

VOLUME 40 | NUMBER 1 | JULY 2023

Quaternary AUSTRALASIA

Aboard the RV *Investigator*

**Continuing the Conversation on
Equity, Diversity, and Inclusion**

AQUA Conference 2022

AQUA LIFE MEMBERS

Current life members are Jim Bowler, Eric Colhoun, John Chappell (dec), Peter Kershaw, John Magee, Matt McGlone, Geoff Hope (dec) and Jeannette Hope.



Jim Bowler
(Photo credit: socialpolicyconnections.com.au)



Eric Colhoun
(Photo credit: Tim Barrows)



John Chappell (dec)
(Photo credit: Helen Chappell)



Peter Kershaw
(Photo credit: ANU)



John Magee
(Photo credit: Giff Miller)



Matt McGlone
(Photo credit: Manaaki Whenua
Landcare Research)



Geoff Hope (dec)
(Photo credit: <https://iceds.anu.edu.au/people/academics/professor-geoffrey-hope>)



Jeannette Hope
(Photo credit: Stephen Berry,
Australian National University Archive)

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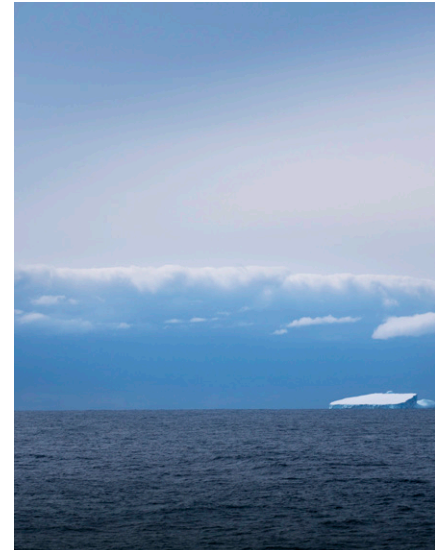
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Front cover photo:

'Ice spy'; icebergs seen from aboard the RV *Investigator* – see Husdell et al. and Szilagyi et al. in News from the Field, page 9 (Photo credit: Aero Leplastrier, Geoscience Australia CC BY 4.0)

Below:

Patrick De Dekker and the fieldtrip group at the Coorong Lakes for the post-AQUA Conference fieldtrip – see 'An all-round positive review' by Ryan North in Reports, page 27 (Photo credit: Ryan North)



EDITORIAL

Dear Quaternarists,

It was wonderful to see so many people and a broad range of topics at the AQUA conference last December. Thanks to the hybrid delivery, both of us were able to attend (Emma in Adelaide and Lydia online). This issue of QA is filled with personal reflections on the conference from last year's ten AQUA Student Travel Awardees covering everything from social events to the AAA-AQUA joint session, to catering and virtual attendance. We think the ECR perspectives really highlight how welcoming the AQUA conferences can be.

We also welcome the new and continuing members of the AQUA Executive Committee, including our new Shadow Editor, Dr Lauren Linnenlucke, and Dr Lydia Mackenzie upgrading from Shadow to Co-Editor. We look forward to all working together on upcoming issues of QA.

On that note, we are also celebrating the 40th anniversary of *Quaternary Australasia* this year! Volume one was released in August 1983, ten years after the first issue of its predecessor, the *Australian Quaternary Newsletter*. It's a good opportunity to reflect on all of the amazing research and many Quaternarists involved in AQUA and QA during that time. Past issues are available to read online in the QA Archive (<https://aqua.org.au/quaternary-australasia/qa-archive>). We would like to encourage submissions to the next issue that celebrate this 40-year history – please get in touch with the QA editorial team!

We think you'll enjoy this issue packed with trips on the RV *Investigator* in News from the Field, many reflections on the AQUA conference including a look at demographics and inclusion, and the Life Membership nomination for Dr Jeanette Hope.

Happy reading,

Emma Rehn and Lydia Mackenzie

Editors



PRESIDENT'S PEN

Dear AQUA colleagues,

By the time this issue of *Quaternary Australasia* is in your mailboxes, the INQUA conference – for those people fortunate enough to go – will be just around the corner. AQUA just held our Annual General Meeting and thanks to those who attended and shared their ideas. Thanks also to folk who sent proxy votes.

The “new” Executive Committee is like the old committee, with a few adjustments. Can I take this opportunity to thank those people who are leaving the committee? Particularly, to Patricia Gadd who took on the role of Secretary at about the same time that her work at ANSTO really ramped up. We’ve been fortunate to have Patricia’s organisation and intellectual input into the role. Thanks, also, to departing Ordinary Members Nick Patton and Olivia Traux. A very warm welcome to our new Secretary, Caroline Mather; Shadow Treasurer, Alex Francke; new shadow *Quaternary Australasia* Editor, Lauren Linnenlucke; and new Ordinary Member, Juliet Sefton. Please keep in mind that time between these meetings seems to fly and that at next year’s AGM there will be a number of vacant positions (e.g., for Vice President). Please consider nominating yourself or speak to any member of the Executive Committee about what is required.

We are now in an exciting no person’s land between AQUA and INQUA. The AQUA Adelaide meeting was wonderful and thanks to everyone who made it such a success. The organisation was absolutely a joint effort of many people, and the flavour of the meeting reflected the wonderful ideas and enthusiasm of the committee. I won’t comment on the science from the meeting since that appears elsewhere in this issue. Amazingly, it’s not too long until the next AQUA meeting.

The committee put out some feelers to a number of New Zealand colleagues to hold the next AQUA meeting there. There was general enthusiasm for this idea and semi-concrete volunteering to host the 2026 meeting. However, for a variety of reasons, it was not possible to do this. In this context, plans have firmed for a July 2024 meeting in south-east Queensland. This initiative is being driven by Helen Bostock and Patrick Moss from The University of Queensland. The most likely scenario is that the meeting will be held on Minjerribah (or North Stradbroke Island) where UQ has a research station with great facilities and cheap accommodation. The Executive Committee are aware that we have previously held a meeting on the island (in 2008). However, this venue provides an opportunity for people, particularly from New Zealand, to easily travel to the meeting at relatively low cost and with a minimum of travel time. This helps to address AQUA’s aim of catering for a diverse range of participants by reducing the time that care givers spend away from their responsibilities and by keeping costs down. Hopefully, it’s been such a long time since the last meeting that the experience will be new to most people.

I’m sorry for those people unable to attend INQUA, but we all will benefit from the reports of the AQUA-supported student prize winners who are attending.

Until then...

Best wishes,

John Tibby
AQUA President

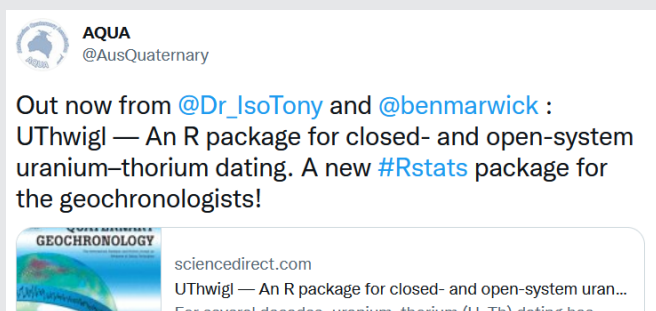


NEWS

Do you have a paper coming out?

WANT TO ADVERTISE A NEW JOB OR SCHOLARSHIP OPPORTUNITY?

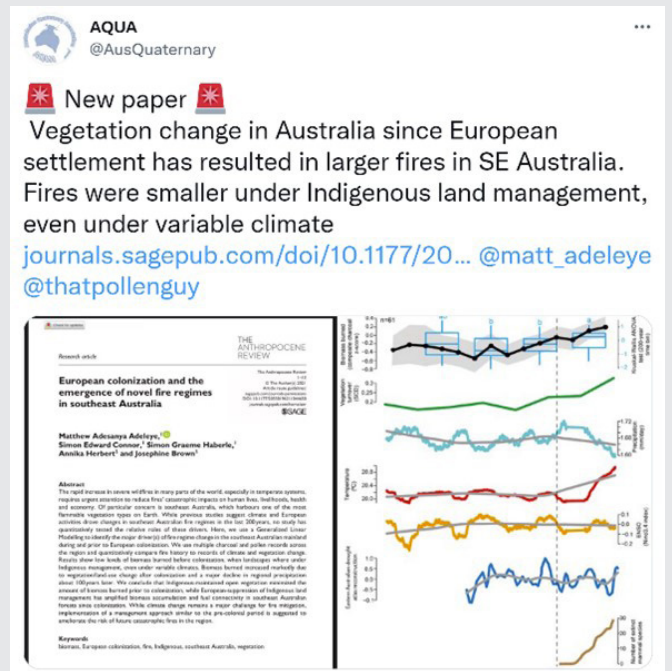
Reach a wider audience with the help of the @AusQuaternary Twitter account! If you would like @AusQuaternary to promote your work either send a Twitter message or email us at communications@aqu.a. With over 500 followers all over the world (and more joining every week), we can help your work reach a broad audience, even if you are not on Twitter!



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Out now from @Dr_IsoTony and @benmarwick : UThwgl — An R package for closed- and open-system uranium–thorium dating. A new #Rstats package for the geochronologists!

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UThwgl — An R package for closed- and open-system uranium–thorium (U–Th) dating has

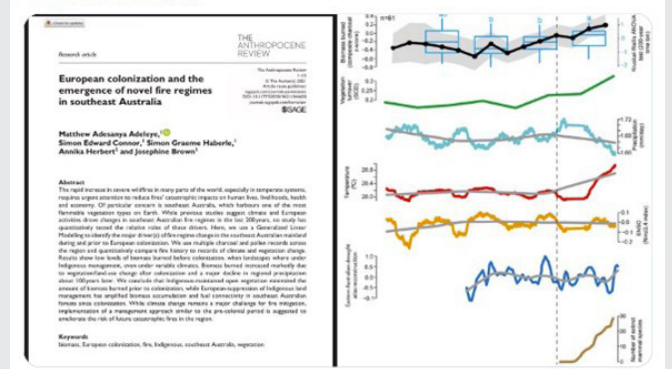


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New paper

Vegetation change in Australia since European settlement has resulted in larger fires in SE Australia. Fires were smaller under Indigenous land management, even under variable climate

journals.sagepub.com/doi/10.1177/20... @matt_adeleye @thatpollenguy



The image shows the cover of the paper 'European colonization and the emergence of novel fire regimes in southeast Australia' and a multi-panel line graph. The graph plots several vegetation indices (e.g., NDVI, EVI, SAVI, SAVI2) against time from 1800 to 2020. A vertical dashed line at approximately 1800 AD marks the start of European colonization. The graph shows a general decline in most vegetation indices after 1800, with a notable dip around 1900. The indices are color-coded: NDVI (black), EVI (green), SAVI (red), SAVI2 (yellow), and another index (blue).

