CBCS NEWS

THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

CREATE CHANGE

A quarterly newsletter of the Centre for Biodiversity and Conservation Science

Yellow Sea World Heritage: CBCS researchers key to nomination success

Hundreds of thousands of migratory shorebirds spend each summer in Australia before undertaking astounding 20,000 kilometre roundtrip journeys to their breeding grounds in northern China, Russia, Mongolia and Alaska.

In July 2019, several key sites in Jiangsu province along China's Yellow Sea coastline were inscribed as Phase I of the two-phase serial World Heritage nomination "Migratory Bird Sanctuaries along the Coast of Yellow Sea/Bohai Gulf of China", which will eventually include at least 16 sites.

The newly inscribed sites include vital habitat for the Critically Endangered spoon-billed sandpiper and thousands

Below: Sign erected at Tiaozini/Dongtai in Yancheng, China to recognise its recent inscription onto the World Heritage List
Bottom: Migratory shorebirds   *Photos:* Micha Jackson

of other shorebirds, which in 2017 was still under threat from plans for coastal reclamation.

CBCS researchers were integral to an international research effort that has shown that multiple species of these remarkable birds have steeply declined in numbers as a result of severe coastal habitat loss, particularly in the Yellow Sea region. Fortunately, CBCS researchers are now also offering leadership towards conserving critical remaining intertidal habitat in the Yellow Sea.

Micha Jackson, a CBCS PhD student, has conducted important work in Jiangsu province that has a role in securing the region's wetlands for shorebird conservation. CBCS's Professor Richard Fuller has been advocating for shorebird conservation for many years, and was a key advisor to Australia's World Heritage representatives, who in turn played a key leadership role in ensuring the success of the nomination. Nonetheless, inscription of the Phase I sites is only the first step towards securing Yellow Sea wetlands for shorebirds. Micha's work has helped to highlight the urgent need for additional management of high tide shorebird habitat, and she was part of the international community representation at the 2019 Yellow and Bohai

Sea Wetlands International Conference, which took place in Yancheng, Jiangsu province. The meeting celebrated the Phase I nomination, but also provided a forum for important discussions about the ongoing management that is needed within the recently inscribed World Heritage sites, and advancing preparations for the forthcoming Phase II nomination.

China's World Heritage nomination is complemented by the Republic of Korea's "Getbol Korean Tidal Flats" World Heritage nomination, which also includes critical shorebird habitat and is scheduled for consideration in 2020. World Heritage status for all these coastal wetland sites would secure globally important habitat for multiple species of migratory waterbirds and represent an enormous contribution to the conservation and management of the world's intertidal flats and associated coastal wetlands. These are exceptionally productive ecosystems that support biodiversity of high conservation importance and provide high value ecosystem services.

CBCS will continue to provide leadership in the large-scale, multi-country collaborative effort that is needed to secure the future of our region's imperilled shorebirds.

References

Choi, C.-Y., Jackson, M.V., Gallo-Cajiao, E., Murray, N.J., Clemens, R.S., Gan, X. & Fuller, R.A. (2018) Biodiversity and China's new Great Wall. *Diversity and Distributions*, 24, 137–143.

Jackson, M.V., Carrasco, L. R., Choi, C.-Y., Li, J., Ma, Z., Melville, D.S., Mu, T., Peng, H.-B., Woodworth, B.K., Yang, Z., Zhang, L. & Fuller, R.A. (2019) Multiple habitat use by declining migratory birds necessitates joined-up conservation. *Ecology & Evolution*, 9, 2505–2515.

Conserving South-East Asia's wildlife

"Life can be diverted unexpectedly. At 22 years of age, finishing my undergraduate degree in Economics and dreading my impending banking job, I flew to Malaysia to trek through the thriving jungles I had seen in countless nature shows. As the plane descended into Kuala Lumpur, I put down Alfred Russel Wallace's *The Malay Archipelago* and squinted through the clouds in search of towering rainforests. Instead, my excitement turned numb as I saw endless rows of oil palm plantations extending into the horizon.

