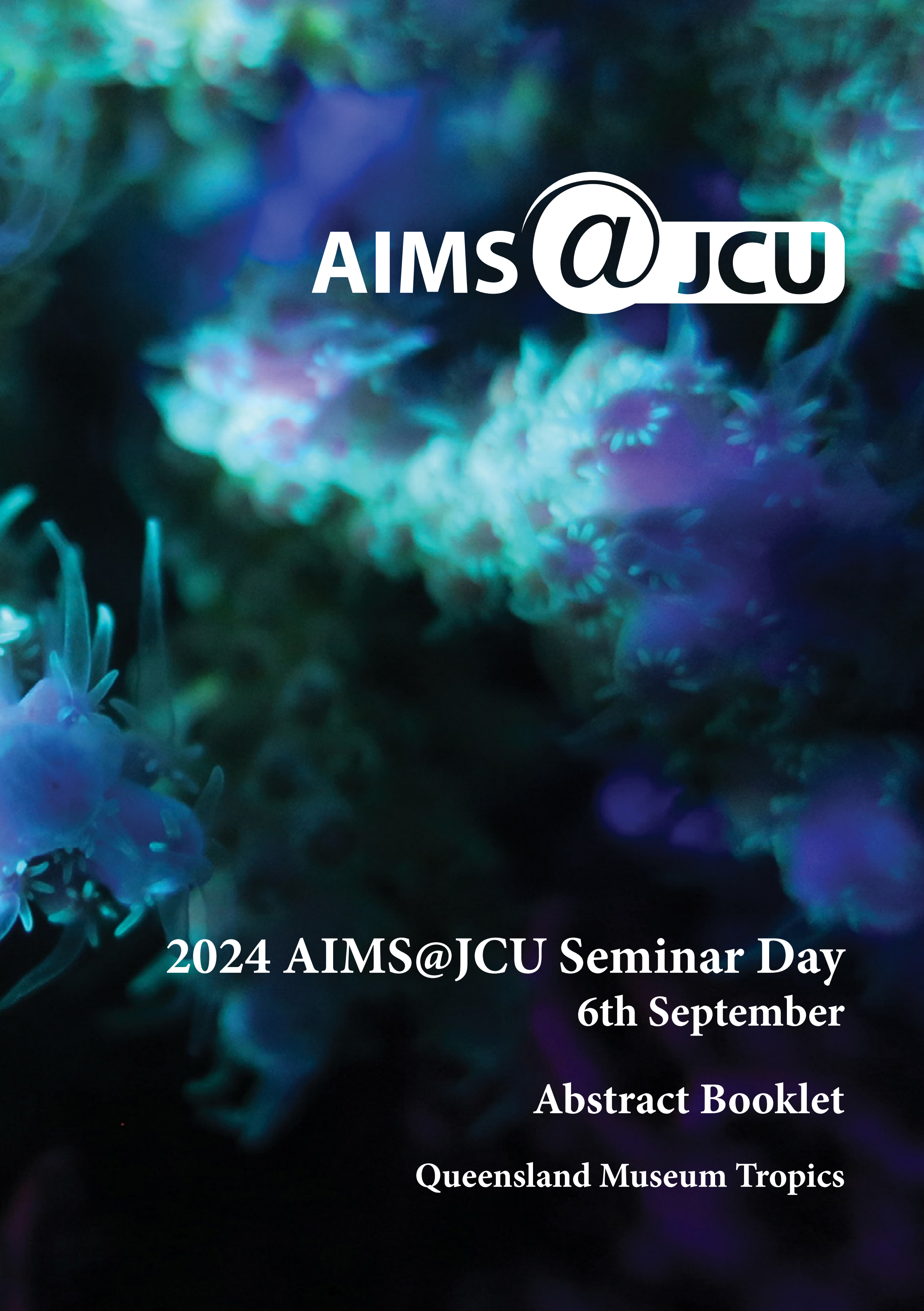

AIMS@JCU

2024 AIMS@JCU Seminar Day

6th September

Abstract Booklet

Queensland Museum Tropics

Joseph Pollock

AIMS@JCU

Seminar Day 2024
Friday, 6th September

Queensland Museum Tropics

Time	Abstract title	Presenter
9:30am	**Welcome to Country - Wulgurukaba Traditional Owner**	**Troy Johnson**
9:45am	**Welcome from AIMS@JCU Research Director**	**Dr. Cherie Motti**
	Session 1	
10:00am	Collaborative design in a marine science outreach program supports engagement of First Nations youth	Dr. Allison Paley
10:15am	From Dreams to Reality: the Journey of an Indigenous Shark Scientist	Courtney Burns
10:30am	An introduction to the AIMS Indigenous Partnerships Program	Libby Evans-Illidge
10:45am	**Morning tea**	
	Session 2	
11:15am	The relative importance of settlement and early post-settlement mortality in shaping the distribution of *Sargassum* on coral reefs	Martina Burgo
11:30am	Bioremediation Potential of Tropical Green Macroalgae to Remove Bisphenol-A from Seawater	Madeleine Sjölund
11:45am	Optimising machine learning performance for monitoring turbid inshore coral reefs	Dharini Jha
12:00pm	**AIMS@JCU Postdoctoral Fellow - Marine AI: A New Era of Monitoring**	**Dr. Alzayat Saleh**
12:30pm	**Lunch**	
1:15pm	**AIMS Chief Executive Officer**	**Prof. Selina Stead**
	Session 3	
1:30pm	Fisheries Management Measures Select for Oligotrophic Seawater Microbes Across the Great Barrier Reef	Marko Terzin
1:45pm	ROVing sharks, evaluating Remotely Operated Vehicles for elasmobranchs surveys	Martina Lonati
2:00pm	Needle in the Haystack: In Search of Whale Sharks in the Coral Sea	Ingo Miller
2:15pm	**AIMS@JCU Keynote Speaker - Paths, skills and connections**	**Dr. Leanne Currey-Randall**
2:45pm	**Poster session and Afternoon Tea**	
	Session 4	
3:15pm	Interactions Among Wildtype and Heat-Evolved Photosymbionts Shape Performance of Coral Recruits	Elizabeth Ivory
3:30pm	Unravelling the Toxic Legacy of Microplastics: The Impact of Chemical Additives on *Artemia franciscana*	Jessica Zacharuk
	Session 5 - Speed Talks	
3:50pm	Reef seeding technology establishment in a remote Maldivian atoll	Crystle Wee
3:55pm	Concurrent Autonomous Surface-Underwater Monitoring System	Daniel Croul
4:00pm	Bringing knowledge together for Sea Country	Redbird Ferguson
4:05pm	Synthesis and Characterisation of Sustainable Plasticisers	Sarah Ghobish
4:10pm	Sea-weeding Secrets: Exposing Ecosystem Impacts in Coral Reef Restoration	Bambang Hermanto
4:15pm	Size matters	Marine Lechene
4:20pm	The colourful world of algal turfs on coral reefs	Raf Rashid
4:25pm	Integrating the Roles of Seawater Microbes and Viruses in Coral Reef Ecosystem Functioning	Marko Terzin
4:30pm	**Judges deliberation**	
4:45pm	**Announce awards, closing remarks**	**Dr. Cherie Motti**
5:00pm	**End of event celebration**	

James Cook University Australia

Australian Government

Australian Institute of Marine Science

AIMS@JCU Seminar talks

Judging criteria:

12 minute presentation; 3 minutes question time

Student talks should be kept to 12 minutes with 3 minutes for questions. Student seminar talks will be judged based on the following components: The Quality of the abstract, Statement of hypotheses (introduction and statement of hypothesis), Clear Objectives, Methodology, Importance of Subject, Innovation and originality, General quality of presentation (grammar, flow, visual appeal of slides, clarity of speech), and the presenter's handling of questions.