International Symposium of Archaeometry

The **International Symposium of Archaeometry (ISA)**, hosted by the University of Melbourne will be from the **27 – 31 May 2024**. Please put it in your calendar and start thinking about posters and papers!

The ISA integrates archaeology and natural sciences on all types of objects and materials associated with human activity, focusing on developing and promoting scientific techniques on cultural heritage materials, landscapes, and environments.

This is the first time that the ISA will be held in Australia since the ISA biennial meetings began in the 1960s, as a partnership with the **Australasian Research Cluster for Archaeological Science (ARCAS)** and the University of Melbourne. The symposium is an opportunity to showcase Australian archaeological science to the international and national community as well as highlight best practice.

ARCAS has an ongoing relationship with **The Society for Archaeological Sciences (SAS)**, including recent conference co-sponsorship in 2021. The conference organisers welcome additional partnerships and sponsorships for this fantastic event.

We look forward to seeing you there – further details to come. Amy Prendergast, *School of Geography, Earth and Atmospheric Sciences, University of Melbourne, Victoria, Australia*

The Leanne Armand Travel Award

This award was set up in honour of the Late Professor Leanne Armand (Feb 1968-Jan 2022). Leanne was Director of the Australian and New Zealand Consortium (ANZIC) and was also Professor of Micropalaeontology at The Australian National University (ANU). Leanne was a world leader on marine diatoms which she successfully used to reconstruct the waxing and waning of sea ice in the Southern Ocean. She was passionate about training the next generation of scientists and was an advocate for diversity and inclusion.

Funds were donated towards the Leanne Armand Travel Award by family members, colleagues, and friends to help train the next generation of microfossil experts. The award is intended for postgraduate and early to mid-career researchers based in Australia and will be administered by the Australasian Quaternary Association (AQUA).

The award consists of a travel stipend to a maximum of A\$3000 and will be offered at most once a year to a single candidate seeking to learn microfossil identification/taxonomy and ecology from an Australian or overseas expert(s).

Applicants for the award must provide a document up to three pages long containing; (1) a brief research biography including details of their current research project; (2) the benefits of the travel grant for their research; (3) details of the opportunity (e.g., workshop) or expert(s) willing to host the applicant; and (4) a budget listing anticipated expenses.

In addition, a letter of support is required from the applicant's supervisor. Application for this award is on condition of travel insurance being provided by the applicant's institution and confirmation from the institution must accompany the application. A successful awardee must also provide a letter of acceptance from the expert offering assistance and

the proposed timing and duration of the visit. Upon completion of the award, the applicant is to submit a report to be published in the AQUA newsletter, *Quaternary Australasia*.

Up to three official members of the AQUA committee, and at least two members of the Research School of Earth Sciences (RSES) at the ANU, are to oversee the applications once a year set by a date advertised on the AQUA web site as well as the RSES web site. Once the funds have expired, this travel award will no longer be offered.

Applications for 2024 are to be submitted to the current AQUA President Associate Professor John Tibby (president@aqua.org.au) by 15 September 2023.



Leanne Armand. Photo credit: <https://doi.org/10.1016/j.marmicro.2022.102095>

Journal of Palaeosciences

I wish to draw the *Quaternary Australasia* community's attention to the Journal of Palaeosciences (<https://jp7sonline.co.in/index.php/jop>). The editor, Dr Binita Phartiyal, is keen for papers from our part of the world that may be comparative with India. We are also invited to actively engage in other ways with this journal and through it the increasingly lively Quaternary community of India. Professor R.J. Wasson *Emeritus ANU, Adjunct JCU and UKM*

LIFE MEMBERSHIP NOMINATION: JEANNETTE HOPE

Timothy Barrows¹ (AQUA Vice President) and Caroline Mather² (AQUA Secretary)

¹University of New South Wales

²University of Western Australia



Dr Jeannette Hope (Photo credit: Stephen Berry, Australian National University Archives)

Dr Jeannette Hope was unanimously elected as a Life Member of AQUA on the grounds of “exceptional long-term service and support to the Association” at the Adelaide 2022 meeting. Jeannette can be considered as the mother of AQUA. After early discussions in the late ‘60s, Geoff Hope recalled that the hosting of the 1973 INQUA in Christchurch necessitated some organisation within Australia to bring the Quaternary community together. Bruce Thom (then Department of Biogeography and Geomorphology) recalls meeting Jeannette in her office (then Department of Prehistory) in the Coombs Building of the Research School of Pacific Studies, Australian National University in the early ‘70s to discuss. Both agreed that Quaternary studies had been taken in a haphazard way because it was so multi-disciplinary. They particularly noted that it was difficult to keep track of developments outside your own discipline. To remedy this, Jeannette and Bruce teamed up to edit the *Australian Quaternary Newsletter* (AQN), the first issue appearing in March 1973. It is now the 50th anniversary of this issue. Bruce was struck by Jeannette’s enthusiasm to lead this initiative and by her editing and reporting skills. AQN sought to gather research reports from the various Quaternary groups (then in Canberra, west Australia, and Victoria) to facilitate collaboration and encourage field projects. The newsletter also sought to keep the community up to date with forthcoming meetings, available facilities, and new publications. Lastly, the AQN also provided a place to potentially organise politically or to lobby to protect sites of importance. A total of 15 issues

were produced and its incredible success can be measured by its circulation of about 240 subscribers by volume 11, more paying subscribers than AQUA today. Issues in 1977 and 1978 canvassed an association but drew a surprisingly lukewarm response from members who later became quite prominent in the community. In the final issue, Jeannette lamented the lack of an official Australian Quaternary organisation, a situation which was remedied shortly thereafter.

Jeannette undertook a Bachelor of Science at the University of Sydney, then a PhD entitled “Biogeography of the mammals on the islands of Bass Strait with an account of variation in the genus *Potorous*” at Monash University in 1969. Jeannette’s ecological research led her into the fields of vertebrate palaeontology and palaeoecology, and she became a specialist in faunal remains. In 1970, she was employed as a faunal specialist in the Department of Prehistory, Research School of Pacific Studies (later Division of Archaeology and Natural History) at ANU where she provided very generous support to postgraduate students. Her studies brought her to western New South Wales, the Darling River, and the Barkandji, People of the Barka River. Jeannette’s collegiality brought different archaeological and palaeontological efforts and her Darling River monographs are a document of this, which stands as a foundation of further study in the region. Jeannette has undertaken extensive archaeological and palaeoecological research in Victoria and New South Wales and is renowned for her collaborative efforts and Indigenous community involvement. Jeannette has published broadly on her research in this region and beyond, including studies on Kangaroo Island and Indonesia with the focus ranging from middens to megafauna (or both!). She has also been vocal on issues of gender in archaeology and published a number of articles on the matter. Dr Hope spent some years with the NSW National Parks and Wildlife Service, whose legislation covered Aboriginal heritage, initially at Broken Hill, western NSW. This period was a turmoil of archaeology’s place in society, in our relations with Aboriginal People, and in how commercial archaeology was developing. From the early 1990s she worked as a consultant specialising in western NSW, moving in 1996 to the town of Wentworth at the Murray-Darling Junction for a four-year project at Lake Victoria for the Murray-Darling Basin Commission. Now (semi) retired she continues working on the story of the Murray-Darling Basin, ranging from Aboriginal history to riverboats.

RESEARCH VOYAGE TO CAPE DARNLEY, EAST ANTARCTICA ON THE RV INVESTIGATOR

Molly Husdell¹, Udara Amarathunga², Sienna Blanckensee¹, Layla Creac'h³, Dawn Herweynen³, Matthew Jeromson⁴, Vikki Lowe¹, Prashasti Singh³, Veda Surapaneni³, Jim Trihey²

¹University of Queensland, Brisbane, Australia

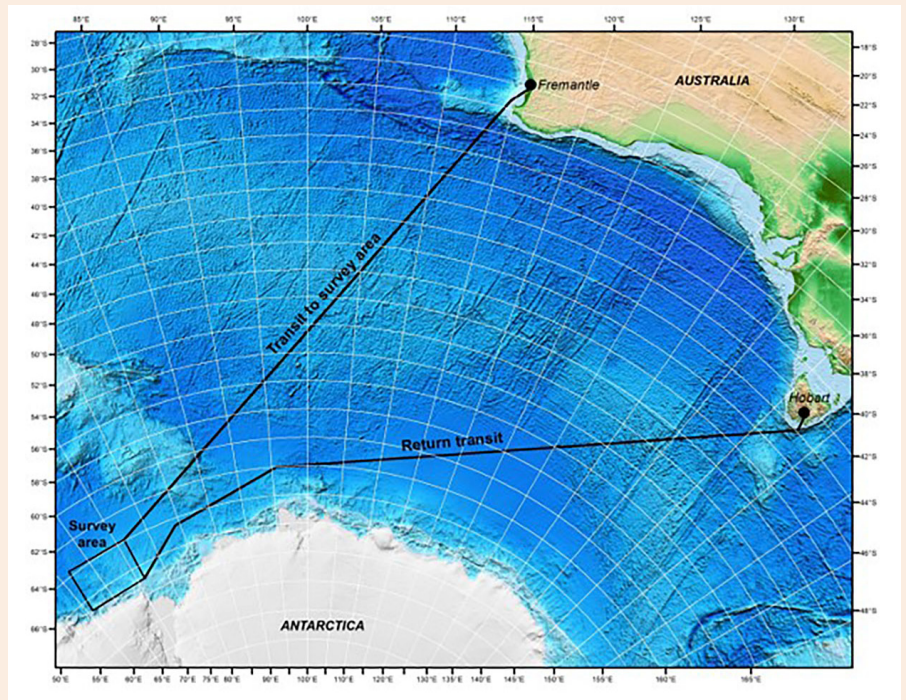
³University of Tasmania, Hobart, Australia

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⁴University of Canberra, Canberra, Australia

Over the span of five weeks from 25 January to 2 March 2023, we were student members of the science party onboard the Research Vessel *Investigator*, bound on an expedition to Cape Darnley, East Antarctica (Figures 1 and 2). This voyage was led by Chief Scientist Alix Post (Geoscience Australia) and funded by the Marine National Facility (MNF), CSIRO. The aim of the voyage was to collect marine sediments to understand Antarctic Bottom Water (AABW) production in the past.

AABW is a very cold, salty, and therefore dense water mass that occupies the oceanic abyss and forms the lower limb of the global ocean circulation. AABW is only formed in four locations around Antarctica: in the Weddell Sea, the Ross Sea, Adelie Coast, and Cape Darnley. Cape Darnley is the most recently discovered region of AABW formation and as a result it is the most poorly understood (Ohshima et al., 2013). Models and geological records indicate that during warmer and colder than present climates AABW formation can be reduced or completely shut down (Hayes et al., 2014; Huang et al., 2020). Therefore, this voyage aimed to collect samples that would help us determine the sensitivity of AABW to warmer and colder than present climates and if climatic tipping points for AABW production exist.