As I made long trips across Malaysia's monotonous oil palm plantations to find isolated national parks, I wondered: How could there be any tigers left? What happens to other species if predators decline? These questions were outside my realm of knowledge and they changed my career trajectory. I found an internet cafe, quit my banking job, and looked up PhD programs in ecology and conservation.

Today, my research program focuses on understanding how wildlife communities change as large intact rainforests are fragmented by agriculture. Nearly all remaining South-East Asian forests face this problem.

During my PhD at the University of California, Berkeley, I spent 13 months in Sumatran rainforests as a National Geographic Explorer to research tigers across the island. I also documented how human immigration associated with oil palm expansion introduces new hunting practices and how the plantations influence forest edges.

My postdoc with the Smithsonian Institute's Forest Global Earth Observatory (based at Nanyang Technological University in Singapore) extended my wildlife research to the impacts on tree communities. My work highlighted an ecological cascade, showing that oil palm expansion drives wildlife pest outbreaks, which degrades the tree community. This work was based on observations that generalist 'pest' wildlife forage on nutritious oil palm fruits. Food-subsidised animals become hyper-abundant in forests and disturb the vegetation. My ongoing work illustrates that subsidised animals also affect tree diversity.

My findings aid conservation efforts by showing (a) the full ecological footprint from agriculture expansion; (b) that protecting small forest patches is inadequate for conservation because they are overrun by pests; (c) that predators are unable to control pests; and (d) that successful conservation must include managing wildlife. I have shared my results with leaders at the Roundtable for Sustainable Oil Palm to improve their policies, as well as communicating directly with plantation managers to improve practices on the ground in Thailand, Malaysia, Singapore and Indonesia.

My 'Ecological Cascades Lab' at The University of Queensland's Centre for Biodiversity and Conservation Science will focus on understanding changes to entire wildlife communities, as measured through community metrics like diversity, trophic structure and food-web connectedness. Since addressing community-level impacts requires comparable data on dozens of species, my approach is to assemble 'big data' in the form of millions of wildlife observations from hundreds of camera-

> My work highlighted an ecological cascade, showing that oil palm expansion drives wildlife pest outbreaks, which degrades the tree community.

A male tiger in Bukit Barisan Selatan National Park, Sumatra. This camera trap photo was taken at the top of a ridge where there had been a landslide, forcing animals onto a narrow track where they could be photographed. *Photo:* Matthew Luskin
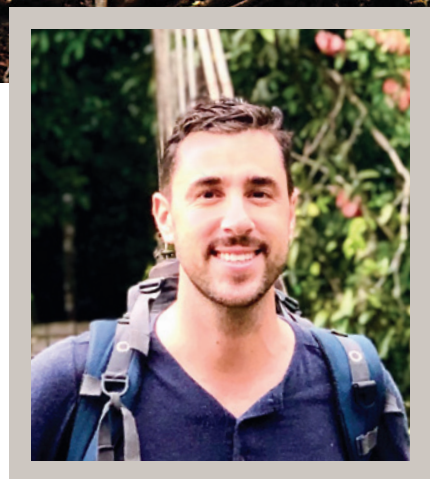
trapping surveys. My lab will continue to conduct new camera trapping throughout key South-East Asian forests, and other datasets will be included through collaborations with academics, NGOs, and governments.

My overarching goal is to provide land managers and conservation practitioners the information required to plan and manage protected areas under realistic conditions. I do this by quantitatively illustrating relationships between threats (forest area, nearby agriculture and hunting) and wildlife communities, including the interacting effects from multiple simultaneous threats.

Looking forward, I plan to expand this research to Australia's rainforests to further my commitment to producing robust relevant knowledge that will contribute to rainforest wildlife conservation.

NEWS IN BRIEF

CBCS-led innovation in the oceans

The *Migratory Connectivity in the Ocean* (MiCO) System, developed by a research consortium led by CBCS Chief Investigator Daniel Dunn, has been listed as a finalist in the Innovation category for the 2020 Ocean Awards given out by Boat International and the Blue Marine Foundation. Winners to be announced in May.

