International webinar

Investigate the shore, sound the past

new methods and practices of maritime prehistory

2 & 3rd Dec. 2020

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IRN PrehCOAST / French Prehistoric Society

Organizers

Grégor Marchand, Yvan Pailler and Pierre Stéphan

University of Brest / IUEM, December 2nd & 3rd 2020

When prehistoric archaeology dips a toe cautiously into the sea, it starts to lose sight of its landmarks. Human occupation at the interface between the maritime and landward domains is a complex research topic that can be hard to grasp, for three reasons. First and foremost, the position of the coastline has fluctuated over time as a result of marine transgressions, erosion, sedimentary inputs or isostatic recovery. Revealing these habitats and other traces of human activity on the foreshore requires a wide range of techniques that is constantly evolving: geophysical surveys, Lidar, coring, etc.

Secondly, the multiplicity of environmental domains that people exploited means that a very wide range of archaeological and archaeozoological evidence is left behind, requiring a wide range of approaches. The study of mammals, fish, birds and shellfish enhances our knowledge and provides a better understanding of how the natural cycles - seasons or tides - were managed (or rather, adapted to) by fishermen and by agro-pastoralist communities. Particular attention needs to be paid to the interdisciplinary nature of the investigation, and to the differing time-frames involved in acquiring different kinds of data. The degree to which this work can be intermeshed will determine the success or failure of these scientific programmes.

Thirdly, prehistoric coastal settlement should not be regarded as a kind of tightrope walk on the edge of an ecotone, but rather as the starting point of economic and social networks that extend far into the land beyond the coast, as well as linking coastal areas: for example, some whalebone paddles or shell ornaments ended up far inland, travelling along such networks. Once again, the study of these artefacts involves the use of state-of-the-art scientific methods.

Finally, we cannot ignore the regulatory aspects that weigh on archaeological and Paleoenvironmental interventions in coastal environments: the diversity of regulations on human or natural heritage and the multiplicity of institutional stakeholders can generate significant bottlenecks in research, even though marine erosion continues in its unrelenting way.

The workshop «Exploring the coast, sounding out the past: methods and practices of maritime prehistory» therefore offers a comprehensive assessment of these new methods of exploring prehistoric habitats in the maritime domain, opening up scientific perspectives. This meeting, which focuses on the methodological and technical aspects of prehistoric coastal land use – a topic that is currently undergoing a transformation in our understanding of it – also aims to address the heritage, ecological and political problems encountered by scientific research when dealing with prehistoric societies on the world's coasts.

This international round table is supported by the European Research Network (IRN) project «Coastal-inland dynamics in prehistoric hunter-gatherer societies" (PrehCOAST), supported by the Institut Ecologie et Environnement of CNRS since January 2019. It also benefits from the scientific dynamics of the ArMeRIE programme (Maritime Archaeology and Interdisciplinary Environmental Research), EUR Isblue, CNRS foundings, etc

The language of the event will be English. Proposals for papers (only in English) should be sent to:

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More information is available on the website
of the French Prehistoric Society

http://www.prehistoire.org/

DETAILED PROGRAM

WEDNESDAY, 2ND OF DECEMBER, 2020

Session 1 To detect: new data, new tools		
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09:30-09:45	**François Lévêque** (Univ. of La Rochelle, France) *Geomagnetic prospection to the rescue of maritime prehistory: potentials and limits*	*p. 11*
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10:15-10:45	Questions	

Session 2 To prospect and excavate: field practices in coastal contexts		
11:00-11:15	**Berg-Hansen *et al.*** (Museum of Cultural History, Univ. of Oslo, Norway) *Coast-concepts in Norwegian Stone Age Archaeology*	*p. 14*
11:15-11:30	**Elías López-Romero *et al.*** (Univ. Complutense de Madrid, Madrid, Spain) *Prehistoric human occupation in the Western Rias of Galicia (Northwest Iberia): a review of methods and prospects*	*p. 15*
11:30-11:45	**Gregor Marchand *et al.*** (CNRS, UMR CReAAH, Univ. Rennes 1, Rennes, France) *Geoarcheology and Prehistory of the Saint-Pierre-et-Miquelon archipelago: theoretical axes, methods and first results*	*p. 16*

