

NEWSLETTER

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OCEANS PAST INITIATIVE

A new start.

Recently, I began a new position as the Aquatic Sciences Officer with the Pew Charitable Trusts, a U.S. non-profit organization that aims to use “*evidence-based, nonpartisan analysis to solve today’s challenges*”. Excited about a new endeavor, I find myself navigating not only new work, but also new colleagues, new modes of communication – and new ways of thinking about problems and solutions. As I transition, I am reminded the importance of not only new tools and new data, but also of new perspectives and new ways of thinking, and of the associated challenges – and opportunities. In this edition of OPN, novel tools and innovative ways of considering resources help uncover novel insights, as new leadership and new resources light the way forward.

Emily S. Klein, OPN Editor

Pew Charitable Trusts, Washington DC, USA



Figure 1. Abalone specimen collected from southern California (USA).

OCEANS PAST SPOTLIGHT*

ABALONE: A New Tool For Reconstructing Upwelling In Eastern Boundary Currents

Christine Bassett

(Dept of Geological Sciences, Univ of Alabama, USA)

Upwelling is one of the most important oceanographic processes driving primary productivity in marine ecosystems, supporting the foundation of coastal food webs as well as some of the world’s largest commercial fisheries. However, the extent to which the frequency, intensity, and duration of upwelling events varied in the past remains unclear. Numerous palaeoclimatological and palaeoceanographic proxies are used to reconstruct changes in water masses throughout Earth’s history. Yet many reconstructions average decades to hundreds and even thousands of years of environmental variability, limiting our ability to extrapolate the sub-annual changes that underly biological productivity. To address this challenge, we examined the geochemical variability in abalone shells from the California Channel Islands (USA) to assess their suitability as a high-resolution archive of upwelling in coastal environments.

The accretionary growth in the skeletal tissue of marine organisms, such as mollusks, record chronologies of sub-annual to seasonal resolution environmental conditions such as sea surface temperature (SST), salinity, and

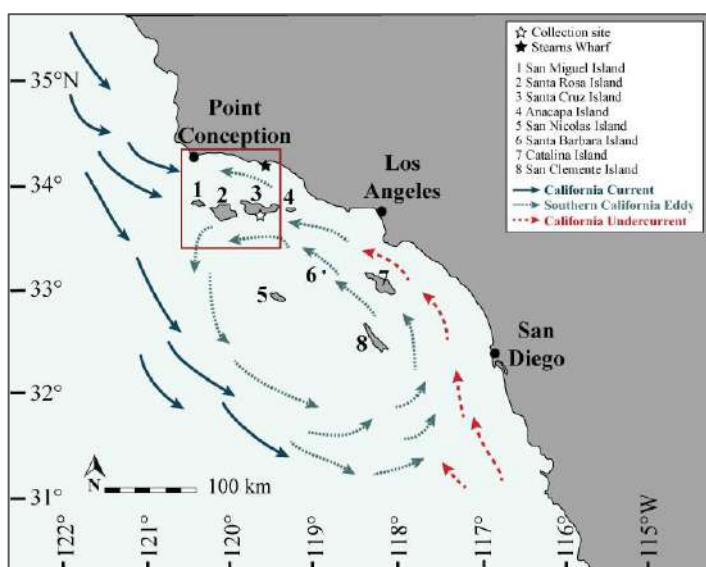


Figure 2. Southern California Current System. During the spring and early summer, prevailing northwesterly alongshore winds drives coastal upwelling in the Channel Islands, particularly affecting San Miguel and Santa Rosa Islands, bringing deep, cold, nutrient-rich water, resulting in high productivity and export of nutrients and organic matter.

productivity. The inorganic calcium carbonate (CaCO_3) matrix of shells has traditionally been the focus of mollusk-based reconstructions. More recently, the organic matrix, composed of carbon- and nitrogen-rich proteins that reflect diet, are providing new insights from environmental reconstructions. Specifically, analysis of organic bound nitrogen provides data on anthropogenic and natural influences on nitrogen cycling in marine environments. To determine how well abalone shells record changes in sources of nitrogen, we analyzed the oxygen ($\delta^{18}\text{O}_{\text{shell}}$), nitrogen ($\delta^{15}\text{N}_{\text{shell}}$), and carbon ($\delta^{13}\text{C}_{\text{shell}}$) stable isotopes in three specimens of abalone from Santa Cruz Island. We compared our results with nearby oceanographic observations such as SST, salinity, nitrate concentrations, and chlorophyll- α concentrations to estimate the timing of nitrogen isotopic variability in shell geochemistry.

