. Credits: All artwork by Josh Wilson.

Evaluating the resilience of our coastal wetlands to sea-level rise

Vicki Bennion
CBCS PhD candidate
Professor Catherine Lovelock
ARC Laureate Fellow and Head, Mangrove and Blue Carbon Lab, CBCS

Moreton Bay encompasses an estimated 18,500 hectares of coastal intertidal wetland communities located throughout the rapidly growing city of Brisbane. Mangroves provide many important ecosystem services within the urban setting of Moreton Bay, including protection from coastal erosion, soil carbon sequestration and habitat for marine and terrestrial fauna.

Their persistence with sea-level rise depends upon their capacity to increase their soil surface elevation at a rate comparable to the rate of sea-level rise, otherwise they will eventually drown. We set out to understand whether coastal wetlands in Moreton Bay can persist with sea-level rise and the processes that make this possible.

Mangroves and saltmarshes

In 2007, we installed 36 instruments called rod-surface elevation tables (RSETs) to monitor soil surface elevation dynamics at six sites in the mangroves and saltmarshes of Moreton Bay. The concept of measuring soil surface elevation using RSETs was developed by the United States Geological Survey in the 1990s.

It has been adopted worldwide since then, with over 20 countries using RSETs to measure soil surface elevation change in a wide range of coastal wetlands, answering fundamental questions about their resilience to sea-level rise. The device measures the precise changes in soil surface elevation using a stable benchmark anchored deep in the soil.

RSET benchmarks consist of stainless-steel rods hammered into the sediment (~12m deep), which are capped with cement at the soil surface. Installation of RSETs can be difficult, as you balance on a platform while hammering so as not to disrupt the soil surface that you plan to monitor for the next decade or longer. The changes in elevation of the soil surface are measured using a portable measuring "table" that is attached to the rods. Levelled and fibreglass pins are carefully lowered to the soil's surface.

In addition to soil surface elevation, we have made a range of other measurements including surface accretion (measured as sediment trapped on the surface) and mangrove tree growth using dendrometer bands that measure growth of the circumference of tree stems.

We found that the dynamics of soil surface within these ecosystems are complex, as there are biotic and abiotic factors that interact to influence trends in soil surface elevation. Using an analytical technique called structural equation modelling, we identified that trends in mangrove soil surface elevation were more strongly influenced by variations in biotic factors than abiotic factors.

Gains in soil surface elevation were greater with the presence of the stilted mangrove *Rhizophora stylosa* than with the dominant species in Moreton Bay, the grey mangrove *Avicennia marina*. Soil surface elevation gains were also higher with high levels of soil turnover by crabs. However, annual rainfall was linked to sediment trapping in the mangroves, reflecting the role of high rainfall in sediment runoff into the Bay, of which a portion is trapped in the mangrove. Increased annual rainfall also supported increased levels of mangrove tree growth.

Our monitoring is set to deliver rich insights into the changing state of Moreton Bay's wetlands as climate change progresses.

Images (left to right) Mangroves slowly colonising the saltmarsh at Point Halloran Reserve. Credit: V. Bennion. Measuring saltmarsh surface elevation in the Tinchi Tamba Wetlands Reserve. Credit C. Lovelock

Although mangroves live with daily inundation by saline tidal waters they rely on fresh water for high growth rates. We also found that stilted mangrove trees have faster growth rates than those of the grey mangrove. Global warming may be enabling the stilted mangrove to increase its abundance in Moreton Bay, which ultimately may enhance the resilience of mangroves to sea-level rise.

Gains in the soil surface elevation within the saltmarshes of Moreton Bay were much less than that observed in the mangroves, and were directly influenced by variation in annual rainfall. The trapping of sediments in the saltmarsh was also influenced by annual rainfall (similar to mangroves) and by plant cover, suggesting that dense plants slow water flows, leading to the deposition of sediment suspended in tidal waters within the saltmarsh. Our ongoing monitoring of the coastal wetlands of Moreton Bay is enabling us to gain a better understanding of potential tipping points of these systems with extreme El Niño Southern Oscillation (ENSO) events and with sea-level rise.