Quality of the abstract
Student abstracts should be kept to 250 words and should be formatted as a scientific abstract for a journal article or scientific conference. Abstracts should be well written, indicate the scientific merit of the research presented (quality of science presented and leading edge of field). Usually, abstracts begin with a clear statement of an issue and end with a substantive conclusion.

Statement of hypotheses
This component is based on the introductory portion of the talk. This section of the talk sets up the context of the work and gives a statement of the hypothesis. This component will be scored based on whether the rationale is well explained and the question or hypothesis is clearly stated.

Clear Objectives
The presentation will be judged on whether the objectives of the work are clearly stated.

Clear Methodology
This judging component is to asses both the methodology of the work as well as the results presented. This component will be assessed on whether the methods and analyses used were appropriate (with regards to results presented).

Importance of Subject
This is to judge whether the speaker clearly expresses the importance of the work both in terms of the particular field and broader scientific context.

Innovation and originality
This is to assess the originality of the research and/or methodology.

Traditional Owner acknowledgement
Appropriate, respectful and genuine acknowledgement of Traditional Owners relevant to the project location.

General Quality of Presentation
This portion is to assess the general quality of the presentation visually (grammar, spelling, overall visual appeal of slides) and speaking quality of the presenter (pronunciation, ability to communicate ideas, ability to answer questions clearly). This section will be judged based on: quality of speaker, quality of slides (grammar, spelling, visual appeal, organization of talk), and speaker skills in answering questions.

11:15am

The relative importance of settlement and early post-settlement mortality in shaping the distribution of *Sargassum* on coral reefs

Burgo M[a,b,c], Fabricius K[c] & Hoey AS[a]

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[b]*AIMS@JCU, James Cook University, Townsville, QLD, Australia*
[c]*Australian Institute of Marine Science, Townsville, QLD, Australia*

Settlement and early post-settlement mortality play a key role in determining the distribution of benthic organisms. On coral reefs, early life stages of tropical macroalgae like *Sargassum* are less known, and thus the factors influencing their distribution are relatively unknown. In this study, we quantified *Sargassum* recruitment on two bays (Hazard and Pioneer Bay) on Orpheus Island on caged and uncaged tiles deployed progressively further away from the *Sargassum* bed. We found that the most important driver of *Sargassum* recruitment was distance from the adult strands as most recruits settled in the *Sargassum* bed. Interestingly, we found that herbivory had a limited effect on *Sargassum* recruitment. When comparing the two bays, Hazard Bay had significantly more recruits per tile compared to Pioneer Bay. Overall, our study suggests that the factors influencing *Sargassum* settlement and early post-settlement mortality are complex and can vary at relatively small spatial scales. Importantly, we found that herbivory has a limited role in controlling the distribution of *Sargassum* on coral reefs and thus understanding the ecology of tropical macroalgae is crucial for predicting reef configurations.

Traditional Owners to be acknowledged: Manbarra

11.30am

Bioremediation Potential of Tropical Green Macroalgae to Remove Bisphenol-A from Seawater

Sjoelund MAC[a], Askew S[b], Motti C[c], Vamvounis G[a] & Cyrus M[a]

[a] *AIMS@JCU; Madeleine.sjoelund@jcu.edu.au*
[b] *JCU*
[c] *AIMS*

Plastic pollution and the leaching of chemicals like Bisphenol-A (BPA) from plastics are major environmental concerns. BPA, an additive in plastics, is linked to cancer, infertility, and other health issues in humans and animals. This study investigated the potential of tropical green macroalgae - *Ulva ohnoi*, *Caulerpa taxifolia*, and *Chaetomorpha* sp. - as bioremediants to remove BPA from aquatic environments. Both short-term (24-hour) and long-term (21-day) exposures were studied. The algae were subjected to various BPA concentrations, and their ability to remove and biodegrade BPA was assessed. Results showed that *U. ohnoi* was the most efficient, removing 13 mg/L of BPA within three days and achieving nearly 100% biodegradation within a week. *C. taxifolia* also removed BPA steadily over seven days and achieved 91% biodegradation within the same period. However, when *C. taxifolia* was removed from contaminated seawater, it fully broke down the BPA within its tissues. In contrast, *Chaetomorpha* sp. did not significantly remove BPA. Additionally, *C. taxifolia* exhibited a higher growth rate than *U. ohnoi* in lower BPA concentrations but bleached in the highest concentration. These findings suggest that *U. ohnoi* and *C. taxifoli*a are effective in BPA removal and biodegradation, making them promising candidates for use as biofilters in aquaculture, wastewater treatments, and industrial settings to purify seawater from BPA and excess nutrients.

Traditional Owners to be acknowledged: Bindal and Wulgurukaba People

11:45am

Optimising machine learning performance for monitoring turbid inshore coral reefs

Jha, D[a], González-Rivero, M[a] & Hoogenboom, MO[a]

[a]*AIMS@JCU; Dharini.jha@my.jcu.edu.au*

Climate change and human activities increasingly threaten marine ecosystems, including coral reefs. Monitoring benthic habitats typically involves analysing images of the reef benthos (photo-transects) to extract information on health status, which delays the delivery of science to inform management actions. We urgently need efficient techniques to analyse extensive imagery rapidly and accurately to monitor and assess benthic communities. This study leverages machine learning (ML) techniques, specifically Convolutional Neural Networks and transfer learning, to optimise automated benthic mapping in inshore reefs. Challenges such as data variability, resolution limitations, and label-set complexity are carefully considered to improve model accuracy. The findings underscore the importance of robust perceptron size and taxonomic resolution in ML models for accurate benthic analysis. Increasing the amount of information provided to ML models through the perceptron size improves accuracy, especially when extracting complex information or taxonomic resolution (Morphological and Genus-level) from the imagery. The taxonomic resolution used for training ML algorithms impacts the performance of automated estimations. At high-level aggregations (Functional groups), models trained with higher taxonomic resolutions improve the consistency of hard coral and algae cover estimations across survey sites. Training ML models for routinely collected data requires considering the temporal variability in reef composition. The results show that ML trained with only one year of data are less accurate in predicting coral cover estimations in the following years. Through meticulous optimisation of ML models and addressing critical challenges, this study makes significant advances in automated benthic mapping, facilitating more effective conservation efforts in marine ecosystems.