We measured $\delta^{18}\text{O}_{\text{shell}}$ from the inorganic matrix, which is controlled by ambient water temperature and $\delta^{18}\text{O}$, the latter being a strongly linked to salinity. Oceanographic observations demonstrated that salinity is relatively stable, meaning that SST primarily drives changes in $\delta^{18}\text{O}_{\text{shell}}$ of our specimens. Therefore, we relied on $\delta^{18}\text{O}_{\text{shell}}$ to infer the timing of changes in $\delta^{15}\text{N}_{\text{shell}}$. Our results indicate that there is a highly significant positive correlation between $\delta^{18}\text{O}_{\text{shell}}$ and $\delta^{15}\text{N}_{\text{shell}}$ in all three shells, demonstrating that $\delta^{15}\text{N}_{\text{shell}}$ is enriched during periods of colder SSTs, when more positive values $\delta^{18}\text{O}_{\text{shell}}$ are measured. During upwelling, colder water with higher nitrate concentrations that are isotopically enriched (~5-6‰) replaces surface waters, enriching the $\delta^{15}\text{N}$ of algae and seaweed and the tissue of organisms that feed on it. Therefore, the tight coupling of $\delta^{18}\text{O}_{\text{shell}}$ and $\delta^{15}\text{N}_{\text{shell}}$ indicate that the shells we analyzed are recording upwelling events in their geochemistry.

We ultimately plan to apply these methods to abalone shells found in the numerous shell middens along the California Channel Islands to generate high-resolution chronologies of upwelling events through time. Such data can complement broader spatial and temporal environmental constructions to better understand how regional and basin scale changes force environmental variability in local ecosystems. An improved understanding of how basin scale changes impact local ecosystems may also help marine resource managers build adaptive strategies to mitigate the challenges associated with a warming ocean.