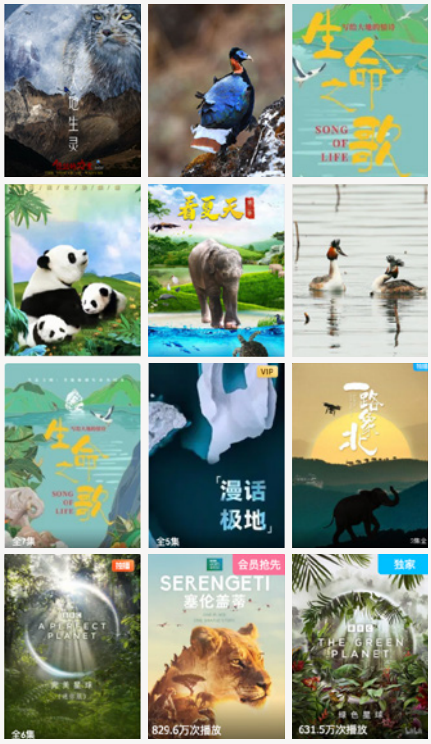
Not for the faint-hearted, but joy-filled

Field work within these ecosystems isn't for the faint hearted, but for those tenderly touched by the love of mud, it's all in a day's work.

Like most field work, it has its challenges and ups and downs, but knowing we are gathering some of the most important baseline data on how wetlands of Moreton Bay respond to sea-level rise and other threats brings us great joy. While our data has not yet captured the impacts of sea-level rise on landward migration of mangroves into saltmarshes, by returning to the same sites over all these years we have watched the mangroves colonise the saltmarsh at Tinchi Tamba Wetlands. In the Boondall Wetlands, we have to argue with a mangrove tree growing laterally into one of our saltmarsh plots that now requires us to adopt yoga poses to measure the RSET – and many other saltmarsh sites are bursting with an abundance of young mangrove saplings. Our monitoring is set to deliver rich insights into the changing state of Moreton Bay's wetlands as climate change progresses.

Reference Bennion, V., Dwyer, J.M., Twomey, A.J., & Lovelock, C.E. (2024). Decadal trends in surface elevation and tree growth in coastal wetlands of Moreton Bay, Queensland, Australia. *Estuaries and Coasts*. **https://doi.org/10.1007/s12237-024-01325-y**

Image Measuring saltmarsh elevation on North Stradbroke Island during a king high tide. Credit. C. Lovelock.



Non-English language conservation documentaries

In a recent paper, CBCS Honours student **Haonan Wei** and the translatE project's **Dr Tatsuya Amano** and **Dr Violeta Berdejo-Espinola** investigated the opportunities and challenges for nature documentaries in China.

The team aimed to raise public awareness of conservation issues, by assessing the thematic, geographical and taxonomic coverages of these documentaries. They found that Chinese-language nature documentaries provide unique information on biodiversity and ecosystems in China, and play an important role in raising conservation awareness in China and worldwide.

The paper also shows an urgent need to import and create more nature documentaries on under-represented, but critically important, realms/biomes (i.e., freshwater realm and deep-sea biome) and taxa (i.e., invertebrates, plants and fungi) and anthropogenic threats.

Read the paper here:
doi.org/10.1016/j.biocon.2024.110522

Reference Wei, H., Berdejo-Espinola, V., Ma, Y., & Amano, T. (2024). Content analysis of nature documentaries in China: Challenges and opportunities to raise public conservation awareness. *Biological Conservation*, 292. **https://doi.org/10.1016/j.biocon.2024.110522**

Image Some of the 2021 nature documentaries that the study looked at. These include both domestically produced Chinese-language documentaries and imported, mostly English-language, documentaries. Credit: Haonan Wei.

PROFILE

A pivot to policy

Dr Nicki Shumway
Research Fellow
Centre for Policy Futures
CBCS Affiliated Researcher

I started my conservation journey as a marine scientist. Even as a small child, I always knew that I wanted to work "with animals" – but that's a pretty wide mandate. In my third year at university, I took a marine science class, joined the dive club and never looked back.

The first time I went diving and was completely enveloped in the deep blue of the ocean, I knew I had found a life-long love. I had various field-based jobs in my early career, and while on an internship at Mote Marine Lab in Florida, I started doing sea turtle research. That work had me undertaking sea turtle nesting studies in Florida, then an in-water mark and recapture study of hawksbill turtles and, eventually, a sea turtle field position on Costa Rica's Osa Peninsula, near Corcovado National Park.

In Costa Rica, I was exposed to turtle poaching for the first time. While out turtle tagging one night, a volunteer and I ran into some local men with machetes who were digging up turtle nests to sell at the local market. That experience really made me think about the range of threats to marine species; and while I enjoyed being out in the field, I started to consider how I could make a bigger difference to the conservation of species.

