

Methodology



Supplementary Figure 1. Methodology for developing this Commentary

On the 27th of November 2025, the Centre for Sustainable Tropical Fisheries and Aquaculture (CSTFA) held a retreat to reflect on impact in fisheries and aquaculture in Australia. As student members of the Centre, we engaged with First Nations representatives, government officials, industry actors and academics. One of our key takeaways from the retreat was that no matter how impact is defined, trust – built through sustained relationships – is the most consistent pathway to impact (Cvitanovic et al., 2021). Prior to this event, we were prompted to reflect on our own lived experiences of striving for impact during doctoral training using a structured vignette template informed by Mark Reed’s framework (<https://www.fasttrackimpact.com>) for planning, achieving, and evidencing impact. The template prompted us to describe the real-world challenge or opportunity our research addressed, our intended or emerging pathway to impact, the research undertaken, the impacts achieved or hoped for, evidence of impact to date, and lessons learned. We developed these experiences into our personal vignettes (see below) and some of us further developed them with our supervisors before sharing them during the retreat. Recognising common patterns across our experiences and drawing on inspiration from Cvitanovic et al. (2022), we then collaboratively synthesised our vignettes into this Commentary.

Limitations

We share our personal experiences as seven full-time PhD candidates from James Cook University in Australia. As such, we are aware that these stories may not be fully representative of the PhD experience and may not be applicable to those outside the Western academic context. Likewise, the section on considerations and practical guidance is informed by our experience in JCU and may not be applicable to all university settings. Although this section is written as a letter of gratitude to research institutions and persons, we advise readers to treat the points as considerations for their practice or institution. Lastly, we acknowledge that not all PhD candidates have the desire to make an impact in the sense that we have defined here (Evans & Cvitanovic, 2018), and so these insights may not be applicable to all PhD candidates.

Authors' Positionality Statements:

1. Tara Abrina

My name is Tara Abrina (she/her), I am currently in my second year of PhD (Agriculture, Environmental and Related Studies) with the College of Science and Engineering at James Cook University. My disciplinary background is in economics and environmental policy, and I applied these in coral reef restoration and fisheries for 10 years before starting my PhD. I was born, raised, and lived in the Philippines until I had to move to Australia to pursue a PhD. As such, the Philippines' rich culture of community-based marine policy and management and our relatively inadequate ecological data available have shaped the way I define research impact and identify and design impact pathways. Thus, for my PhD, I designed models for policy analysis that can work with limited data, using relational information among stakeholders to contextualise model uncertainties and enhance model interpretation.

2. Tom Gammage

I am a marine social scientist in the third year of my PhD at James Cook University, conducting research on equity in marine conservation co-management in Indonesia. As a British researcher born, raised and trained in Western contexts and academic institutions, but living and working primarily in Indonesian coastal communities, I occupy a position that is both external and embedded. I aim to centre local perspectives and lived experiences in my work, yet remain shaped by academic frameworks, expectations, and cultural biases that influence how I interpret knowledge and understand impact.

My research relies on close engagement with government actors, community members, and other stakeholders, requiring ongoing reflexivity about how my presence, assumptions, and positionality shape both the research process and its outcomes. I am particularly conscious of the power dynamics inherent in representing diverse perspectives, especially in contexts where knowledge is relational, culturally embedded, and not always easily translated into formal research outputs.

Rather than claiming neutrality, I approach my work as a situated and iterative process, recognising that my interpretations are partial and shaped by the contexts in which I operate. This awareness informs both my analytical approach and my efforts to engage in research that is both rigorous and relevant to the communities and systems I work with.

3. Varsha Balu

I am Varsha Balu (she/her), and I am currently in the fourth year of my PhD (Agriculture, Environmental and Related Studies) with the College of Science and Engineering at James Cook University. Though originally from India, I moved to Australia 10 years ago, in pursuit of my Master's degree in Marine Biology and Ecology. My PhD project sits under the disciplinary backgrounds of marine biology and aquaculture with a focus on aquatic animal surveillance using genetic and proteomic tools. My project is part of an Australian Research Council-funded Industrial Transformation Research Hub. My work is aimed at making

cheap, easy to use and farmer-friendly diagnostics in aquaculture, and thus involves working closely with industry and on an operational fish farm.

4. Roy Barkan

My name is Roy Barkan, and I recently completed my PhD at James Cook University within the College of Science and Engineering, where I focused on decoding the genetic basis of thermal stress tolerance in abalone. From an early age, I have always been fascinated by the oceans, which has shaped my academic path and research interests.

My doctoral research integrated multi-omics approaches, including genome assembly, comparative genomics, and transcriptomics, and resulted in the first chromosome-level genome assembly for abalone, providing a key resource for both evolutionary biology and aquaculture.

Prior to and during my PhD, I gained extensive experience in molecular biology, bioinformatics, and laboratory management, including roles as a research and laboratory assistant, head technician, and teaching assistant.

5. Rakesh Chandra

My work focuses on engaging people across two different but connected spaces: local communities and professional stakeholders. Over time, I have built relationships at both levels, shaped by cultural understanding, trust, and long-term engagement. My approach combines informal, community-based dialogue with more structured professional interactions. I am in my third year of PhD in society and culture and my research is on how moral values of individuals and communities can or cannot shape climate change adaptation in coastal communities. This is a Discovery Early Career Researcher Award (DECRA) project under the umbrella of Dr. Jacqueline Lau. I am from Fiji and this is where my project sites are.

