Centre for Biodiversity and Conservation Science

CBCS NEWS

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Alice Twomey wins UQ Faculty of Science Award for Excellence

Samantha Wong-Topp
CBCS PhD candidate

CBCS postdoctoral research fellow **Dr Alice Twomey** has been recognised with the prestigious UQ Faculty of Science Award for Excellence for her service in advancing inclusivity and promoting diversity across the research community.

The Awards for Excellence celebrate the achievements of staff whose leadership and service reflect the University's core values. These awards are open to all staff, regardless of their position, and aim to highlight the behaviours and contributions of staff that help shape UQ's culture and its future.

Left to right: Alice with her award. Image credit: Supplied.

Alice accepting her award from Professor Melissa Brown, Executive Dean Faculty of Science. Image credit: UQ Communications.

Vision is rewarded

Alice's award recognises her transformative leadership of the Centre for Marine Science Early and Mid-Career Researcher (EMCR) Committee, which she revitalised after stepping into the role of chair in late 2023. She reinvigorated the committee by creating new terms of reference, securing formal status and ensuring that current and future members receive official recognition for their contributions.

For example, Alice incorporated within the new EMCR committee terms of reference a clause that stipulated the need for gender parity of its membership, prompting a broader shift toward more inclusive, equitable and representative governance. Her vision for the EMCR community has created substantial structural improvements and set a great precedent for the future of this committee.

"I was really excited when I was announced as the winner," she said. "But also very curious, as I didn't know what I'd been nominated for! When my nomination citation was read, I was humbled because I was being acknowledged for work I'd done that was really important to me that I thought had gone unnoticed."

Embodying UQ values

Alice also undertook extensive engagement with EMCRs to better identify key barriers to participation, such as policy and procedural complexity, episodic funding and lack of recognition. Her collaborative and forward-thinking leadership has created lasting structural improvements and set the stage for stronger engagement across the EMCR community. Alice's selfless advocacy and dedication to her peers exemplify UQ's values of integrity, courage, respect and inclusivity, and underscore her excellence in service to the UQ community.

"I'm most proud that serving on committees at UQ has led to tangible positive change. As an ECR, I had assumed I was not senior enough to enact change, but I'm quite stubborn and I persevered. I recently gave a talk on how to overcome career challenges for transdisciplinary ECRs at a CBCS Tuesday seminar which has since sparked many conversations by others who experience these challenges. I want to try and bring some of these solutions into UQ's frameworks", Alice says.

When asked what advice Alice would give to other ECRs looking to drive similar change in their respective institutions, she advises others to "give it a go and persevere and ask around to find someone who might be able to help you! After all, 'to do good, you have to actually do something', a quote by Yvon Chouinard. If you want something to change, first we should simply try asking for it".

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PROFILE

An interdisciplinary journey

Professor Justine Bell-James
TC Beirne School of Law and CBCS

I chose to study law not for any particularly clear reason – I wish I could say it was about wanting to promote justice, or even to make money – but it was just the classic "smart, bad at maths" decision. I fell into environmental law research entirely by accident. I realised very quickly I had no interest in practising law, and I was fortunate enough to find a role as a research assistant on an environmental law project. I went on to do a PhD and then found a job at UQ in 2009 teaching environmental law.

The transformational point in my career came in 2010, when I was offered a postdoctoral role at the Global Change Institute in an interdisciplinary team with fellow postdocs Megan Saunders, Javier Leon, and Morena Mills (all complete superstars now!). We worked on a sea-level rise project supervised by UQ's who's who of science, including Ove Hoegh-Guldberg, Cath Lovelock and Hugh Possingham. This postdoc role really confirmed that marine and coastal ecosystems are my passion – for their beauty and complexity, but also because of the really thorny legal issues that arise when you have a clash of tenures and jurisdictions. Most importantly, this postdoc immersed me in interdisciplinary research and taught me to think and approach problems in a completely new way.

Finding a niche

I've realised that a lot of interdisciplinary research happens organically as a result of forming good relationships with people from other disciplines. So many of my big projects and papers have come from a casual chat with a scientist about their ideas. For example, maybe eight years ago now Cath Lovelock told me about a burgeoning idea to remove bund walls from farms to allow tidal reinstatement. This immediately made me think about the legal questions – what does this mean for property boundaries, and what happens if the flooding occurs outside of the expected boundaries? These were questions that I got to unpack in the development of the first blue carbon method, which became law in 2022 – a turning point for coastal restoration in Australia. Another example is a piece I recently published in *Nature Ecology and Evolution* with James Watson. This came about from a chat over coffee at Old Parliament House in Canberra (between debating the proposed reforms to the *Environment Protection and Biodiversity Conservation Act 1999*).

Working this way has also allowed me to carve out a really unique research area and establish myself as the leading expert – something that I think is really challenging to do in your disciplinary silo! Some highlights of my career have been going to COP21 in Paris and attending the launch of the International Partnership on Blue Carbon (I also got to meet Sir David Attenborough!), and, of course, the many workshops on Heron Island that you get to attend working in the marine and coastal space.

My vocation

These days I am a Professor in the TC Beirne School of Law at UQ. I still teach environmental law to final-year students but I am also really lucky to now be teaching foundations of law to first years and using this to embed climate change and biodiversity content into our core curriculum (alongside really critical work underway to Indigenise our curriculum). I am working on (probably way too many!) excellent projects and papers on marine and coastal restoration, and biodiversity law reform in Australia. I'm really excited to have joined the Wentworth Group this year.

I am also the Director of UQ's Climate Change Research Network, a major initiative that kicks off this year as an "umbrella" to sit across the huge depth and breadth of work underway across UQ (including CBCS). I am really happy about using this opportunity to design initiatives to hopefully give the next generation of researchers the same formative immersion in interdisciplinary research that I was so fortunate to have.

Reference

Bell-James, J & Watson, JEM (2025). Ambitions in national plans do not yet match bold international protection and restoration commitments. *Nature Ecology & Evolution* **9**, 417–424. https://doi.org/10.1038/s41559-025-02636-4

Clockwise from top right: Me with Sir David Attenborough at COP21 in Paris. Image credit: supplied.

Blue Heart project at the Sunshine Coast, August 2023 – Australia's first registered Blue Carbon project. Image credit: Justine Bell-James.

UQ's wetland law and science team at AMSA 2024 – **Maddison Brown**, **Jack Hill**, me, **Vicky Bennion** and **Rose Foster**. Image credit: supplied.

From boat to border: New research on Australia's seafood trade policies

Dr Leslie Roberson
CBCS Research Fellow

Associate Professor Carissa Klein
CBCS Deputy Director – Advancement

Rosa Mar Dominguez-Martinez
CBCS PhD candidate

The Ocean Conservation Team recently published two articles that take a close look at the "ins" and "outs" of Australia's seafood trade. Together, they highlight some big problems in the regulation of seafood we import and export – and those gaps are putting marine biodiversity and the seafood industry at risk.