To Australia, and CBCS

Over the next two years, I worked as a dive guide in Florida in the winters and as a nature guide in Alaska in the summers while I (very unsuccessfully) applied to grad schools in the US. Because I wasn't able to find any funded positions in the US, I decided to look further afield – and ended up finding the Master of Conservation Science at The University of Queensland.

Taking stock and pivoting in life and in your career is inevitable and will help drive your success.

Image Nicki diving with a whale shark during her dive guide days in West Palm Beach, Florida. Credit: Laz Ruda.

Images (left to right) Nicki and other members of the Reef Restoration and Adaptation program presenting at the Sustainability Research and Innovation (SRI) congress. Credit: Taryn Kong. Nicki during an in-water sea turtle mark and recapture study. Credit:Jim Abernethy.

My plan was simple: move to Australia, get my Masters, learn to surf and then head back to the States after a couple of years. However, that was 14 years ago, and I am still here. I finished my Masters research at UQ, then went into consulting. Once again I was in the field seeing incredible wildlife, but this time I was doing pre-mining fauna surveys – surveying all the wildlife that would be lost when a coal mine was inevitably approved. In fact, the one and only time I've seen a black-throated finch was doing fauna surveys at a pre-mine site. So, with a CV that was not quite good enough to secure an international scholarship for a PhD program, I started doing research assistant work at the Centre for Biodiversity and Conservation Science and teaching for a variety of classroom, laboratory and field-based courses.

With this additional experience, I was to begin my PhD at UQ, though the subject matter (biodiversity offsets in the marine environment) wasn't precisely what I had initially planned. Little did I know that my work in offsets would set me down the policy path and lead me to my current research.

Policy for change

I love going out in the field and seeing wildlife, but during my PhD it became clear to me that policy was a key mechanism for effecting change. With offsets, for example, despite strong alignment with best practice, I saw that we were failing to achieve conservation outcomes. My PhD quickly became focused on examining those outcomes and evaluating the challenges and opportunities to do better.

By improving conservation policy, exponential change for better biodiversity outcomes seemed to be possible. Despite this, a disconnect was apparent between conservation policy and the science underpinning it. I would see (and, indeed, write) papers saying, "This may have important policy implications". However, it was never quite clear what those policy implications were, or how a decision-maker might pick up that paper and be able to apply that science in practice.

Bridging the science–policy gap

My work now focuses on bridging that science–policy gap. As a research fellow in the Centre for Policy Futures, I work on a variety of biodiversity-related policy projects that enable me to evaluate policy to identify how better conservation outcomes can be achieved.

I can now see how the work I'm doing will be used to improve future conservation policy.

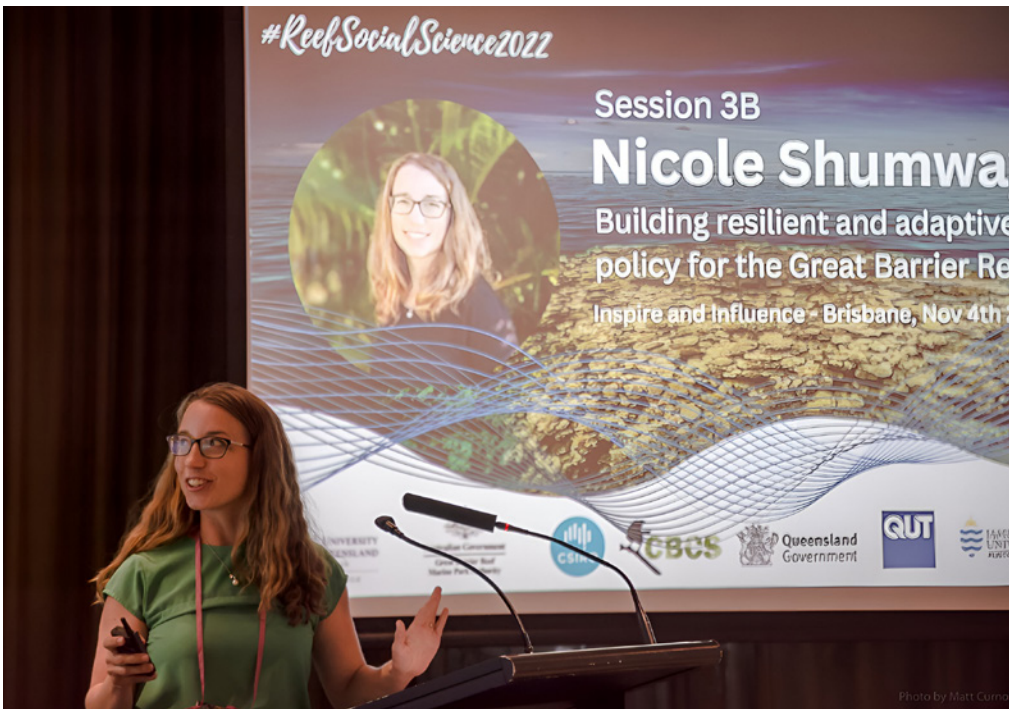
Through this research, I have been able to collaborate with governments, non-government organisations and stakeholders to integrate science more effectively into policy. In one such project, I am currently the regulatory co-lead of the Reef Restoration and Adaptation Program. In this role, I work with state and federal government agencies, the Great Barrier Reef Marine Park Authority and the Queensland Department of Environment, Science and Innovation, in particular, to evaluate the current regulatory environment in the Great Barrier Reef and the ability of current policy frameworks to assess large-scale, novel restoration and adaptation interventions.