16:00-16:15	**Jean-Marc Pétillon *et al.*** (CNRS, UMR Traces, Toulouse, France) *Whale species and their exploitation on the Atlantic shore in the Late Upper Paleolithic: the evidence from Santa Catalina (Lekeitio, Bizkaia)*	*p. 26*
16:15-16:30	**Catherine Dupont & Yves Gruet** (CNRS, UMR CReAAH, Univ. Rennes 1, Rennes, France) *A question of size! When sieving increases the activities of fisher-hunter-gatherers*	*p. 27*
16:30-16:45	**Jean-François Cudennec *et al.*** (CNRS, UMR LEMAR, Univ. Bretagne Occidentale, Brest, France) *Determining a season of collect from oxygen isotopes of Patella vulgata shells: the case of Molene archipelago (Finistère, France)*	*p. 28*
16:45-17:00	**Meghan Burchell *et al.*** (Memorial University of Newfoundland, Canada) *The Site, The Shell, The Species: Shifting analytical resolution and interpretation in shell midden archaeology*	*p. 29*
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THURSDAY, 3RD OF DECEMBER, 2020

Session 4

To Model (landscape changes, population dynamics, human mobility and adaptations)

09:00-10:00	Conference of **Alison Sheridan** (Natural Museum Scotland) *How about 'Maritime movement and interaction during the British Neolithic' ?*	*p. 30*
10:00-10:15	**Inger Marie Berg-Hansen *et al.*** (University of Oslo, Museum of Cultural History, Norway) *New Perspectives on Old Shores: Current approaches on the Stone Age in Eastern Norway*	*p. 31*
10:15-10:30	**Edijs Breijers *et al***. (Institute of Latvian history, University of Latvia, Latvia) *Detecting the displacement of the Baltic basin's ancient shorelines via clustering terrain and distance data along the glacioisostatic uplift axis*	*p. 32*

10:30-10:45	**Benjamin Gehres** (CNRS, UMR CReAAH, Univ. Rennes 1, Rennes, France) *Archaeology of island economies: Diachronic and paleo-economic approaches to island occupations through the contribution of ceramic analysis*	*p. 33*
10:45-11:00	**Jorge Calvo Gómez *et al.*** (CNRS, UMR CReAAH, Univ. Rennes 1, Rennes, France) *Technology of the maritime hunter-fisher-gatherers in the Cantabrian coast: preliminary results of the functionality of the knapped tools from El Mazo and El Toral III through the use-wears analyses*	*p. 34*
11:00-11:30	Questions	
11:30-11:45	**Neil Carlin *et al.*** (UCD School of Archaeology, University College Dublin, Ireland) *Maritime and material connections in the later Neolithic of Ireland and northern Britain*	*p. 35*
11:45-12:00	**Stephanie Piper** (Department of Archaeology, Univ. of York, UK) *Empty Edges? 10 Years of Searching for Prehistory on the Atlantic Coasts of Scotland*	*p. 36*
12:00-12:15	**Fritz Jürgens & Oliver Nakoinz** (Institute of Prehistoric and Protohistoric Archaeology, Kiel University, Kiel, Germany) *Maritime Societies? A diachronic view from two Baltic Fjords*	*p. 37*
12:15-12:30	**Clément Recq & Héloïse Barbel** (Centre d'études Nordiques, département de géographie, Université Laval, Québec, Canada) *Methodological stakes upon Inuit material heritage under coastal erosion*	*p. 38*
12:30-13:00	Questions	

Marine geoarchaeology and maritime prehistory

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Maritime aspects of prehistory have been attracting increasing attention over the last decade, reshaping the agenda for research into prehistory. In parallel there have been rapid advances in the scale and reach of marine geoarchaeological investigations in both commercial and academic contexts, leveraging recent technological advances. In this paper I will explore recent results from work on the Channel and French Atlantic coast regions, reflecting on how they have impacted on our understanding of the past, and the potential for future research.