The timing of this work is especially relevant, with Australia's national environmental legislation – the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) – currently under review and facing heavy scrutiny from experts. The federal government has promised to reform the Act, but progress has stalled.

And while much of the political spotlight is on terrestrial species and land clearing, our work shows that Australia's laws are also failing to protect threatened marine biodiversity.

Left to right: A "blue boat" from Vietnam – one of Australia's major trade partners for seafood and aquaculture. Blue boats have been an ongoing concern for illegal fishing. Image credit: Gilles Hosch.

The school shark (*Galeorhinus galeus*) can be legally exported from Australia, despite being listed as Critically Endangered globally on the IUCN Red List. After many years of its Australia-specific "Conservation Dependent" listing on the EPBC Act, school shark stocks have not recovered. Image credit: Adobe Stock.

What's going out?

Our first paper, led by Rosa Mar Dominguez-Martinez, examined Australia's seafood exports. While Australia spends considerable effort managing its fisheries to ensure they're legal and sustainable, our international trade patterns paint a different picture. We found that Australia can legally catch and export three marine species listed as threatened on the EPBC Act – including fish assessed as Critically Endangered.

We also found that Australia catches and exports an additional 13 species listed on the IUCN Red List.

We argue that this inconsistency needs to be addressed in the upcoming reform of the EPBC Act. Our paper outlines three key policy recommendations to ensure commercial value doesn't compromise a species' survival.

What's coming in?

The second paper, led by Leslie Roberson, looked at what's entering Australia's borders – and found the regulations are even more full of holes.

The EPBC Act currently has no provisions at all for managing Australia's impact on biodiversity beyond its borders. And that's a huge oversight in today's globalised seafood market. About 60–70% of the seafood Australians eat is imported, mainly from countries with weaker environmental regulations, higher rates of illegal fishing and greater risks of labour exploitation, including modern slavery. Current Australian policies don't require key information like where seafood was caught or even what species it is.

Products can arrive under vague labels like "frozen fish", making it impossible to trace their origin.

Globally, Illegal, Unreported and Unregulated fishing accounts for around 20% of wild-caught seafood. It's linked to biodiversity loss, organised crime and human rights violations. Yet, Australia has very few safeguards to keep this kind of seafood out of our supply chains.

To support ongoing efforts by the Australian Government to improve seafood import controls, our team reviewed global best practices and developed eight design criteria that could help make Australia's system more effective, transparent and future-proof. We found that while countries like the US and Japan and the European Union have systems in place, they rely on outdated paperwork and lack coordination. Australia has the opportunity to build something better – using digital technologies, automated fraud detection and facilitating traceability from fishing boat to border.

Time to act

Perhaps related to the recent election, the government is dragging its feet on both the regulations for national biodiversity (the EPBC Act reform) and on new regulation to manage imported species (the seafood imports policy). It's time for Australia to act, and to give marine biodiversity the same attention as terrestrial ecosystems. Australia has the resources and responsibility to lead by example – starting with fixing how we export and import seafood.

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A Threatened Frog Index for Australia

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Dr Sarah McGrath
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A Fleay's barred frog (*Mixophyes fleayi*) from the Springbrook plateau, south-east Queensland. Image credit: Geoffrey Heard.

Last year, or any year before that, you would have been unable to provide a simple answer to this simple question: "Are Australia's threatened frogs still declining or have they recovered?" This year, you can.

If we step back a little, a question like this would be an obvious thing for a politician, a government agency or a funding body to ask. The reason is that while many of Australia's frogs were hit hard by the introduction of chytrid fungus to the continent in the 1970s, there have been promising reports of species recovering in recent years. The beautiful Fleay's barred frog (see above) from the rainforests of south-east Queensland and northern New South Wales is a key example. Populations of this species have grown markedly over the past two decades, and the species has even recolonised locations from which it was extirpated by the fungus.

But what about others, and what of the collective trend? Have Australia's threatened frogs rebounded after chytrid's full impact, or is the pathogen – or other threats – driving ongoing declines?

"The frog index demonstrates that Australia's imperilled amphibians continue to decline."

Enter the TSX

Questions such as these are the reason the Threatened Species Index (TSX) exists. Established in 2016 at CBCS – through the Herculean efforts of Hugh Possingham, and CBCS alumni Elisa Bayraktarov, Ayesha Tulloch and Micha Jackson – the TSX collates monitoring data for Australia's threatened and near-threatened taxa and estimates abundance trends. The TSX seeks to be an objective measure of change in the populations of Australia's imperilled species, as well as a repository for all the hard-won monitoring data collected over recent decades. It is the only infrastructure presently available to do either of these things and is now a key biodiversity metric for the country. It is used in the Australian Government's *State of the Environment* report and is also the biodiversity metric for Treasury's *Measuring What Matters* initiative – Australia's first national wellbeing framework. Today, the TSX is a key product of the National Collaborative Research Infrastructure Strategy (NCRIS)-enabled Terrestrial Ecosystem Research Network (TERN), co-funded by the Australian Government's Department of Climate Change, Energy, the Environment and Water.

The TSX continues to grow. The index first covered birds (2018), then integrated mammals (2019) and then plants (2020). From 2021 to 2023, the index remained at this coverage, although the team were working hard behind the scenes to update existing datasets and bring in new ones.

A leap to frogs

Through 2023 and 2024, the TSX team sought to expand the taxonomic coverage of the index and it was agreed that bringing in frogs was the logical next step. There were several reasons to prioritise amphibians. First, we knew the drastic historical declines of amphibians were a crucial element of biodiversity trends in Australia. Second, amphibians have the highest rate of imperilment among Australian vertebrates, with around 30% of taxa listed as threatened or near-threatened. Third, we knew there was extensive monitoring data available and we wanted to secure it as soon as possible.

To this end, we completed a literature review of frog monitoring in Australia and compiled a list of known monitoring programs and the relevant contacts. Across 2024, we reached out to numerous herpetologists and ecologists across the country, asking whether they would be willing to share their data. Thankfully, many were receptive. When combined with data we managed to extract from publications – using the expert coding skills of CBCS alumnus Alex Bezzina – the datasets started to accrue. We pulled the trends together in November 2024 and launched Australia's first Threatened Frog Index in December at the annual conference of the Ecological Society of Australia in Melbourne. In total, we amassed 587 eligible monitoring datasets for 27 taxa.

Hence, we can now return to the opening question: "Are Australia's threatened frogs still declining or have they recovered?" Sadly, the data we compiled suggest that Australia's imperilled frogs continue to decline and very steeply in some cases.