Above - Figure 1: Proposed map of transit from Fremantle to the survey site at offshore Cape Darnley, and back to Hobart.

Below - Figure 2: The science party about to depart on the RV *Investigator*. From left to right: Aero Leplastrier, Bethany Behrens, Alix Post, Sienna Blanckensee, Zanna Chase, Tom Williams, Molly Husdell, Joline Lalime, Veda Surapaneni, Udara Amarathunga, Helen Bostock, Dawn Herweynen, Rachel Nanson, Layla Creac'h, Jim Trihey, Vikki Lowe, Matthew Jeromson, Kathy Gunn, Taryn Noble, Prashasti Singh, Andrew Carroll, and Linda Armbrecht (Photo credit: Aero Leplastrier)





Figure 3: Water sampling from the CTD rosette. Left to right: Kathy Gunn, Sienna Blanckensee, Alicia Navidad, and Veda Surapaneni (Photo credit: Joline Lalime)

The students on the voyage worked as part of the scientific team and had a range of different roles sampling water from the Conductivity Temperature Depth (CTD) rosette and sediment sampling from Kasten cores (a type of gravity core) and piston cores. The CTD rosette allowed us to sample seawater for various biogeochemical tracers including radiocarbon, carbon and oxygen stable isotopes, trace elements and isotopes, eDNA, as well as nutrients, oxygen, and salinity (Figure 3). Some of this water was also sampled for polar-specific plankton, such as diatoms and radiolarians. The Kasten cores were sampled on the voyage for a large range of different analyses including sedimentary ancient DNA (*sedaDNA*), grainsize, microfossils, trace elements, and isotopes, with over 500 samples taken from each of the cores (Figure 4). This

required a significant sampling party! During the voyage we retrieved one long piston core (15 m) that will be sampled back in Australia. We also helped with deployments of autonomous Argo floats, continuous plankton recorder (CPR), and a deep towed camera. All data and these samples will be worked on by the Chief Investigators and several PhD students.

On the long 11-day transit south, we sampled surface seawater from the RV *Investigator's* underway system. Once we had got over our sea sickness (which took a while) and then passed through a large storm (17 m waves and 70 knot winds) we also took the opportunity to give talks about our past and present research projects and to get to know how ships work. We also had a high school teacher on board, Joline Lalime, who did outreach sessions

with primary and secondary schools in Australia, and internationally, providing them with ship tours and opportunities to ask questions about the ship and research.

Highlights from the trip: in addition to the cool science we got to partake in and meeting many new friends and colleagues, life on board the ship was full of highlights. Firstly, the food aboard the ship never failed to appease. Three meals per day were served, and the lovely cooks on board always ensured there was something new to try. Outside of meal times, many snacks were consumed, as the pantry and ice-cream freezer were accessible 24 hours a day. We never went hungry! Secondly, as the transit of this voyage was particularly long (25 days total), we needed to get creative to drive the boredom away. Yoga, movies, colouring, jigsaw puzzles, treasure hunts, trivia

quizzes, science presentations, and pottery making are a few activities that helped us retain our sanity while waiting for work to do.

Lastly, the scenery we witnessed was extraordinary. Once we crossed the polar front (60° S), the icy waters around us were chock-full of big, beautiful icebergs. For many of us, these were the first bergs we had ever seen, and we spent hours out on deck watching them as we passed by. The best surprise was left until the final week, however, as on the transit back to Australia, the Southern Ocean treated us to a stunning bright green Aurora Australis.

Lowlights from the trip: unfortunately, the voyage was cut short by a medical evacuation. The vessel has a doctor, a nurse, and a hospital on board, and the patient was well looked after. Due to the limited science time in Antarctica, we were not able to get all the samples that we had planned to get. Fieldwork is not always successful for a large number of reasons that are often out of your control.

If you want to find out more you can check out the website (mnf.csiro.au/en/Voyages/IN2023_VOI) and blog (antarctic.org.au/canyons-blog). You can also check out the Facebook and Twitter accounts @CANYONS_voyage

ACKNOWLEDGEMENTS

We would like to express our gratitude to the Chief Investigator, Alix Post and the Principle Investigators Helen Bostock, Zanna Chase, Taryn Noble, Linda Armbrrecht, Andrew Carroll, and Rachel Nanson for bringing us along on this voyage. The skills and experience we have gained are invaluable and will be drawn upon for the remainder of our careers. We would also like to thank the early career researchers who came along and imparted knowledge of their various skills: Bethany Behrens, Thomas Williams, Kathy Gunn, and Aero Leplastrier. We also acknowledge the ship's master Mike Watson and crew for running the ship, and the ship doctor and nurse for providing excellent medical treatment.

Finally, we also extend our thanks to the Marine National Facility and CSIRO for funding and the technical staff for managing this voyage. Funding for the science is provided by the Australian Centre for Excellence in Antarctic Science and an Australian Research Council Discovery Project.

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Figure 4: Sampling a Kasten core. Left to right: Molly Husdell, Layla Creac'h, Dawn Herweyner, Taryn Noble, Jim Trihey, Prashasti Singh, and Bethany Behrens (Photo credit: Helen Bostock)

HALO: HALIMEDA BIOHERM ORIGINS, FUNCTION, AND FATE IN THE NORTHERN GREAT BARRIER REEF

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⁴ James Cook University, Townsville, Australia

² The University of Queensland, Brisbane, Australia

⁵ University of Sydney, Sydney, Australia

³ The University of Tokyo, Tokyo, Japan

Halimeda calcareous green algae is a major contributor to coral reef and shelf sediments and found in large volumes along the northern Great Barrier Reef (GBR) (Hopley et al., 2007; Mathews et al., 2007; Rees et al., 2007; Whiteway et al., 2013). Previous studies of extensive live *Halimeda* bioherms demonstrate an underestimated inter-reef habitat that hosts higher average species richness and diversity than the neighbouring non-coral inter-reef (McNeil et al., 2021a). Their high productivity and rapid calcification may have a large influence on the shallow marine carbon cycle and make them potential blue and inorganic carbon sinks (Hill et al., 2015; Hinestrosa et al., 2022; McNeil et al., 2021b) in the GBR Marine Park, covering > 6000 km² (~26% of the northern shelf) (McNeil et al., 2016; Orme and Salama, 1988). They potentially preserve a near-continuous geochemical record of northeast Australian Holocene oceanographic and climatic changes, filling spatial and temporal gaps not covered by coral and other marine sediment proxies (Webster et al., 2023). To better understand these mysterious structures, a multidisciplinary research team set out on a voyage as part of a project called HALO (Halimeda Bioherm Origins, Function, and Fate).

We were all lucky enough to be student members of the science party on the Australian Research

Vessel *Investigator* operated by the Commonwealth Scientific and Industrial Research Organisation (CSIRO), and Marine National Facility (MNF), from 12 August to 7 September 2022 (Figure 1).

The project focused on the inter-reef *Halimeda* bioherms on the northern Great Barrier Reef, led by Chief Scientist Professor Jody M. Webster (The University of Sydney) (HALO – Marine National Facility). This collaboration between several Australian and international universities and agencies collected targeted geophysical, sedimentological, biological, biogeochemical, and oceanographic data over three sites in the region to better understand the processes that control the development and distribution of *Halimeda* calcareous green algae both in the past and present, and their role as a potential inter-reef benthic habitat and carbon sink (Webster et al., 2023) (Figure 2).

Previous works have recorded extensive live *Halimeda* meadows and mounded deposits, or bioherms, in the 1970s-1980s (Davies and Marshall, 1985; Orme et al., 1978; Wolanski et al., 1988), although they have been poorly studied until the past 5 years (Downes, 2020; Hinestrosa et al., 2022; McNeil et al., 2021a; McNeil and Kennedy, 2018; McNeil et al., 2021b; McNeil et al., 2021c; McNeil et al., 2022; McNeil et al., 2018; McNeil et al., 2016). High-resolution spatial mapping, using LiDAR bathymetry

data, reported complex bioherm shapes and morphologies (McNeil et al., 2016); however, data were still inadequate.

To answer the questions arising around bioherm morphologies, systematic bathymetry mapping was combined with the simultaneous collection of 507 linear km of acoustic subbottom profiles. RV *Investigator*'s state-of-the-art retractable drop keel was equipped with a 200-400 khz multibeam echo sounder (Kongsberg EM710 and EM2040) and capable of mapping shallow seafloor features to submeter resolution (Webster et al., 2023) (Figure 2). Data revealed previously not visible bioherm shapes and patterns that will be further analysed to understand the complex geomorphology that forms the substrate of this unique region of seafloor (Webster et al., 2023).

To investigate the oceanography and water chemistry of these shallow marine areas, our hydro-biogeochemistry team collected several CTD (conductivity, temperature, and depth) and sea-surface water samples (Figure 3). The CTD profiler allowed us to measure temperature, salinity, oxygen, and fluorescence (biological productivity) in real-time in the water column. Water samples were also taken with the CTD rosette (36 bottles) to further measure nutrients (oxygen, nitrate, phosphate, silicate, nitrite, ammonia), total carbon, and trace and rare earth



Figure 1: Science party, from left to right: Monique Webb (USyd), Yuning Zeng (UTokyo), Luke Nothdurft (QUT), Bethany Behrens (UTokyo), Matthew Clements (USyd), Helen Bostock (UQ), Molly Husdell (UQ), Kimberley Chua (UQ), Stefano Borghi (JCU), Maria Byrne (USyd), Juan-Carlos Braga (UGranada), Mardi McNeil (GA), Jody M. Webster (USyd), and Zsanett Szilagyi (QUT) (Photo credit: Luke Nothdurft).