I begin by acknowledging the Traditional Custodians of the land on which we gather today, and pay my respects to their Elders past and present. I extend that respect to Aboriginal and Torres Strait Islander peoples here in Australia.

12.00pm - AIMS@JCU Postdoctoral Fellow

Marine AI: A New Era of Monitoring

Saleh, A[a,b], Olsen, M[c], Rahimi Azghadi, M[b] & Senadji, B[b]

[a]*AIMS@JCU*
[b]*James Cook University, Townsville, Australia; alzayat.saleh@jcu.edu.au*
[c]*Australian Institute of Marine Science, Townsville, Australia*

Marine applications present unique challenges for computer vision due to the complex and dynamic underwater environment. Traditional methods often struggle to capture the rich information and variability inherent in underwater videos and images. This seminar introduces novel deep learning architectures that address these challenges by leveraging self-supervised learning, unsupervised learning, adaptive uncertainty distribution, and lightweight transformer models. These architectures enable tasks such as fish segmentation, trajectory tracking, image enhancement, landmark detection, weight estimation, and morphometric analyses. Self-supervised learning utilizes auxiliary tasks to extract valuable representations from unlabelled data, while unsupervised learning extracts insights without the need for explicit supervision or labels. Adaptive uncertainty distribution models the uncertainty of predictions and adapts them based on the specific input data. Lightweight transformer models reduce computational complexity and memory requirements while maintaining high performance. The proposed methods have been extensively evaluated on diverse public and private datasets of underwater videos and images, demonstrating state-of-the-art performance in accuracy, robustness, and efficiency. This seminar will highlight how these advancements in marine computer vision can facilitate applications such as fish monitoring, stock assessment, and environmental protection, contributing to a more sustainable and informed understanding of marine ecosystems.

I acknowledge the Bindal and Wulgurukaba people as the Traditional Owners of the land and sea country this work was conducted.

1:30pm

Fisheries Management Measures Select for Oligotrophic Seawater Microbes Across the Great Barrier Reef

Marko Terzin[a,b,c], Steven J. Robbins[d], Sara C. Bell[a], Kim-Anh Lê Cao[e], Katherine E. Dougan[d], Julian Zaugg[d], Samuel Chaffron[f], Renee K. Gruber[a], Michael Emslie[a], Philip Hugenholtz[d], Nicole S. Webster[g], David G. Bourne[a,b,c], Yun Kit Yeoh[a,b,c] & Patrick W. Laffy[a,b,c]

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[d]*Australian Centre for Ecogenomics, University of Queensland, St Lucia, QLD 4072*
[e]*Melbourne Integrative Genomics and School of Mathematics and Statistics, University of Melbourne, Parkville VIC 3052*
[f]*Université de Nantes, CNRS UMR 6004, LS2N, F-44000 Nantes, France*
[g]*Institute for Marine and Antarctic Studies, University of Tasmania, TAS, 7001*

Establishment of no-take zones is a widely accepted management strategy to protect exploited species of marine ecosystems. Rezoning the Great Barrier Reef (GBR) Marine Park into no-take and take zones in 2004 demonstrated benefits in protected areas including increased biomass of fish species targeted by fisheries, lower coral disease levels, less severe outbreaks of crown-of-thorns starfish, and faster recovery of coral communities following acute disturbances. We investigated how seawater microbiomes are structured on GBR reefs within no-take and take zones, using ~5,000 surface seawater bacterial and archaeal MAGs (metagenome-assembled genomes) collected and assembled across 48 GBR reefs, alongside in situ reef health surveys. Supervised machine learning identified 160 discriminatory microbes that predict reef zoning with ~70% accuracy. Oligotrophic Pelagibacter and SAR86 MAGs with streamlined genomes were indicative of no-take zones, while opportunistic Flavobacteriaceae and Rhodobacteraceae affiliated taxa associated with non-protected sites. Patterns in no-take zones were partially explained by increased crustose coralline algae cover, encrusting and tabulate Acropora corals, dissolved phosphorus, and higher numbers of herbivorous and detritivorous fish. In contrast, take zones were characterised by elevated dissolved nitrogen and soft coral cover. A novel metric of microbial networks (community 'cohesion') showed a prevalence of competitive microbe-to-microbe interactions in take zones, with indicator microbes of take zones outcompeting other microbes for dissolved nitrogen in take reefs. These indicator microbes hold potential for application in reef monitoring to assess health status of marine protected areas and compliance with reef zoning through development of rapid indices for fish stock assessments.

Traditional Owners to be acknowledged: See next page

1:30pm

Fisheries Management Measures Select for Oligotrophic Seawater Microbes Across the Great Barrier Reef

Marko Terzin[a,b,c], Steven J. Robbins[d], Sara C. Bell[a], Kim-Anh Lê Cao[e], Katherine E. Dougan[d], Julian Zaugg[d], Samuel Chaffron[f], Renee K. Gruber[a], Michael Emslie[a], Philip Hugenholtz[d], Nicole S. Webster[g], David G. Bourne[a,b,c], Yun Kit Yeoh[a,b,c] & Patrick W. Laffy[a,b,c]

[a]*Australian Institute of Marine Science, PMB no3 Townsville MC, Townsville QLD 4810; marko.terzin@my.jcu.edu.au*
[b]*College of Science and Engineering, James Cook University, Townsville, 4811*
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[d]*Australian Centre for Ecogenomics, University of Queensland, St Lucia, QLD 4072*
[e]*Melbourne Integrative Genomics and School of Mathematics and Statistics, University of Melbourne, Parkville VIC 3052*
[f]*Université de Nantes, CNRS UMR 6004, LS2N, F-44000 Nantes, France*
[g]*Institute for Marine and Antarctic Studies, University of Tasmania, TAS, 7001*

Traditional Owners to be acknowledged:

The seawater samples analysed in this study for metagenomics and physico-chemical variables were collected in the (1) Cape Grenville and Princess Charlotte bay sectors (northern GBR) from the traditional sea Country of the Yirrganydji, Kuku Yalanji, Wuthathi, Girramay, Juru, Bunda, and other Indigenous groups who are Traditional Owners of the land associated with reefs McSweeney, Monsoon, 11-049, 11-162, Mantis, Lagoon, Davie, Corbett, 13-124, Sanbank 1, and St Crispin; in the (2) Cairns and Cooktown / Lizard island sectors (central GBR) from the traditional sea Country of the Djaku-nde, Jangga, Birri, Gugu Badhun, and other Indigenous groups who are Traditional Owners of the land associated with reefs Agincourt 1, Hastings, Arlington, Thetford, Moore, Hedley, McCulloch, Peart, Feather, Farquharson, and Taylor; in the (3) Innisfail and Townsville sectors (central GBR) from the traditional sea Country of the Wulgurukaba, Wanyi, Bindal, and other Indigenous groups who are Traditional Owners of the land associated with reefs Little Kelso, Kelso, Roxburgh, Fore and Aft, Rib, John Brewer, Myrmidon, Chicken, Knife, Fork, Lynch, Centipede, Grub, and Helix; and in the (4) Swains and Capricorn Bunker sectors (southern GBR) from the traditional sea Country of the Byelle, Bunda, Gooreng Gooreng, Taribelang Bunda, and other Indigenous groups who are Traditional Owners of the land associated with reefs 21-550, 22-084, Chinaman, 21-580, Small Lagoon, North, Fairfax, Hoskyn, Boult, Masthead, Erskine, and Broomfield. We pay our respects to their Elders past, present, and emerging. Our desktop / lab research took place at the Australian Institute of Marine Science (AIMS) headquarters at Cape Ferguson, and we wish to acknowledge the Wulgurukaba and Bindal peoples as the Traditional Owners of that land. This research was also undertaken at the JCU Townsville Bebegu Yumba campus, and the authors acknowledge that the Australian Aboriginal and Torres Strait Islander peoples are the original inhabitants and traditional custodians of this continent and have unique cultural and spiritual relationships to the land and waters.

1:45pm

ROVing sharks, evaluating Remotely Operated Vehicles for elasmobranchs surveys

Martina Lonati[a,b,c,g], Stacy L. Bierwagen[d,e], Andrew Chin[d] & Adam Barnett[a,b,g]

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[b]*Marine Data Technology Hub, James Cook University, Townsville, QLD, Australia*
[c]*AIMS@JCU, Townsville, QLD 4810 Australia*
[d]*AIMS@JCU, Division of Research and Innovation, James Cook University, Townsville, QLD, Australia*
[e]*Australian Institute of Marine Science, 1526 Cape Cleveland Road, Cape Cleveland, QLD 4810 Australia*
[f]*Centre for Tropical Water and Aquatic Ecosystem Research (TropWATER), James Cook University, 1 James Cook Drive, Douglas QLD, 4811 Australia*
[g]*Biopixel Oceans Foundation, Cairns, QLD, Australia*

Significant challenges are present when surveying elasmobranchs in low visibility and in deep water. Traditional survey methods, such as underwater surveys and BRUVs can fall short when collecting abundance and occurrence data in deep water, limited and visibility. Remotely Operated Vehicles (ROVs) can be a solution for surveying elasmobranchs at temporal and spatial scales that have been largely unachievable. To evaluate the effectiveness of this technology, this study employs a small, observation-class ROVs (modified BlueROV2), which are accessible and comparatively affordable to a wide range of research applications. This study demonstrates how ROV technology can be optimized for elasmobranch surveys via application of various light and camera customizations and an iterative survey approach. The ROV performance is compared to three methods; UVS, BRUVS, and catch data, investigating overall counts and species richness detected across three locations along the Great Barrier Reef and the Coral Sea. Overall, ROVs proved comparable to UVS in terms of relative abundance and species composition, while BRUVS detected more species but lower relative abundance for some reefs. Meanwhile, ROVs detected more elasmobranchs overall and different species composition compared to catch methods. This study suggests that elasmobranch research could benefit from ROV technology as a complementary tool for mobile transect surveys in conditions where diving not possible.

I acknowledge the numerous Traditional Owners of the land and sea that encompass the GBR locations on which I conducted my work.

2:00pm

Needle in the Haystack: In Search of Whale Sharks in the Coral Sea

Miller, IB[a,b,c], Reynolds, S[d,e], Pierce, S[f], Erdmann, M[g], Fitzpatrick, R[b], Norman, B[d,e], Abrantes, K[b,c], Dove, A[h], Hoopes, L[h], Rohner, C[f], Niella, Y[i], Dudgeon, C[j] & Barnett, A[b.c]

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[b]*Biopixel Oceans Foundation, Cairns, Qld, Australia*
[c]*Marine Data Technology Hub, James Cook University, Qld, Australia*
[d]*Ecocean Inc., Coogee, WA, Australia*
[e]*Murdoch University, Murdoch, Australia*
[f]*Marine Megafauna Foundation, West Palm Beach, FL, USA*
[g]*Conservation International Aotearoa, University of Auckland, Auckland, New Zealand*
[h]*Georgia Aquarium, Atlanta, GA, USA*
[i]*Sydney Institute of Marine Science, NSW, Australia*
[j]*Animal Ecology, School of Science and Engineering, The University of the Sunshine Coast, Petrie, Qld, Australia*

Globally, whale shark (*Rhincodon typus*) conservation is guided by research at aggregation sites. However, with only sporadic sightings reported, the east coast of Australia (including the Coral Sea) remains a black hole in terms of whale shark knowledge. To address this knowledge gap, we overlayed historical sightings data (from anecdotal reports, public databases, and aerial surveys) with environmental/oceanographic information, aiming at identifying potential aggregation sites. Wreck Bay in the far northern GBR was identified as the most likely aggregation site during monsoon season. Since 2018, three field trips were conducted to this area, involving aerial surveys, satellite tagging, and photo identification. Here, we present the first species distribution model for the region. This model integrates recent satellite tracking data, historical sightings, and a suit of environmental variables to establish a detailed understanding of habitat suitability and movement patterns in the region. The model confirms that the Wreck Bay area is an essential habitat to whale sharks and identifies other potentially important sites. We also present preliminary demographic insights, shedding light on the population structure. Our findings fill a critical knowledge gap in whale shark research not only for the Coral Sea, but also for the broader Asia/West Pacific region. Results will contribute to regional population estimates, with implications for global conservation initiatives.

I acknowledge Aboriginal and Torres Strait Islander peoples as Australia's first scientists. I pay my deepest respects to Elders past, present and future, and the custodians of the land and sea country on which I work, including the Irukandji people of Cairns.

3:15pm

Interactions Among Wildtype and Heat-Evolved Photosymbionts Shape Performance of Coral Recruits

Elizabeth A. Ivory[a,b], Jos C. Mieog[b]; Matthew R. Nitschke[a,c], Madeleine J. H. van Oppen[a,d] & David Abrego[b]

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[b]*Faculty of Science and Engineering, Southern Cross University, Lismore, NSW, Australiaa*
[c]*School of Biological Sciences, Victoria University of Wellington, Wellington, New Zealand*
[d]*School of BioSciences, University of Melbourne, Parkville, VIC, Australia*

Anthropogenic climate change has driven many coral reef ecosystems to the brink of collapse as extreme temperature events cause widespread bleaching and mortality. Interventions that boost coral resilience are being developed to help restore reefs, and one such intervention is the manipulation of a coral's symbiotic algae (which greatly affects their host's physiology). New experimentally evolved symbiont strains have shown promise in increasing their host's thermal tolerance, but how they will perform in juvenile corals when other strains are present is unclear. This study investigates the uptake and establishment of experimentally evolved *Cladocopium proliferum* and *Durusdinium trenchii* in mixed inocula and describes the effects hosting multiple symbiont strains has on the growth and survival of juvenile corals. Our results reveal that while both strains in the mixed culture inocula were taken up, most recruits were dominated by *D. trenchii*. Corals hosting *D. trenchii* over *C. proliferum* also displayed faster growth despite previous studies showing the opposite. We show that the costs and benefits of hosting mixed communities are highly dependent on the identities of the individual strains therein and suggest the compatibility of symbiont-symbiont-host assemblages should be assessed before being used for restoration.