As part of this project, we have developed a regulatory forum that brings together a wide range of decision-makers and scientists to discuss both the science and policy of emerging coral reef interventions. This forum creates collaboration between agencies and scientists and helps to bridge the science–policy gap.

Restoration and nature-based solutions

Another ongoing project with many UQ and current and former CBCS colleagues through the National Environmental Science Program (NESP) looks at identifying and overcoming barriers to marine and coastal restoration and nature-based solutions in Australia. As part of this work, colleagues and I mapped the regulatory framework for two different types of restoration projects across four states, collaborating with state government and local restoration practitioners. Our current NESP project will use those results to work with relevant government agencies to "de-risk" restoration throughout Australia.

This research will have multiple on-ground policy outcomes, including contributing to the development of a national restoration target under the Kunming–Montreal Global Biodiversity Framework, providing much needed information to inform the development of a biodiversity market, and informing restoration investment and prioritisation in multiple states (Qld, SA, Tas).



Images (top to bottom) Nicki presenting at the Social Science for the Reef Symposium in Brisbane in 2022. Credit: Matt Curnock. Nicki with other expert panellists at the Reef Futures Roundtable at the Australian Academy of Sciences in Canberra. Credit: Australian Academy of Sciences.

The winding path

In my current work, I see the policy impact that I wanted to make. I can see how the work I'm doing now will be used to help improve policy frameworks for a range of conservation initiatives. But it wasn't a linear path. There were many bumps along the road and career pivots to get here, and more to come I'm sure as I navigate the research I would like to be doing, as a mum with two small children.

While writing this piece, I read some of the other researcher profile pieces that have been published in this newsletter. What became abundantly clear, from my story and those of others, is that taking stock and pivoting in life and in your career is inevitable and will help drive your success. So, wherever you are on your career path, and especially if you're in the midst of your own life/career pivot, know that we have all been there before, and will likely be there again soon.

Examining multilingual matters in scientific publishing

CBCS collaborator Henry Arenas-Castro has led a large multidisciplinary team of scholars, many of whom are members of CBCS, in a new study looking at language barriers in the dissemination of scientific knowledge between diverse language communities.

The research revealed that scientific journals are making minimal efforts to foster a multilingual community of authors and readers.

Reference Arenas-Castro, H., et al. (2024). Academic publishing requires linguistically inclusive policies. *Proceedings of the Royal Society B*, 291(2018). **https://doi.org/10.1098/rspb.2023.2840**

Image credit Amador Loureiro_Unsplash.

Henry and his co-authors examined the linguistic policies of 736 journals in biological sciences, gathering information from author guidelines and surveys sent to Editors-in-Chief. The study showed further that society-owned and lower-Impact Factor journals were more likely to have policies that are inclusive for non-native English speakers and to promote the multilingualisation of scientific knowledge. The authors concluded the publication by providing a set of actions that can be implemented by journals and urging publishers and journals to act immediately to overcome language barriers in academic publishing.

Read the paper here:
doi.org/10.1098/rspb.2023.2840

Transcending language barriers: wins for science

CBCS PhD candidate **Kelsey Hannah** has recently led a paper with co-author Neil Haddaway, and CBCS supervisors **Dr Tatsuya Amano** and **Professor Richard Fuller**, that reveals important findings for improving the quality of ecological research worldwide.