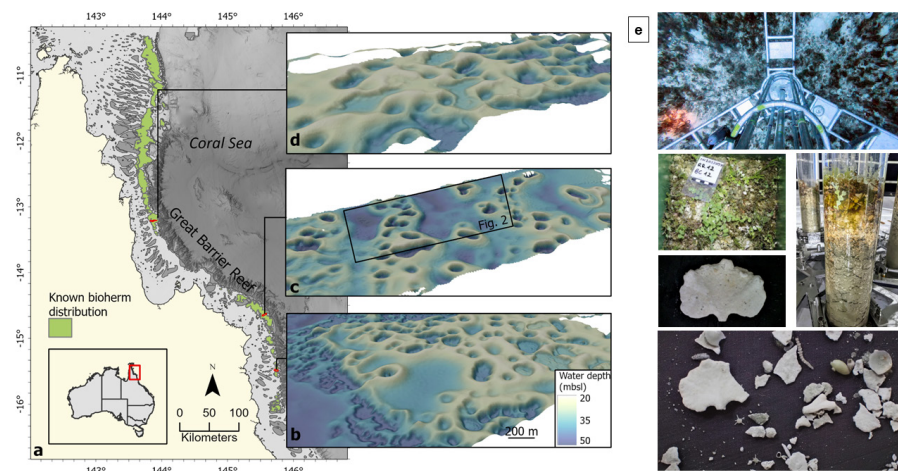


Figure 2: Map of HALO IN2022V07 site locations (a) with high resolution images of newly collected bathymetry data showing complex bioherm morphologies on each site (b – Site 1: Ribbon Reef; c – Site 2: Cormorant Reef; d – Site 3: Tjijou Reef), and highlights from the expedition (e) top – vibrocorer, left first – *Halimeda* meadow in Boxcorer, left second – *Halimeda* flake, right – Multicorer tube with bioherm sediment and alive *Halimeda*, bottom – grains of bioherm sediment (after Webster et al., 2023).

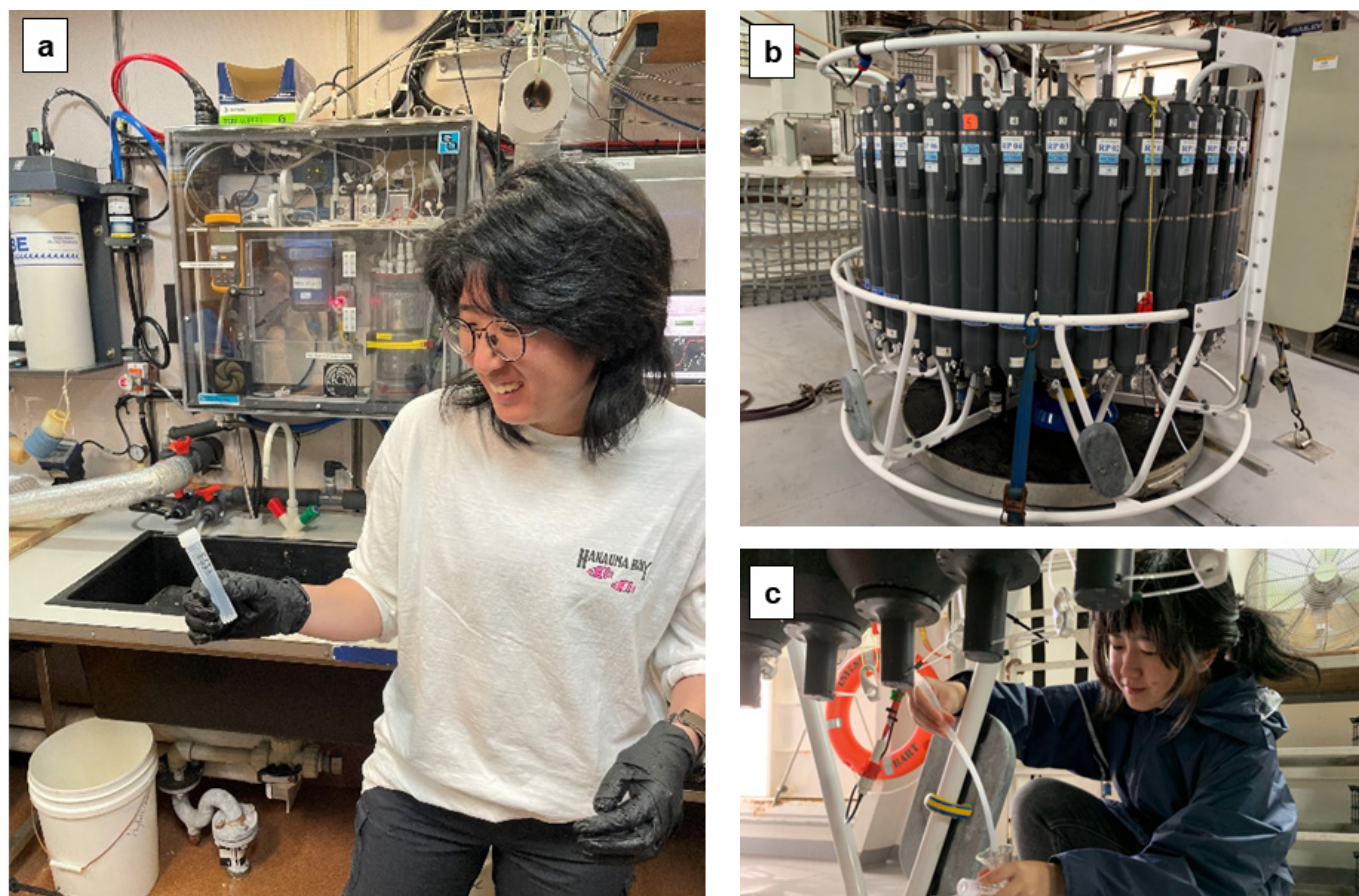


Figure 3: (a) Sea-surface water sampling, (b) CTD (conductivity, temperature, depth) profiler, and (c) seawater sampling from CTD rosette.

elements (Figure 3). Our goal was also to understand the interaction between the surface sediment and water, and to track any nutrient and carbon biogeochemical cycles produced by *Halimeda* bioherms. Therefore, we collected short, surface sediment cores including seawater by a Multicorer. This equipment contained six approximately 1 m long tubes that penetrated the surface sediment. All the tubes – usually holding around 30 cm of sediments, some live biota, and overlaying seawater – went under incubation (light/dark) experiments to understand the nutrient flux between *Halimeda*/sediment and seawater (Figure 4).

Further sediment/rock and biological samples were collected systematically by our sedimentology and biology team with different targeted

methods – such as box-coring, Smith-McIntyre grabbing, rock dredging, and vibrocoring – to study the sediment deposition, internal structure, and composition of the bioherms, and the occurring inter-reef biota in the area (Figure 5). To discover more about this diverse and poorly known habitat and to choose our location of target, we used a drop camera system.

More than 1,000 biological specimens – epifaunal (surface-dwelling) and infaunal (burrowing) invertebrates, *Halimeda*, coralline algae, and large benthic foraminiferas – were identified and curated from the surface *Halimeda* meadows and sediments, showing that they host distinct biologic communities (McNeil et al., 2021a; Webster et al., 2023).

Grab, box core, and dredge sediment samples will be analysed for grain size, texture, and composition to assess the internal structure of the bioherms and their composition change by morphotypes.

A vibrocoring system was used to collect up to 6 m long cores of the sediment sequence along precisely targeted transects overlying the Pleistocene karst surface across the bioherms (Figure 2e and Figure 6). By studying these cores and combining findings with the other datasets, we can have a better picture of the internal structure of the bioherms and their morphotypes, as well as reconstruct their 4D development through the Holocene (Webster et al., 2023).

To understand the adjacent seascapes and the sediment transport from the shelf to the deep



Above - Figure 4: (a) Multicore sediment tubes, and (b) incubation experiment.



Left - Figure 5: (a-b) Sampling rock dredges, and (c) identifying biotas.

Below - Figure 6: (a) Labelling a vibrocore sample before cutting it into representative length, and (b) subsampling a giant piston sediment core.



ocean floor, targeted giant piston sediment cores were collected up to 10 m long from the submarine canyons on the continental slope (Webster et al., 2023) (Figure 6).

Project HALO will contribute to the World Heritage Convention's Outstanding Universal Value designation of the Great Barrier Reef Marine Park by describing the bioherms' extent, geomorphology, and habitats (Webster et al. 2023). If you are interested in learning more about the project or exploring research opportunities, we encourage you to get in touch with our dedicated science team.

ACKNOWLEDGEMENTS

We thank the entire science party – Jody Webster, Luke Nothdurft, Helen Bostock, Mardi McNeil, Maria Byrne, Yusuke Yokoyama, Juan C. Braga, Robin Beaman, Trevor Graham, and Darren Skene – for taking us onboard and giving us this incredible opportunity as students. We also thank the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and Marine National Facility support staff, and the captain and crew of RV *Investigator* for their help and experiences on the voyage. The project was supported by a grant of sea time on RV *Investigator* from the CSIRO Marine National Facility, part of Australia's national science agency, the National Geographic Society, and the Ian Potter Foundation.

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ECOLOGICAL DRIVERS OF PLEISTOCENE HOMININ AND FAUNAL DISPERSAL ACROSS SOUTHEAST ASIA (EPHSEA 2022) WORKSHOP

2–4 NOVEMBER 2022, BANGKOK

Kantapon Suraprasit¹ and Julien Louys²

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WORKSHOP OVERVIEW

Southeast Asia is critical for broad studies of human evolution because the region yields one of the highest diversities of Pleistocene hominin species. Although evolutionary trends and biogeographic affinities among Southeast Asian hominins have long been studied over the past decades, the growing fossil records from the region have complicated what was once a straightforward evolutionary story. Integrating multiple lines of evidence (faunal, chronological, genetic, and environmental information) challenges the traditional hypothesis of Pleistocene hominin and faunal dispersal patterns in Southeast Asia, and the timing and ecological influences on their settlement success. In particular, questions of how early hominins adapted to their surrounding environments and exploited available resources in the region, and how they dispersed into island Southeast Asia, remain hotly debated. The aim of this workshop was to bring together experts to examine the environmental conditions, ecological factors, and types of corridors that allowed Pleistocene hominins to cross biogeographic barriers. This workshop improved our understanding of the potential routes and timing of early hominin expansions and opportunities for admixture. The final output of the discussion by workshop participants will result in the

evaluation of large-scale ecological and biogeographical schemes for the dispersal of Pleistocene hominins across Southeast Asia.

INTRODUCTION

A three-day workshop on the ecological drivers of Pleistocene hominin and faunal dispersal across Southeast Asia (EPHSEA 2022), organised by Kantapon Suraprasit (Chulalongkorn University, Thailand) and Julien Louys (Griffith University, Australia), was held at Mandarin Bangkok Hotel, Bangkok in Thailand for the first time in November 2022.

The study of human evolution has a long history in Southeast Asia. With the discovery of the first *Homo erectus* fossils in Java by Dubois in the closing decade of the 19th century, Southeast Asian palaeoanthropology was launched. But the region has an even deeper history in the story of human evolution, starting perhaps with Alfred Russel Wallace's collections and expeditions in the Malay Archipelago. It was in the islands and tropical forests of this region that evolution by natural selection was independently conceived. The faunal and environmental gradients across space in Southeast Asia were among Wallace's main observations for the impacts of natural selection. This workshop returned to these themes but examined faunal and environmental gradients across time.

