

## History for the present.

I recently gave an internal seminar for the Pew Charitable Trusts exploring the wide range of historical work I've been involved in, aiming to showcase the breadth of research our community does, as well as how history matters for the conservation, management, and policy of today. I received many positive responses from my colleagues and requests to share the seminar recording – a reminder of another reason why history is so important. We connect over our shared past, and delight in the history of people and places that are new to us. It gives us a headwaters from which common goals can flow, and reminds us of common values we share. Our July Spotlight furthers that argument, helping to put into perspective the rates of mercury in coastal communities reliant on our oceans, and further contributions in this edition of OPN on new collaborations as well as new resources to encourage connection.

*Emily S. Klein, OPN Editor*

*Pew Charitable Trusts, Washington DC, USA*



## OCEANS PAST SPOTLIGHT\*

**Sentinel marine species in Unangan middens provide insight to natural mercury dynamics in the Aleutian Islands**

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The World Health Organization\* lists **mercury** as one of the top 10 contaminants of concern for human health. Coastal and Arctic communities are especially vulnerable to the effects of mercury contamination due to their dependence on fish and marine resources for food and sociocultural needs. In the Arctic, there are two primary sources of mercury: (1) natural inputs from volcanos, melting permafrost, fires, and river systems, and (2) human sources from mining and industrial activities farther south transported through the atmosphere and deposited in the Arctic.

Given this importance, our team of interdisciplinary scientists, including paleoecologists, archaeologists, volcanologists, physiologists, and toxicologists, embarked on a five-year NSF funded project to better understand mercury in our environment (Avery, Misarti, Funk, & Rea NSF-ARCSS/ASSP 1935816). Our goal is to investigate changes in environmental mercury dynamics by analyzing the mercury content of bones from predator species important to Indigenous Unangan communities in the Aleutian Islands and commercial fishing in the north Pacific Ocean and southern Bering Sea.

Long-lived, top predators serve as sentinels for environmental mercury as they bioaccumulate (lifetime accrual) and biomagnify (increasing with higher trophic position) this contaminant. In our work, modern, historical, and archaeological bone samples retrieved from archived collections and new excavations will track mercury concentrations over 3 millennia in three targeted species, Pacific cod (*Gadus microcephalus*), Northern fur seals (*Callorhinus ursinus*), and Steller sea lions (*Eumatopias jubatus*), in the Aleutian Islands. The Aleutian archipelago is a chain of volcanic

islands in the Northern Hemisphere spanning Alaska to Russia, separating the Bering Sea from the North Pacific Ocean. The significant volcanic activity in the eastern Aleutian Islands is well-studied and important for our work as a potential source of natural mercury. Our collaborators are actively investigating western and central Aleutian volcanic history, and information from volcanic tephra throughout the Aleutians will inform ancient periods where environmental mercury may have been more abundant.

In our preliminary work, we examined bone samples ( $n=36$ ) from Aleutian otariids (Steller sea lions and Northern fur seals) from 4000 to 200 calibrated years before present (cal BP), excavated from Sanak Island (Figure 1) in the eastern Aleutian Islands. These samples helped us determine if relatively high total mercury concentrations ([THg]) in modern sea lions increased from historic concentrations. Bone specimens showed large variation in [THg] (8 to 1640 ppb; Fig 2), and significant differences were observed in [THg] based on bone type ( $p=0.004$ ;  $145.3\pm 130.9$  vs.  $76.4\pm 68.4$ ; spongy vs. compact, respectively; Fig 3). Surprisingly, the greatest concentrations were not in contemporary bones as expected, but were observed at 3500 cal BP, a period of high volcanic activity.