Looking for the hidden Palaeolithic: a preliminary report on an underwater survey of the continental shelf of the Bay of Biscay

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More than one third of the land area occupied by Palaeolithic human groups in Europe was drowned by the Holocene sea level rise. It is to be expected, therefore, that the main settlements of the Palaeolithic groups are below current sea level. The continental shelf of the Bay of Biscay holds some features that make it particularly promising for this kind of research:

- The density of the Palaeolithic and Mesolithic settlements near the current coastline is among the highests in Europe, which suggests that it was part of a much larger network reaching what it now the flooded continental shelf.

- The narrowness of the continental shelf, which reduces the area to be explored and places the prehistoric sites at short distance from the modern coastline.

- There is a subseafloor karst where archaeological sites similar to the well known cave and rockshelter sites inland might exist.

This communication presents the preliminary results of PaleoSuB, a research project which intends to search evidence of prehistoric human activity in this area. A broad range of advanced mapping and environmental reconstruction techniques have been applied to identify and investigate locations prone to human settlement, jointly with the study of the landscape and coastline evolution, and the environmental setting of the hunter-gatherer groups.

Geomagnetic prospection to the rescue of maritime prehistory: potentials and limits

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In near-surface geophysical imaging, regardless of the method, the spatial density of the measurements determines the accuracy of the observations that can be obtained. Since magnetic field measurements do not require contact with the ground, they can be made continuously while moving. As a result, and thanks to the high measurement rates of magnetometers, geomagnetic prospecting is a powerful method for obtaining information with high spatial resolution in a limited acquisition time. However, the conventional field of application of geomagnetic prospecting is open fields with a flat, monotonous surface with low vegetation, or after harvesting in field crops. There are two reasons for this: first, the absence of obstacles allows movement along evenly spaced profiles and second, the topographic effects on magnetic field deformation are limited to those of micro-reliefs generated by tillage. Nevertheless, the magnetic contrast between the bedrock and the object revealed by the imagery must be significant. A soil is generally more magnetic than the substrate on which it develops. By more magnetic we mean that it is more capable of carrying a magnetization. This can be permanent, such as the thermoremanent magnetization produced by a past fire that raised the temperature of the substrate to several hundred degrees Celsius. During cooling, the magnetic order generated by the geomagnetic field of the time is frozen. This permanent magnetization is also associated with a magnetization induced by the interaction with the geomagnetic field. In the most favourable cases, magnetic minerals (known as ferrimagnetic) formed by fire from minerals containing iron in little or no magnetic form (known as quanted antiferromagnetic or paramagnetic respectively) increases the magnetizations carried by the heated materials. In the context of prehistoric sites, there is usually no highly magnetic object. Geomagnetic anomalies, which reflect the local deformation of the geomagnetic field by these sources, remain modest. Knowing that an anomaly attenuates very rapidly as it moves away from the source that generates it (according to a law in (1/r)n with a value of n close to 3, r being the distance between the source and the position of the magnetic field measurement), it is important to stay close to the surface of the ground so as near the potential source being sought. In a coastal context, the topography can be rugged, generating a significant topographic effect. Vegetation

may also be bushy. The distance between the ground surface and the measurement then becomes irregular. In order to take these effects into account, it is necessary to obtain both a precise 3D spatialization of the measurements and a topography with a similar accuracy, in relation to the characteristic dimension of the entities. Finally, the temporal variation of the geomagnetic field, often of similar amplitude to that of the signal under study, must be taken into account. In complex cases, the gradiometric measurement (pseudogradient, or vertical pseudogradient) becomes unfavourable compared to the so-called total field measurement. If the described limits are surpassed, the search for prehistoric site foci by geomagnetic prospecting can be fruitful.