It was logical that this workshop took place in Thailand, at the intersection of the two great biogeographic zones of Southeast Asia: the northern Indochinese and southern Sundaic realms. Although the demarcation of these realms is not as sharp or easily defined as those observed by Wallace between Sunda – the southern parts of Southeast Asia – and Sahul – the continental landmass including New Guinea and Australia. Nevertheless, they form a critical part in the thinking of human and faunal distributions and migrations in the region. The concept that these have changed across time and space poses fascinating challenges for scholars, and diversified disciplinary backgrounds are required to understand interactions between habitats, environments, and the humans and animals that relied on them.

WORKSHOP SUMMARY

This workshop brought together 19 multidisciplinary scientists from 11 different countries (Australia, Indonesia, Malaysia, France, Germany, Denmark, the Netherlands, Spain, the United Kingdom, the United States, and Thailand) to share new and established techniques and data for addressing these themes (Figure 1). We sought to compare the fossil and archaeological records under the different spatial and temporal scales at which they sample the past and

determine where the commonalities and differences between these proxies lie.

Four main questions were discussed to evaluate ecological factors controlling the movements of Pleistocene hominins across Southeast Asia:

- 1) What are the characteristic Pleistocene faunas associated with hominins, how long did these faunas inhabit the region, and are the chronological frameworks in the fossil sites sound?
- 2) Did the savanna corridor exist along the trans-equatorial region of Southeast Asia? What was the boundary of savanna distribution during the Pleistocene, against the backdrop of humid tropical rainforests?
- 3) What differences in zoogeographical patterns existed between the Pleistocene and Holocene? Did the zoogeographical boundaries between Indochinese and Sundaic mammals shift?
- 4) Did the savanna ecosystem facilitate the dispersal of Pleistocene hominins? When did the hominin dispersal take a savanna corridor (or a coastal route and other pathways) into island Southeast Asia?

Our three-day event was divided into two sessions: a public seminar for the first day, and a closed group discussion for the second and third day. On the first day, 19 oral reports were presented and each attendee highlighted their specific geographical region or specialty, summarising the current level of knowledge in that area. For the second and third day of the workshop (3rd and 4th November 2022), closed group discussions examined the main questions indicated above (Figure 2).

PRESENTATIONS

The presentation topics included various research perspectives linked to faunal and multi-proxy evidence for the existence of a savanna corridor, geochronological frameworks and landscape simulations for the timing and potential route of early human dispersal across Southeast Asia, and applications of virtual imaging and palaeoproteomic techniques for the taxonomic classification of Pleistocene hominid fossils. The abstract book is available for download here: <https://drive.google.com/drive/folders/1Xgtqkk-R6cteD6tBnjFniH6QiERN7Pcl>. The presentations were accessible to all interested academics and members of the public. The interdisciplinary workshop theme appealed to a wide range of Thai scientists, including archaeologists, biologists, geneticists, palaeontologists, and others, with a total of 40 external meeting participants attending this seminar (Fig. 3).

WORKSHOP OUTCOMES

Our workshop determined that, while definitive answers to these questions may come only sometime in the future, if at all, many of the underlying or longstanding assumptions used by researchers in this area are due for critical re-examination. This includes the concept and nature of the Sunda 'savanna corridor' (Heaney, 1991; Bird et al., 2005); the major biochronological schemes still in use in the region, especially the *Stegodon-Ailuropoda* Middle Pleistocene marker (Matthew and Granger, 1923; Colbert and Hooijer, 1953) but also those faunas used to distinguish the Sunda and Indochinese realms; and the diversity and nature of hominins recovered from the region. The workshop highlighted

that a worldwide effort will be required to address the questions raised in our sessions, and more crucially, that these questions are of global importance. What could be more crucial to us as a species than attempting to comprehend our origins? Given the current dangers of climate change and biodiversity loss, such knowledge is essential for knowing where we could be heading in the future.

ACKNOWLEDGMENTS

The workshop was sponsored with funds from the Wenner-Gren Foundation (conference and workshop grant no. Gr. CONF-881 awarded to Kantapon Suraprasit and Julien Louys) and the Center of Excellence in Morphology of Earth Surface and Advanced Geohazards in Southeast Asia (MESA CE), Department of Geology, Faculty of Science, Chulalongkorn University (Bangkok, Thailand).

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Top - Figure 1: Participants at the EPHSEA 2022 workshop, Mandarin Bangkok Hotel in Thailand (Photo credit: K. Suraprasit)

Above - Figure 3: Lim Tze Tshen draws our attention to his interesting presentation during the 2nd day of workshop (conference day) (Photo credit: K. Suraprasit)

Left - Figure 2: Closed group discussions during the 3rd day of EPHSEA 2022 workshop (Photo credit: K. Suraprasit)

CONTINUING THE CONVERSATION ON EQUITY, DIVERSITY, AND INCLUSION IN AQUA

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The 2022 AQUA Biennial Meeting was held in Adelaide, South Australia in December. As part of an ongoing conversation about diversity, equity, and inclusion in Australasian geosciences (see Barrows, 2019; Cadd and Petherick, 2021; Handley et al., 2020; Reeves, 2019), the organisation collected demographic data on registrants. The data were collected via an opt-in questionnaire completed at the time of registration. The data were recorded anonymously on the understanding that the questionnaire would help us learn about participation and diversity in the AQUA community, and how the demographics change through time. This survey was first implemented ahead of the 2021 AQUA Online conference, as reported in Cadd and Petherick (2021). By collecting these data regularly, we hope to build a longitudinal dataset to track changes in community demographics.

We present the results here to document the current demographics of the community, and to continue the conversation with the ultimate aim of improving equity in the Australasian geosciences.

Total registration for the conference was 119, including 22 online attendees. This number was slightly down on the last face-to-face meeting in Auckland, 2019, and much lower than the last online meeting in 2021. All conference registrants either completely or partially filled out the questionnaire. We have combined nonbinary respondents and those who preferred not to share their gender to avoid the possibility of re-identification of any of the respondents. We do

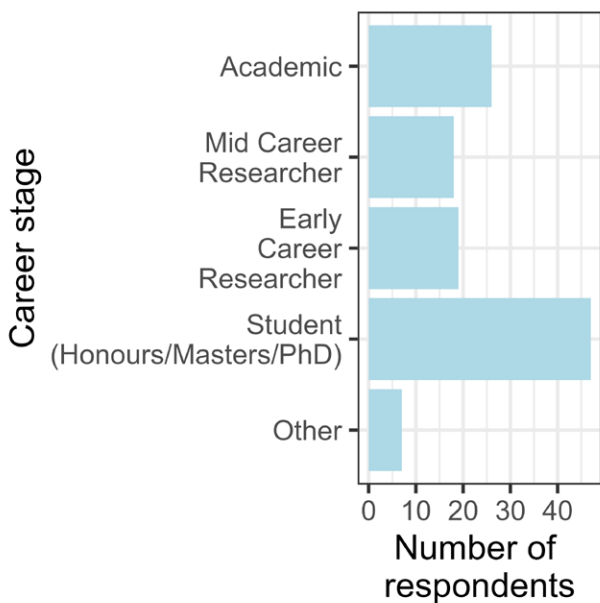
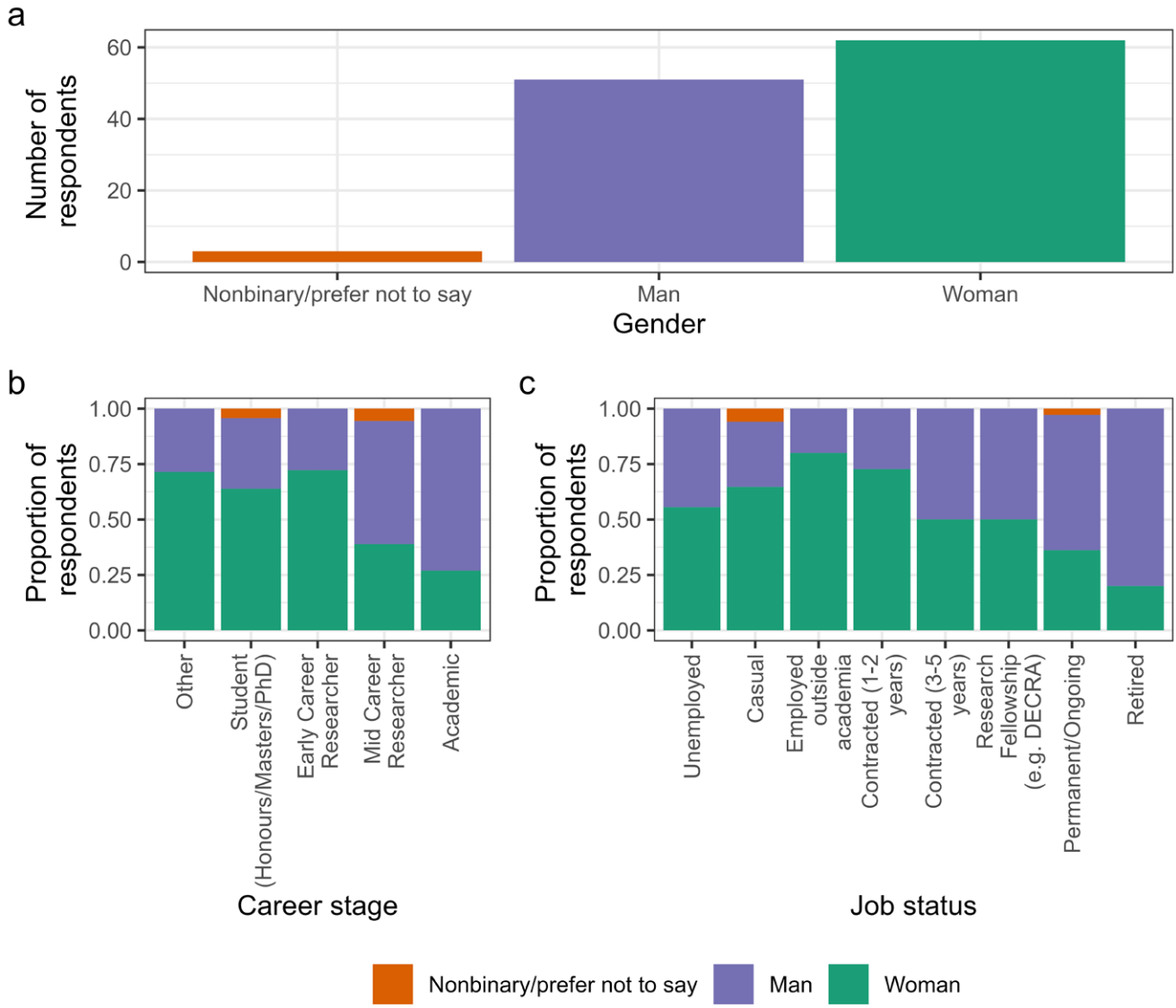
note that gender-diverse people are likely under-represented in the AQUA community. In this context, while the 2021 Australian Census did collect relevant data, they determined that the results are not useable due to poor definition of the nonbinary concept in the broader community (Australian Bureau of Statistics, 2021).