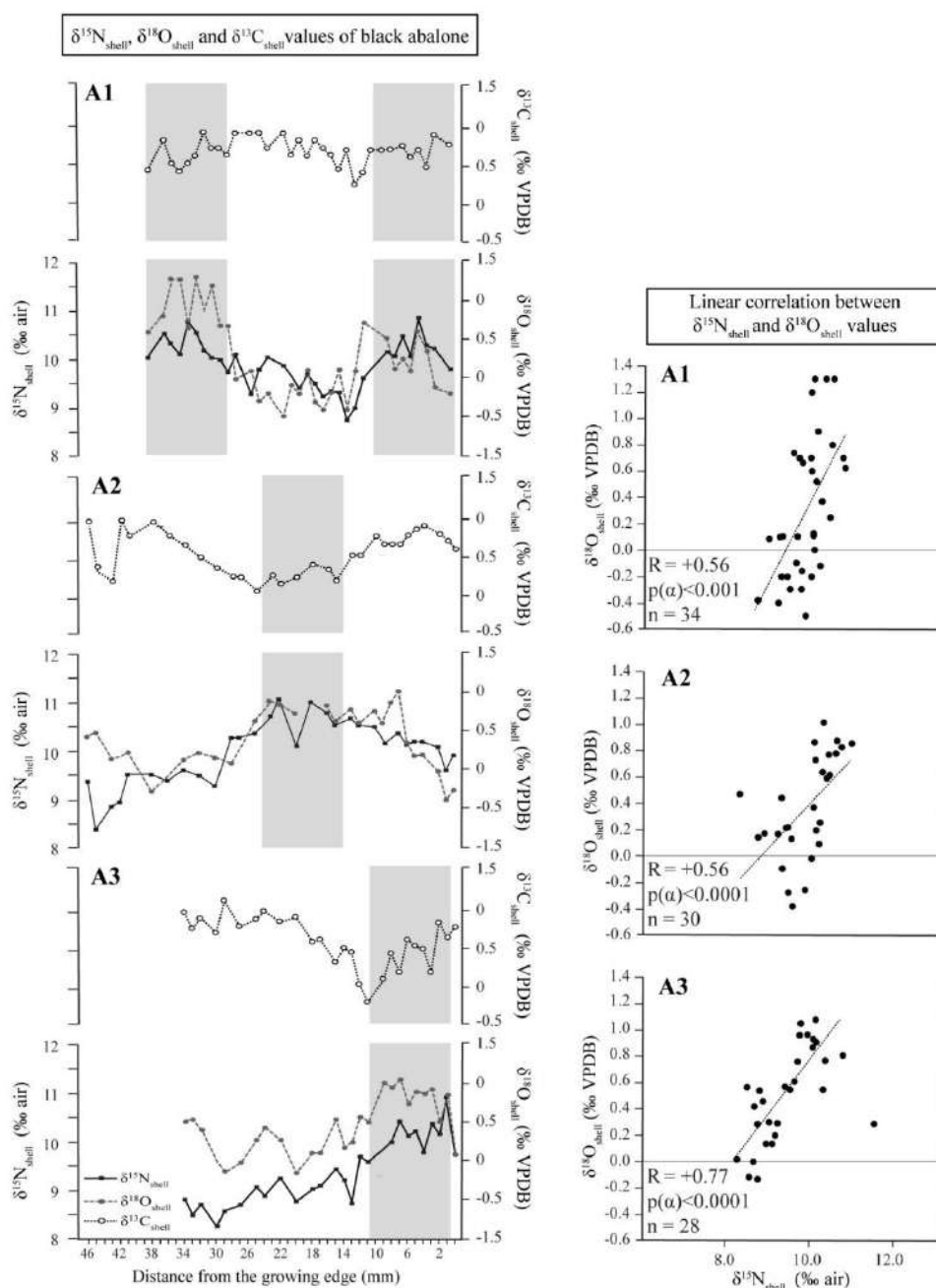
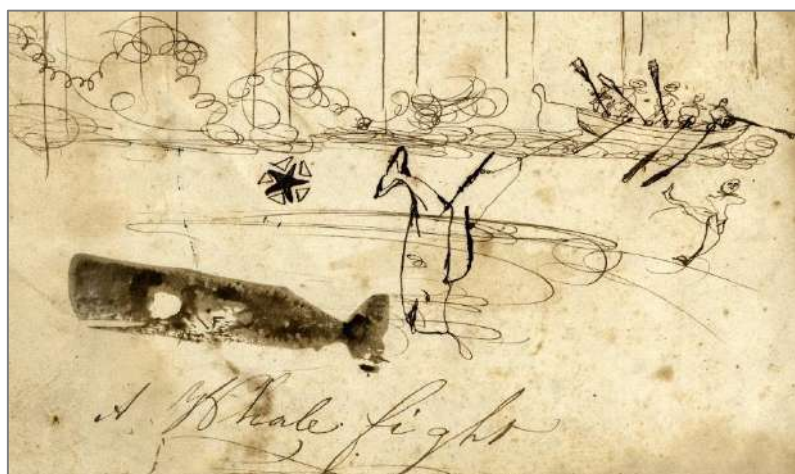


Figure 3. A) $\delta^{15}\text{N}_{\text{shell}}$, $\delta^{18}\text{O}_{\text{shell}}$, and $\delta^{13}\text{C}_{\text{shell}}$ from modern samples of *Haliotis cracherodii*. $\delta^{15}\text{N}_{\text{shell}}$ (vs. ‰ air) are plotted with the solid black line and $\delta^{18}\text{O}_{\text{shell}}$ (vs. ‰ VPDB) indicated by the dashed gray line in the lower panel. $\delta^{13}\text{C}_{\text{shell}}$ (vs. ‰ VPDB) are plotted separately with the dotted black line in the upper panel. Light gray bars indicate the timing of winter during ontogeny. B) Plots the linear correlation between $\delta^{15}\text{N}_{\text{shell}}$ and $\delta^{18}\text{O}_{\text{shell}}$.



Detail from the logbook of the vessel *Brunswick* (© Alex Aguilar), showing a “whale fight”: a harpooned sperm whale fights back and a man falls from the rowing boat. Black whale stamps such as that in the image were used to indicate when a whale was caught and processed.

RESEARCH NEWS

Ancient logbooks to reconstruct sperm and Southern right whale catches in the southwestern Atlantic Ocean.

People have hunted whales since the Neolithic age. After centuries of exploitation with rudimentary techniques, whaling assumed an industrial scale during the 18th and 19th centuries, causing the decline of several whale populations across the globe. Today, despite the fact that ban on commercial whaling and regulations of this activity have been in place for a few decades, some whale populations still struggle to recover.