Back to Hoedic: recording the breton mesolithic cemeteries from a 21st century perspective

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The excavations carried out by Saint-Just and Marthe Péquart at Téviec (1928-1930) and Hoedic (1931-1934) provided one of the richest funerary assemblages of Europe's last hunter-gatherers. However, in spite of the high standards of the Péquarts' field work and the good preservation of the materials, dealing with old Museum collections presents serious limits. Issues such as the chronology of the funerary structures, the formation processes of the sites, or the relationship between the graves and other coeval features are hard to study without direct contact with the field. Since 2018, a Spanish-French team has started a new programme of field work at Hoedic, intending to re-analyse the cemetery and its context using 21st Century techniques. This communication presents the results of the two first field seasons, which have focused on a detailed exploration of the site using surveying techniques such as Ground-penetrating radar (GPR), Electrical resistivity tomography (ERT), Magnetogradiometry, and mapping of the magnetic field intensity. Moreover, sedimentological cores and test pits were opened, allowing us to get a precise pre-view of the stratigraphy. This has permitted us to establish the extension of the Mesolithic site, and to select some areas where anomalies suggesting the existence of Prehistoric features exist. That will allow us to plan the new excavations on a realistic basis.

Coast-concepts in Norwegian Stone Age Archaeology

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The coast plays a major role in Norwegian Stone Age archaeology. Hundreds of sites from the Mesolithic and Neolithic periods were situated close to or directly at the shorelines. They witness of the economic, social and ritual importance of the coastal zone. However, the "normality" of coastal sites seems to have prevented further reflections about the concepts that have been applied to study coastal sites and the relevance of the coast in the Stone Age.

Our talk will identify concepts and epistemological perspectives of how archaeologists have dealt with coastal issues in Stone Age archaeology in a research historic perspective – from early geoarchaeological studies focussing on land uplift and coastal sites ("the beach model"), via more processually oriented division of landscape spaces and their environmental characteristics. We will also discuss the sites' economic functions, based on more recent, ethnoarchaeologically influenced, perspectives on taskscapes, movement in and experience of the coastal zone.

Prehistoric human occupation in the Western Rias of Galicia (Northwest Iberia): a review of methods and prospects

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Located in the Northwest of the Iberian Peninsula, Galicia is the region with the longest coastline in Spain. This coast is characterized by the presence of several estuaries (Rías), the bigiest of which are located on the West; a number of islands and islets can be found within at the mouth of such rias, as it is the case in Ría de Viio, Ría de Pontevedra and Ría de Arousa. Having being a focus of population atraction since prehistoric times, coastal areas in Galicia are home to a whole area of archaeological and cultural heritage remains, from prehistory to present. Unlike other European Atlantic regions, the occurrence of Neolithic and Bronze Age sites in topographically low coastal locations has traditionally been considered rare in the area. However, prehistoric human subsistence strategies in the region largely benefited from the extremely rich coastal and maritime resources, and there is increasing material evidence of sites from these periods as well as of long-distance exchange of materials and ideas between these and other European Atlantic communites.

In this presentaton we will focus on the different survey, feldwork and dating methods and approaches that have recently been undertaken in these Western Rias and we will discuss the future prospects of prehistoric coastal research in the area.

Geoarcheology and Prehistory of the Saint-Pierre-et-Miquelon archipelago: theoretical axes, methods and first results