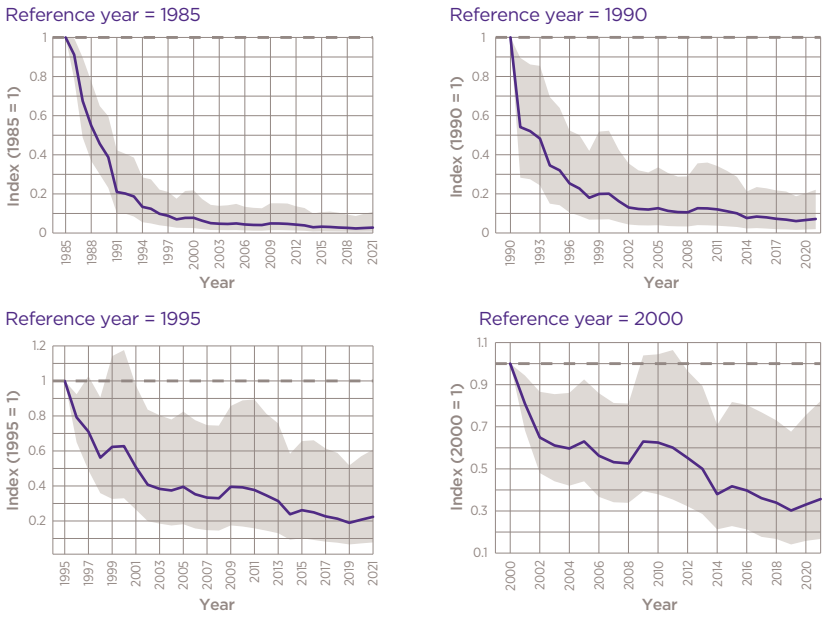

Figure 1: Trend estimates from the 2024 Threatened Frog Index, with reference years of 1985, 1990, 1995 and 2000. In each case, the green line shows the average change in relative abundance compared to the baseline year. The shaded areas show the confidence limits.

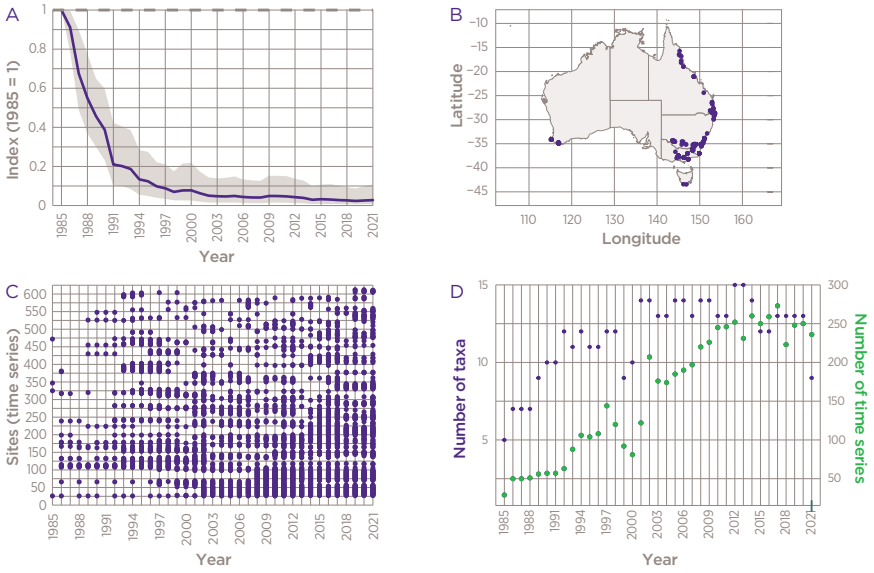

Figure 2: A) The 2024 Threatened Frog Index for Australia based on all data compiled on threatened and near-threatened frog taxa. The purple line shows the average change in relative abundance compared to the baseline year of 1985 where the index value is set to 1. The shaded areas show the confidence limits. B) A map showing where the threatened frog data were recorded in Australia. The purple dots indicate repeatedly monitored sites. C) A dot plot showing the years for which monitoring data were available to compile the index. Each row represents a time series where a taxon was monitored with a consistent method at a single site in Australia. D) The number of taxa (in purple circles) and number of time series (in green circles) used to calculate the index for each year.

Tracking declines

Beginning with the earliest reference year of 1985, the estimated decline in the relative abundance of Australia's imperilled frogs up to 2021 was immense, at 97% (Figure 1). This is the largest decline among the species groups included in the TSX to date. It stems from: (1) the collapse of numerous frog populations due to chytrid fungus in the late 1980s and 1990s; (2) the numerical dominance of taxa impacted by chytrid fungus in the early monitoring datasets; (3) the lack of recovery of many of these taxa; and (4) continued decline of others in more recent years.

But what of threats over more recent decades, after chytrid epizootics dissipated? Unfortunately, the data we collated suggest declines continue (Figure 1). With a reference year of 1995, the estimated average decline to 2021 was 78%. With a reference year of 2000, the average decline was 64%. These are still very significant declines.

A range of threats

A crucial element of these more recent trends are declines among taxa thought to be largely unaffected by chytrid fungus. Across the datasets we compiled, chytrid-impacted taxa declined by 53% on average between 1997 and 2021, compared with 71% among non-chytrid-impacted taxa. While data are limited for non-chytrid-impacted taxa (restricting the comparison to 1997 onwards), this surprising result speaks to the fact that Australia's frogs face various other threats. Among non-chytrid-impacted taxa, declines are related to habitat loss and fragmentation, exotic pests and the cumulative impacts of climate change – including heat waves, deepening droughts and increased fire frequency and severity. For example, significant declines were evident in the key long-term monitoring data we received for the Wallum sedge frog (*Litoria olongburensis*) (see left), collected since 2009 by by Harry Hines of the Queensland Parks and Wildlife Service and consultant Ed Meyer. This species is not known to be impacted by chytrid, but the severe drought of 2018–20 in south-east Queensland caused significant declines for some populations.

A Wallum sedge frog (*Litoria olongburensis*) from south-east Queensland, a species not known to be impacted by chytrid fungus, but which has suffered declines during periods of severe drought. Image credit: Geoffrey Heard.