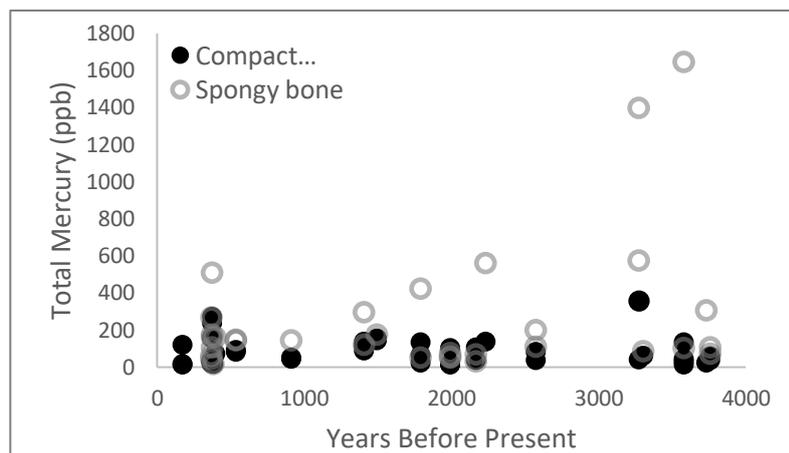
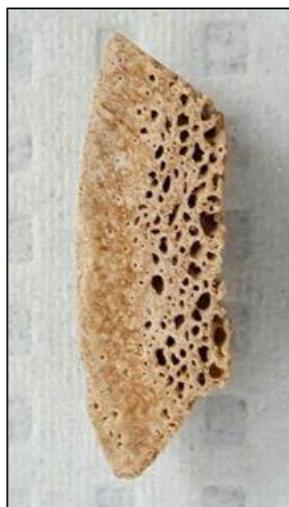


Fig 2. A wide range of Hg concentrations (8 to 1640 ppb) were observed in Steller sea lion and Northern fur seal bones from Sanak Island middens in the Eastern Aleutians. The greatest concentrations were observed 3500 calibrated YBP during a highly active period of volcanic eruptions in this region (USGS pers comm). Presented at SETAC Conference November 15-19, 2020.



Over the next few years, our team will analyze mercury and stable isotopes in bone of Aleutian marine predators throughout the Aleutian Islands within the context of food web dynamics, broad-scale climatic change, regional-scale regime shifts, acute natural occurrences and potential anthropogenic inputs, to determine key contributors underpinning mercury ecosystem dynamics in the Aleutian ecosystem. Results will provide critical insight into mercury and its influences over time, helping inform and protect communities reliant on our oceans into the future.

Project Email: [UAF-AleutianMercury@alaska.edu](mailto:UAF-AleutianMercury@alaska.edu)

Project Website: <https://ine.uaf.edu/werc/aleutian-mercury>

\*<https://www.who.int/news-room/fact-sheets/detail/mercury-and-health>

Fig 3 (left). Trabecular or spongy bone (left) and cortical or compact bone (right) are mechanically separated and analyzed separately for mercury content. Differences in bone turnover rate between spongy and compact bone may provide two different temporal windows in one bone cross section. Spongy bone provides an average Hg exposure over 3 to 4 years prior to death while compact bone likely reflects mercury exposure over the animals' lifetime.

## RESEARCH NEWS

**Environment-recruitment relationship of a small spring spawning herring population in the Baltic Sea during 1958-2015.** The influences acting on the recruitment abundance dynamics of commercial fish has a long history of research, but remains one of the most prominent questions in contemporary fisheries science. Several studies have shown that the environment may have a stronger effect on recruitment compared to that of the spawning stock biomass. By combining a suite of methods designed to detect the non-linear, non-stationary, and interactive relationships with long term data, we have re-evaluated the potential drivers and their interactions responsible for the multiannual dynamics of the recruitment dynamics of the Gulf of Riga (Baltic Sea) spring spawning herring (*Clupea harengus membras*) population at the longest time-span to date (1958-2015) allowing coverage of variable ecosystem conditions. We found that recruitment abundance was affected significantly by density of the prey (copepodite stages IV-V of small-bodied copepod *Eurytemora affinis*) and the severity of the first winter. Although spawning stock biomass was not a good predictor of recruitment, adding interaction with spawning stock biomass significantly