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A first heritage approach was initiated in 2017 by the Prefecture of Saint-Pierre and Miquelon and the Ministry of Culture in order to give a temporal depth to a proposal to classify the archipelago as UNESCO World Heritage Site. It also involved intervention on the Amerindian and Paleoeskimo site of Anse-à-Henry, which has been strongly affected by marine erosion. The team gathered around Réginald Auger and Grégor Marchand wished to install this archaeological intervention in a wider reflection on the occupation networks of the entire archipelago before the European occupations, which should lead to an archaeological map. As a matter of principle, it is no longer possible to neglect erosion, which strongly constrains the nature of the «archaeological signal» delivered by the sediments and which damages the heritage. The landscapes of the past and the understanding of the resources available at different times are not possible either without a thorough investigation of geographical conditions. The archaeological project in Saint-Pierre and Miquelon therefore immediately associates geomorphology and archaeology, in the service of a strong societal demand. This paper presents the methods adopted, with an initial state of the archaeological map established after processing LiDAR images in 2018, followed by surveys of prehistoric sites (habitats and volcanic rock extraction workshops). Finally, it focuses on the tools deployed at Anse-à-Henry, to identify habitat areas and propose an erosion model that should lead to recommendations to anticipate its destruction.

Methods in coastal and intertidal archaeology: the example of the Gironde estuary coastline

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The Gironde estuary in SW France is the largest in Western Europe and has attracted human populations since prehistoric times. From the 1970s to the 1990s, intense archaeological research was undertaken on the long and highly dynamic coastline just south of the estuary mouth. Innovative interdisciplinary research since 2014 is yielding new information about the settlement and landscape dynamics and about the long-term interaction between human societies and the environment. Significantly, this research has been exacerbated by increased coastal erosion in the area. This erosion process not only results in the destruction of archaeological sites and sedimentary archives but also forces us to adapt our working strategies and planning to a very rapidly changing environment. In the course of these six years of research in the area, a number of original fieldwork and survey methods have thus been implemented or adapted to face this situation. In this presentation we will discuss these constraints and methods and how they could be applied to other coastal and intertidal areas.

The collaborative project ODySéYeu reveals the existence of a coastal bog frequented by humans at the end of the Neolithic

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As a result of global climatic change, low-lying coastal areas are particularly exposed to increasing risks, especially storms events and human activities. Putting the different time scales into perspective is essential in order to identify the sources of these impacts (sea level rise, storm frequency, human activities, etc.). Thus a better knowledge of past processes will help to understand the different phases of sea level rise since the beginning of the Holocene. The ODySéYeu (Observation de la Dynamique Sédimentaire de l'île d'Yeu) project is a participatory project which involves the «Islais» themselves (schoolchildren, students, associations, the town hall,…) to acquire and collect different types of observations and measurements on the island's beaches. Thanks to these high-frequency observations, a peat outcrop with bovid tracks was identified, after a storm in May 2020, on the «Plage des Sapins» (sandy beach). A survey was conducted during the following summer, focusing on sample collection and 3D data acquisition. Dating allow comparison of this local peat outcrop with other coastal ones described on the Atlantic seafront. These peats are diachronic. Their ages range from 8000 years cal. BP at the base of submarine cores, at about – 20 m water depth (Baltzer *et al.*, 2014), to the Middle Ages at the base of the actual coastal barrier (Van Vliet-Lanoe *et al.*, 2014b). On the Rhuys peninsula, in the Gulf of Morbihan, peat deposits covering a period ranging from 7000 to 1000 years cal. BP have been described by Visset and Bernard (2006). Using the sea-level index points method of Stephan *et al.*, (2014), these new results will contribute to refine the sea level rise curve for the Vendée region.

Holocene environmental evolution and relative sea-level (RSL) change in north-eastern Spain

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Fluvial paleovalley deposits provide critical data to study changing environments during Holocene relative sea-level (RSL) change. To this end, several cores from such deposits located in north-eastern Spain were studied. All such cores reached the bedrock of Mesozoic age, providing a complete Holocene history. Paleoenvironmental reconstructions were performed applying a multi-proxy approach based on benthic foraminifera and grain size and put in a temporal framework using a series of radiocarbon dates. The benthic foraminifera assemblages varied from near-marine and brackish intertidal deposits to salt marsh environments. The grain size was sand-dominated in near-marine and brackish intertidal environments and mud-dominated in the salt marshes. The chronology was constrained by radiocarbon dates from plant debris, marine shells and wood fragments.