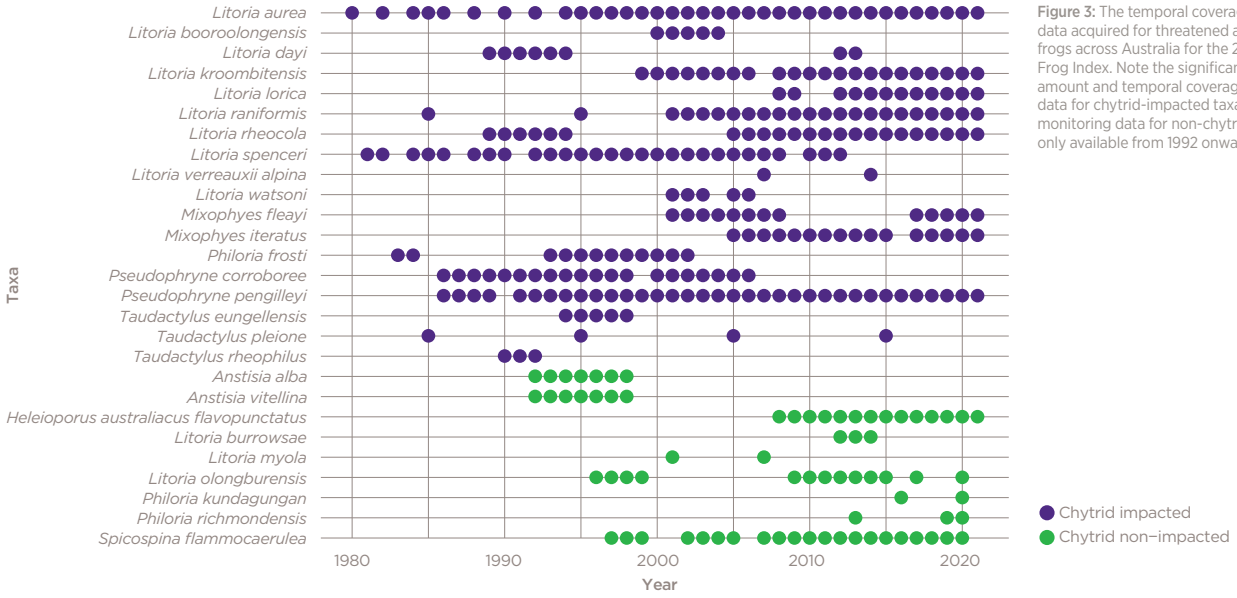

Figure 3: The temporal coverage of monitoring data acquired for threatened and near-threatened frogs across Australia for the 2024 Threatened Frog Index. Note the significantly greater amount and temporal coverage of monitoring data for chytrid-impacted taxa, and the fact that monitoring data for non-chytrid-impacted taxa are only available from 1992 onwards in this pilot index.

The data collated so far for the frog index are primarily from eastern Australia, in line with the distribution of threatened and near-threatened Australian frogs (Figure 2). Tasmania is represented by a single species (*Litoria burrowsae*) and Western Australia by three species (*Anstisia alba, A. vitellina* and *Spicospina flammocaerulea*). No suitable monitoring data were obtained for South Australia or the Northern Territory, although they each have only one threatened frog species.

Monitoring through time

A key limitation of the current dataset is its temporal coverage. In 1985, data were available for only four taxa (16% of the total) from 29 time series (5% of the total) (Figure 2). The number of taxa and datasets grew rapidly during the 1990s as monitoring of chytrid-impacted taxa increased, with some drop-off in more recent years.

An important additional factor that must be considered when interpreting the national trend is that all data acquired before 1992 were for chytrid-impacted taxa (Figure 3), particularly those showing rapid population crashes in eastern Australia, such as in northern Queensland. Very steep declines early in the frog index reporting period reflect this and produce the very significant overall decline of 97% when using 1985 as a reference year.

Our new frog index suggests that, overall, declines outweigh stabilisations and recoveries. While crucial information, it also presents a disheartening reality. Yet, the frog index – and the TSX more broadly – includes various datasets that highlight our capacity to recover threatened taxa. For frogs, key examples include the southern bell frog (*Litoria raniformis*) in New South Wales and the armoured mist frog (*Litoria lorica*) in Queensland's Wet Tropics (see right). Long-term monitoring by Skye Wassens of Charles Sturt University confirms that significant investment in environmental watering has been a boon for southern bell frogs in western New South Wales. In the Wet Tropics, recent translocations led by Conrad Hoskin of James Cook University are helping secure the armoured mist frog – a species for which all populations except one appear to have succumbed to chytrid, and which was thought to be lost forever until its rediscovery in 2008.

In 2025, we will seek to finalise the frog index, pursuing key datasets from Queensland, New South Wales, Victoria and Western Australia. Some of these datasets have been amassed over decades and are crucial to fully understanding how our threatened frogs are tracking. However, all monitoring data are valuable for projects such as this. If you have data you feel might be suitable, or if you would like to know more about the project, we would love to hear from you. Please reach out to the team at tsx@tern.org.au.

"Australia's frogs face various threats other than chytrid."

Top to bottom: The southern bell frog (*Litoria raniformis*) from western New South Wales and the armoured mist frog (*Litoria lorica*) from the Wet Tropics of Queensland. Image credits: Geoffrey Heard (*Litoria raniformis*) and Conrad Hoskin (*Litoria lorica*).

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We are a group of mathematical ecologists who run **R Workshops @ UQ** twice a year in summer and winter. Our upcoming winter R Workshops @ UQ are designed for individuals with a foundational understanding of R who are eager to master the essential skills for effective data wrangling, visualisation, spatial analysis and interactive data sharing. Join us to elevate your R proficiency and become a data manipulation and presentation expert!

Since 2012, we have taught >1,500 people at these workshops. We look forward to helping the next generation of R programmers and applied statisticians learn the skills they need to meet the demands of the modern research environment.

Our workshops are interactive, informative and fun. We provide all the code, datasets and notes – the notes provide an invaluable reference guide for you in the future.

We work at a pace that allows participants to follow along, acknowledging that there is a diversity of experience in every room.

Image credit: Christina N. Zdenek

Any questions?
E cbcs-workshops@uq.edu.au

Please use the QR code to visit our website (created with R!), to register, and for further information about topics, prices and testimonials.

Current approaches and future opportunities for climate-smart protected areas

Kristine (Tin) Buenafe
CBCS PhD candidate

Climate change and biodiversity loss are intertwined global problems, where failure to address one often exacerbates the effects of the other. Protected areas – among other area-based management tools – are designed to separate biodiversity from threats, but they have done little to ameliorate climate-change impacts. Even worse, climate change also reduces the effectiveness of existing protected areas.

Despite advances in climate-change ecology, conservation science has been slow to translate these insights into action. As we move towards protecting 30% of land, waters and seas by 2030 (also known as the 30 x 30 initiative), we have a once-in-a-lifetime opportunity to design new protected areas that consider climate change from their outset.

Synthesising the current approaches

Conservation planning refers to the structured process of identifying, assigning and monitoring areas for conservation or management. Spatial prioritisation – the process of identifying priority areas where specific conservation and/or management measures can be implemented – is one crucial step of conservation planning, where new protected areas that could be established are identified.

While several reviews have synthesised how climate change has been incorporated in different steps of the broad conservation planning process, approaches that explicitly incorporate climate change in climate-smart spatial prioritization have not been synthesised since Jones et al. (2016).