Overall, more women attended AQUA 2022 than any other gender (Figure 1a), and they represented a greater proportion of students, early career researchers, and those working outside of the academic framework (Figure 1b, 1c). Women and gender-diverse people were also more likely to be unemployed, casually employed, employed outside of academia, or employed on a short-term contract (1-2 years) than men (Figure 1c). For mid-career participants and academics, men made up the majority of respondents, although women and gender-diverse respondents were only slightly outnumbered at the mid-career stage. As job security increases (longer contracts, DECRA Fellows, and ongoing positions), the proportion of women and gender-diverse respondents decreased and, by retirement, men represented >75% of respondents (Figure 1c).

Students dominated the conference registrants, representing nearly 40% of attendees (Figure 2). Early-career (up to 5 years post-PhD), and mid-career (5-15 years post-PhD) respondents represented 15% and 16% of attendees, respectively, while “academics” represented ~22% of attendees. “Other” and blank responses comprised 7.6%

of respondents. High student numbers are perhaps a result of AQUA’s reputation as a student and ECR-facing organisation which has made a conscious effort since conception to be relatively informal. Without a longitudinal dataset we are unable to determine if numbers of early and mid-career researchers were unusually low at the 2022 conference. Internationally, difficulty in recruiting postdoctoral researchers has been reported (e.g., Woolston, 2020; Woolston, 2022), which has been attributed to the pandemic compounding high employment uncertainty, among other things. In Australia, ECRs report being unsatisfied at very high levels (Christian et al., 2022). As such, data presented here may warrant some concern.

The AQUA community is overwhelmingly of white European descent, reflecting the broader population. Because ethnicity was self-selected in the questionnaire, it is not possible to present all the data here. Nonetheless, 52/119 respondents included ‘white’ in their responses. Participation by Māori and Aboriginal researchers was low ($n = 1$ and $n = 2$, respectively). For Australia this slightly underrepresents the broader population (3.2% in the 2021 census; Australian Bureau of Statistics (2021). For Aotearoa-New Zealand, this slightly exceeds the proportion of the population who are Māori (17.4% in a 2022 estimate). We do note, however, that participation from New Zealand was overall very low (just 5/119 registrants).



Above - Figure 1: The distribution of respondents by gender, career stage, and job status. Note that career stage and job status are presented as proportions to better visualise the gender distribution within each group.

Left - Figure 2: The distribution of respondents by career stage.

Pleasingly, all respondents felt welcome in the AQUA community, at least some of the time.

The final part of the survey was a freeform comment section. Key themes that emerged were that the support for ECRs and recognition of women is notable, and something that AQUA does well. The hybrid format of the conference was popular, and it was noted that this was a great step towards being inclusive to caregivers, people working outside of the field but who are still interested in staying up to date, and those with disabilities (the last was shared with @AusQuaternary on Twitter at the time). Selected comments are presented below.

“I feel that AQUA is more inclusive than many other societies and am pleased to see action on things like recognition of senior women researchers. Having that kind of recognition will make things easier for people who identify as trans, queer or come from other traditionally marginalised groups.”

“Thank you for adding an affordable online option that will allow me to view the session I am especially interested in.”

“Having an online option for the conference is very inclusive”

“Thanks for offering an online option! It allows me to attend some of the conference while caring for my son at home.”

“Appreciate the cheap online-only registration. As someone in insecure casual employment (outside academia), this enables me to keep in touch with the field. I would not be able to afford the combined cost of registration plus lost income through taking time off work to attend in person.”

Some comments highlighted potential blind spots in the survey. For example, disability was not included in our data collection, and the career questions were phrased from an academic perspective, reflecting historical participation. Future surveys will take these suggestions on board. Finally, some concrete suggestions were made for improving equity, such as taking into consideration students from under-represented groups when allocating travel awards.

In recent years, AQUA has been working to improve equity in the Association. Ahead of the 2022 Conference, organisers instructed session chairs to balance audience questions by gender and career stage. Additionally, 2/3 of the keynote presentations were delivered by women, with one of those being an ECR. These features were part of a broader diversity plan developed to support a submission to AINSE for conference travel support. More generally, AQUA has been working to support ECRs through our mentoring program, which ran for the first time in 2022, and by continuing to fund students to travel to AQUA and INQUA. The mentoring program was a concrete outcome of community discussion at the 2021 AQUA AGM (Cadd and Petherick, 2021), and will be run on a biennial basis to coincide with AQUA conferences. In 2022, we also welcomed our much-overdue first female Life Member, Dr Jeanette Hope.

While comparison with results presented in Cadd and Petherick (2021) shows no major differences to equity, diversity, and inclusion in AQUA (noting that only ~18 months had elapsed), the above outcomes demonstrate the importance of maintaining this conversation and recording this information. The Association is committed to making AQUA a more welcoming

community for everyone, and we welcome any suggestions on how we can continue to work towards that goal. Please email communications@aquas.org.au if you have any thoughts on how we can improve.

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SOCIAL ASPECTS OF THE 2022 AQUA MEETING

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Throughout the COVID-19 pandemic, doing a PhD became what felt like an increasingly solo process. Feelings of isolation during a PhD are already typically part of the journey, but when combined with no conferences (or the switch to dreaded online conferences), working from home, and a lack of in-person social events, the feelings of isolation are bound to escalate.

The AQUA 2022 meeting was incredibly beneficial to placing us students in a position where we could network with other like-minded students on similar journeys and connect in both an academic and a social setting. We had the opportunity to meet so many students from around Australia and New Zealand, students we otherwise wouldn't have had the chance to meet.

Many of us appreciated the support of AQUA 2022 in providing the opportunity for us, as PhD and Masters students, to present in a friendly, often semi-informal environment. Such an opportunity is a chance to engage with the community without the added pressures of larger, impersonal conferences, allowing for often much-needed feedback to be given.

From ice breakers to meet and greets with Australian wildlife, the 2022 organising committee provided us with numerous opportunities to interact in a social setting and make connections within the Quaternary science community. Without this social engagement, the nervousness of a first-time attendee would surely have put a damper on their overall experience.

The mixer on the first night really broke the ice. When you go to your first conference alone, it's easy to see where the nerves might have come from. It didn't take long for awkward introductions and discrete name-tag checks to ease into small groups chatting throughout the night. It turns out that in a small community like ours, everyone knows someone you knew (or even knew you!). The benefits of this icebreaker were also seen early the following day at the opening of the conference, with new friends sitting and chatting with each other (like the authors of this article!).

The ECR event on the second night provided an excellent opportunity for the ECR community to connect. The love of adorable native animals was the perfect common ground to bond over and cement the positive and friendly tone of the conference. The charm of a quokka's smile made this event a huge success and led to the opening of an ECR AQUA Facebook page to share memories and opportunities, which is still frequented today.

The conference dinner, complete with paper Christmas crowns, was a night filled with regaling each other with fieldwork tales and escapades accompanied by good food and beer. Many of us also took the opportunity to expand on the short coffee chats we had been briefly having throughout the conference with fellow researchers. The celebrations went well into the night, as did the laughter. It felt oddly reminiscent of a school camp, with everyone gathered around long tables sharing a meal. However, let us be clear,

we are early-career researchers and many paper napkins were also filled with scientific doodles and potential future research projects.

The final social event of the conference was the trivia pizza night. For many of us, this was an introduction to the traditional AQUA trivia quiz and a chance to recap the research presented during the conference with just a hint of friendly rivalry.

We left the 2022 AQUA conference with renewed motivation for our own research projects and knowing that in future conferences such as INQUA, AQUA, or otherwise, there is a very good chance that we will be in the company of friends and that the next conference would be a little less daunting.

AQUA 2022: THE ABSTRACT

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Having now attended a grand total of two conferences, I think it's fair to say I'm more or less a connoisseur. I am therefore pleased to report that AQUA 2022 stands head and shoulders above all other conference(s) that I have attended. Discussing Australia's Quaternary environments with other enthusiasts was exhilarating and gave my friends and family a wonderful three-day reprieve from hearing me bang on about "some old rocks". They've actually requested that the conference be held annually, possibly even monthly.

The first day of the conference began with a series of incredibly interesting talks. However, by the end of the day I was preparing a letter of resignation to send to my supervisor. One pat of a pademelon and I think half the ECRs in the room were ready to form a procession over to the zoology department and begin their new careers in the field of Marsupial Adoration. When we returned to the lecture theatre the next morning to find the floor and seats littered with future coprolites, the charm of the previous night's animal encounters had begun to wear off and I was in a better position to intellectually engage with the day's content. But when it came to curiosity, none were a match for Felix Lauer, who had possibly watched too much CSI Miami and wanted to try his hand at criminal interrogation. Between sessions I sampled the snack selection with such ferocity that onlookers would be forgiven for mistaking me for someone with an annual income only \$4400 AUD above the official Australian poverty line. After perusing the excellent array of posters, I took the opportunity to trial my novel Radiometric Acronymic Dating (RAD) method, whereby I ascertain the seniority of a scientist by the decay of their full-worded sentences into the daughter product: a string of acronyms.

All in all, it was a very eventful conference. Of particular note was the momentous rise of the Crocs™ market capitalisation by \$190 billion USD following Lucinda Duxbury's talk. Thank you to all who were involved in the organisation of the conference. I had a truly wonderful time, and I'll see you at AQUA 2024 (if my application to join the zoology department is rejected).

AAA/AQUA JOINT SESSION AT AQUA 2022

Chloe Stringer

School of Geography, Earth and Atmospheric Sciences, The University of Melbourne, Carlton, Australia

I was honoured to receive a student travel award to attend and present my research at AQUA 2022. This was my first in-person conference since the COVID-19 pandemic, and I was glad to find a warm and friendly community who provided me with very useful feedback about my research.

One of my biggest highlights for the conference was the joint session between AQUA and the Australian Archaeological Association (AAA) conference, chaired by Caroline Mather and Patrick Morrison (UWA). This session took place across two session blocks, before and after lunch on Wednesday 7 December. A noble quest: this session on 'Human-Environment Interactions' allowed presenters at the concurrent AAA conference in Darwin to broadcast their presentations to the Mawson Lecture Theatre at the University of Adelaide, and vice versa, demonstrating the potential of Zoom in a post-pandemic world. The session was of particular interest to me as an archaeological scientist who investigates the relationship between past people and their surrounding Quaternary environments, and who grappled with the decision of whether to attend AQUA or AAA last year. The crossover between the two communities was clear given the popularity of the session, with 12 speakers presenting between the two conferences.