To effectively manage and protect these species, it is necessary to assess their status in relation to their pre-whaling population size and reconstruct their demographic trends. In their work, **Morgana Vighi and colleagues** analysed old whaling logbooks to extract information on the whaling activities that took place in the southwestern Atlantic Ocean between the late 18th and the early 20th centuries. Sightings and catches (failed and succeeded) of sperm whales (*Physeter macrocephalus*) and Southern right whales (*Eubalaena australis*) were used to assess trends in whaling efficiency and estimate correction factors to account for whales that were struck, sometimes killed, and lost, during catch attempts. The proportion of injured whales that were lost and not included in the catch records is crucial for assessing the impact of whaling, which may be underestimated when only processed whales are accounted for.

The analysis of almost 20,000 days of whaling activity showed that whalers heavily targeted Southern right whales until 1840. After their decimation, whalers gradually shifted their attention to sperm whales. Numbers of whale lost were 1.1-1.5 times the number of whales successfully processed. In addition, loss values were higher for Southern right whales and decreased over time, indicating an improvement in whaling efficiency. Results of this research stress the relevance of historical sources to address ecological and conservation issues, and the importance of accurately assessing whaling impacts to establish the relative status of whale populations, which is critical to design well-targeted conservation measures. ~ Morgana Vighi (Univ of Barcelona, Spain). Related Publication: Vighi M, Borrell A, Jackson JA, Carroll EL, Pennino MG, Aguilar A, 2020. The missing whales: relevance of “struck and lost” rates for the impact assessment of historical whaling in the southwestern Atlantic Ocean: doi.org/10.1093/icesjms/fsaa205.

Tracking turtles in the past. A recent study provides new insight on the deep history of human-turtle interactions, focusing on the Eastern Mediterranean. In this work, the authors used the zooarchaeological evidence to illuminate the nature and intensity of past human interactions with green, loggerhead, and Nile soft-shell turtles in this region. Species and sex identifications, estimates of relative abundance, and size reconstructions at five coastal archaeological sites demonstrate the variety in interactions, from turtle capture to processing. Their findings have implications for understanding on the distribution and variability of past Mediterranean turtles and for informative comparisons with present-day distributions of these species across the region. Moreover, turtles can be important indicators of past human impacts on marine biodiversity. Related publication: Çakırlar C, Koolstra FJ, Ikram S. 2021. Tracking turtles in the past: zooarchaeological evidence for human-turtle interactions in the ancient Eastern Mediterranean: doi:10.15184/aqy.2020.95.



Figure 3 from the text: A) *Trionyx triunguis* carapace fragment from Fadous; B) *Cheloniidae* carapace from Clazomenae; C) complete *Caretta caretta* carapace from Fadous (scale bar = 0.25m) (figure by F.J. Koolstra, C. Çakırlar & H. Genz).

COLLABORATIONS

New leadership for the ICES working group on historical fisheries. The last months have seen the passing of the torch for the **International Council for the Exploration of the Sea (ICES) Working Group of History of Fish and Fisheries (WGHIST)**. After 6 great years led by Drs. **Emily Klein** and **Ruth Thurstan**, the WG is ready for two new



leaders: Drs. **Bryony Caswell** and **Camilla Sguotti**. Bryony (left photo) is a lecturer in marine biology and geology at the University of Hull (UK) who investigates the response of seafloor communities, and ecosystems, to environmental and anthropogenic change in recent and deep time. Camilla (right photo) is a PostDoc at University of Hamburg (Germany) and is interested in understanding how ecosystems change through time in response to anthropogenic impacts and how management reacts to these changes. Two different backgrounds, but we are used to be a very interdisciplinary group at WGHIST! The objectives of the group's next 3-year iteration are ambitious and include 4 topics:

- 1) Collecting historical data and establish best practices for their utilization.
- 2) Exploring how different types of historical data can be used together, and be used to bridge different disciplines.
- 3) Evaluate long-term change within marine socio-ecological systems and the potential to use transdisciplinary approaches to directly incorporate historic data into management or contemporary science.
- 4) Using historical data to understand socio-economic outcomes emerging from different management strategies.