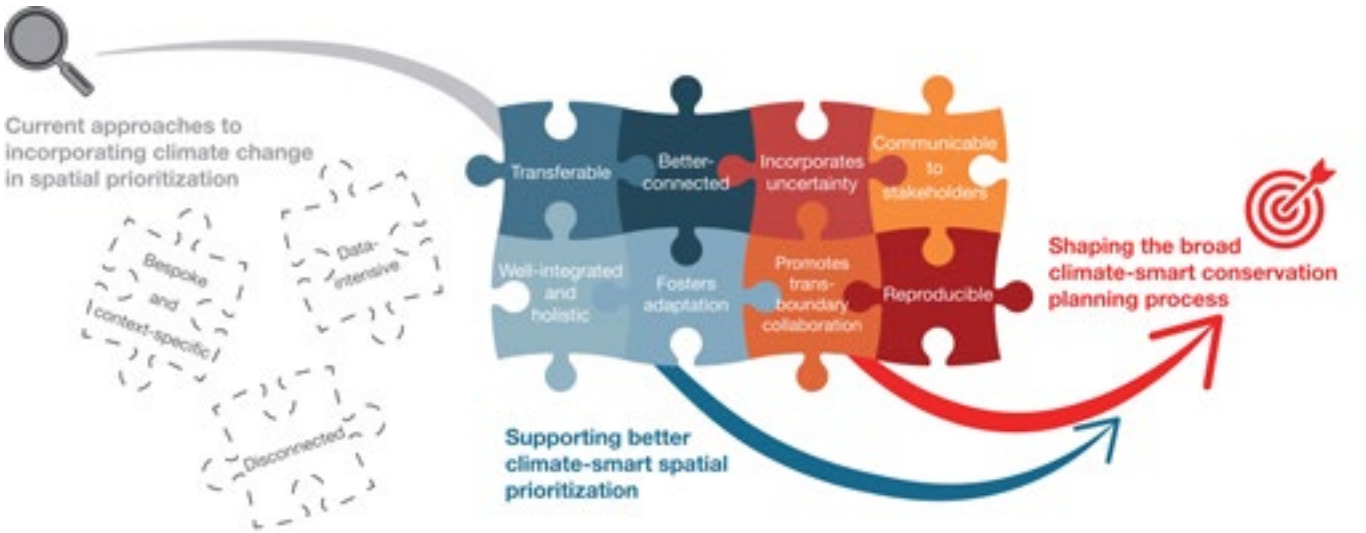
In this review, we scoured more than one hundred peer-reviewed articles that used climate projections to inform their spatial prioritisations. We synthesised four key approaches that explicitly incorporate climate change in spatial prioritisation: protecting species' future habitats; protecting climate refugia (areas projected to buffer biodiversity from climate change); protecting areas that facilitate climate connectivity (shifts and changes in species' climate niches); and protecting areas that foster natural adaptation to climate change. We also provide actionable guidance for applying these "climate-smart" approaches in spatial prioritisation, resulting in protected areas that are more resilient to the changing climate.

Top to bottom: A broad view of how climate change can be incorporated in the different steps of systematic conservation planning. Figure credit: Tin Buenafe.

Tin speaking at her PhD confirmation. Image credit: Harris Wei Khang Heng.

Overcoming challenges

However, integrating climate change into conservation planning is not without its challenges, limiting the uptake of these climate-smart approaches in on-the-ground conservation planning. Appropriately capturing uncertainty in climate projections and species' responses remains a hurdle in climate-smart conservation planning. There are noticeable data gaps that limit the number of climate-smart approaches that can be applied in data-poor regions, such as the high seas and the Global South. Finally, navigating the seemingly limitless complexities and trade-offs of the different climate-smart approaches presents a considerable challenge. However, these challenges can be overcome. We call attention to the ways these challenges can be circumvented, such as properly accounting for uncertainty by considering multiple emission scenarios and using an ensemble of climate models, taking advantage of approaches that use measures of climate exposure from climate projections as proxies whenever species-specific biodiversity data are not available, and applying "bet-hedging" strategies in conservation planning where multiple (potentially contrasting) climate-smart approaches could be included in the same protected-area design.



A roadmap to shaping the broad climate-smart conservation planning process. Figure credit: Tin Buenafe.

Looking ahead

We end this review by highlighting promising ways to integrate advances in climate-change ecology into conservation planning:

1. Developing climate-smart strategies applicable to data-poor regions
2. Embedding climate connectivity into protected-area designs
3. Enhancing reproducibility of conservation-planning frameworks
4. Promoting transboundary collaboration in conservation planning.

This is the first paper coming out of my PhD and I am ecstatic! Leading this review was a very intense but fruitful journey. I am nothing but grateful to my supervisors, especially Professor Anthony Richardson and Associate Professor Daniel Dunn, for their guidance and help as we navigated the process. I am also very grateful to my wonderful co-authors, many of whom are from CBCS (past and present). Their collective insights helped me shape the review into something that could be more meaningful for different interest groups in conservation.

I hope that scientists, planners, managers and practitioners find some useful guidance in this piece and that this review might serve as a stepping stone towards bridging advances in climate-change ecology in applied, protected-area design.

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From research to policy: CBCS attends Science Meets Parliament 2025

Samantha Wong-Topp
CBCS PhD candidate

Earlier this year, two CBCS postdoctoral research fellows, **Dr Lily Bentley** and **Dr Alice Twomey**, were invited to attend Science Meets Parliament, a national event that connects scientists with policy-makers to bridge the gap between research and decision-making.

For both Lily and Alice, the experience was a unique opportunity to take an inside look at how Parliament operates – how quickly things can move and just how valuable timely, well-communicated research can be.

"I hadn't realised just how busy politicians are. At times, the bells were ringing every ten minutes, summoning them to Parliament. If you want to discuss your research, your elevator pitch needs to be perfect – you might literally only have the time it takes for a single elevator ride to make your case!" Alice says.

"A superb insight into how decisions are made in the Australian political context."

Lily and Alice at the gala dinner at the Australian National Museum. Image credit: Supplied.

"The entire event was a superb insight into how decisions are made in the Australian political context", Lily adds. "I appreciated hearing from an incredibly unfiltered Bill Shorten, who has recently made the jump from politics to academia, as the new Vice-Chancellor of the University of Canberra. Hearing such frank discussion from someone whose previous role required a highly controlled media presence was a unique opportunity – and provided a lot of insight into one VC's perspective on the potential challenges facing the university sector."

EPBC Act reform and other challenges

Participants were given the chance to meet with Parliamentarians. Lily sat down with Senator Karen Grogan, who has worked extensively on reform of the *Environment Protection and Biodiversity Conservation Act 1999*, and discussed how research may be able to support the case for better environmental laws.

"You need to put your research in the right hands and have a conversation."

"Having insight into how politicians might use the research we publish has helped hone my focus to ensure I am answering the right questions and communicating my results to the right channels", Lily says. "While I don't believe that every scientist should feel obliged to engage with policy-makers, there are certainly some of us for whom doing so can be a real advantage. In particular, I think if you're engaging with issues that might be viewed as politically 'challenging', like conservation, the insight you can gain from discussions with law-makers can really help to see where the gaps in knowledge are".

Putting research into the right hands

The experience also evolved Alice's approach to science communication. "It really made me realise that no one is going to 'stumble' on my research and use it in policy. I need to put it in someone's hands", Alice says. "When I publish research in the future, I'll write a half-page summary and send it directly to the policy-makers and decision-makers who can benefit most. I'll also offer to meet with them for a quick, five-minute explanation – after all, politicians are busy people!"

Who can use your research?

Attending the event gave both researchers valuable clarity on how to integrate policy engagement into their academic work.