Highlights of the session included: Lauren Cunningham's high-resolution microscopic images of faunal remains that had been predated by Tasmanian devils and/or spotted-tailed quolls; Emma Rehn's engaging introduction to the OCTOPUS database (<https://octopusdata.org>), which is sure to have important implications for archaeological and Quaternary research; and the detailed insights into palaeoenvironmental conditions at Tam Pà Ling in Laos, being established using the analysis of sediment microstratigraphy and plant wax lipid biomarkers, as showcased in the presentations by Vito Hernandez and Meghan McAllister.

While a fantastic idea, like all best laid plans (especially those involving Zoom), there were a few technical issues on the Darwin end which impeded the Adelaide audience from understanding what the AAA speakers were saying, and sometimes led to the feed being lost

altogether. This was due to issues with the AV equipment at the venue in Darwin, something that could not have been foreseen by Caroline and Patrick. However, I hope that these issues do not deter similar sessions being held at future AQUA/AAA conferences. Being able to connect these two research communities is extremely valuable, especially when their conferences usually run concurrently every two years. Thank you to the organisers and speakers for making the session a success!



Figure 1: University of Melbourne PhD Candidates, Chloe Stringer and Mahsa Alidoostsalimi, enjoying the jacarandas near the University of Adelaide campus.

AQUA CONFERENCE: AN OPPORTUNITY TO CULTIVATE OUR CURIOSITY

Jessica Macha

Securing Antarctica's Environmental Future (SAEF), School of Earth, Atmosphere and Environment, Monash University, Clayton, VIC, Australia

The first in person meeting of the Australasian Quaternary Association since 2018 was held in Adelaide, and it was a joyous three days, where fantastic Quaternary science was presented and discussed throughout. As a relative newbie to the Australasian Quaternary science field (international PhD student), and this being my first external scientific conference, I was somewhat unsure what lay in store.

We began the first day with a Welcome to Country, followed by hearing from keynote Dr Katharine Grant, who gave a fantastic talk on dramatic changes in North African hydroclimate from Eastern Mediterranean marine cores. I was presently surprised by the range of questions which followed from individuals from a range of disciplines, expecting predominantly sedimentologists and those working within the field to voice questions. I was wrong and enjoyed the following discussion with a range of perspectives.

Next was a memorial session for Dr Lynda Petherick, entitled 'People, Dust and Late Quaternary Environments', which included talks on a broad range of natural archives, proxies, and environments, including talks on Antarctic black carbon, coastal peatlands, pollen, sediment geochemistry, macro fossil evidence, and more. Through this first session of AQUA I was continuously amazed by the breadth and diversity of research presented.

After morning tea, we took a dive into the 'Ocean and Coasts' session, with talks on sclerochronology, reconstructing the El Niño-Southern Oscillation from coral cores, past sea-level changes and impacts of past peoples, a new Radiolaria species, ocean circulation history, bivalve shells as a palaeoclimate archive, and marine radiocarbon reservoirs. Many of the presentations' research areas were new to me, and it was exciting to learn about such diverse topics. It became clear through the morning that whilst presentations were grouped into sessions, there were many presentations which would fit into numerous sessions and that this grouping process was simply for organization rather than research topics neatly fitting into different sessions. This resulted in each session including a wide variety of research topics, with

diverse archives and environments discussed. Rather than this leading to the audience becoming lost in the talks, due to the high calibre of communication in each talk and clear science questions being asked and answered the audience was engaged in the broad Quaternary science perspective of each presentation rather than getting stuck in the nitty-gritty details.

After lunch, we had a range of lightning talks, which were slick 5-minute science-filled presentations that gave a fantastic snapshot into research undertaken on freshwater molluscs, aeolian sediments, tufa archives, pollen data, hydroclimate risk assessments, mammoth teeth, cultural burning and fire histories, palaeodust, regional aerosol loading in the Pacific, and long-term fire and fuel dynamics. Many of these lightning talks were a 'trailer' for a research poster, so with these lightning talks having only heightened our appetite, we headed upstairs to the poster session for the remainder of the afternoon. Again (and unsurprisingly by this point) posters included a real spectrum of topics. Curious audience members engaged with heightened interest with poster presenters on their research, and presenters made the most of the range of perspectives in the room and presented to a broad cohort of Quaternary scientists.

During this first day, it became clear that despite individuals utilising different archives and proxies to infer environmental changes, often on different timescales, there is an eagerness in the Quaternary science community to understand research outside of an individual's 'niche'. This was refreshing, as many in the audience were able to listen and learn about a huge range of scientific topics through the conference. Personally, as a PhD student this was very stimulating, as I was able to learn about areas of research where I had little to no previous understanding and to have research methods and techniques explained to me which I had never heard of before.

Let this be an encouragement to the Quaternary science community that conferences and other research opportunities which cause us to encounter and engage with science and research outside of our own research field often re-ignites our own curiosity and interest in the science we fell in love with in the first place.

AN INSIGHT INTO VIRTUAL CONFERENCE ATTENDANCE: AQUA 2022

Jo Hanson

School of Earth and Environment, University of Canterbury, New Zealand

Kia ora (hello)! My name is Jo Hanson and I'm a PhD student at the University of Canterbury, Christchurch.

I was lucky enough to be given a student travel award to attend the AQUA conference in Adelaide. However, unfortunately COVID struck and so I instead attended online during my mandatory self-isolation. I was truly grateful that AQUA had an online option and that the Adelaide committee were so accommodating for allowing me the opportunity to present online very last minute. Thank you so much!!! While I'm sure travelling to Adelaide and attending the conference would have been fantastic, the online option provided a great alternative for those who could not make it.

I've still yet to attend an AQUA conference in person, but what an awesome conference AQUA 2022 was! Even online, just listening to all the interesting research going on was really exciting and motivating. It was great to see the online hype and very frequent updates on our social media platforms.

Special shout out to Helen Bostock and Micha Campbell who managed to tweet about basically every presenter – that was very impressive and really fun to read! One of the biggest downfalls of attending online was that I didn't get to see all the great poster presentations which is a shame, and I also really wish I'd made it to all the social events and the Animals Anonymous – it sounds like everyone had a lot of fun!

But of course, there are understandably limitations to online attendance and as far as things go, the online option really did provide a great opportunity to hear about the range of research going on in our community.



Figure 1: Here's me re-enacting my AQUA presentation live :)

I was really glad that the online registration included the streaming of the OCTOPUS workshop run by Emma Rehn and Haidee Cadd. For someone who works a lot with sedimentary charcoal and radiocarbon dating, and also more modern dating methods, I found OCTOPUS to be a fantastic initiative and was really interested to hear about it in more detail. By attending this workshop, I learnt a lot about this database and am looking forward to contributing my own research to this open-access database.

Overall, my online experience of the AQUA 2022 conference was fantastic! Thank you to everyone for all their hard work in putting this together and I look forward to meeting you all in person at AQUA 2024!

AN ALL-ROUND POSITIVE REVIEW: AQUA BIENNIAL CONFERENCE, ADELAIDE 2022

Ryan North

GeoQuEST Research Centre, School of Earth, Atmospheric and Life Sciences, University of Wollongong, Wollongong, NSW, Australia

THE AQUA CONFERENCE EXCEEDED EXPECTATIONS

Last year's AQUA Conference in Adelaide was a great experience that exceeded my expectations. It was exciting to hear about the newest research in local and global Quaternary science. I presented a poster on ice melt from the Antarctic Peninsula and had many interesting discussions about my project and about science in general. The organising team from Adelaide were also generous enough to let me exhibit some photos from a recent field trip to the Northern Territory! As with any conference, trying to absorb the amount of information contained within three days' worth of talks is a mammoth task, but we were very encouraged by great food, native animal visits, and a field trip to the Coorong. The encouragement must have worked for some of us since our team won Tim Barrows' infamous quiz. Or maybe it was the quality of sleep I had in one of the twelve bedrooms of the mansion in North Adelaide that Haidee Cadd organised for attendees from Wollongong. Regardless, the conference was excellent, and the organisers deserve great recognition.

MY NETWORK (SCIENTIFIC AND SOCIAL) HAS GROWN

Attending AQUA's conference has expanded my scientific network, which I can see will result in collaborations in the future. I had the pleasure of meeting people who, like me, study Antarctic environments and cryospheric change. People in this community are sparse in Australia. Without personal connections to scientists within and adjacent to your field, it is easy to become stuck in your own ways and lose sight of the big picture. I have also made new friends and was able to catch up with some old friends. I am looking forward to meeting everyone again at the next AQUA event!

AQUA CATERED FOR VEGANS VERY WELL

After eating vegan/vegetarian for ~5 years, I know not to expect much when it comes to catered events. However, AQUA was extremely aware of everyone's dietary requirements and choices and obviously put in a great deal of effort – I, and the other 50% of young attendees who were vegan/vegetarian, did not go hungry.



Figure 1: Patrick De Dekker and the group at the Coorong Lakes.

One sitting to highlight was a three-course meal and drinks which included cauliflower wings, vegan lasagne, and a vegan chocolate lava cake. I think those who had the duck entrée were envious of the cauliflower wings!

WITHOUT AINSE, THIS WOULD NOT HAVE BEEN POSSIBLE

I have to thank AINSE for their generosity in awarding me a Travel Grant to cover the cost of flights to Adelaide. Without this, I would have been personally out of pocket if I wanted to attend the conference because my PhD project is unfunded, and my research stipend

is limited. I am very grateful for the opportunity to attend the conference and still have enough money to prioritise for laboratory analyses. I would recommend applying for an AINSE grant to anyone who is restricted financially but would find value in engaging with the AQUA community.

LETTER OF APPRECIATION FOR THE AQUA COMMUNITY

Zuorui Liu

School of Geography, Earth and Atmospheric Sciences, University of Melbourne, Australia

Last December, I was able to attend my first in-person conference, AQUA 2022 in Adelaide. The first experience for almost everything is the most memorable, and I am certain AQUA 2022 will be remembered for a long time in my later life, especially because it was friendly, well-organised, and full of the latest world-leading Quaternary research findings. During the three days of the conference, there were many impressive talks and posters presented by researchers from across Oceania and also other parts of the world. These sessions featured multiple aspects of the past environments, ecosystems, and people during the Quaternary. I was amazed by both the quality and the diversity of this meeting, as I found palaeontological research was also present (at least from my own perspective, this is relatively niche in Quaternary studies), and it feels a relief and less lonely to find someone in this community is also doing similar research to yours.

After listening and discussing with many fellow researchers in this friendly community, I have gained a lot of knowledge and experience. I was also fortunate to have the opportunity to give a lightning talk and a poster session to present my own research findings. For both sessions, I presented my latest findings on obtaining palaeoenvironmental records from multiple enamel ridges of the same mammoth tooth and provided insights and suggestions for sampling strategies in future studies.