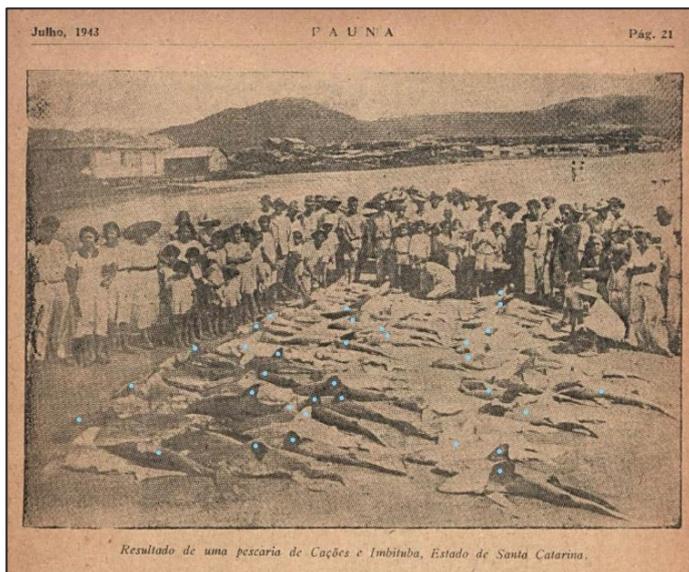
improved performance of the model. Hence, we conclude that the effect of the two environmental variables on recruitment was modulated by spawning stock biomass. While temporal changes in the environment-recruitment relationship were generally gradual, several abrupt changes were evident in the strength of these relationships. In addition, non-stationary, linear, and non-linear relationships were observed. Further progress in explaining recruitment dynamics can be achieved by using more sensitive measures of the true reproductive potential of the stock than the spawning stock biomass. Moreover, much of these patterns could not be seen without decades of data. To increase our understanding of the stock's



Baltic herring – image credit: University of Tartu.

dynamics, consideration should be given to adaptive changes in the reproductive investment in relation to the effects of environment and exploitation. ~ *Henn Ojaveer (University of Tartu, Estonia). Related publication: Ojaveer, H., Klais-Peets, R., Einberg, H. and Rubene, G. Spawning stock biomass modulation of environment - recruitment relationship in a marginal spring spawning herring (Clupea harengus membras) population. CJFAS.*

**Historical newspapers reveal human impacts in coastal Brazil.** Members of the **TRADITION** (ERC-CoG) project at the **Universitat Autònoma de Barcelona** (Spain) have reconstructed 150 years of anthropogenic impact on coastal and ocean ecosystems in Brazil using digitized historical newspapers. **Santiago Sandoval**, a Master's degree student in the team, has systematically analyzed hundreds of items in newspapers published between 1849 and 2016 in the state of Santa Catarina, one of the largest fish producing territories in Brazil. He found evidence for anthropogenic impacts on marine fish and shellfish dating back to the end of the 19th century. These historical newspapers were also found to contain information on local community perceptions of environmental and resource changes, thus potentially providing complementary data for studies involving local, traditional-citizen knowledge in conservation



and management programs. Digitization has made historical newspapers readily accessible through online platforms, offering a relatively cost-effective approach for historical socio-ecological analysis, particularly in times of world-wide mobility restrictions. As part of TRADITION, the study received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 817911. ~ *André C. Colonese, Institute of Environmental Science and Technology, Universitat Autònoma de Barcelona (Spain).*

*Related paper: 150 years of anthropogenic impact on coastal and ocean ecosystems in Brazil revealed by historical newspapers. 2021. Sandoval Gallardo S, Fossile T, Firme Herbst D, Begossi A, Geraldo Silva L, Colonese AC. Ocean & Coastal Management.*