Photo: Cristina Linares

Endangered Mediterranean red coral protected in Catalonia

CBCS PhD candidate Nur Arafeh Dalmau and colleagues published a letter in *Science* in 2019 that has contributed to the recent decision of the Spanish Ministry of Agriculture and Fisheries to grant two years of full protection to red coral in Catalan waters, which will likely be extended for another 10 years. The letter called on the European Commission to protect the prized red coral not only from overexploitation but also from political conflicts that imperil its persistence. **science.sciencemag.org/content/363/6423/135**

Biodiversity offsetting is contentious: Here's an alternative

The Science for Nature and People Partnership (SNAPP) 'Compensatory Conservation' working group, led by CBCS researchers, has developed an alternative approach to biodiversity offsetting. The new approach – target-based ecological compensation – addresses many of the flaws of current offsetting practice, and harnesses compensation requirements of developers towards the achievement of national biodiversity targets. The paper was recently published in *Conservation Letters* **doi.org/10.1111/conl.12695**, and an overview is available on the CBCS YouTube channel **www.youtube.com/watch?v=kQ-3rkcmQ9I**.

Left: Seroprevalence survey in Samoa with local team members Va'a Witness Taulapapa and Red Cross volunteer Tane Gfamasaga, Upolu, Samoa

Below: Helen at the WWT London wetlands centre

PROFILE
Dr Helen Mayfield, CBCS
Postdoctoral Research Fellow

From deforestation to diseases

"After working in IT for a decade, I decided to change my career to environmental conservation, in particular, the application of computer technology and data analysis methods. I enrolled in a Masters degree with a project that examined the use of machine learning for predicting deforestation. While discussing the project with a colleague at the World Conservation Monitoring Centre in Cambridge in the UK, he mentioned that while most conservation scientists have heard of machine learning, they tend to avoid it and stick to the tried and tested statistical methods, given the confusing number of different techniques and the lack of guidance about when each one should be used. I accepted the challenge and transferred to a PhD, which looked to address this deeper question.

I volunteered at the Wildfowl and Wetlands Trust London Wetland Centre during my PhD, getting hands-on experience with reserve management, wildlife surveys and public liaison. Some of the most rewarding aspects were the diversity of the other volunteers, and developing the skills to lead after-hours bat walks, which the team took as an opportunity to spread awareness and enthusiasm for urban wildlife.

On completing my PhD, I secured a job applying Bayesian networks modelling to infectious diseases. I am now lucky enough to work across two incredibly important fields, epidemiology and biodiversity conservation. I'm constantly seeing more similarities than differences between the two, particularly around the need for innovation, the importance of early inclusion of decision-makers and the challenges of dealing with uncertainty. In essence, my work is all about helping people make the best use of their data so they can make informed decisions, be it freely available satellite data, expert judgements, or empirical data collected in the field.

I am now lucky enough to work across two incredibly important fields, epidemiology and biodiversity conservation.

Part of my work is often helping to collect the data. In my epidemiology work, this involved spending several months in the field in Samoa, working with their remarkable local Red Cross team to conduct large-scale seroprevalence and mosquito surveys for lymphatic filariasis, an infectious disease transmitted by mosquitoes. This study was led by the Australian National University, and the data are being used to help evaluate the effectiveness of Samoa's lymphatic filariasis elimination program, which includes developing machine learning models to help find infection hotspots.

My work with the Centre for Biodiversity and Conservation Science focuses on how to use expert judgments in a robust and structured way. One great thing about this work was facilitating regional office workshops for the New South Wales Department of Planning, Industry and Environment and meeting with DPIE species managers, site coordinators and other people working on the front line to save Australia's amazing native plants and animals. By holding workshops and having the end-users tell us what worked and what didn't, we were able to provide a set of guidelines that are now regularly used to help DPIE staff generate their adaptive management plans. We are extending this work to link in expert judgement for estimating the benefits of proposed biodiversity offset schemes for priority species.

Being part of CBCS means I can contribute to some really interesting projects outside of my main job. For example, I was recently involved in a rapid analysis of the effect of the 2019–2020 mega-fires on endangered species habitat. I'm also part of a team of researchers working on a systematic literature review of management actions for woodland birds in Australia, summarising the existing evidence about which management practices are effective, as well as identifying the gaps in our knowledge."