A key challenge in research is the disconnect between communities and decision makers. Community members often feel more comfortable sharing their experiences in informal settings, while institutional discussions tend to be more structured and distant from everyday realities. This gap can limit how well policies and decisions reflect real needs. Trust takes time and cannot be rushed. Informal conversations are not separate from the work they are central to it.

I have also learned the importance of adapting my approach depending on the audience. Flexibility and relationship-building are key to working effectively across different groups.

Most importantly, impact often begins with simply creating space for people to speak and be heard.

6. Rayhan Dudayev

My name is Rayhan Dudayev, and I am a first-year PhD student at the College of Arts, Society and Education at James Cook University. My research focuses on the inclusion of non-dominant or plural knowledge systems in marine conservation and how this relates to equity outcomes.

I am from Indonesia, born and raised in Jakarta, where I had access to education and information, while coming from a modest family background. This shapes how I understand inequality, including in knowledge production. Growing up, I was exposed to outdoor activities, as well as nature-based spiritual practices, which shaped how I see humans and nature connection.

My academic and professional experience spans law, marine affairs, and international environmental policy. Through these experiences, I see that inequality in broader and environmental governance is also epistemic, about whose knowledge is legitimated. As a first-year HDR student, I am learning to navigate and question these structures. I may not be able to fix global inequality, but I hope to contribute a small piece by opening more space for different ways of knowing in marine governance.

7. Megan Moran

My name is Megan Moran, and I am in the final stages of submission for my PhD (Agriculture, Environmental and Related Studies) within the College of Science and Engineering at James Cook University. Previously, I completed an undergraduate degree in environmental biology at Christopher Newport University. I also graduated from the Master of Environmental Management program at Duke University. Afterwards, I worked for a couple of years at Texas A&M University as a Research Associate and Genetics Lab Manager. At James Cook University, my research focused on optimising commercial traits through genome editing in farmed barramundi.

Authors' Impact Story Vignettes

Uncertainties as relational: an impact vignette

Tara Abrina

Abstract

As a researcher from the Global South, my work requires navigating through the limitations of ecosystem modeling in data-poor contexts. Policy decisions are made regardless of the quality of the models. Uncertainty therefore has to be recognized as a feature rather than a failure in environmental planning. For my PhD, I reframe the uncertainties of my models as relational and transform them into a platform for policy deliberation in the context of coral restoration in the Philippines. By making uncertainties explicit in the models and by building on a decade of ACIAR's work in coral restoration, we may be able to learn from how stakeholders navigate uncertainty and assess the social value of information in marine policy space in the Philippines. This work will be used to support the on-going development of the coral restoration national roadmap and policy framework in the country.

Vignette

Policy will always have a real-world impact. Therefore, as a policy researcher from the Philippines, my job is to figure out what that impact is going to be so that rational people can make rational decisions. Since my policy niche is coral restoration, I use historical data to model coral reef futures under different policy scenarios; in the Indo-Pacific, we like to say, "walking backwards towards the future." But what happens when there is no data to walk back on?

When I first arrived in Australia to pursue my PhD, I was as giddy as a kid in a candy shop with all the materials available for modeling. The Great Barrier Reef (GBR) has data every year from around the time I was born. Back in the Philippines, we've only ever had two national assessments: one in 1981, and another in 2014. Between them, we lost 30% of our coral reefs. And in legislative meetings, I've always been expected to know the reason why. I always have to know what can be done, how much it's going to cost, and why the reefs are even worth saving. So I decided to explore these questions in my PhD.

At first, I started out by building a model of coral reef futures from all the current and available data in the Philippines. I overlayed them spatially to map a network of connected reefs and their resilience to disturbances. I then made projections about what these reefs might look like in the future to assess the impact of restoration and alternative policies. It ended up becoming a site selection tool based on the predicted ability of reefs to recover without active restoration, allowing the national government to be strategic about where to fund restoration initiatives.

I was lucky that from the get-go, my PhD was built on the shoulders of the Australian Centre for International Agricultural Research (ACIAR)'s 10-year coral restoration work in the Philippines. Their work has given me an edge in terms of stakeholder buy-in with government, the academe, and civil

society. While the models are still being developed, they have been informed by and will be used to support the development of the national coral restoration policy in the country. However, because I took inspiration from models trained on the GBR Long Term Monitoring Program data, I was acutely aware of the incompleteness of my models and the ever still unpredictability of coral futures in the Philippines. Sure, there are ways to model uncertainty, but I never really felt comfortable pursuing them – imagine trying to model the universe of alternative possibilities just based off of two assessments.

You see, I was always taught the golden standard for answering these questions, but never how to design the boat with missing parts or how to sail it through uncharted waters. But when I look back on my ten years of experience as a policy researcher, I realize that despite these uncertainties, decisions are still made. Decisions *have to* be made, and all of them impact our shared future with coral reefs. So while “waiting for more data”, we must recognize that uncertainty is and always has been a feature rather than a failure in environmental management and planning. This is especially important for us researchers in the Global South.