"Moving forward, I feel much more confident to participate in policy conversations, and to reach out to members of Parliament about issues related to my research. Australia is a representative democracy – parliamentarians should actually represent their constituents! We also heard from First Nations academics and professionals, including journalist John Paul Janke and Associate Professor Kalinda Griffiths, on collaborating with Aboriginal and Torres Strait Islander researchers and communities to better include their perspectives and sovereignty in academia and policy. These discussions were incredibly useful, and I look forward to applying what I learned as I move forward in my career", Lily says.

Echoing this call to action, Alice reflects: "In many of my published articles, I end the abstract with, "These findings have implications for policy and decision-makers". But this event made me realise that those decision-makers have names – and I can speak to them directly. It's not enough to publish research and hope the right person stumbles upon it. You need to put it in their hands and have a conversation. This event was a clear call to action: **Who is the person who can use your research?**"

Left to right: Senator Mehreen Faruqi (engineer, Deputy Leader of the Australian Greens; Senator for New South Wales), Professor Brett Sutton (Director of Health and Biosecurity, CSIRO; qualified public health physician) and Professor Mark Hutchinson (Interim Director of the Institute for Photonics and Advanced Sensing (IPAS); Professor, University of Adelaide) discussing using STEM for the greater good. Image credit: Lily Bentley.

The Hon. Bill Shorten (Vice-Chancellor and President, the University of Canberra) in conversation with Anna Maria Arabia, chief executive of the Australian Academy of Science, on navigating democracy. Image credit: Lily Bentley.

Left to right: A gorilla in Uganda. All great ape species are Critically Endangered and in decline. Image credit: Rod Waddington from Kergunyah, Australia, CC BY-SA 2.0.

The sCreate team at iDiv at the first working group meeting. Front row, left to right: CBCS's Hugh Possingham, Angela Dean and Emily Massingham. Image credit: Luise Dietel.

Improving conservation outcomes: Dr Emily Massingham leads workshop on participatory structured decision-making

Samantha Wong-Topp
CBCS PhD candidate

Great ape conservation sits at the intersection of some of the most complex challenges in the world – poverty, political instability and land-use pressures.

"Their conservation happens within complex social-ecological systems", says Dr Emily Massingham, whose PhD examined the interplay between the ecological success of orangutan conservation projects and various social outcomes. "Great ape conservation is a particularly interesting and complex conservation problem – they receive so much conservation funding, yet all species are either Endangered or Critically Endangered and their populations are declining almost everywhere".

Building a team of experts

Earlier this year, Emily ran a workshop with Professor Hugh Possingham at The German Centre for Integrative Biodiversity Research (iDiv), focused on participatory structured decision-making (SDM) as a pathway to more equitable and effective outcomes in human–wildlife conflict, especially in the context of Africa's great apes. "A wonderful diverse group of researchers and practitioners from multiple disciplines (including Associate Professor Angela Dean from CBCS, as well as experts from Oxford, Edinburgh, Germany, Spain, Côte-d'Ivoire, Kenya and the US; and from universities, NGOs, the United Nations, IUCN, etc.) came together to explore this topic within the context of human–great ape conflict in Africa.

"We were keen to build a team that would allow us to develop something grounded in both research and real-world experience", Emily says. "Our group plans to identify the key ingredients of successful participatory processes and develop practical, scalable tools that enable conservation practitioners to implement these processes within budget and time constraints".

Equitable decision-making

SDM is a flexible approach based on decision science that helps diverse groups make more strategic and transparent decisions in complex situations. SDM workshops can provide stakeholders with a platform to define their objectives and potential actions, assess trade-offs, and design coexistence interventions that balance ecological protection with community needs. "Ultimately, we were interested in how to make decision-making in conservation more equitable, transparent and effective – especially in circumstances where poor or rushed engagement can undermine long-term success", Emily says.

"Many projects address human–wildlife conflict, but outcomes vary widely. This could be due to decision-making processes that are rushed, top-down or fail to account for local perspectives", she says. The group's discussions identified several key pitfalls that commonly derail human–wildlife conflict (and broader conservation) efforts, such as unclear objectives, confusing actions with goals and poor stakeholder engagement.

Other issues include failing to account for risks, lacking implementation or evaluation plans, and lacking an exit plan from financial or technical support – all of which can lead to perverse outcomes or wasted resources.

Real-world solutions

The team is now working to transform these findings into real-world solutions via the creation of best practice guidance, training resources and an online tool for practitioners. Already, the workshop outputs are coming to fruition. The team of experts has drafted a research paper on using participatory SDM to improve human–wildlife conflict conservation planning. They are also gathering data from 100 great ape conservation projects across Africa to understand approaches to address human–great ape conflict, and how communities are or aren't being involved in decisions around this.

"We're piloting our participatory SDM approach in Indonesia with local NGO partners, providing training in decision science and SDM. Together, we're designing workshops to develop coexistence interventions that benefit both people and nature. We're currently seeking funding to implement the interventions identified through these workshops", Emily says.

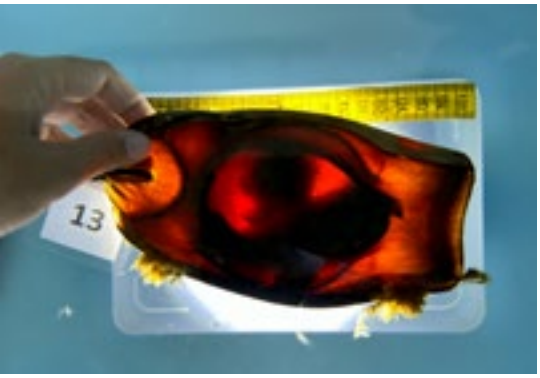
With participatory decision-making increasingly seen as the "secret sauce" to improving outcomes in human–wildlife conflict, Emily and her collaborators hope their work will help to reshape how conservation decisions are made in some of the world's most complex ecological and social contexts.

ReSharking the Ocean

Dr Christine Dudgeon
CBCS Affiliated Researcher

During the warmer months, the waters off south-east Queensland and northern New South Wales become a significant aggregation site for leopard sharks (*Stegostoma tigrinum*).

Notably, Manta Bommie near Minjerribah (North Stradbroke Island) and Nguthungulli (Julian Rocks) in the Cape Byron Marine Park host over 500 mature individuals annually, representing the largest known leopard shark population worldwide. While this species inhabits coastal waters across the western Pacific and Indian Oceans, overfishing has drastically reduced its numbers, leading to an Endangered global status on the IUCN Red List in 2015 and a Critically Endangered designation for the western population in 2024.



This status starkly contrasts with the thriving populations observed in large public aquariums globally, where leopard sharks readily breed in captivity and are known as the largest oviparous shark species, laying upwards of 80 eggs each year. This paradox between the precarious wild populations and successful captive breeding sparked the idea of a tertiary conservation program centred on *ex situ* breeding – a novel approach for shark conservation.

