Newsletter of the Conservation Paleobiology Network

Issue #28
March 2025

CPN Newsletter

Conservation Paleobiology Network

INSIDE THIS ISSUE:

Randall Preserve Working Group

By Maria Viteri

The Randall Preserve Conservation Paleobiology Working Group is a joint initiative of the Conservation Paleobiology Network (CPN) and the California (CA) Chapter of the Nature Conservancy (TNC). The goal of the group is to leverage the historical, archaeological, and paleontological record to inform the biodiversity goals of TNC's Randall Preserve, a ~82,000 acre protected space located at the base of the Sierra Nevada Mountains in Kern County, CA. Nearby Quaternary fossil sites and local historical records offer an exciting opportunity to integrate paleo data into conservation decision-making at this important place.

We hope that demonstrating the power of the geohistorical record at TNC California's largest preserve will inspire similar collaborations across TNC's conservation estate and beyond. The working group, composed of both academic scientists and conservation practitioners, met in December 2024 at the Randall Preserve. The group spent lots of time out in the field scrambling over rocks and looking for cool critters, but also took the time to discuss and document paleo-informed management recommendations for the preserve, including identifying candidate species/communities for local rewilding efforts. The group will continue to meet virtually, and hopefully again in person, with the long-term goal of informing ongoing management at Randall Preserve.

***Image caption**: Members of the Randall Preserve working group on site in California.*

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Supported by RCN-NSF Award: EAR-1922562

Conservation Paleobiology Research Highlight

By Dr. Mikkel Skovrind, University of Copenhagen

Impact of 700 years of Inuvialuit subsistence hunting on beluga whales

An international team of researchers, led by scientists from the University of Copenhagen and University of Toronto, analysed beluga whale bones retrieved from archaeological sites in the Mackenzie Delta, Northwest Territories, Canada, to shed light on the sustainability of centuries of Inuvialuit beluga whale subsistence harvests. Inuvialuit ancestors arrived in the Mackenzie Delta around 800 years ago, and beluga whales have been central to their livelihood and culture. However, little is known of the impact of centuries of sustained subsistence harvests on the beluga population.

"Inuvialuit harvests had a negligible impact on the genetic diversity of contemporary Mackenzie belugas."

Integrating paleogenomics, genetic simulations, and stable isotope analysis of 45 zooarchaeological beluga remains, and comparing the findings with contemporary data from tissue samples provided by Inuvialuit hunters from their beluga subsistence hunts, the team characterised the effect of 700 years of subsistence harvests on beluga genetic diversity, population structuring, and foraging ecology.

The authors found no changes in genetic diversity or population structuring over time, indicating population continuity. Our findings suggest Inuvialuit harvests had a negligible impact on the genetic diversity of contemporary Mackenzie belugas. The authors used genomic data to sex the belugas and found remarkable shifts in the ratio of females and males harvested across time, suggesting past changes in Inuvialuit resource use.

The stable isotope data showed concurrent shifts in the foraging ecology of female and male belugas, and may suggest changes over time in beluga behaviour or regional ecosystems.

Our study highlights the applicability of combining genomic sexing and isotope analysis of zooarchaeological remains for advancing our understanding of past hunting practices and faunal ecologies.

***Image caption**: Painted wooden plaque depicting a group of Inuvialuit hunters in kayaks pursuing a pod of beluga whales. Drawn for and collected by Roderick MacFarlane (Hudson Bay Company) for the Smithsonian Institution ca. 1863. Image credit: E2545, Department of Anthropology, Smithsonian Institution. Photo: S Loring.*

For more information see the article: M. Skovrind et al., Elucidating the sustainability of 700 y of Inuvialuit beluga whale hunting in the Mackenzie River Delta, Northwest Territories, Canada, Proc. Natl. Acad. Sci. U.S.A. 121 (34) e2405993121, (2024). https://doi.org/10.1073/pnas.2405993121

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Practitioner Perspective *By Lucia Snyderman*

Rob Brewster, Director of Rewilding Australia

***Image caption**: Rob Brewster.*

1. How would you introduce yourself to our readers?

I'm just somebody who felt an overwhelming urge to do something practical to turn around a continent in trouble because of accelerating rate of environmental damage people have caused to Australia, mostly, over the past couple of hundred years. Rewilding embodies everything that I want to achieve - from putting lost animals back into our ecosystems, to growing a community who feels connected to their wildlife and landscapes.