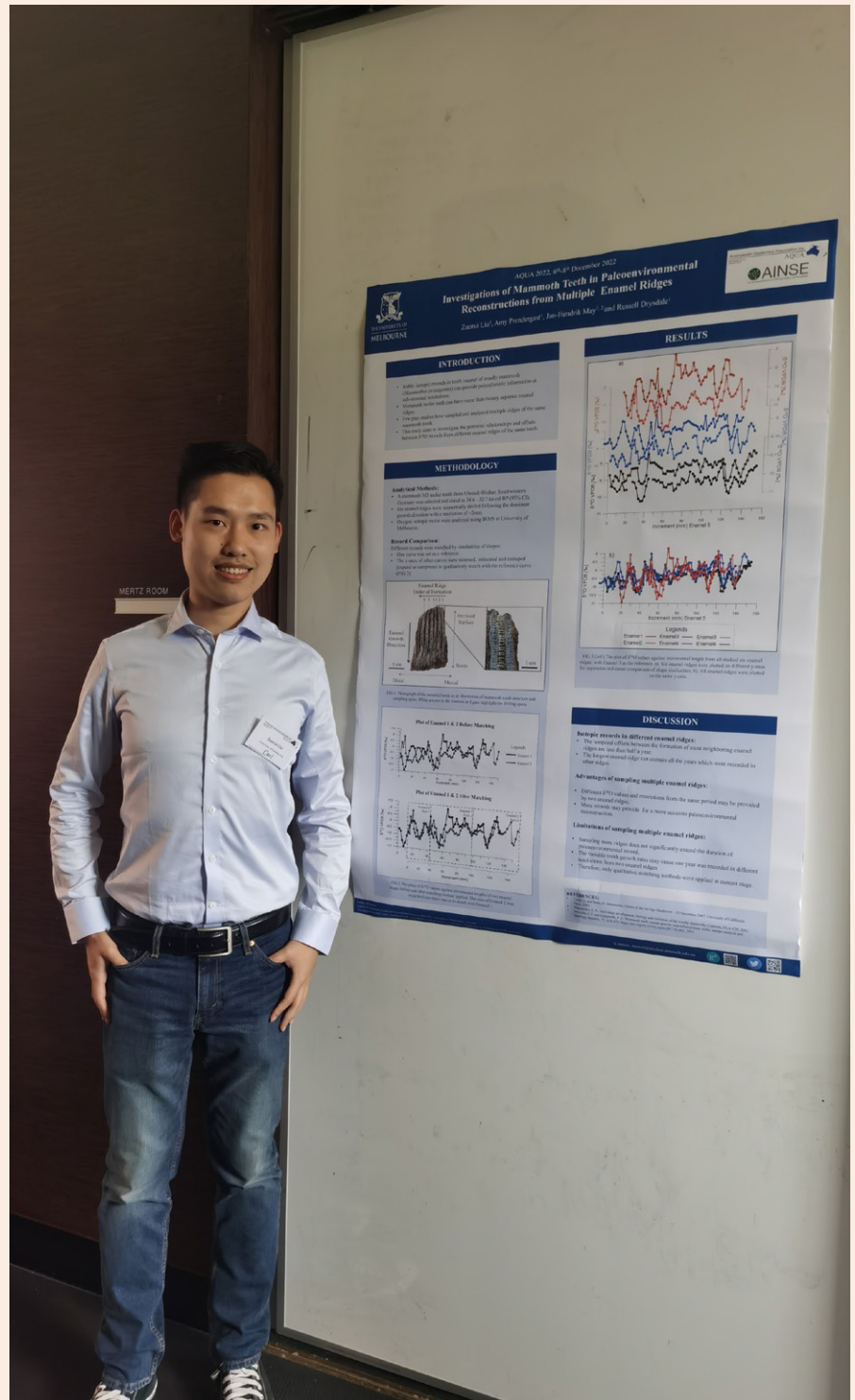


Figure 1: Zuorui Liu with his poster at AQUA 2022.



Figure 2: A group photo of AQUA 2022 attendees from the University of Melbourne.

I would like to express my appreciation to the AQUA community for organising the well-ordered meetings, a warm welcome, helpful OCTOPUS workshop, and excellent meals. I would also like to give thanks for the travel award granted to me by the AQUA community, which significantly relieved my financial pressure in travelling and accommodation in Adelaide. Last but not least, the Animals Anonymous event deserves a special acknowledgement. It provided an overseas student such a rare opportunity to get in close with the endemic

Australian wildlife, and everyone else also seemed to have a great time with the animals. Overall, my friends and I all enjoyed the conference and travelling in the early summer of Adelaide. I really look forward to joining the next AQUA conference, presenting my new results, and seeing the advances in Australasian Quaternary research.

THESIS ABSTRACT

TRANSFORMATIONS IN A PEOPLED RIVERSCAPE IN THE RIVERLAND REGION OF SOUTH AUSTRALIA

Craig Westell (PhD)

College of Humanities, Arts, and Social Sciences, Flinders University, Adelaide, Australia

This thesis examines a record of Aboriginal occupation in the upper Riverland region of South Australia against a backdrop of an evolving riverscape. The development of the River Murray floodplains is explored through a geomorphological interpretation of two anabranch systems: the Calperum and Pike floodplains. The structural changes evident in the Riverland floodplains are assessed against a history of shifting hydroclimate identified elsewhere in the broader Murray-Darling Basin (MDB). Some peculiarities in the local evidence are attributed to the nature of flow transmission in the MDB and the configuration of the River Murray valley in the Riverland.

The history of Aboriginal occupation in the Riverland has manifest in a staggering array of archaeological sites and materials. The geomorphological interpretation provides a basis in which to interpret and contextualise this record. The archaeology preserved across the Calperum and Pike floodplains is cast amongst a time series in landscape development as a means of value-adding, and validating, a set of radiocarbon ages returned on exposures of shell midden and other occupation materials. In combination, the survey and dating results indicate that Aboriginal lifeways in the Riverland existed at the periphery of more sustained occupation in the MDB over a long period of time following the initial Aboriginal settlement in the basin c. 50–45 ka. Short-lived pulses in occupation, or strategies embedded in high mobility, seem to have persisted in the Riverland until a major, albeit short-lived, phase in site development c. 15 ka. This parallels evidence from the broader south-western MDB and illustrates a major reconfiguration of regional settlement patterns following the nadir of the Last Glacial Maximum (LGM). This reconfiguration was defined, in large part, by an expanded use of riverine corridors beyond major lacustrine settings.

The initial phase of site development appears to have been short-lived. A staggered development of middens across the terminal Pleistocene is likely to reveal tipping points in riverine ecology where the viability of freshwater mussel as an economic staple may have periodically collapsed. It is not until the early Holocene that the extant evidence suggests a more persistent Aboriginal occupation incorporating the broader habitat mosaic into economic strategies. Subsequent periods of climatic variability and ecological stress across the Holocene were accommodated through an expanded use and emphasis on plant resources. The diversified riverine economy observed in historical observations reflects an essential template to accommodate the high level of variability inherent in this riverscape.

Existing narratives and conceptual frameworks around Aboriginal demographic and economic changes in the MDB are assessed against the Riverland evidence. The role of population increase as the instigator of change in past Aboriginal society has been fundamental to a common narrative, though little support for this is found in the Riverland evidence. Instead, economic strategies and technologies employed in various MDB regions were applied in unique combination in the Riverland and honed to suit local circumstance independent of population changes. These solutions may, however, have provided a platform for a substantial increase in economic capacity and Aboriginal populations with improved hydrological conditions in the very late Holocene.

<https://theses.flinders.edu.au/view/2cdd19f1-eacc-447e-ab29-62bd091b7a60/1>

UPCOMING MEETINGS

2023

JULY 2023

Palaeo Down Under 3

Venue: Perth, Australia and online
Date: 10-14 July 2023
www.australasianpalaeontologists.org/pdu3

XXI INQUA Congress

Venue: Sapienza University of Rome, Italy
Date: 14-20 July 2023
<https://inqua2023.org/>

AUGUST 2023

14th International Conference for Archaeozoology (ICAZ)

Venue: Cairns Convention Centre, Australia
Date: 8-12 August 2023
<https://www.ica2023.org>

NOVEMBER 2023

Geoscience Society of New Zealand Annual Conference

Venue: Te Herenga Waka Victoria University of Wellington, New Zealand
Date: 13-16 November 2023
<https://gsnz.org.nz/news-and-events/geoscience-conference-2023>

DECEMBER 2023

AGU Fall Meeting

Venue: San Francisco, United States
Date: 11-15 December 2023
www.agu.org/Fall-Meeting/

2024

International Symposium of Archaeometry

Venue: The University of Melbourne, Australia
Date: 27-31 May 2024
<https://arcas.org.au/isa2024.melbourne>

AQUA Conference

Venue: Moreton Bay Research Station, Minjerribah (North Stradbroke Island), Australia
Date: 24-29 June 2024

SEMINAR SERIES

Pal(a)eoPERCS (Palaeo Early Career Seminars) Series

Weekly seminars given by ECRs across palaeo – disciplines
<https://paleopercs.com>

RECENT PUBLICATIONS

- Chaneva, J., Kluger, M.O., Moon, V.G., Lowe, D.J. & Orense, R.P. (2023). Monotonic and cyclic undrained behaviour and liquefaction resistance of pumiceous, non-plastic sandy silt. *Soil Dynamics and Earthquake Engineering* 168, 107825. <https://doi.org/10.1016/j.soildyn.2023.107825>
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- Vachula, R.S. & Rehn, E. (2023). Modeled dispersal patterns for wood and grass charcoal are different: Implications for paleofire reconstruction. *The Holocene* 33(2), 159-166. <https://doi.org/10.1177/09596836221131708>

Quaternary AUSTRALASIA



Quaternary Australasia publishes news, commentary, notices of upcoming events, travel, conference and research reports, postgraduate thesis abstracts and peer-reviewed research papers of interest to the Australasian Quaternary research community. Cartoons, sardonic memoirs and images of mystery fossils are also welcome.

The Australasian Quaternary Association (AQUA) is an informal group of people interested in the manifold phenomena of the Quaternary Period. It seeks to encourage research by younger workers in particular; to promote scientific communication between Australia, New Zealand and Oceania; and to inform members of current research and publications.

It holds biennial meetings and publishes the journal *Quaternary Australasia* twice a year. Full annual membership of AQUA with an electronic subscription to QA is AUD50. For students, unemployed or retired people, the membership is AUD20.

The AQUA website (www.aqua.org.au) has information about becoming a member; alternatively please contact the Treasurer. Members joining after September gain membership for the following year.

Existing members will be sent a reminder in December.

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