In my journey, I learned that I took the most comfort in literature that reframed uncertainty as relational. I attribute this to my being Filipino. They found that the better the relationships are among stakeholders, the less important uncertainty is in the benefit-cost calculus of environmental governance. Brugnach et al. (2021, p. 12) wrote, “...addressing uncertainty in collective decision-making processes is not just a matter of gathering more and better information about the managed system, but it also requires tending to how relationships among actors are configured and organized in defining what is at stake and what must be done.” So for the last chapter of my PhD I thought, why don’t I make the uncertainties of this model explicit and transparent, take it back to ACIAR partner communities, and see how they navigate through the unknowns? Why don’t I use the vulnerability of uncertainties as an opportunity to build trust – level the playing field, so to speak – between academics and practitioners?

Perhaps they might use the little we know about reef futures to strengthen already existing relationships, enabling both policy design and adaptive management. Perhaps they might drop the model in favor of direct action (and this is also data!). But my hope is that being upfront about uncertainties will enable us to drive a more collective kind of innovation. Afterall, we might not be rich in data, but tending to relationships is something the Philippine marine policy community truly excels in – a practice we can all learn from as we sail through unprecedented waters in coral reef history, together.

All models may be wrong, but some can be relational.

Lessons Learned

- Embrace uncertainty and turn it into opportunities – e.g. use vulnerabilities of ‘experts’ as opportunities for trust building (and the rejection of administrative rationalism)
- Practice critical reflexivity as a policy researcher – whose standards are we adhering to? How can we make research more contextually relevant to its foundation (epistemology)?

- Make steps towards open data culture – e.g. having a databank allows us to use the data for important policy evaluation

References

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Silent Clues: Decoding disease in aquaculture

Varsha Balu

1. Summary

Fish can't tell us when they're sick - but their environment can, through silent clues in the water and their skin mucus. Through my PhD, I set out to create real change, not just in theory but in real time - improving fish welfare, supporting farmers, and strengthening sustainability for future food security. My research develops early warning systems by reading these "silent clues" in barramundi aquaculture. By detecting traces of pathogen DNA in water or stress signals in fish skin mucus, I can decode molecular messages that let farmers act early and prevent losses. This non-invasive approach turns disease detection from reactive to proactive, helping aquaculture move toward a more sustainable and responsible future. For me, impact means more than discovery - it's about empowering a misunderstood industry to value health as much as harvest, proving that sustainability and productivity can thrive together.

2. The Challenge

At the end of my Masters in Marine Biology and Ecology, I undertook a research project. The research area, and the project itself was very fascinating, and I enjoyed it thoroughly, but I found myself questioning how that work could play a role in mitigating real problems, in real time. I found I wanted my work to have impact, that I could see or measure rather than just answer questions with hypothetical solutions. I also wanted to diversify my areas of research to broaden the scopes of what I was working on outside of pure marine biology and ecology research. This led me to my PhD in aquaculture 'omics'. This opportunity to work in aquaculture ticked all the boxes, with the avenue for real time impact, not just from the research perspective but also on farmers, operation owners, and the community that relies on seafood for food security.

3. Pathway to Impact

In my head, my PhD was not necessarily designed with a full 'impact framework' in mind, though my supervisors may have had a different view. However, right from the start, the applications of my research was always clear – cheap, rapid and farmer friendly! Going on site to see how the farm operates and building my sampling plan to align with farm operation brought about an element of co-design. This

facilitated higher engagement with staff on the farm and opened a line of direct feedback. Data collection metrics and methods evolved through this feedback along with adoption of SOPs already established for daily farm operations. The most significant pathway to impact came from the direct access and communication with the staff on these farms.

4. The Research

My PhD focuses on early pathogen detection using advanced -omics approaches in aquaculture. I use genetic tools to detect parasite eDNA, and also proteomics to identify pathogen induced stress biomarker proteins from fish. In my attempt to make diagnostics in fish farming as non-invasive as possible, my work looks at samples such as fish skin mucus and pond water for diagnosis, as opposed to the more traditional gill clips and manual observations which requires training and labour. My research not only establishes necessary baselines for future work on diagnostics, but also integrates longitudinal datasets, for a more holistic perspective on disease management on farms. Work like mine allows for industry and university partners to collaborate and work towards shared goals.

5. Achieving Impact

Personally, I struggle with quantifying or measuring the impact of my work and often find myself having to measure milestone to correlate to impact. In the short-term, my project creates better awareness of what is happening with the animals and on their farms in terms of pathogens, which helps develop targeted sampling and control strategies. It also validates the viability of non-invasive samples in their operations. On a more medium-term impact scale, the success of my project could help boost economic stability for farmers through early detection of infections, fewer mortalities and better animal welfare, while improving record-keeping and disease forecasting. The long-term impacts are aspirational - the adoption of eDNA and protein biomarker approaches to disease monitoring across the industry, and integration of non-invasive sampling methods for biosecurity and surveillance.

6. Evidence of Impact to date

Establishing baselines are an essential part of any research, and particularly important in the development of diagnostics, which is predominantly where my project has taken me so far. It is not the easiest to evaluate the impact this has had on a big picture just yet, outside of the farm maintaining more robust records. However, I recently presented a poster at an Industry event, when I had a Post-Doc see my poster, and pitch a small project structured around the methods I had developed. The translation of the work I had produced, into animal health diagnostics in a different species was a big sign of impact for me. I am also at the stage of my PhD where I have started producing manuscripts for publication as well as presenting at big conferences, where I have had quite a bit of engagement from academics as well as industry partners on the implications of my research.