2. Tell us about your work with Rewilding Australia. What data do you consider most useful for informing and guiding ecosystem conservation?

I lead WWF-Australia's Rewilding Australia program. Back in early 2020, in the days following Australia's most catastrophic bushfires in living history, WWF called me and said, hey, it's pretty clear that as an organisation we're going to have to do more in the next decade than we've done in the last 60 years. Can you help? We quickly integrated into an organisation that has this amazing capability of getting big vision projects done. And ever since, Rewilding has been a central strategy for regenerating Australia.

We often think there was a wave of destruction that came with colonisation, and then everything settled down. But nothing is stable in Australia. We're still in the midst of an extinction wave that shows no sign of abating anytime soon. And now we have a fast-growing human population that is increasingly disconnected from knowing and loving our wildlife. We're still knocking down forests for woodchips, clearing land to build more houses, and throwing all our disposable wealth at pet dogs and cats. So, we need our greatest minds on this crisis, and it's certainly too big a job for just me (yes this is a recruitment call for more rewilders!).

Data that shows just what we've lost is vitally important to understanding Australia and the opportunity to implement rewilding. Australia's museums and explorer's journals contain a vast treasure trove that describes our ecosystems in the first century following colonisation. And it was a totally different place – full of at least another 35 mammal species that are now totally extinct.

Practitioner Perspective continued

Our wildlife was abundant and provided significant functional roles in helping to do everything from cycling nutrients, burying and germinating seeds, even burying leaf litter to create conditions for cooler burning bushfires. And of course there were our predators – thylacines, devils, quolls – which are now either extinct, functionally extinct, or perhaps even in terminal decline. So many of these unique records detail the final days of species that evolved over 40 million years.

Other data sets that are vitally important to rewilding is the data generated from following animals following reintroduction. We need to know what happens to our rewilded species – do they persist or are they killed by foxes? Are there enough resources out there for them? Do captive-bred animals have the appropriate skillset to hunt and scavenge? Rewilding offers the perfect project for students wanting to sink their teeth into some really interesting, satisfying work. So we're always developing partnerships with universities to ensure that rewilding in Australia embeds itself in strong research alliances.

3. Does your work intersect with historical and palaeontological data? If yes, how?

To look forward, we must look back in time! Some of our most innovative work is now looking at environment-DNA (or 'eDNA') within the ancient sediment profile from protected rockshelves from across Australia. We're working closely with the University of Adelaide's Centre for Ancient DNA to unravel just what our ecosystems looked like. In so many cases, foxes and cats arrived before there was a chance to document what species were actually living in some of our ecosystems. So, collecting bone fragments and DNA and unravelling what ecosystems looked like can really provide a baseline for where our rewilding ambitions can be properly informed from.

4. What would you say to scientists who are hoping to apply their research directly to conservation? To students who hope to get involved in conservation work?

I think the most important thing a scientist can do in this era is to ensure their work can be applied to fixing some of the issues we see as intractable. We really don't have time to muck around with pumping out research papers that are so abstract that their contents don't really help fix those things that need fixing. If you don't have a problem that you are working on resolving, then go out there and find somebody who does, and use your research to help find a solution to it.

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Student Section

Student Panel Welcomes New Database Manager *By Emilia Galli, Carli Peters, and Broc Kokesh*

The CPN Student Panel is pleased to introduce our new Student Database manager Emilia Galli! We also wish to thank Carli Peters for her amazing service as the inaugural Database manager for the last five years!