Traditional Owners to be acknowledged: Wulgurukaba, Bindal, Manbarra, and Bwgcolman people

3:30pm

Unravelling the Toxic Legacy of Microplastics: The Impact of Chemical Additives on *Artemia franciscana*

Zacharuk JL[a,b], Motti C[c,d], Vamvounis G[a,b] & Cyrus M[a,c]

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[b]*AIMS@JCU, Division of Research and Innovation, James Cook University, Australia*
[c]*Centre of Sustainable Tropical Fisheries and Aquaculture, James Cook University, Australia*
[d]*Australia Institute of Marine Science (AIMS), Townsville, Australia*

In the marine environment, planktonic organisms are significantly impacted by plastic pollution at every stage of their lifecycle. Approximately 90% of plastic waste in the ocean breaks down yearly into microplastics (MPs; <5mm in diameter), which have been shown to cause various negative physiological and behavioural effects. While microplastic studies have received significant attention in recent years, the effects of leaching chemical additives from these MPs on marine organisms remain underexplored. This study investigated the acute (48-hour) effects of Polystyrene (PS) MPs, both with and without incorporated Di (2-ethylhexyl) terephthalate (DEHT) plasticiser, and free DEHT at two different concentrations (high; [0.02 µL/mL] and low [0.01 µL/mL]) on the behaviour and physiology of *Artemia franciscana* nauplii. Mortality, growth, swimming behaviour and the feeding rate differences investigated will be discussed in this presentation. This presentation sheds light on the preliminary results revealing significant impacts with high mortality rates for free DEHT exposures at both high and low concentrations. Accelerated growth/ moulting of metanauplii when exposed to PS, PS + DEHT and ethanol, and adverse swimming behaviours for both MPs exposures and free DEHT at low concentrations. These findings suggest that both PS and DEHT plasticiser pose an ecotoxic threat to the ecology of *A. franciscana.* Understanding the complex interactions between microplastics and chemical additives is critical for assessing the full extent of their environmental impact. With future research focusing on the toxicity of different plastic polymers and chemical additives together as plastic pollution continues to pose a long-term threat to the marine environment.

Traditional Owners to be acknowledged: Bindal and Wulgurukaba People

AIMS@JCU Speed talks

3 minute presentation; 1 question

The required format and judging guidelines for the 3 minute speed-talks will follow those of the national 3MT competition with which most students would already be familiar, with the addition of a 100 word abstract. The 100 word abstract should be an extended title of the presentation, which indicates the importance and context of the research and its outcomes.

The presentation should follow the following format:

- A single static PowerPoint slide is permitted. No slide transitions, animations or 'movement' of any description are allowed. The slide is to be presented from the beginning of the oration.
- No additional electronic media (e.g. sound and video files) are permitted.
- No additional props (e.g. costumes, musical instruments, laboratory equipment) are permitted.
- Presentations are limited to 3 minutes maximum and competitors exceeding 3 minutes are disqualified.
- Presentations are to be spoken word (e.g. no poems, raps or songs).
- Presentations are to commence from the stage.
- Presentations are considered to have commenced when a presenter starts their presentation through either movement or speech.
- The decision of the adjudicating panel is final.

Judging guidelines are as follows:

Comprehension & Content

- Was the abstract well written, and did it capture the importance and context of the research that was presented?
- Did the presentation provide an understanding of the background to the research question being addressed and its significance?
- Did the presentation clearly describe the key results of the research including conclusions and outcomes?
- Did the presentation follow a clear and logical sequence?
- Was the thesis topic, key results and research significance and outcomes communicated in language appropriate to a non-specialist audience?
- Did the speaker avoid scientific jargon, explain terminology and provide adequate background information to illustrate points?
- Did the presenter spend adequate time on each element of their presentation - or did they elaborate for too long on one aspect or was the presentation rushed?

Engagement & Communication

- Did the oration make the audience want to know more?
- Was the presenter careful not to trivialise or generalise their research?
- Did the presenter convey enthusiasm for their research?
- Did the presenter capture and maintain their audience's attention?
- Did the speaker have sufficient stage presence, eye contact and vocal range; maintain a steady pace, and have a confident stance?
- Did the PowerPoint slide enhance the presentation - was it clear, legible, and concise?

Speed Talk - 3:50pm

Reef seeding technology establishment in a remote Maldivian atoll

Wee C[a], Randall C[b], Abdul Wahab M[b] & Hoogenboom M[c]

[a]*AIMS@JCU; Crystle.wee@my.jcu.edu.au*
[b]*Australian Institute of Marine Science (AIMS)*
[c]*James Cook University (JCU)*

Coral seeding is a reef restoration method that harnesses sexual reproduction. It offers advantages over traditional methods because of its scalability over large areas and potential for enabling assisted evolution to increase tolerance of restored corals to environmental stressors. However, coral seeding may be particularly challenging in remote areas where technical expertise and equipment is limited. This study focuses on evaluating the effectiveness of coral seeding via the ReefSeed system in the Maldives, while improving the understanding of local coral reproduction patterns. It also seeks to identify barriers to the survival and growth of coral larvae in remote reef ecosystems.

Traditional Owners to be acknowledged: Maldives – Maniyafushi Island, South Male Atoll (Maldives Marine Research Institute)

Speed Talk - 3:55pm

Concurrent Autonomous Surface-Underwater Monitoring System

Croul D,[a,b], Zhou SH[a] & Rigby P[c]

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Marine vehicles and autonomous technologies have progressively emerged to the forefront of research due to their diverse applications, particularly in underwater exploration and environmental monitoring. Autonomous Surface Vehicles (ASVs) and Autonomous Underwater Vehicles (AUVs) have been commonly used to perform large-scale surface surveys and characterise benthic processes respectively. Unlike ASVs, an accurate localisation estimate of AUVs is hindered by poor localisation references (lack of GPS). To harness the full potential of autonomous systems in marine conservation, the individual ASV-AUV systems can be coupled by an Umbilical Cable (UC), facilitating reliable transfer of power and telemetry. Control of the concurrent system presents a difficult challenge due to the highly nonlinear system dynamics, and inability to directly manipulate the UCs configuration. Therefore, novel model-based control strategies are required to ensure sound performance in conducting hydrography related tasks.