International collaboration

The concept of *ex situ* breeding materialised in 2019 during a workshop hosted by Georgia Aquarium in the US. The workshop brought together representatives from major public aquariums, Dr Mark Erdmann from Conservation International, and myself from The University of Queensland, contributing expertise on wild leopard shark populations. This collaboration led to the establishment of the StAR project (*Stegostoma tigrinum* Augmentation and Recovery).

The initial proposed location for StAR was Raja Ampat in eastern Indonesia. This site was selected due to several key factors: (1) it falls within the species' natural distribution; (2) the wild population had experienced a severe decline (fewer than 20 individuals observed in the preceding decade); and (3) the recent establishment of an extensive marine protected area network, including Southeast Asia's first shark and ray sanctuary, offered crucial protection for released animals.

"ReShark signifies a unified global effort towards shark and ray conservation."

Furthermore, the project garnered significant support from local communities to the regional government of West Papua, with two local conservation foundations willing to construct and manage hatcheries.

A high-level meeting with the Indonesian federal government in Jakarta addressed two primary concerns – first, the necessity of the intervention, questioning why the population couldn't recover naturally now that threats were presumably reduced and, second, the source of the animals. To address the first concern, we conducted a population viability analysis (PVA) in collaboration with the IUCN Conservation Strategy Planning Group. This analysis heavily relied on data from my PhD and postdoctoral research in eastern Australian waters, providing crucial insights into wild population demographics and ecology. The PVA modelling indicated that under a business-as-usual scenario, population recovery could take up to a century with a substantial risk of extinction. However, various augmentation scenarios projected the potential for recovery into a genetically diverse and self-sustaining population within a couple of decades.

Genetics and husbandry

The second concern revolved around the potential for genetic pollution. My PhD research had identified two distinct major populations globally, separated by the deep-water barrier of the Indonesian Throughflow Current, aligning with the Wallace Line biogeographic boundary. Leopard sharks exhibit clear genetic differentiation on either side of this feature, with Raja Ampat situated on the eastern side. Consequently, potential breeders from eastern populations, including those in Australian waters, were deemed genetically appropriate for the Raja Ampat project.

Top to bottom: Candling a leopard shark egg at the Misool Foundation nursery. Image credit: Nathaniel Soon/ReShark.

Dr Lisa Hoopes (left) and Dr Christine Dudgeon (middle) taking a cloacal swab from a leopard shark for diet analysis, while film-maker Luca Vaime (right) captures the moment. Image credit: Mark Erdmann/ReShark.

Top to bottom: Dr Christine Dudgeon (left) and colleagues surveying the leopard sharks at Minjerribah (North Stradbroke Island). Image credit: Mark Erdmann/ReShark.

Leopard shark James after having been released at Kri Island in Raja Ampat. Image credit: Mark Erdmann/ReShark.

With the Indonesian government's approval, the StAR project moved forward rapidly. An Indonesian program manager, Nesha Ichida, was appointed. Two hatcheries with sea pens were constructed: one at Kri Island in the Dampier Strait (associated with Raja Ampat Research and Conservation Centre) and another in southern Misool (Misool Foundation). Twelve young Indonesian aquarists, affectionately known as "shark nannies", received training in leopard shark pup husbandry. To establish a genetically diverse breeding stock, 164 potential breeding animals from aquariums in the US, Australia and Asia were genotyped.

"We combined our expertise in handling wild sharks with the specialised skills of veterinarians."

Wild release

In August 2022, the first leopard shark eggs were shipped to Raja Ampat from Sea Life Sydney Aquarium, and the first pup hatched six weeks later. To date, 90 eggs have been transported, resulting in the release of 22 pups to the wild. Local school groups have actively participated by collecting live food, primarily snails, to nourish the developing pups before their release. We are meticulously monitoring the pups' diet and growth. Each released pup is equipped with radio frequency identification and acoustic telemetry tags for post-release tracking.

A citizen science initiative, an extension of the Spot the Leopard Shark program initiated in Thailand in 2013, has been launched to monitor both released pups and other wild leopard sharks in the region. Research in Australia has shown that adult leopard sharks possess unique and stable body patterns for up to 20 years, facilitating individual identification.

However, juvenile leopard sharks undergo significant transformations from striped hatchlings to various spotted patterns in adulthood, and the point at which these patterns stabilise for reliable individual tracking remains unknown.

Enter ReShark

Our ongoing work with wild Australian populations aims to address critical knowledge gaps, including diet and reproductive cycles, such as mating and egg-laying sites. In November 2024, we conducted an ambitious expedition off Minjerriba (North Stradbroke Island) (GASSE: Great Aussie Stegostoma Semen Expedition) to collect sperm from wild male leopard sharks for artificial insemination, while on SCUBA. This endeavour combined our expertise in handling wild sharks with the specialised skills of veterinary colleagues from Hong Kong Ocean Park, who had developed techniques for blood and semen collection underwater. We successfully sampled 17 males and artificially inseminated six female leopard sharks in aquariums across Australia and Singapore. The first potential artificially inseminated pups have recently hatched, and we will soon conduct genetic analysis to confirm the success of the artificial insemination.

The success of the StAR project has spurred the development of an overarching program: ReShark. This initiative aims to expand *ex situ* conservation efforts to more locations (StAR Thailand has recently commenced) and encompass other threatened shark and ray species. Given that sharks and rays are the second-most threatened vertebrate group after amphibians, immediate conservation action is crucial. As a tertiary conservation project, StAR complements and reinforces effective primary and secondary conservation measures, while also inspiring them, such as the full protection of leopard sharks enacted in Thailand in 2024. The ReShark global coalition has rapidly grown to 105 partners across 19 countries in 2025, encompassing government agencies, NGOs, zoos and aquariums, academic institutions and businesses, signifying a unified global effort towards shark and ray conservation.

Learn more about the program at **reshark.org**

The race to ratification: insights from the BBNJ Symposium, March 2025

Samantha Wong-Topp
CBCS PhD candidate

Kristine (Tin) Buenafe
CBCS PhD candidate

In 2023, 112 nations came together and agreed on the need to conserve and effectively manage areas beyond the national jurisdictions of countries, the "high seas". This historic document, the Biodiversity Beyond National Jurisdiction (BBNJ) treaty, has been agreed upon and, once ratified, will provide a mechanism to conserve more than 60% of the global oceans. To put the BBNJ agreement into force, 60 countries need to ratify the agreement.

On 18–19 February 2025, CBCS PhD candidate Tin Buenafe and CBCS Director Associate Professor Daniel Dunn attended the BBNJ symposium in Singapore hosted by Singapore's Ministry of Foreign Affairs and the Centre for International Law at the National University of Singapore. The venue for this second BBNJ symposium was apt, given that Ambassador Rena Lee from Singapore championed finishing the text of the BBNJ agreement after gruelling negotiations in the sessions of the Intergovernmental Conference on the BBNJ.