Emilia is a 4th year PhD student at the Complutense University of Madrid (Spain). Her thesis focuses on how climate change shaped terrestrial mammals' biomic specialization throughout the Cenozoic, looking into both intrinsic and extrinsic factors that influenced their evolutionary history. Emilia previously served as a Database volunteer with other students for three years.

***Image caption**: Emilia Galli.*

The CPN Student Database is an actively maintained list of resources with job and funding opportunities, field schools, workshops, short courses, conferences, and open-access resources for everyone to check out (https://conservationpaleorcn.org/resources/) from undergraduates to senior researchers, technicians, curators, managers, and any academic fellow, regardless of their age and experience!

We are looking for 3 – 4 student volunteers from different academic disciplines to help us update and maintain the Database. The expected time commitment is no more than a couple of hours per month. If you have suggestions about how to improve the database or are interested in getting involved, please email the CPN requesting Emilia's contact info.

European Association of Vertebrate Palaeontologists

Dear friends and colleagues, it is our pleasure to warmly invite you to attend the 22nd Annual Meeting of the European Association of Vertebrate Palaeontologists (EAVP), which will be hosted by the Institute of Systematics and Evolution of Animals of the Polish Academy of Sciences in Krakow, from 30 June to 5 July 2025.

Website: https://eavp2025.wixsite.com/eavp2025

1st circular: https://eavp.org/wp-content/uploads/2025/01/EAVP-2025-First-circular-v2.pdf

Paleo Proxy Spotlight – Pteropods *By Nina Keul*

What are pteropods?

Pteropods, commonly called "sea butterflies," are small, pelagic mollusks belonging to the class Gastropoda. These fascinating creatures inhabit oceans around the world, from tropical to polar regions, and are a critical component of marine ecosystems. They are abundant in all major ocean bodies and their physiology is known to be sensitive to climate change (ocean acidification and ocean warming; see e.g. Lischka et al. 2011).

They possess aragonitic shells, which makes them susceptible to variations in ocean chemistry, particularly pH and carbonate ion concentrations. Aragonite is more soluble than calcite, causing pteropods to be particularly vulnerable to ocean acidification. As such, their shells record changes in seawater carbonate chemistry over time, providing valuable insights into the historical impacts of CO_2 levels on marine environments.

Their unique characteristics, biological significance, and sensitivity to environmental changes make them interesting tools for understanding past and present oceanic conditions.