7. Lessons Learned

My PhD has truly been a journey of ups and downs, but I've come to realise that is not out of the ordinary. I've had many wins, and even more losses, which have taught me the most valuable lessons in adaptability, patience and resilience. I've learnt that things will almost never go perfectly to plan, regardless of how well planned it might be. Working with live animals, complex farm environments, and unpredictable weather meant I had to accept uncertainty as part of the process rather than something to avoid.

One of the biggest lessons I've learned is that the system will not adapt for you, you must adapt to the system. Farm operations will not change to accommodate for data collection or sampling convenience, and learning to align my research around real-world constraints has been humbling but invaluable. It forced me to design experiments that were not only scientifically sound but also practical, respectful of farmers' time, and realistic within commercial settings. This experience deepened my appreciation of applied science and the importance of co-design in achieving impact.

I also underestimated the amount of trial and error that would go into every step of my research. Looking back, much of my current work involves revisiting choices and decisions made by my less experienced self. At times, this has been frustrating - but I can recognize the tangible sign of growth. These 'mistakes' were part of developing my scientific intuition and critical thinking.

When I started this PhD in an area that was unfamiliar to me, my motivations stemmed from wanting to have more impact with my work. Yet, somewhere along the way, under the weight of deadlines, milestones, and constant troubleshooting, I often lost sight of that broader vision. Like many students in the same boat, I have been tunnel-visioned and focused more on the finish line, rather than the journey. If I could do one thing differently, it would be to consciously evaluate impact throughout the journey, not just at the end. Even just working on this vignette has had an impact on my perspective of research impact. At times, I've felt like a drop in the ocean, but even a drop can create ripples. I've gained invaluable skills, evolved as a scientist and established meaningful relationships, all of which shaped not just the direction of my research but also how I think about scientific impact more broadly.

Unveiling the First Chromosome-Level Abalone Genome: A Milestone for Abalone Genomics

Roy Barkan

1. Summary

Abalone are ecologically, culturally, and economically important marine gastropods that support coastal ecosystems, indigenous cultural practices, and high-value global aquaculture and fisheries. Yet, these species are increasingly threatened by climate change, overexploitation and habitat degradation. Rapid ocean warming and intensifying marine heatwaves are already driving mass mortality events, while more than 40 abalone species are currently listed as threatened on the IUCN Red List. Despite their significance, abalone have historically lacked the high-quality genomic resources needed to understand their adaptive capacity and to guide conservation and sustainable aquaculture. My PhD addressed this critical gap by generating the first chromosome-level abalone genome assembly and using comparative

genomics across multiple species to uncover the genomic architecture of thermal tolerance. The resulting genomic resources provide essential foundations for selective breeding, population management, and conservation strategies to safeguard abalone biodiversity and support sustainable aquaculture in a rapidly changing ocean.

2. The Challenge

High-quality genome assemblies and annotations are essential for understanding adaptation and guiding aquaculture and conservation, yet abalone and other marine invertebrates have long lacked chromosome-level genomic resources. Generating suitable data is also challenging, as extracting high-molecular-weight DNA from polysaccharide-rich molluscan tissues has historically limited the use of long-read and chromosome-scale scaffolding technologies.

Even where draft genomes exist, annotation remains constrained by sparse long-read transcriptomic data. Consequently, incomplete and poorly annotated references have obscured genome architecture, constrained comparative analyses, and slowed the identification of climate-relevant genes, limiting the application of genomics to abalone breeding and conservation.

3. Pathway to Impact

My PhD was driven by the needs of the abalone aquaculture and conservation sectors, where limited genomic resources have long constrained abalone research. Addressing this gap required overcoming challenges across the full pipeline: from sourcing suitable animals and extracting high-molecular-weight DNA and intact RNA from fresh tissues, to adopting multiple cutting-edge long-read sequencing techniques, but also developing robust bioinformatic workflows. Guided by strong mentorship and a commitment to using the best available methods without compromise, I generated and curated chromosome-level abalone genome assemblies and annotations

4. The Research

The success of my project was underpinned by continuous engagement with world-leading experts in genomics and close collaboration with sequencing and technology providers. I worked across wet-lab and bioinformatic stages, rigorously troubleshooting each step and maintaining strict quality control over samples, sequencing outputs, and assemblies. By staying closely involved throughout the process, adopting the newest tools and technologies, and seeking targeted guidance from the right experts at critical points, I ensured that data generation and analysis met the highest standards. This proactive, detail-oriented approach was central to achieving robust chromosome-level genome assemblies and annotations.

5. Achieving Impact

Once completed, published in a high-impact journal, and made publicly available, the chromosome-level abalone genome became a globally accessible resource for researchers, aquaculture practitioners, and conservation scientists. Given the known difficulty of assembling molluscan genomes, this achievement also demonstrated the capabilities of advanced sequencing platforms and service providers, setting a benchmark for future non-model marine genome projects.

The genome formed the central foundation of my PhD, enabling gene expression analyses, comparative genomics, and multiple downstream genetic studies across chapters. Beyond my own research, I supported other groups pursuing similar genomic resources in their species, shared protocols and analytical approaches, and built international collaborations through conference presentations and specialist meetings. Collectively, these activities amplified the reach of the resource and accelerated genomic capacity within the abalone and broader marine invertebrate research communities.

