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# Editorial: Living on the edge—interdisciplinary perspectives on coastal and marine ecosystems in human prehistory

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Editorial on the Research Topic
Living on the edge—interdisciplinary perspectives on coastal and marine ecosystems in human prehistory

## Introduction

Coastal and marine ecosystems dominate the world's surface area. Since the beginnings of the discipline, prehistoric archaeology has had an interest in the human use and habitation of these environments, may it be in the form of seafaring or impressive shell middens (e.g., Forchhammer et al., 1852). In 1968, however, the influential archaeologist Lewis Binford relegated intensive human use of aquatic resources to a set of "post-Pleistocene adaptations" that included the development of agriculture. For most of the 20th century, interest in coastal and maritime cultures focused on the Holocene period that shows much evidence for hunter-fisher-gatherer, farming, and early state communities around the globe having diverse ties to shores and oceans. Deeper time perspectives on the role of these ecosystems in human evolution have received attention only recently, with empirical data still limited, due largely to the effects of post-glacial sea level rise.

Since the beginning of the new millennium, ongoing work on the relationship between humans, coasts and oceans worldwide has become decidedly interdisciplinary, with research expanding further back in time to include the whole timespan of human existence, and potentially even before then (e.g., Zilhão et al., 2020). Inspired by the seminal work of Erlandson (2001) and others, the archaeology of aquatic adaptations saw an increase in scholarly publication based on quantitative and scientific approaches—including zooarchaeology, geoarchaeology and marine geology, genomics, isotopic biochemistry, sclerochronology, and modelling studies—and intensified work on the Pleistocene (e.g., Marean, 2014; Villagran, 2014; Jerardino, 2016; Klein and Bird, 2016; Will et al., 2019). This Research Topic brings together articles interested in deep-time, diachronic, and multidisciplinary perspectives on the varying role of coastlines, oceans and marine resources for past societies and human evolution, including ecological, geographical and geological aspects.

## Interdisciplinary perspectives on coastal and marine ecosystems in human prehistory

The articles in this Research Topic synthesise interdisciplinary data ranging from the late Middle Pleistocene to the recent past, covering archaeological sequences from South America, North America, Europe and Africa.

Bicho and Esteves review evidence for coastal adaptations of Pleistocene hunter-gatherers during the Middle and Upper Paleolithic in Atlantic Iberia including behavioral, geographic and geological aspects. They find that Neanderthals and modern humans inhabited coastal ecosystems and consumed diverse marine foods in a similar way, with most differences between sites likely stemming from variable distances to the ocean.

Wurz et al. report new results of U-Th dating, taxonomy and taphonomy of the shell midden deposits from the Middle Stone Age (MSA) site of Klasies River, South Africa. The interdisciplinary approach demonstrates that groups of early modern humans exploited coastal ecosystems in a stable and systematic manner by at least 110,000 years ago. Working at the same site, Reynard performed the first taphonomic analysis of its faunal remains. Combined with existing taxonomic and contextual data, his results provide a diachronic overview from MIS 5-3 on the relationship between human behavior and paleoenvironments by reconstructing occupation intensity in the local paleoecological context.

Will et al. combine archaeological findings with coastal geomorphology, GIS modelling and offshore marine geophysical investigation to assess the extent of potential Pleistocene coastal adaptations in eastern South Africa. The review concludes that while sites are still scarce, people settled coastal landscapes and consumed marine resources during both the MSA and LSA, with most past evidence likely being submerged.

The Zanzibar Archipelago during the last 20,000 years and the relation between humans and the intertidal zone constitute the focus of Faulkner et al. Reviewed environmental, archaeological, and modern socio-ecological evidence shows the long-term but complex and changing connections of societies with different socio-economic structures and these coastal ecosystems and potential drivers behind these patterns are discussed.

In a methodology-focused article, Simões and Aldeias employ micromorphological analyses with microscopic FTIR of shells to demonstrate macroscopically invisible fire use in midden deposits. Combined with experimental work, these methodological insights are applied to two Mesolithic shell midden contexts from Portugal, yielding novel evidence for the cooking of shellfish.

Gusick et al. report on the exploration of an extensive submerged landscape located around California's Northern Channel Islands, which have lost ~75% in area to rising seas since the last glacial maximum. They use remote sensing and coring to reconstruct this drowned landscape and document the presence of intact soils beneath the seafloor, suggesting that Late Pleistocene sites may be found with additional research.

Dillehay et al. examine the development of mixed maritime and terrestrial economies along the arid coast of Peru between 14,500–3,800 years ago. Between ~7,500–5,000 years ago, adding agricultural production to rich local fisheries led to the rise of complex civilization marked by social differentiation, proto-urban populations, monumental public architecture, elaborate ritual iconography, and intensive landscape modification.

Reyes et al. focus on the influence that permeable geographical barriers in western Patagonia's archipelago could have had on the circulation and contact among canoe populations. Most interesting are emerging geographical patterns indicating differences in cultural trajectories among the canoe groups that inhabited this fragmented part of the southern Pacific coastal region.

Sanchez et al. study the indigenous engagement with coastal resources for over ~7,000 years on the central California coast. Using a historical ecological framework, the authors identify the use of diverse marine and terrestrial resources by mobile groups who intensified their economies by the Late Holocene, and created habitat mosaics by fire management that are still visible today.

The British Columbia (Canada) clam gardens are studied by Holmes et al. using an integrated approach combining GIS, drone imagery, and radiocarbon dates. The study reveals a close, temporal relationship between the clam gardens and increased human settlements in Kanish and Waiatt Bays, indicating the need for sustainable food production to support larger populations.

## Summary and outlook

A golden thread throughout the Research Topic concerns the feedback between changing landscapes, climate, ecology and human behavior. The articles illuminate the deep-seated and complex connections of humans with coastlines, oceans, and the organisms living there, while also highlighting the long-term influences our species had on them. Considering current global climate change and the biodiversity crisis that affects some ecosystems more strongly than others, the UN declared 2021-30 the "Decade of Ocean Science for Sustainable Development." Archaeological research demonstrates the deep history of humanity's role as active agents of ecosystem changes with implications for modern ecological, socio-cultural, and economic systems (Boivin et al., 2016; Stephens et al., 2019). Archaeology can provide unique windows into the positive and negative ways in which humans have lived in and engaged with shores and oceans. Future research in island and coastal archaeology—examining the timing, duration, impact, magnitude, and possible reversibility of anthropogenic change in the past—may also provide important knowledge and baselines for more effective restoration of beleaguered coastal and other aquatic ecosystems and fisheries in the future.

## Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

## Publisher's note



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