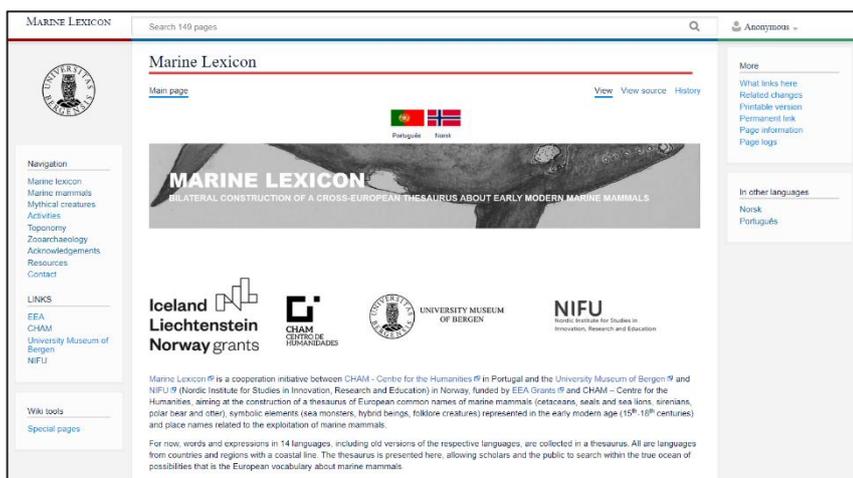
## COLLABORATIONS

**UN Ocean Decade 2021-30: endorsement of new Cultural Heritage Framework Programme.** To mark World Ocean Day on 8th June, 2021, a new **Cultural Heritage Framework Programme** was announced as one of the first Actions officially endorsed as part of the **United Nations Decade of Ocean Science for Sustainable Development, 2021-2030** (<https://bit.ly/3exLwET>). The Cultural Heritage Framework Programme (CHFP) is led by the **Ocean Decade Heritage Network** (ODHN, <https://www.oceandecadeheritage.org/>), established during the planning phase of the UN Ocean Decade to increase integration of the historical dimension of people's relationships with the sea within ocean science

and policy. The broad objective of CHFP is to ensure that cultural heritage contributes effectively to sustainable development over the course of the UN Ocean Decade. The CHFP will provide a supportive infrastructure for cultural heritage to be encouraged, shared, and supported. This includes advice and assistance to other programmes, projects, and activities that touch on ocean heritage in key areas such as: showcasing integration of heritage and ocean science; facilitating co-design; managing data and knowledge; developing capacity; enabling greater diversity and representation; encouraging ocean literacy, public engagement and outreach; and evaluating impact. Over the next ten years, the CHFP will ensure that **'the ocean we want'** is inspired and informed by the long and diverse histories and living heritage of people and the sea. Further news about the programme will be posted on ODHN's website, and we are keen to reach out to other networks and initiatives relating to the UN Ocean Decade that share common strands with ODHN and the Cultural Heritage Framework Programme. If this resonates with your own interests and aspirations, please get in touch. ~ *Antony Firth, Co-chair, ODHN (info@oceandecadeheritage.org, https://www.oceandecadeheritage.org/, https://twitter.com/DecadeHeritage).*

## RESOURCES

**Launch of the Marine Lexicon.** The Bilateral initiative "**Marine Lexicon – The construction of a cross-European thesaurus about early modern marine mammals**" held a launching session of its platform on the European Day of the Sea, May 20th. This platform is the result of collaborative work between Portugal and Norway, supported and funded by the **EEA Grants Bilateral Relations Fund** and **Centre for the Humanities (CHAM)** of the Faculty of Social and Human Sciences of **Universidade NOVA de Lisboa**. The team is composed by researchers from CHAM, the **University of Bergen** and the **Nordic Institute for Studies in Innovation, Research and Education (NIFU)**.



The initiative **Marine Lexicon** aimed at the joint construction of a dictionary of European common names of marine mammals (cetaceans, seals and sea lions, sirenians) and of elements represented in the early modern period (sea monsters, mermaids, hybrid beings and elements of folklore). This project allowed the establishment and strengthening of the network of contacts and historical research on whaling, seal hunting and appropriation of marine mammals, their trade and uses since medieval to modern times (15th-18th centuries).

The new platform combines common names, species, related information, relevant studies, and historical representations of marine mammals in 14 different languages. Besides the written and graphic component, the platform also has a sound component, with the pronunciation of these names in different languages. These animals are also associated with human activities, mythical creatures, toponymy and zooarchaeology. The user may search on each category, and the interface of the platform is in Portuguese, English and Norwegian.