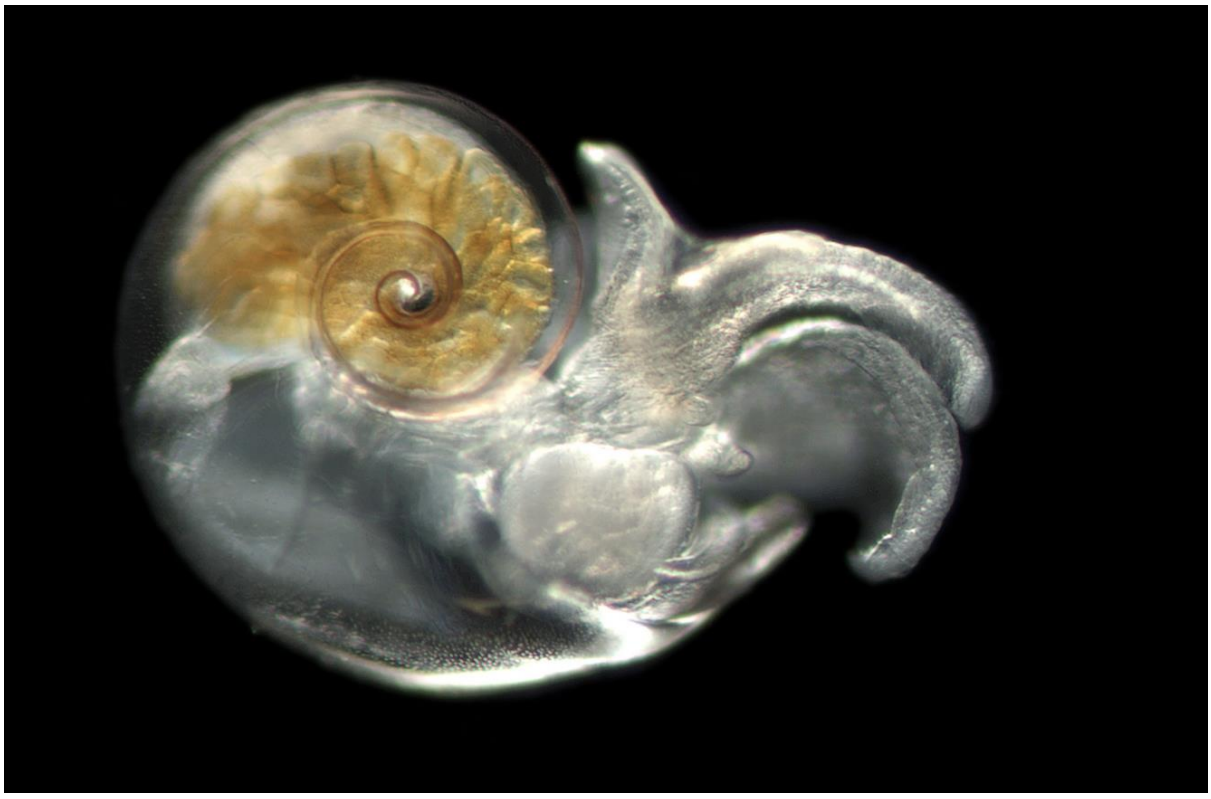

***Image caption**: Pteropod species Heliconoides inflatus (Katja Peijneburg/Erica Götze, Naturalis Biodiversity Center in Leiden (Netherlands)).*

Paleo Proxy (Pteropods) continued

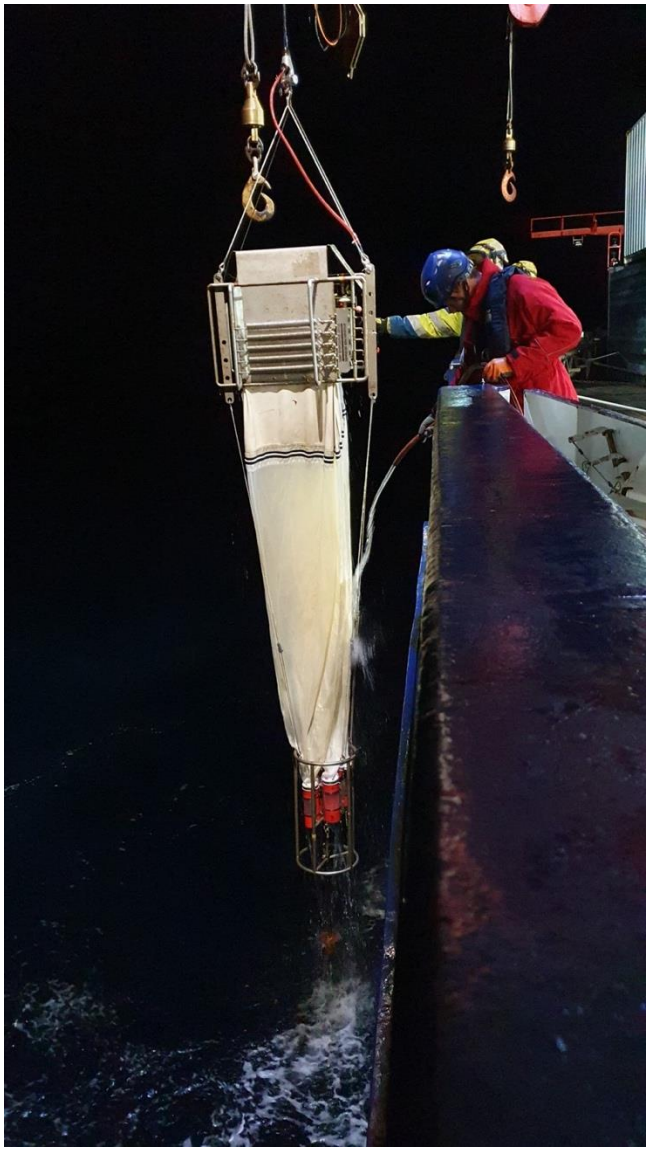

***Image caption**: catching pteropods for proxy development onboard RV Polarstern (credit: Anna Völkert, CAU Kiel).*

What makes the ideal proxy?