We acknowledge the Australian Aboriginal and Torres Strait Islander peoples as the traditional owners of the lands and waters where we live and work.

Speed Talk - 4:00pm

Bringing knowledge together for Sea Country

Ferguson, Redbird[a,b], Joyce, Karen[a,b], Reepmeyer, Christian[c,d], Puotinen, Marji[b,e], Groom, Rachel[f,g], Pollard, Kellie[h] & Fourmile, Gudju Gudju[i]

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[h]*College of Indigenous Futures, Education & the Arts, Charles Darwin University, Darwin, Australia*
[i]*Gimuy Walubara Yidinji Elders Corporation, Cairns, Australia*

Climate change significantly threatens Sea Country, the island, marine, and coastal areas of Australia. As the urgency to recognise and include Indigenous Knowledge and cultural values in our solutions increases, we need to consider every resource, and all knowledge systems. This project uses co-design to integrate new technologies, such as remote sensing and statistical analysis with Indigenous Knowledge. Remote sensing delivers high-resolution data, while statistical analysis deciphers complex environmental trends. Equally crucial is the incorporation of Indigenous expertise, which provides valuable insights. By collaboratively developing best practice frameworks with all stakeholders, including Indigenous communities and scientists, we can create robust strategies to monitor, analyse, and mitigate climate impacts, fostering resilient marine environments and informed policy decisions.

Traditional Owners to be acknowledged: Gimuy Walubara Yidinji

Speed Talk - 4:05pm

Synthesis and Characterisation of Sustainable Plasticisers

Ghobish, S[a]

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There's about 200 million tons of plastic floating in our oceans today. As the plastic waste problem becomes a hazard to the marine ecosystem, the need for sustainable plastics and their additives grows more persistent. Plasticisers have become a priority because of their toxicity to marine organisms. Nonetheless, they are indispensable in the plastic industry. The research into bio-based plasticiser leads us to extract a chemical substance from algae to modify and turn into a sustainable plasticiser that is harmless to the aquatic environment. Leaching profile, biodegradability and toxicity studies will follow the design and synthesis of the new plasticiser.

We acknowledge the Australian Aboriginal and Torres Strait Islander peoples as the traditional owners of the lands and waters where we live and work.

Speed Talk - 4:10pm

Sea-weeding Secrets: Exposing Ecosystem Impacts in Coral Reef Restoration

Hermanto, B[a,b,c,e], Smith, H[a,d], Page, C[b,c] & Bourne, D[a,b,c]

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Coral reefs globally face unprecedented degradation due to human impacts and climate change. Some nearshore reefs along the Queensland coast are characterized by high macroalgal cover. In my PhD work, I aim to explore sea-weeding as a potential solution, focusing on coral reef ecosystems surrounding Magnetic Island. Specifically, I am investigating how removing macroalgae affects coral communities, fish populations, and cryptic benthic fauna in the face of varying and intense disturbances. Using both traditional surveys and cutting-edge DNA techniques, I will build a comprehensive picture of reef responses to this restoration approach and understand how sea-weeding shapes reef recovery.

I acknowledge the Bindal and Wulgurukaba peoples as the Traditional Custodians of the land on which we gather today and pay my respects to their Elders, past, present, and future

Speed Talk - 4:15pm

Size matters

Lechene MAA[a,b], Ferrari R[b], Alvarez-Noriega M[b] , Hoogenboom M[a,b], Figueira W[c], Gordon SE[b] , Aston EA[b], Toor M[b] & Becker M[b]

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In forests, tall canopy trees face risks like wind damage and harsh sunlight, while smaller understory plants thrive in sheltered areas. Similarly, in coral reefs, environmental influences vary with colony size and shape. I investigated six coral taxa to see how initial size affects their size-frequency distribution across different environments. Results revealed that larger corals, especially table-shaped ones prone to mechanical damage, were predominantly found in sheltered areas. Size also plays a crucial role in survival and growth, particularly in the context of disturbances like bleaching, which is a focus of ongoing research.

Traditional Owners to be acknowledged: The Wulgurukaba and Bindal people, as well as the Traditional Custodians of the Great Barrier Reef whose sea country this data was collected from, with prior consent, and finally all Aboriginal and Torres Strait Islanders.

Speed Talk - 4:20pm

The colourful world of algal turfs on coral reefs

Rashid AR[a,b,d], Joyce KE[c], Fabricius KE[d] & Maier SW[e]

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Turf algae are a ubiquitous feature of the world's coral reefs, and are expected to increase in prominence with climate change. Turf algae are mixed-species assemblages of cyanobacteria and filamentous algae, and may be highly diverse, yet most surveys treat them as homogenous, measuring its percent cover, relative to other benthic groups. This is partly due to how difficult and time-consuming traditional methods of characterizing algal turf assemblages have been. In this speed talk, we introduce a novel application of established remote sensing technology, i.e. hyperspectral imaging, and techniques to the unique context of algal turfs on coral reefs.

The authors acknowledge the Traditional Owners of the land and sea country where this research was conducted, the Bindal and Gumbaynggirr peoples. We pay our respect to their Elders, past, present and emerging, and acknowledge their continuing spiritual connection to their land and sea country

Speed Talk - 4:25pm

Integrating the Roles of Seawater Microbes and Viruses in Coral Reef Ecosystem Functioning

Marko Terzin[a,b,c], Steven J. Robbins[d], Sara C. Bell[a], Kim-Anh Lê Cao[e], Katherine E. Dougan[d], Julian Zaugg[d], Samuel Chaffron[f], Renee K. Gruber[a], Michael Emslie[a], Philip Hugenholtz[d], Nicole S. Webster[g], David G. Bourne[a,b,c], Yun Kit Yeoh[a,b,c] & Patrick W. Laffy[a,b,c]

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Marine viruses are the most abundant biological entities in the ocean, lysing up to 40% of microbial cells daily. Emerging evidence suggests that high virus-to-bacteria ratios in seawater correlate with healthy coral reefs, since viruses prevent the detrimental accumulation of ecosystem energy in the microbial food web. Despite their potential as predictors of reef health, viruses are largely understudied in the Great Barrier Reef. Here I detail novel omics-integration approaches combining ~360,000 viral contigs with ~5,000 seawater bacterial and archaeal genomes, to obtain a holistic understanding of virus-microbe-environment interactions across the GBR.

Traditional Owners to be acknowledged: See Marko's seminar abstract for details.

Poster

The influence of cleaner wrasse on the soundscapes of patch reefs at Lizard Island

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We investigated the influence of Cleaner Wrasse (Labroides dimidiatus) on reef soundscapes at Lizard Island by comparing five reefs with and three without cleaner wrasse, using three acoustic methods. Sound pressure levels differed among reefs and with time of day, but not with cleaner wrasse presence. Acoustic complexity indices identified two groups, with one 'absent' reef mixed with the 'present' group and vice versa. Finally, reefs with cleaner wrasse generally exhibited more 'high-energy' shrimp clicks than those without. These results demonstrate the suitability of ecoacoustics towards capturing ecological information relating to the presence of cleaner wrasses.