If you are interested in marine historical ecology or marine environmental history and would like to work with a diverse and international group, feel free to contact us! Our annual meeting (21st-25th June 2021) will be a virtual event hosted by the ICES HQ in Copenhagen. If you would like to attend our day of public seminars or are interested in becoming a member please do get in touch using one of the below email addresses. We are ready for the next 3 years... stay tuned! ~ *Best wishes, WGHIST co-chairs Bryony Caswell and Camilla Sguotti (b.a.caswell@hull.ac.uk & Camilla.sguotti@uni-hamburg.de); www.ices.dk/community/groups/Pages/WGHIST.aspx*

RESOURCES

Conservation Paleobiology Network Student Resources Database launched. The **CPN Student Panel** is pleased to announce the launch of the **Student Resources Database!** It is hosted on Google Sheets and lists current job openings, funding opportunities, field schools, workshops, and other resources tailored to conservation paleobiology. The Database will be curated and maintained by the Student Panel, but anyone from the broader community can contribute resources. We hope that this collaborative platform will encourage community-building and the sharing of information between network members about upcoming opportunities. While the initial framework is now available to peruse, the Student Panel is also actively seeking recommendations to expand the list of resources. To view the database, please visit our resources page: <https://conservationpaleorcn.org/resources/>, and to contribute resources, please fill out this form: <https://forms.gle/aMD1WDfrRkWgXUmH6>. If you have any questions or are interested in getting involved, please contact **Sage Vanier** (students.cpn@gmail.com).

Initial webinar kicks off recorded lectures for Conservation Paleobiology Network. The CPN webinar panel is excited to announce their first video webinar lecture: **An Introduction to Conservation Paleobiology: The Colorado River Delta**. It can access it through their webinar page: <https://conservationpaleorcn.org/webinars/>. This 46 minute video briefly covers some of the basic principles, objectives, materials, and approaches used in conservation paleobiology. This is the first of what will be a series of webinars that can be used individually or as part of a hybrid in-class/on-line course on conservation paleobiology. Some webinars will focus on a particular topic, other webinars could present instructive case-studies. CPN is also interested in topics and case studies of interest to the community and welcome your ideas! Visit the website for more.

RECENT PUBLICATIONS

- Attanayake C (ed). 2021. **Maritime Sri Lanka: Historical and Contemporary Perspectives**. World Scientific.
- Bashirova LD, Ulyanova MO, Kovalev, AA, Lappo AD, Danilova LV, Kapustina MA. 2021. **On the Legal Status of Maritime Cultural Heritage and Its Management in the Russian Sectors of the Baltic Sea**. *Journal of Maritime Archaeology*. doi.org/10.1007/s11457-020-09288-4.
- Çakırlar C, Koolstra FJ, Ikram S. 2021. **Tracking turtles in the past: zooarchaeological evidence for human-turtle interactions in the ancient Eastern Mediterranean**. *Antiquity* 95 (379): 125-141. doi:10.15184/aqy.2020.95.
- Clark CT, Horstmann L, Misarti N. 2021. **Walrus teeth as biomonitors of trace elements in Arctic marine ecosystems**. *Science of the Total Environment* 772. doi.org/10.1016/j.scitotenv.2021.145500.
- Charapata P, Horstmann L, Misarti N. 2021. **Pacific walrus bones reveal changes in stress-related and reproductive steroid hormones over the last 3 millennia**. *Conservation Physiology* 9(1). doi.org/10.1093/conphys/coaa135.
- Fan J, Li H. 2021. **On-demand Maritime Trade: A Case Study on the Loading of Cargo and the Packaged Goods of the Sinan Shipwreck**. *Journal of Maritime Archaeology*. doi.org/10.1007/s11457-021-09295-z.
- Gal D, Saaroni H, Cvikel D. 2021. **A new method for examining maritime mobility of direct crossings with contrary prevailing winds in the Mediterranean during antiquity**. *Journal of Archaeological Science*: 129. doi.org/10.1016/j.jas.2021.105369.
- Guilan L, Weiwei D. 2021. **Synergetic management strategy for maritime cultural heritage protection and marine development in China**. *Marine Policy*: 125. doi.org/10.1016/j.marpol.2020.104383.
- Le Normand B, Lemmen S. 2021. **Ports in state socialism, or why the Cold War matters to maritime history**. *International Journal of Maritime History* 33(1): doi.org/10.1177/0843871421991176.
- Macauley M. 2021. **Distant Shores: Colonial Encounters on China's Maritime Frontier**. Princeton University Press.
- Raicevich S, Caswell BA, Bartolino V, Cardinale M, Eddy TD, Giovos I, Lescrauwaet A-K, Thurstan RH, Engelhard GH, Klein ES. 2021. **Sidney Holt, a giant in the history of fisheries science who focused on the future: his legacy and challenges for present-day marine scientists**. *ICES Journal of Marine Science*. doi.org/10.1093/icesjms/fsab019.
- Sauriau P-G, Dartois M, Becquet V, Aubert F, Huet V, Bréret M, Viricel A, Pante E. 2021. **Multiple genetic marker analysis challenges the introduction history of *Ulva australis* (Ulvales, Chlorophyta) on French coasts**. *European Journal of Phycology*. doi.org/10.1080/09670262.2021.1876249.
- Vighi M, Borrell A, Jackson JA, Carroll EL, Pennino MG, Aguilar A. 2020. **The missing whales: relevance of “struck and lost” rates for the impact assessment of historical whaling in the southwestern Atlantic Ocean**. *ICES Journal of Marine Science*. https://doi.org/10.1093/icesjms/fsaa205.
- Whitehead H, Smith TD, Rendell L. 2021. **Adaptation of sperm whales to open-boat whalers: rapid social learning on a large scale?** *Biology Letters* 17(3): https://doi.org/10.1098/rsbl.2021.0030.