Systematic reviews often overlook non-English literature, but this literature may hold valuable insights. This study of 72 systematic reviews and maps from the journal *Environmental Evidence* reveals that 44% of articles excluded non-English sources. A survey of authors of the papers reveals a variety of explanations for this exclusion, such as time or resource constraints.

Kelsey and their co-authors propose several solutions to help alleviate the barriers faced by authors in aiming to include non-English language literature, such as diversification of the review team, machine translation and incorporating translation costs into funding applications. Kelsey and their co-authors' study highlights the need for broader language inclusion in ecological research to reduce bias and enhance evidence quality. This study works to support the translatE project (translatesciences.com), which focuses on the often-overlooked challenge of transcending language barriers in science.

Read the article here:
doi.org/10.1002/jrsm.1699

Reference Hannah, K., Haddaway, N.R., Fuller, R.A., & Amano, T. (2024). Language inclusion in ecological systematic reviews and maps: barriers and perspectives. *Research Synthesis Methods*, 2024: 1-17. **https://doi.org/10.1002/jrsm.1699**

Image credit Carl Wang_Unsplash.

Meet Australia's most recently named and described longhorn beetle: *Excastra albopilosa!*

James Tweed
CBCS PhD candidate

Some of you may recognise this beetle from the media coverage it has received since publication of our paper in March. I was lucky enough to literally stumble upon this species while camping at Binna Burra Lodge in Lamington National Park back in 2021.

I knew it was something special, but it wasn't until I got back to Brisbane that I began to realise just how unique this find was. I reached out to Australia's leading longhorn beetle expert, Dr Adam Ślipiński from the Australian National Insect Collection (ANIC), and he confirmed he'd also never seen anything like it. A trip down to ANIC to work with Adam and Dr Lauren Ashman (also an expert on Australian longhorn beetles) solidified that we not only had a new species, but a new genus as well!

The discovery of a new longhorn within Australia is hardly surprising, with many undescribed species, and even genera, known to exist within entomological collections.

However, the fact that this highly conspicuous species has avoided attention for so long is something of a mystery. As far as we are aware, the holotype is the only specimen ever collected. Evidently, some aspect(s) of the behaviour, biology, phenology, ecology or distribution of *Excastra albopilosa* limits collection opportunities, but until additional specimens are found, it is difficult to say what that may be.

The long white hairs that cover much of the body of *E. albopilosa* are suspected to help the specimen mimic an insect infected and killed by an entomopathogenic fungi. Now that people are aware of this species, hopefully additional specimens and occurrence records can be documented and we can begin to learn more about it.

It has taken a couple of years for me to submit the paper, as I've juggled working on it with my PhD as well as numerous other side projects, but it was finally published a couple of months ago in the *Australian Journal of Taxonomy*. The media coverage has far exceeded my expectations, with outlets around the world picking up the story. It is great to see insects and taxonomy feature in the media!

From a conservation perspective, discoveries like this emphasise just how important it is to protect natural areas, not only for known threatened species, but also for the thousands of as-yet undiscovered species. Such discoveries also emphasise the importance of taxonomy, which is an often-underappreciated science but vitally important to many aspects of conservation. Undescribed species tend to slip through the gaps in conservation efforts (e.g., they can't be listed on the IUCN Red List except under exceptional circumstances). Naming and describing a species, and publicly advertising the discovery, therefore ensures it is visible not only to fellow scientists but also to conservationists, policy-makers and the public, greatly reducing the risk of them being overlooked. To paraphrase David Attenborough: "no one will protect what they don't care about; and no one will care about what they ~~have never experienced~~ [never new existed]".

Read the paper here:
doi.org/10.54102/ajt.iv1x5

Reference Tweed, J.M.H., Ashman, L.G., & Ślipiński, A. (2024). *Excastra albopilosa*, a remarkable new genuse and species of Lamiinae (Insecta: Coleoptera: Cerambycidae) from southeastern Queensland, Australia. *Australian Journal of Taxonomy*, 54: 1-8. **https://doi.org/10.54102/ajt.iv1x5**

Media Explore some of James's media stories: an ABC news article **here**, an *Australian Geographic* article **here**, and a UQ News piece **here**.

Image *Excastra albopilosa* means, aptly, "white and hairy from the camp". Credit: James Tweed.