6. Evidence of Impact to date

The impact of this work is already evident through its uptake across the field. The chromosome-level abalone genome has been adopted in high-quality studies published in leading journals including Science, Molecular Ecology, and Cell Press, and is now widely used as a reference for comparative genomics tools and evolutionary analyses in molluscs and other marine invertebrates. The assembly and annotation pipelines developed during my PhD have also been shared with colleagues and collaborators, enabling multiple groups to complete their own high-quality genome assemblies. By providing both a benchmark genomic resource and reproducible computational workflows, my work has accelerated genome-enabled research capacity across the abalone and broader non-model organism communities.

7. Lessons Learned

The most valuable lesson is the realisation that I am capable of tackling challenges that initially seemed beyond reach. Generating a chromosome-level genome for a non-model marine invertebrate was daunting at the outset, particularly as molecular and computational genomics were not my original areas of expertise. Through sustained effort, curiosity, and the exceptional support of my supervisors and mentors, I developed deep competence in both domains and achieved outcomes I once thought impossible.

This journey reinforced the importance of commitment to excellence at every stage, asking the right questions, seeking guidance from the right people, and learning continuously from both successes and setbacks. It also highlighted the critical role of a supportive research environment. While the scientific impact of my work is significant, the personal growth - confidence, resilience, and a passion for genomics and collaboration - has been even more transformative. These lessons now shape how I approach research and challenges across all areas of my career and life.

Bridging Science and Soul: How Moral Values Transform Climate Adaptation in the Small Islands States

Rakesh Chandra

A Research Case Study from Fiji (WIP)

A Personal Reflection

Before I began this research, I sought to understand why well-funded programs were failing. This story started post Cyclone Winston (cat5) in a small rural town of Fiji where I was leading a town council. Communities suffered despite millions of dollars' worth climate adaptation infrastructures and programs.

What I discovered was more profound when I started this research through DECRA project I was asking the wrong questions. The question isn't "How do we adapt Pacific communities to climate change?" The real question is: "How do we create adaptation systems worthy of the communities they serve, systems that honour their past, secure their present, and preserve their future?"

The waves are rising around Fiji. Not metaphorically, but literally, inch by inch, year by year. We don't notice this when we are enjoying our vacation on a resort beach but when you are living with your family next to it, perspectives are different. For the people of this Pacific Island nation, climate change isn't a distant threat debated in conference halls or COP's. It's the saltwater creeping into their taro patches and subsistence farms, the storms that grow fiercer each season, and the very real possibility that their ancestral lands may disappear beneath the ocean.

When I first examined climate adaptation efforts in low-lying Pacific nations, I encountered a paradox:

- Funding was increasing → Millions of dollars allocated for adaptation projects
- Technical solutions were advanced → Sea walls, early warning systems, relocation plans
- Yet outcomes were disappointing → Projects abandoned, communities resistant, inequitable results.

The conventional wisdom suggested we needed *more* funding or *better* technology. But my preliminary investigations reveal something deeper: the most sophisticated adaptation strategies were failing because they ignored the moral fabric of Pacific Island communities.

This realization led me to a fundamental question:

"What happens when climate adaptation strategies are misaligned with the moral values and traditional knowledge systems of the communities they're meant to serve?"

We hypothesized that the missing ingredient wasn't more money or better engineering it was moral values and cultural integration into governance frameworks working hand in hand for design and implementation of adaptation actions.

In working across diverse communities, my approach has evolved into a two-level engagement model that bridges grassroots realities with professional expertise.

The journey started in villages where formal processes rarely capture the true depth of people's experiences. Here, my intention is simple: **enter the space as a human being first, and a researcher second**, becoming part of their culture.

I used Talanoa, traditional protocols, and informal conversations, I sat with community members in spaces where they feel comfortable, verandas, cooking shelters, community halls, under trees. We talked about everyday life before touching on project issues.

People begin to share not just information, but **feelings, fears, aspirations, and lived realities** that formal interviews often miss. Of course, I still focus on the set formal questions for the research. At the second level, my engagement with government officials, technical experts, and influential leaders—people I’ve built relationships with through years of collaboration.

My main objective is always to build strong trust, gain respect and encourage participation, remember I am not just there for the purpose of my PhD, I want to see through all the way to implementation.

During this halfway journey I have some lessons learnt that I want to share:

Networking is very crucial for such community research and doing this in a place that you are comfortable with is more effective.

I also believe that more time needs to be spent with communities, sample size has to be bigger than only 2 villages, there shouldn’t be a rush in such research, need to visit communities over a period of time not just once.

Understanding basic finance techniques is also crucial in this journey.

Finally, this is my impact story. The Fiji case study isn't just about one nation's adaptation action it will become a blueprint for equitable climate action worldwide.

Bridging Knowledge Systems for Fairer Marine Policy in Indonesia and Beyond

Rayhan Dudayev

Summary

My research builds on years of collaboration with Indigenous Peoples and local communities in Indonesia advocating for the recognition of Locally Managed Marine Areas (LMMAs). These experiences revealed how policies often value technical and scientific expertise over community knowledge, leading to unequal participation in marine decision-making. Through my PhD, I explore how marine spatial planning (MSP)/marine conservation can move beyond this imbalance by integrating other forms of knowledge and scientific knowledge systems. By comparing Indonesia and Australia, I study how institutions such as universities, government agencies, and the media shape which forms of knowledge are considered legitimate. This research aims to show that fair and sustainable marine planning/marine

conservation depends not only on good science but also on recognizing and enabling those whose lives and identities are deeply tied to the sea as knowers.