Traditional Owners to be acknowledged: The Dingaal Aboriginal people—Traditional Owners of Lizard Island, Jiigurru

Poster

Mapping summer thermodynamics: advanced metrics for coral bleaching prediction

Cornet VJ[a,b], Heron SF[b], Cantin NE[c] & Joyce KE[d]

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Coral reefs, vital biodiversity hotspots, are increasingly threatened by rising sea temperatures that drive widespread bleaching. Accurate predictions are essential for effective management. Traditional metrics like Degree Heating Weeks (DHW) focus on accumulated heat stress above the bleaching threshold (Maximum Monthly Mean +1) but may miss key temperature dynamics. This study explores how summer thermodynamics, including variability, heating/cooling rates, and protective periods, influence bleaching sensitivity at the community level. We developed alternative metrics to analyse these factors alongside DHW. Results indicated a positive relationship between summer variability and bleaching, suggesting it as an additional stressor. Among various heating rates tested, the one from the lowest pre-peak temperature to the peak summer temperature showed the strongest positive correlation with bleaching, particularly above a threshold of 0.02°C/day. Cooling periods following peak temperatures above the bleaching threshold negatively correlated with bleaching, suggesting relief from heat stress. Similarly, a higher absolute cooling rate also correlated with reduced bleaching occurrence, as well as the inclusion of a protective period, speaking to the potential for acclimatisation within a hot summer. While expanding the set of predictive metrics can offer deeper insights into coral bleaching dynamics, caution must be exercised to avoid overfitting models, which can also compromise their practical application. Nonetheless, our findings demonstrate that incorporating a broader range of temperature dynamics—including acute heat stress factors, as well as cooling periods—significantly enhances the accuracy of bleaching predictions, thereby supporting more effective coral reef management and conservation strategies.

I would like to acknowledge the 70 Traditional Owner groups of the Great Barrier Reef, and their elders past, present, and emerging, whose sea country this data were collected from. I would specifically like to acknowledge the Wulgurukaba people as the Traditional Owners of Yunbenun, the land on which I conducted my research.

Poster

Methylome profiling of the Pacific crown-of-thorns seastar (*Acanthaster* cf. *solaris*) using Oxford Nanopore Technology (ONT)

Kwong, S[a,b,c], Budd, A[b,c,d], Hung, J[b,c], Pratchett, M[b], Villacorta-Rath & Uthicke, S[a]

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Epigenetic studies enrich ecological research by uncovering an additional layer of insight into the complex interplay between genetics and environmental factors. However, our understanding of DNA methylation in non-model species remains limited, with only a handful of studies presenting comprehensive methylome profiles in invertebrates. In this study, we conducted the first methylome profiling of the Pacific crown-of-thorns seastar (CoTS; *Acanthaster* cf. *solaris*) using Oxford Nanopore Technology, demonstrating its robustness for comprehensive genomic and methylation analysis in non-model species. Our findings revealed a genome-wide methylation level of 37 – 38%, with a sparse and mosaic methylation pattern characteristic of invertebrates, contrasting the widespread methylation observed in vertebrates. The methylation landscape of CoTS reaffirms the intermediate position of deuterostome invertebrates in the evolutionary spectrum of DNA methylation, balancing gene expression flexibility with regulatory robustness. Additionally, we observed unique features such as intronic methylation, which may have important implications for the biological adaptability and resilience of CoTS. Overall, our comprehensive methylation profiles not only establish a foundational understanding of the CoTS epigenetic landscape but also offer a critical dataset for future functional epigenome and comparative analyses, contributing to our understanding of DNA methylation in natural populations.

Traditional Owners to be acknowledged: Bindal and Wulgurukaba

Poster

Novel Use of Deep Neural Networks on Photographic Identification of Epaulette Sharks (*Hemiscyllium ocellatum*) Across Life Stages

Martina Lonati[a,b,c,g], Mohammad Jahanbakht[f], Danielle Atkins[a], Stacy L. Bierwagen[d,e], Andrew Chin[d], Adam Barnett[a,b,g] & Jodie L. Rummer[a]

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Photographic identification (photo ID) is an established method that is used to count animals and track individuals' movements. This method performs well with some species of elasmobranchs (i.e., sharks, skates, and rays) where individuals have distinctive skin patterns. However, the patterns used for ID must be stable through time to allow re-identification of individuals in future sampling events. Here, photo ID is used to identify individual epaulette sharks (*Hemiscyllium ocellatum*) at different life stages for two years. Novel artificial intelligence (AI) solutions were used to assess and compare the reliability and persistence of unique patterns. Results indicate that immature life stages are unreliable for pattern identification, using both human and AI approaches, due to the plasticity of these sub-adult growth forms. Mature sharks on the other hand, maintain their patterns through time. Adults can be identified with more than 90% accuracy and precision by the AI model developed in this study. This study's novel deep neural network offers a streamlined and accessible framework for generating a reliable model without requiring high-performance computing. The photo ID and AI protocol in this study can validate the stability of ID patterns through time, but testing on wild populations is still needed to establish the benefits of this approach. Overall, this approach has the potential to address challenges associated with photo ID data sets and the application of AI for shark identification.

I acknowledge the numerous Traditional Owners of the land and sea that encompass the GBR locations on which I conducted my work.

Poster

Assessing survival and growth of corals produced using Assisted Gene Flow during an adverse heating event

Macadam, A[a,b,c], Morgans, C[b], Severeti, A[b], Laffy, P[b], Strugnell, J[a], Quigley, K[a,d] & Cooke, I[a]

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The tropics have seen an increase in frequency of mass coral bleaching and mortality events over the past several decades, causing degradation and changes in coral species composition. Assisted Gene Flow (AGF) is proposed intervention that could accelerate adaptation in less heat-tolerant reefs by introducing novel, heat tolerance-associated genetic variants. While prior studies in aquaria and ambient field conditions are promising, the performance of out-planted AGF corals during heat stress remains uncertain. To investigate, we deployed mixed crosses of Acropora hyacinthus from reefs along a thermal gradient on the Great Barrier Reef onto a reef in the Palm islands during an adverse heating event. Survival, growth, and bleaching were compared between purebred and hybrid offspring. Over 95 days, temperatures peaked at 31.4°C, with 17 days at NOAA bleaching alert level 1. Hybrid corals had 462% greater survival odds, while native corals showed higher growth rates. Growth and survival trade-off analysis showed a distinct decrease in growth with improved survival. These findings suggest complex trade-offs in early-life heat tolerance and other fitness traits in corals.