Issue 18 Winter 2024

PROFILE

Diversity in location, diversity in life

Chloe Dawson
CBCS HDR Representative – Community

My journey has taken me from the bustling streets of London to the serene beaches of Phuket, from the arid heat of Perth to the crisp air of Canberra, and from the untamed expanses of Hokkaido to the structured slopes of Thredbo. It has been a constant exploration, both geographically and personally, and now finds me rooted in Brisbane, pursuing my passion for conservation science as a PhD candidate at The University of Queensland.

Nature has always been my sanctuary, my playground and my inspiration. As a child, I was drawn to the wonders of the outdoors. Whether roaming through a pristine park in England or diving into the depths of the ocean off the coast of Thailand, I found solace and excitement in the natural world.

London to Canberra

My family's frequent relocations only fuelled my curiosity, exposing me to a diverse array of cultures from a young age. When I was six years old, we made the leap across continents, moving from London to settle in Western Australia. It was there, surrounded by the laid-back ambiance of Fremantle, that I discovered my affinity for the great outdoors. Yet, my journey into academia took a winding path. Initially drawn towards international relations and Arabic studies in Canberra, I soon realised that my true passion lay elsewhere.

I began my path into science at The Australian National University. There I found my calling in climatology and environmental studies. Fuelled by a desire to protect the planet that had captivated me since childhood, I earned my Bachelor of Science, laying the foundation for my future endeavours.

Nature and mining

It was during my Master of Environmental Management in Brisbane that my passion for research truly ignited. Under the guidance of Dr Laura Sonter, my supervisor, I delved deep into the intricacies of biodiversity conservation, specifically focusing on assessing the assumptions made in the literature surrounding the biodiversity and climate implications of land-based and deep-sea mining. This project not only sharpened my research skills but also deepened my understanding of the complex interplay between human activity and ecosystems.

Now, as a PhD student at UQ, I stand at the opening of a new chapter in my journey. Guided by a passion for nature and a dedication to conservation, I am determined to make a meaningful impact in the field of environmental management. My research focuses on understanding the biodiversity implications of expanding mining operations for energy transition metals. Specifically, I aim to develop a framework for informed decision-making on where to mine, considering both terrestrial and deep-sea supply, to minimise biodiversity losses and promote sustainable conservation outcomes.

I am determined to make a meaningful impact in environmental management.

Images (clockwise from top right) Peak of Mt Niseko-Annupuri, Japan. Credit: Aaron Carpenter. Miami Beach, Gold Coast. Credit: Ashley Thomas. Cedar Creek Falls with fellow HDR students. Credit: Ashley Thomas.

Images (left to right) New York City, view of Brooklyn Bridge. Credit: Ashley Thomas. Backcountry touring in Thredbo, Australia. Credit: Phil Waddington.

Snowfields, self-defense and sci-fi

Among my academic pursuits, there's another facet of my life that holds a special place in my heart – skiing. From the slopes of Thredbo in Australia's own Snowy Mountains to the powder fields of Niseko, Japan, I've spent countless hours navigating the snow-covered terrain, sharing my passion for skiing as an instructor. The crisp mountain air, the exhilarating rush of carving through fresh groomers and the company of fellow skiers have all enriched my life and broadened my appreciation for the natural world. Similarly, horse-riding, a once-favourite activity of mine, has provided many moments of freedom and connection with nature.

Additionally, I have found joy in practising Krav Maga, a discipline that combines physical fitness with self-defence skills, and I am proud to be graded in this martial art.

In addition, I have a deep love for literature, particularly the genres of fantasy and science fiction. The escapism they offer, coupled with the scientific concepts they explore, provide a perfect balance to my academic pursuits. I am an avid reader, always eager to dive into new worlds and explore the depths of imagination. If you ever need a book recommendation, please look no further!

And what the future holds

During my time at UQ, I've cherished the friendships and connections I've made within the CBCS community. The supportive environment and sense of camaraderie have made my PhD journey even more rewarding. As the CBCS HDR representative for community, I've had the privilege of engaging with fellow HDRs, fostering connections and contributing to a vibrant and inclusive community.

Looking ahead, I'm excited about the opportunities to make a meaningful impact in conservation science and beyond.

I cherish the friendships and connections I've made in CBCS.

About CBCS

The Centre for Biodiversity and Conservation Science (CBCS) is a world-leading solution-oriented research centre for biodiversity conservation.

Based at The University of Queensland (UQ) in Brisbane, Australia, CBCS works in partnership with scientists, governments, non-governmental organisations and industry to help solve the most important conservation problems around the world.

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