Vignette

“Listen to what people say, not who throws the words.”

That is a line from my grandmother. She was an intelligent woman, even though the only education she had was primary school, and she didn’t even finish it. Her knowledge and wisdom came from life experience raising six kids and growing up as the oldest daughter of thirteen siblings in poverty. Yet in a meritocratic society, where formal education often defines legitimacy (Sandel, 2020), someone like my grandmother is rarely seen as an intellectual. This is the challenge that brings me to my research: who is recognised as a knowledge holder in marine policy making?

I encountered this challenge again when I began working in small-scale fisheries (Dudayev et al., 2023). For five years, I worked with Bajau or Sama communities in West Sumbawa, Indonesia, through a community-based organisation, supporting locally managed coastal areas grounded in their daily practices and deep knowledge of the sea (Yayasan Pesisir Lestari & Ministry of Marine Affairs and Fisheries of Indonesia, 2022).

But when we sought government recognition, it became difficult. At the same time, the provincial government was developing the Selat Alas Marine Protected Area. Despite the Bajau people’s rich ocean knowledge (Ariando et al., 2023), they were excluded from expert consultations and invited only at the final public consultation stage, when decisions were largely fixed. Remembering my grandmother’s words, I realised that Bajau practices and ways of reading the sea are forms of truth, even if not written in technical language. This was my “epifoni”: a deeper awareness of how knowledge is filtered, ranked, and legitimised in political life, particularly in marine governance.

At first, the power asymmetry between what people call “traditional knowledge” and “Western science” seemed clear. Over time, I realised the reality is more complex. Power also operates within Western science itself, where certain disciplines and methods dominate others. At the same time, we live in a market society (Sandel, 2012), where political and environmental problems are increasingly framed through market instruments.

I had the opportunity to attend COP30, where these pressures were clearly visible. Traditional knowledge appeared mainly in side events, not in the core political agenda. Meanwhile, key mitigation priorities such as agreeing on a fossil fuel phase-out and halting deforestation could not be secured (UNFCCC, 2025), while carbon market negotiations remained central, despite the Paris Agreement stating that market mechanisms should complement, not replace, real mitigation (UNFCCC, 2015). This reflects who has influence: analyses of UNFCCC COPs show that thousands of fossil-fuel-linked delegates enter negotiations as observers, sponsors, or even members of national delegations, giving industry privileged access (Gupta et al., 2024). Together, this shows how market logic shapes whose voices are

heard and which forms of knowledge are treated as legitimate, even as science warns that far higher ambition is needed to avoid severe climate impacts (IPCC, 2023).

For me, achieving impact means challenging these structures: not only the inequality between traditional knowledge and science, but also internal hierarchies within science and the dominance of market thinking. I hope marine policy can move toward recognising different ways of knowing as equal partners, rather than token voices added at the end of decision-making.

Because my PhD is still ongoing, I do not yet have strong evidence. However, my research examines whether global and national frameworks particularly under the Kunming–Montreal Global Biodiversity Framework (CBD, 2022) enable or constrain the recognition of diverse forms of knowledge in marine planning. I may not be able to fix global inequality, but I hope to contribute a small piece by opening more space for different ways of knowing in marine resource management.

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Towards Fair and Inclusive Marine Conservation: Understanding Equity in Indonesia's East Bintan MPA

Tom Gammage

1. Summary

Despite intending to undertake a deeply participatory project, my PhD began with a research design created before I ever saw the places or people it was meant to serve. When I finally arrived in East Bintan, Indonesia, I quickly realised how complex and deeply human the idea of “equity” in marine conservation really is. Communities face persistent issues with illegal and commercial fishing, unclear rights, and pollution - problems that directly affect their ability to feed their families. My work explores how government and community actors understand equity (or ‘fairness’) in managing the East Bintan MPA. While they agree on equity criteria in principle, they apply it very differently in practice, creating tensions and weakening trust. Navigating time pressures, limited funding, and institutional requirements meant I couldn’t design the fully participatory project I had hoped for, and at times I feel I slipped into the very “parachute science” patterns I wanted to avoid. Still, I’ve tried to learn, listen, and build genuine relationships throughout the process. I’m now analysing my data and preparing to return the results through workshops and a policy brief, with the hope of supporting more fair, trusted, and locally meaningful conservation.

2. The Challenge

Equity concerns are central to marine conservation, where diverse actors with unequal power navigate uneven costs, benefits, participation and recognition. Despite global commitments to “equitably managed” protected areas, how equity is understood and evaluated in practice remains unclear, particularly in co-management settings. In the East Bintan MPA, Indonesia, persistent inequities around fishing access, tenure, and pollution undermine local livelihoods, making it essential to understand and address these issues for long-term conservation effectiveness.

3. Pathway to Impact

From the outset of my PhD, I was determined for my work to be impactful. This is ultimately why I began this journey. I care deeply about the people and ecosystems I work with, and I believe social science is essential for understanding how to improve both human wellbeing and environmental outcomes. But very quickly, I learned how challenging it is to translate that intention into practice. Coming from a natural sciences and policy background, it took many months simply to get my head around the literature and social sciences more broadly. With limited funding and the pressure to progress toward confirmation, I had to move forward before I felt fully prepared.