Traditional Owners to be acknowledged: Wulgurukaba Aboriginal Corporation, Bindal, Manbarra, Wuthathi, Gunggandji, Walmbaar

Poster

Needle in the Haystack: In Search of Whale Sharks in the Coral Sea

Miller, IB[a,b,c], Reynolds, S[d,e], Pierce, S[f], Erdmann, M[g], Fitzpatrick, R[b], Norman, B[d,e], Abrantes, K[b,c], Dove, A[h], Hoopes, L[h], Rohner, C[f], Niella, Y[i], Dudgeon, C[j] & Barnett, A[b.c]

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Globally, whale shark (*Rhincodon typus*) conservation is guided by research at aggregation sites. However, with only sporadic sightings reported, the east coast of Australia (including the Coral Sea) remains a black hole in terms of whale shark knowledge. To address this knowledge gap, we overlayed historical sightings data (from anecdotal reports, public databases, and aerial surveys) with environmental/oceanographic information, aiming at identifying potential aggregation sites. Wreck Bay in the far northern GBR was identified as the most likely aggregation site during monsoon season. Since 2018, three field trips were conducted to this area, involving aerial surveys, satellite tagging, and photo identification. Here, we present the first species distribution model for the region. This model integrates recent satellite tracking data, historical sightings, and a suit of environmental variables to establish a detailed understanding of habitat suitability and movement patterns in the region. The model confirms that the Wreck Bay area is an essential habitat to whale sharks and identifies other potentially important sites. We also present preliminary demographic insights, shedding light on the population structure. Our findings fill a critical knowledge gap in whale shark research not only for the Coral Sea, but also for the broader Asia/West Pacific region. Results will contribute to regional population estimates, with implications for global conservation initiatives.

I acknowledge Aboriginal and Torres Strait Islander peoples as Australia's first scientists. I pay my deepest respects to Elders past, present and future, and the custodians of the land and sea country on which I work, including the Irukandji people of Cairns.

Poster

An open-source, hyperspectral imaging system for close-range underwater mapping of algal turf communities

Rashid AR[a,b,d], Joyce KE[c], Fabricius KE[d] & Maier SW[e]

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Turf algae are mixed-species assemblages of cyanobacteria and filamentous algae, and may be highly diverse, yet most coral reef surveys treat them as homogenous, measuring its percent cover, relative to other benthic groups. Traditional methods of characterizing algal turf assemblages are difficult and time-consuming, and requires a high level of expertise. In this study, we have designed and developed an open-source hyperspectral imaging platform for lab-based underwater characterisation of algal turf assemblages. Here, we demonstrate how remote sensing technologies, i.e. hyperspectral imaging, that had been developed for terrestrial environments had to be adapted to address some of the unique challenges posed by the context of algal turfs. We also describe the data collection and analyses pipeline for the processing and analysis of these underwater hyperspectral images.

The authors acknowledge the Traditional Owners of the land and sea country where this research was conducted, the Bindal and Gumbaynggirr peoples. We pay our respect to their Elders, past, present and emerging, and acknowledge their continuing spiritual connection to their land and sea country

Poster

The influence of cleaner wrasse on the soundscapes of patch reefs at Lizard Island

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The giant triton snail, *Charonia tritonis*, is a predator of adult coral-eating crown-of-thorns starfish (CoTS) and has been considered as a possible biocontrol agent to control CoTS populations which are prone to outbreaks. However, a decline in *C. tritonis* numbers resulting from previous overharvesting has raised concerns about the species' viability and the possible role this has had in the increased frequency and intensity of CoTS outbreaks. Traditional survey methods for detecting *C. tritonis* populations are costly and often ineffective due to the snail's cryptic and nocturnal nature. Reported here is a species-specific eDNA assay, based on the mitochondrial COI gene region, which is designed to improve detection for monitoring of *C. tritonis* in natural habitats. The assay's sensitivity and specificity were tested against tissues of both target and non-target species, and its effectiveness further validated using *C. tritonis*-conditioned water samples. Additionally, aquarium experiments were conducted to determine the eDNA shedding and degradation rates of *C. tritonis*, data that is crucial for interpreting eDNA signals in environmental samples. Our results demonstrate that Triton eDNA becomes detectable within one hour of introduction of the snail into the tank. Additionally, Triton eDNA was detectable for up to five days following the removal of the snails from the tanks. Together these results provide the foundation upon which an eDNA monitoring method can be developed that will advance our understanding of *C. tritonis* distribution, to further support its conservation, and allow for comparative population analyses with CoTS to reveal their interspecific interactions.

Traditional Owners to be acknowledged: Traditional Owners of the Great Barrier Reef, specifically the Yirrganydji, Wulgurukaba, Bindal and Manbarra peoples.

Poster

Reef Bacterioplankton: Key Players in Nutrient Cycling Across the Great Barrier Reef

Marko Terzin[a,b,c], Steven J. Robbins[d], Sara C. Bell[a], Kim-Anh Lê Cao[e], Renee K. Gruber[a], Pedro R. Frade[f], Nicole S. Webster[g], Yun Kit Yeoh[a,b,c], David G. Bourne[a,b,c] & Patrick W. Laffy[a,b,c]

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Seawater bacteria and archaea are vital for coral reef ecosystems, driving nutrient cycling and energy transfer. This study integrates metagenomics data with 17 physico-chemical variables (e.g., temperature, salinity, nutrients) collected from 48 offshore reefs in the Great Barrier Reef (GBR). By analyzing these data, we identify stable microbial indicators and elucidate the role of reef bacterioplankton in nutrient dynamics, proposing a mechanistic understanding of how picocyanobacteria *Synechococcus* and *Prochlorococcus* influence reef nutrient cycling. These picocyanobacteria uptake dissolved inorganic nutrients (DIN) such as nitrogen (ammonium, nitrite, nitrate) and phosphorus (phosphate), and convert them into particulate organic matter (POM) through photosynthesis. This process results in reduced DIN concentrations and increased POM and biomass, as indicated by higher chlorophyll a levels. *Synechococcus* drives up to a 3-fold increase in POM production during summer, while *Prochlorococcus* contributes significantly in winter. This produced POM enters the microbial loop, where heterotrophic microbes like *Rhodobacteraceae*, *Rhodospirillaceae*, *Oceanospirillaceae*, *Burkholderiaceae*, and *Flavobacteriaceae* degrade it. Heterotrophic seawater microbes encode genes for nutrient uptake and cellular respiration to remineralise POM into DIN and dissolved organic carbon (DOC). The remineralised nutrients are then available for uptake by picocyanobacteria, allowing them to photosynthesize again and sustain nutrient flow. Picocyanobacterial POM supports higher trophic levels through two pathways: an indirect route where heterotrophic microbes are grazed by larger organisms, and a direct route where POM escapes immediate microbial metabolism and is consumed directly. Thus, picocyanobacteria play a crucial role in maintaining nutrient flow and supporting higher trophic levels in the offshore and midshelf GBR.

Traditional Owners to be acknowledged: See Marko's seminar abstract for details.

Image courtesy of
Dr Joseph Pollock

http://aims.jcu.edu.au