This platform is organic and can be fed regularly - we can all contribute, making it grow. Our wish is that the Marine Lexicon became a working tool for those who are interested in the sea, its animals, their contact and relationships with humans, and in the interactions that influenced names, designations, places, and legends. Find it at [https://wiki.uib.no/marinelexicon/index.php/Marine\\_Lexicon](https://wiki.uib.no/marinelexicon/index.php/Marine_Lexicon); if you wish to give us feedback, please write us at [catedraoceanos@fchsh.unl.pt](mailto:catedraoceanos@fchsh.unl.pt). ~ *Cristina Brito, Joana Baço, and Nina Vieira (CHAM, NOVA FCSH).*

## RECENT PUBLICATIONS

Aune M, Raskhozheva E, Andrade H, Augustine S, Bambulyak A, Camus L, Carrolla J, Dolgov AV, Hop H, Moiseev D, Renaud PE, Varpe Ø. 2021. **Distribution & ecology of polar cod (*Boreogadus saida*) in the eastern Barents Sea: A review of historical literature.** *Marine Environ Res* 166: 105262. <https://doi.org/10.1016/j.marenvres.2021.105262>.

Bevacqua L, Reiner FR, Becerril-García EE, Elorriaga-Verplancken FR, Juaristi-Videgaray D, Micarelli P, Galván-Magaña F, Curiel-Godoy P, Giglio G, Tripepi S, Barca D, Sperone E. 2021. **Trace elements and isotopes analyses on historical samples of white sharks from the Mediterranean Sea.** *The European Zoological Journal*, 88:1, 132-141, DOI: [10.1080/24750263.2020.1853265](https://doi.org/10.1080/24750263.2020.1853265).

Marila M and Ilves K 2021. **Maritime Archaeology in Finland: History and Future Tasks.** *Journal of Maritime Archaeology*. <https://doi.org/10.1007/s11457-021-09303-2>.

Ojaveer H, Klais-Peets R, Einberg H, Rubene G. 2021. **Spawning stock biomass modulation of environment - recruitment relationship in a marginal spring spawning herring (*Clupea harengus membras*) population.** *Canadian Journal of Fisheries and Aquatic Sciences*. <https://cdnsiencepub.com/doi/10.1139/cjfas-2021-0018>.

Ólafsdóttir GÁ, Edvardsson R, Timsic S, Harrison R, Patterson WP. 2021. **A millennium of trophic stability in Atlantic cod (*Gadus morhua*): transition to a lower and converging trophic niche in modern times.** *Sci Rep* 11, 12681. <https://doi.org/10.1038/s41598-021-92243-7>.

Roque AC, Brito C, Veracini C, Vieira N, Freitas JG. 2020. **Peoples, Nature and Environments: Shaping Landscapes.** *Humanities Special Issue*: [www.mdpi.com/journal/humanities/special\\_issues/shaping\\_landscapes](http://www.mdpi.com/journal/humanities/special_issues/shaping_landscapes).

Roque, AC, Veracini C, Brito C. 2021. **Shaping Landscapes: Thinking On the Interactions between People and Nature in Inter- and Postdisciplinary Narratives** *Humanities* 10:2 75. <https://doi.org/10.3390/h10020075>.

Sandoval Gallardo S, Fossile T, Firme Herbst D, Begossi A, Geraldo Silva L, Colonese AC. 2021. **150 years of anthropogenic impact on coastal and ocean ecosystems in Brazil revealed by historical newspapers.** *Ocean & Coastal Management* 209:105662. <https://doi.org/10.1016/j.ocecoaman.2021.105662>.

## ANNOUNCEMENTS

**Editorial opportunity.** The **Conservation Paleobiology Network** seeks a new member for their newsletter editorial team. The ideal person would be a graduate or undergraduate student interested in conservation paleo, historical ecology, archaeology, or related disciplines. If you are interested or have questions, please email [conservationpaleo@floridamuseum.ufl.edu](mailto:conservationpaleo@floridamuseum.ufl.edu).

**Pre-announcement for the 2022 Oceans Past Conference:** The 2022 conference will be held in-person at the University of Washington, Seattle, United States, from the 22-25 June 2022. The first day will be held as a joint meeting with the **Ecosystem Studies of Subarctic and Arctic Seas Program**. More details will be revealed very soon. In the meantime, please note these dates in your diary and we look forward to seeing you in Seattle next year!

## 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](mailto:emily.klein04@gmail.com)).

*The next Oceans Past News will be out mid-October 2021. We warmly welcome submissions through mid-September.*

## 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](https://twitter.com/oceans_past)