Like many HDR students, my project shifted substantially from the original proposal as I began to understand the complexity of the topic. Even with incredibly supportive supervisors, institutional pressures meant I was effectively designing a research project before visiting the field or deeply understanding the fairness issues I hoped to study.

Despite this, I made a concerted effort to engage early with the Riau Islands Department of Fisheries, local government, and village leaders to ensure my questions were locally relevant. However, because much of the study design was pre-conceived before this engagement, the research was not fully participatory in the ideal sense, where rights-holders co-define, co-analyse, and co-translate the work. A key lesson during this period was that impact does not emerge from producing findings or publishing papers, but from relationships, humility, and time spent on the ground. Trust is built through repeated presence and honest conversations, and the strongest insights often arise not from formal methods, but from relationships. I learned that my research, ironically focused on equity, depends first on ensuring relational equity.

I nonetheless continue to try to embed participation throughout the process through informal conversations, feedback sessions on emerging insights, and relationship-building across government and community levels. These interactions have opened space for dialogue about persistent inequities, even if not to the depth that true co-production would require. At times, I have felt disappointed that aspects of my work still resemble the extractive tendencies of “parachute science,” despite my strong intention to avoid this from the outset. This is a reminder to me of how difficult it is to practice fully participatory research within existing institutional, academic, financial and temporal constraints as an HDR student. Looking ahead, I hope that a dedicated dissemination trip in 2026, combined with a policy brief and follow-up discussions and focus groups will help ensure that the recommendations from my research are returned to communities and decision-makers in a way that supports meaningful, socially grounded improvements in MPA governance.

4. The Research

My research explored how equity is understood and evaluated in marine conservation co-management, using the East Bintan Marine Protected Area as an instrumental case study. I partnered with a local university, Universitas Raja Ali Haji (UMRAH), to conduct qualitative interviews with government officials and coastal residents to examine how equity is conceptualised across the dimensions of distribution, procedure, and recognition (“notions” of equity). I then used insights from these interviews to develop a survey instrument to measure perceived equity of management processes and outcomes in practice.

5. Achieving Impact

This research has strengthened my capacity to bridge academic inquiry with applied conservation challenges and deepened my commitment to producing work that is both rigorous and socially grounded. It has also shaped how I want to conduct research in the future, starting with the needs and priorities of communities rather than designing projects independently and retrofitting participation.

At a collaborative level, the work has helped build ongoing relationships between James Cook University, UMRAH, and the Riau Islands Department of Fisheries, laying foundations for future co-produced projects. It has also provided valuable professional experience for my local research assistants, supporting their long-term career opportunities.

Scientifically, the research offers empirical evidence that notions of equity are plural, contextual, and deeply rooted in different ontologies and epistemologies with significant implications for designing fair and effective conservation governance. I hope this work contributes to attitudinal shifts in how government actors interpret community perspectives and to stronger bridges between local and official understandings of conservation.

At the policy level, the findings have potential to inform Indonesia's development of Other Effective Area-Based Conservation Measures (OECMs) and strengthen attention to fairness and legitimacy in marine conservation governance more broadly.

It is my hope that together, these forms of personal, relational, scientific, attitudinal and policy impact have the potential to contribute to environmental, economic, cultural, and wellbeing benefits for the communities and ecosystems with whom I work.

6. Evidence of Impact to date

Evidence of impact is emerging through ongoing engagement with the DKP, which has expressed appreciation for having social science research inform MPA governance as until now this has been dominated by biophysical metrics. I am planning a dissemination trip in 2026 to return results to my study villages and to host discussions with government officials and local communities on how my findings might inform future management. I also plan to develop a policy brief and practical options for improving equity after completing my final chapters. I hope these activities will help translate research insights into accessible, policy-relevant outputs that strengthen both governance legitimacy and community trust. While I see it as my responsibility to carry this forward, the extent to which I can do so will depend on future funding and employment opportunities after my PhD.

7. Lessons Learned

- Achieving meaningful impact is far more complex than simply producing good science. In the Bintan MPA, progress toward equity is constrained by overlapping and sometimes contradictory regulatory frameworks, limited institutional capacity, and inconsistent political will. It took me more than two years to understand the governance landscape well enough to see where change might realistically be possible.
- Equity research requires relational equity. I designed much of my project before deep field engagement due to institutional pressures, limited funding, and confirmation timelines. This taught me that impactful research must be built with communities, not merely about them. At times I felt disappointed that elements of my work still resembled “parachute science,” despite my intention to avoid it.

- Relationships are the foundation of impact. Trust building with communities, especially through respected local leaders, has proven far more influential than formal methods. Engagement with local government is challenging; communication often feels partial or politically constrained.
- Participatory research faces structural barriers. Although co-production is the ideal, HDR timelines, funding models, and academic incentives rarely allow it to be done well. Participation is often reduced to tokenistic involvement or dissemination at the end of projects. I learned that impact needs to be planned from the very beginning.
- Impact is constrained by broader institutional conditions. With donor programmes like COREMAP and USAID withdrawn, and the MPA authority under-resourced, even strong evidence struggles to translate into practice. Boundary organisations like NGOs, intermediaries, hybrid partnerships are essential to bridge science, policy, and practice.
- Communities expect and deserve more. Especially among groups like the Indigenous Orang Suku Laut, fatigue with extractive “parachute science” is clear. Unless impact becomes a normal part of research practice, communities will disengage, with serious consequences for equity and conservation effectiveness.
- I wish I had the time, training, and institutional incentives to design a flexible, participatory project from the very beginning. Despite being told by my supervisors that my project would change, I didn’t fully grasp how significant that shift would be until I entered the HDR system with its timelines, funding limits, and publication pressures, which offered little support for doing the kind of grounded, community-led work I had hoped to do.