ANNOUNCEMENTS

Call For Diversity, Equity, and Inclusion Panel members for the Conservation Paleobiology Network. The CPN is looking to expand membership of the Diversity, Equity, and Inclusion Panel. The Panel informs CPN's various other panels as they develop activities and holds the network accountable for meeting goals outlined in the Anti-Racism Statement and Call for Action here: <https://conservationpaleorc.org/anti-racism-statement-and-call-for-action/>. We are currently exploring ways to expand the role of the panel and implement effective strategies for fostering diversity, equity, and inclusion within the RCN. If you are interested in joining the panel, please email DEI Panel Co-chairs **Nicole Cannarozzi** (ncannarozzi@floridamuseum.ufl.edu) or **Anita Marshall** (anita.marshall@ufl.edu).

ANNOUNCEMENTS: CONFERENCES

The **Ecosystem Studies of Subarctic and Arctic Seas** (ESSAS) is resuming its Annual Meeting schedule this year with a FREE online conference May 30-June 4th, 2021. The **Paleoecology of Subarctic and Arctic Seas** working group (PESAS), a community simultaneously embedded within ESSAS and OPI, has been invited to partner with the **AnalogueART Working Group**, to produce a joint workshop on June 2 (Japan Time). We plan to discuss efforts to use proxies from the past and present as analogues to inform scenarios of the future. Pre-recorded (5-10 minute) talks will be made available before the work and workshop discussion will evolve from the following questions:

1. What can we learn from spatial and temporal gradients of different scales (time/space/complexity)? What are the advantages and disadvantages of such studies into contemporary and paleo-data?
2. How do we link biological responses to environmental variables across spatial and temporal dimensions with the goal of future projections/scenario building/ model parameterization?
3. How can we study/what have we learned about the plasticity of organisms [communities and cultures] to adapt to environmental changes based on spatial and temporal patterns?
4. How can we put people into the picture and add societal relevance to our working groups? How do we scale from biological analogs to societies and future relevance?

Register for the conference at: https://essas.arc.hokudai.ac.jp/what_s_new/2021-essas-annual-science-meeting/. Expressions of interest/nominations to present for the workshop can be sent to **Ben Fitzhugh** (fitzhugh@uw.edu) or **Nicole Misarti** (nmisarti@alaska.edu) by **May 10th**.



CONTACT

Oceans Past News is a quarterly newsletter that aspires to both unite and inform the worldwide community interested in historical perspectives of marine social-ecological systems by providing insight into the wide-ranging and excellent work being done and the resources available. If you would like to propose work for OPN in the future, please contact **Emily Klein** (emily.klein04@gmail.com).

The next Oceans Past News will be out mid-July 2021. We warmly welcome submissions through mid-June 2021.

RESOURCES

The Oceans Past News Archive is available online: <https://oceanspast.org/newsletter.php>

More on the Oceans Past Initiative: <http://oceanspast.org>

OPI on Facebook: <https://www.facebook.com/groups/122288493384/> and Twitter: @oceans_past