When we think about an ideal proxy carrier, it should be cosmopolitan and highly abundant, with a good preservation in sediments. Furthermore, the proxy carrier should have a long life span and we need to know where in the water column the shells are build. How do pteropods perform in this regard?

1.High abundance and cosmopolitan distribution: Pteropods are widely distributed throughout the world's oceans, inhabiting both tropical and polar regions. They are most abundant in colder, nutrient-rich waters, such as those near the Arctic and Antarctic, where they can dominate the zooplankton community. Their populations vary with seasonal changes, ocean depth, and food availability, often concentrating in surface waters. Due to their planktonic nature, pteropods can drift with ocean currents, making them integral components of marine ecosystems across diverse environments. Their widespread presence ensures they play a significant role in global marine food webs and biogeochemical cycles.

2) Depth of calcification: Pteropods calcify in the epipelagic zone of the ocean, which extends from the surface down to approximately 200 meters. This is where conditions such as light availability, temperature, and carbonate ion concentration are most favorable for the formation of their aragonite shells. The fact that pteropods calcify in the upper ocean makes them excellent indicators of changes in surface water chemistry, including ocean acidification trends.

3) Distribution in sediments: The distribution of pteropods in marine sediments reflects their pelagic lifestyle, abundance in surface waters, and the environmental conditions of the ocean. Their shells, made of aragonite, are often found in sediments but can be subject to dissolution before or after settling.

Paleo Proxy (Pteropods) continued

How can we use pteropods as proxy carriers?

We have been able to show that pteropods are indeed good proxy carries for climate change, via the stable isotopic composition of their shells (Keul et al., 2017). We performed a calibration on pteropod samples that were collected across a number of oceanographic provinces in the Atlantic. Not surprisingly we found the pteropod species *Heliconoides inflatus* calcifies at shallow depths in the Atlantic (upper 75 m of the water column), making their pteropod shells good recorders of surface water masses. Furthermore, correlations between the stable isotopic composition of shells and parameters of the water column allowed us to establish *H. inflatus* shells as good proxy carriers for temperature and carbonate ion reconstructions via the stable O and C isotopic composition. We have been able to demonstrate the applicability for these pteropod proxies for the Holocene to late Peistocene in sediments off Western Australia (Hallenberger et al., 2022). This work is an ongoing effort, we are currently working on pteropods from sediments in the North Atlantic and are establishing a multi-species calibration in the Pacific. If you have sediments samples containing pteropods we would be happy if you reach out so we can extent this work (please email the CPN for contact info).

Future Implications

Understanding the role of pteropods as proxies extends beyond academic research; it also highlights their vulnerability in the face of ongoing ocean acidification. It has been shown in a few areas that populations of certain pteropod species are already declining (e.g. Fram Strait), which could have cascading effects on marine food webs, emphasizing the urgency of addressing climate change to preserve ocean health.
In conclusion, pteropods are invaluable proxy carriers for reconstructing past climate and ocean conditions. Their sensitivity to environmental changes, global distribution, and complementary nature with other proxies make them a useful tool for advancing our understanding of Earth's changing climate and the ocean’s role in regulating it.

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Lischka, S., Büdenbender, J., Boxhammer, T. and Riebesell, U., 2011. Impact of ocean acidification and elevated temperatures on early juveniles of the polar shelled pteropod *Limacina helicina*: mortality, shell degradation, and shell growth. *Biogeosciences,* 8(4), pp.919-932.