The symposium's main objective was to continue the momentum leading up to the ratification of the BBNJ agreement. Delegates from various countries were in attendance, primarily from the Asia–Pacific region. The symposium was structured around discussions between panellists from different sectors. These ranged from lawyers and policy-makers talking about the challenges and opportunities around the legislation and regulation of environmental impact assessments and marine genetic resources to the co-chairs of the BBNJ Preparatory Commission detailing the priorities that need to be addressed by the Commission to provide more structure on the modalities surrounding the BBNJ agreement.

"In a hall full of attendees, probably less than 10% were scientists. Attending this symposium and immersing myself in the policies surrounding the conservation and use of the high seas was very valuable for my research", says Tin.

"My work focuses on developing tools that explicitly incorporate climate change into conservation planning work in the high seas. This symposium presented many opportunities for conservation scientists to influence how the BBNJ agreement – when put into force – can and should serve as the backbone to conserve and sustainably use resources in the high seas."

The BBNJ agreement has only been ratified by 21 nations and, as such, has not yet been put into force. Many nations are only starting to come together to push for the conservation and sustainable use of the high seas. Despite the current malleable nature of the BBNJ agreement, Tin remains hopeful.

"There is so much work to do – from the delegates pushing for different agendas and promoting advocacies, through policy-makers shaping the modalities and contexts of the agreement across the different pillars of the agreement, to the scientists who make sure that science is integrated in decision-making every step of the way. As a marine conservation scientist championing climate-smart conservation planning, my hope is to continue to contribute to the ongoing discussions that shape the conservation and management of the high seas. As a human being, my hope is for the BBNJ agreement – which is only made possible by transboundary cooperation and collaboration – to continue being a beacon of hope in our increasingly divided world."

Left to right: Panel discussions at the BBNJ Symposium at the Orchard Hotel in Singapore. Image credit: Tin Buenafe.

Tin and CBCS Director Associate Professor Daniel Dunn at the BBNJ Symposium, Singapore, February 2025. Image credit: Ana Colaço.

PROFILE

A trifecta of loves

Dr Emily Massingham
CBCS ECR Representative – Engagement

My three great loves have always been people, nature and music. While my journey might look like a patchwork of interests and curiosities, it's always been strongly guided by those three principles, and I've loved all the steps to get here.

Growing up

Growing up, most of my weekends were spent either camping, often at Inskip Point with my toes and face in a rockpool, or at my grandparents' farm, hanging with cows and horses, playing in the creek, helping Grandad in the shed or Grandma in the garden. I was often up a tree. I'm hoping my favourite tree stayed loyal and still has the best friend bracelet I tied to its branch when I was five years old. I also come from a very musical family, so music often filled the house.

Early career dreams

The first thing I wanted to be was a singing doctor – an early attempt to mash together my love of music and helping people. I also loved animals as a kid, and my next dream was to be a marine biologist and work with dolphins. I later tried my hand with work experience at a vet and discovered that blood made me faint. Then I realised working with great apes was a legitimate career. I'd always loved great apes. I was drawn to their eyes, their humanness, and I was equally intrigued by the ape within us. I wanted to move to the rainforest and study them. Seeing Jane Goodall's approach to caring about people and great apes appealed to me very much.

So, I kept taking a step at a time, trying to figure out how to make a difference for people and nature in the way that felt right for me...

Conservation and music

On the final day to choose my university course in Grade 12, it was a very close tie between becoming a conservation scientist and becoming a music therapist. I ended up choosing and starting conservation (well, ecology), but auditioned for Bachelor of Music on the side – I thought I wouldn't get in. I got in, and I did it, knowing music would always be a big part of my life so was worth investing a few years in (it's worth noting that my second-year vocal performance included a little rap). This took me to San Francisco and London and to play at many fun and sometimes questionable/sticky venues.

Dogs and people

I was also a disability support worker and spent four years working as a guide dog trainer and puppy development supervisor. I miss being smothered in puppy kisses on the daily. That time taught me a lot about animal behaviour, human–animal relationships, people living with different challenges, and how much I love and respect dogs. Side note: I'm getting a puppy in a week and I cannot wait.

Clockwise from top right: Presenting on the killing of orangutans at the Ecological Society of Australasia, Wollongong. Image credit: Vicki Martin.

With beloved dog Earnie. Image credit: Caroline.

Ol Pejeta Conservancy in Kenya (seated, top). Image credit: supplied.

Great apes and people

I eventually came back to finish my ecology degree. I still loved great apes, but felt like enough people were already working on great ape conservation and that I should do something with more of a direct benefit to people.

Throughout all of this, I did a lot of travel. I volunteered in beautiful places, with animals I loved: monitored orangutans, spent weeks in the forest with elephants, built fences, met wonderful people who shared their homes and their culture with me.

I started my Honours (shout out to Rich Fuller and Ange Dean), looking at how nature experiences shape conservation concern. During that time, Johannes Refisch from the United Nations came to talk at CBCS and I realised exactly what I wanted to be doing. He spoke about how great apes are deeply entangled with big social issues like conflict, poverty and so on. And tackling their conservation requires working with those communities and seeking to improve social outcomes. I realised it covered two of my big loves – nature and people. I was very excited to get started. And I'd just have to do a lot of music on the side.

So, I asked Johannes for a coffee, which led to me moving to Kenya to intern and later work with the United Nations Great Ape Survival Partnership and the Wildlife Unit. That time in Kenya was amazing. Weekends were spent on safari. I met Sudan, the last male northern white rhino, before he passed. I danced to incredible Kenyan music. I worked on exciting great ape conservation projects and worked with lots of countries reporting on their Convention on Biological Diversity commitments. It was a good mix of exciting work and exciting life stuff. I also discovered my deep love of coffee in Kenya.

I finished my PhD, a social ecological evaluation of orangutan conservation, in 2024. I absolutely loved my PhD topic. My supervisory team (Ange Dean, Hugh Possingham, Kerrie Wilson, Erik Meijaard and Truly Santika) played a big part in helping me survive and enjoy the ride.

Today

My current work interests include great ape conservation, human–wildlife conflict and coexistence, involving people in decisions that affect them, social equity and decision science. I work at UQ and also with a US-based great ape conservation organisation called Wildlife Impact. I'm lucky to collaborate with a network of passionate, thoughtful people from all over the world. Honestly, one of my favourite things is sitting down with others who care about the world and having big, philosophical chats about how to make it better.

My three big loves – people, nature, music – have stayed the same. My current work brings the people and nature stuff together in a way that feels really meaningful. I feel lucky to be doing work that matters to me like that. I fit all three into my personal life too, through time with my daughter Olive, music*, time in nature and hanging out with friends and family.

*These days, music mostly looks like me belting out Disney songs with (or at) my daughter.

Top to bottom: Chasing waterfalls in the Atherton Tablelands. That's me, centre. Image credit: Chris Darbyshire.

Playing guitar around the campfire. Image credit: Chris Darbyshire.

Muddy volunteering in Gladstone on Rich Fuller's shorebird project. Image credit: supplied.

Singing with the band. Image credit: supplied.

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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