Megan Moran

1. Summary

Aquaculture has become one of the fastest growing sectors of food production and is expected to play a role in achieving food security and sustainability. However, the rate of genetic improvement can be limited, especially when traits are influenced by low heritability, epigenetics, or a lack of knowledge regarding genes responsible for a desired trait. Incorporating gene editing into the aquaculture industry has the potential to expedite genetic improvement by introducing favourable alleles from wild stock populations and/or incorporating advantageous *de novo* changes currently absent from nature through gene knockouts. For my PhD thesis, I developed a gene editing protocol for barramundi by targeting increased growth rate and fillet quality through gene knockout using CRISPR/Cas9. Results showed high efficiencies for both targets and resulted in changed phenotypes. Incorporating both of these targets has the potential to result in a greater fillet yield, improved feed efficiency, and a more attractive fillet.

2. The Challenge

Aquaculture is the fastest-growing sector of global food production, now surpassing capture fisheries in output. Since the seafood industry serves as a primary source of protein for numerous populations around the world, aquaculture is expected to play an integral role in meeting future nutrition demands. Yet, compared to terrestrial livestock and crop species, most aquaculture species remain within the

early stages of the domestication process. The incorporation of genetics into breeding programs has increased how well certain traits respond to selection; however, progress can be slow when influenced by low heritability, epigenetics, or a lack of knowledge of genes responsible for a desired trait.

3. Pathway to Impact

At the start, it was important to directly speak with the industry partner regarding where they would like to see improvement in their barramundi breeding program. Their main interests aligned with improving fillet quality as well as growth rate. Rare golden-colour variants of barramundi exhibit no greyness within their fillet, making them a much more desirable product. However, this variant cannot be produced at large numbers on the commercial scale due to low heritability. To address this, the development of a gene editing technology specifically tailored to barramundi could allow for targeted and permanent phenotypic changes within only one generation.

4. The Research

The industry partner allowed for me to come on the farm and provided me with a lot of the knowledge required to successfully work on my project. This allowed for me to be able to inject multiple batches of fertilised eggs over multiple nights. The combination of knowledge received from the industry partner as well as their allowing for me to come to the farm and participate in the spawnings was the direct driving force behind the success in this project.

5. Achieving Impact

Gene editing remains mostly at the research stage and the implementation of gene editing into aquaculture breeding programs is predicted to occur on a gradual scale. Currently in Australia, organisms with gene knockout are allowed on the market. However, the manner in which gene editing is introduced to the market will make all the difference regarding public acceptance. I hope that this project will allow others within the field of aquaculture to realise how effective gene editing technology can be in terms of accelerating genetic improvement. There are many different traits that can be improved within a short period of time using gene editing; however, through my work, I demonstrated techniques that can lead to a greater fillet yield, improved feed efficiency, and a more attractive fillet in a much shorter period of time compared to traditional selective breeding. These traits can directly influence the profitability and sustainability of the industry.

6. Evidence of Impact to date

To reduce the amount of greyness within the barramundi fillet, I targeted two genes within the melanogenesis pathway for gene knockout using CRISPR/Cas9. Around 50% of the hatched individuals were determined to be gene edited. Individuals with the highest levels of gene editing were also those with the most obvious reductions in pigmentation and gene expression. This study provided valuable insights into the melanogenesis pathway as well as the potential to produce a true breeding barramundi exhibiting the target trait.

To increase growth at a faster rate, I successfully knocked out *Myostatin-b*, a negative regulator of muscle development, using CRISPR/Cas9. Out of the hatched individuals, 70% were successfully gene

edited. The methodology described sets forth a successful and reproducible technology allowing for future studies to further investigate how this technology could influence growth rate in the long-term.

7. Lessons Learned

Gene editing shows great potential in barramundi and can be an effective way to expedite genetic gain and obtain target traits at a much faster rate compared to traditional selective breeding. My work sets forth a reproducible technology, and allows for the expedited improvement of many different types of target traits such as improved feed efficiency, increased fillet yield, and improved fillet quality etc.

I also learned how important it is to communicate directly with the industry partner. They are the true experts in fish breeding and larval rearing, and they provided a lot of insight relating to my experimental design. Unfortunately, I was limited with how many spawnings I was able to partake in as well as time to further develop my larval rearing setup. For these reasons, I had to sample all of the larvae directly upon hatching so that I would obtain enough data for my PhD as well as ensure that the gene editing technology had worked correctly. Therefore, I only had one fish that I was able to raise long-term. I believe that if I had more fish that were gene edited and raised long-term, this would have allowed for a better visualisation of the impact that this research could have in the future. Starting communications with the industry partner earlier on might have allowed me to realise that there was a general lack of knowledge regarding raising larvae on a smaller scale and might have given me more time to work on a better setup. However, there is still plenty of opportunity for this research to impact change and the impact of this type of research will likely take time to be fully realised.