Postcards from the Field

In this feature of our newsletter, we showcase members' research in the field, lab, or other settings. Please submit your "postcards" with approximately 100 words of text to us at conservationpaleo@floridamuseum.ufl.edu

***Image caption**: Eocene oyster reef dominated by the Giant Oyster (Striostrea gigantissima) at Negritos Creek, Star County, Texas, U.S.A. Photos by J. Gonzalez ©.*

Eocene Oysters (*Striostrea gigantissima*) from south Texas - by Carlos E. Cintra-Buenrostro and Juan L. Gonzalez (Professors at the School of Earth, Environmental and Marine Science. The University of Texas Rio Grande Valley)

A large fossil reef of Giant Oysters is being exposed by stream erosion at the bed of Los Negritos Creek, a small, ephemeral tributary of the Rio Grande in Starr County, South Texas. Located in a remote area within a nature preserve managed by the U.S. Fish and Wildlife Service, the reef is closed to the public. According to the geologic map, the reef is part of the Eocene age Jackson. Estuarine sediments from this formation accumulated along the margins of the Claiborne Sea — an embayment of the Gulf of Mexico coastline within the Rio Grande Embayment that existed during the Eocene Epoch.

The primary species found on the reef is the Giant Oyster *Striostrea gigantissima* (formerly *Crassostrea gigantissima*). The exposed reef offers a unique opportunity to study the Eocene paleogeography and biota along the Gulf Coast. Our primary objectives are to characterize and map the reef's areal extent, quantify the density of *S. gigantissima*, refine the reef's chronology, and establish correlations with other formations within the Claiborne Sea.

Conservation Paleobiology Network

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Are you interested in:

…contributing to **Postcards from the Field**?
…sharing a recent publication as a **Research Highlight**?
…being featured in a **Practitioner's Perspective** piece?
…providing other content suggestions for this newsletter?

If yes, please email us at conservationpaleo@floridamuseum.ufl.edu

Invite Your Colleagues to Join our Network!

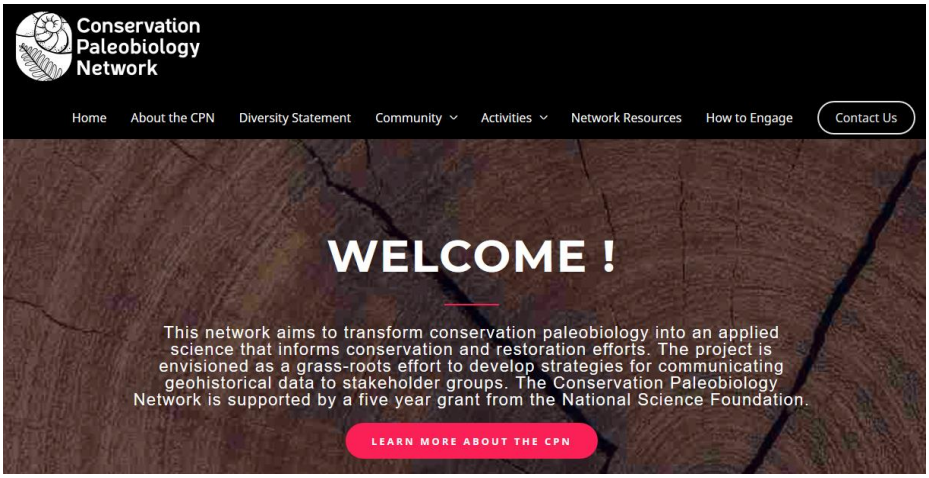
If you know people who might be interested in our network, please invite them to join. You can use the link below to extend your invitation on behalf of our network.

By joining the network, you become a member of our Community of Practice. The membership does not impose any obligations, but enables participants to engage fully in network activities. Members will be able to:

1. Participate in the CPN mailing list
2. Nominate and self-nominate for committees and panels
3. Submit announcements for publication in the CPN Newsletter
4. Apply to participate in the CPN activities
5. View CPN webinars and submit proposals for webinar modules

To join please go to our website and select "Join the Network"

Visit the website! https://conservationpaleorcn.org/



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