Paleoenvironmental reconstructions show there was a progressive shallowing of the estuaries as rates of RSL reduced during the Holocene. Between ~11,000 and 7,000 cal BP pre-Holocene fluvial gravels were replaced by both sandy marine and brackish intertidal sediments. Since then tidal flat sediments have been replaced by accumulating muddy salt-marsh deposits that were overlain by anthropogenic deposits derived from agricultural, dredging and dumping activities throughout the last 200 years.

This information was used to produce an updated regional Holocene RSL curve based on new and age recalibration of previous sea-level index points and marine limiting dates. Sea-level index points locate RSL in space and time and for this study were derived from salt marsh samples. Marine limiting dates provide the lower limit on the position of RSL at a specific point in time and for this study were derived from near-marine and brackish intertidal samples. Data show there is no significant RSL fall during the Holocene and, at no time, RSL exceeded the current position. Rates of RSL change were highest during the early Holocene and decreased over time due primarily to reduced input of meltwater.

Coupling historical map and sedimentological archives to rebuilt the Belle-Henriette lagoon paleoenvironment

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This work exposes the paleoenvironmental evolution of the Belle-Henriette lagoon and suggests a hypothesis about the infilling of the former Golfe des Pictons, in western France. Nowadays known as the Marais poitevin, this marsh is the second biggest wetland in France, covering nearly 100,000 ha. A transect composed of five sediment cores was collected in 2019 using both a Beeker gravity corer and a vibracore corer, starting from the sandy barrier to the center of the lagoon. High-resolution elemental analyses of sediment cores were done using an Avaatech XRF core scanner, and X-radiographs were taken using a Scopix system. Grain size analyses were measured at a resolution of 1 cm using a Malvern 2600 laser diffraction particle size analyzer. Dating was derived from sedimentary profiles of 137Cs and 210Pb, measured on an aliquot of 2 g dried sediment using a low background, well-type γ spectrometer (Canberra). Historical maps were extracted from the Bibliothèque François-Mitterrand and from departmental archives. Nearly fifty maps were studied to understand the composition of each detected layer and to reconstruct the historical landscape of the western part of the Marais poitevin. This work gives clues about the creation of this marsh during the last few centuries, by the infilling of the former Golfe des Pictons and the evolution of the Lay river (former St. Benoist) estuary. We also expose the creation of the Belle-Henriette lagoon during the last decade by the progradation of several coastal spits.

The message carried by palynological tools (pollen and dinoflagellate cysts) in paleo-archeo-sciences from coastal to marine sediment archives (Bay of Brest, South Brittany, Loire)

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During the Holocene (the last 11.7 kyr), the multiple and interlocking natural (i.e., atmospheric and oceanic circulations) and anthropogenic forcings have contributed to significant landscape changes with major impacts on continental, coastal and marine ecosystems. For several decades, palynological studies have attempted to characterize the evolution of (i) landscapes through terrestrial bio-indicators (i.e., pollen grains and other non-pollen palynomorphs), as well as (ii) surface hydrological conditions (temperature, salinity), nutrient inputs and trophic conditions through marine bio-indicators (i.e., dinocysts).

Recently, studies carried out on surface sediments collected in the Loire estuary (Ganne *et al.*, 2016) and in the Bay of Brest (Lambert *et al.*, 2017) have shown, in northwestern France, a great distortion - well known to palynologists - between pollen percentages recorded in subactual sediments and current vegetation cover on land. This distortion is characterized by an over-representation of tree taxa (e.g. Quercus, Pinus) and an under-representation of herbaceous plants (e.g. ruderal and adventives plants, Cerealia type) in pollen records. On the other hand, a comparative study using Mesolithic palynological records distributed along a proximal (cores: MD08-3204CQ and VC2012-08-PQP: 7 km from the coast; KS24: 2 km from the coast) - distal (core: VK03-58bis: 22 km from the coast) transect, has recently led to a better understanding of the distribution, concentration and diversity of palynomorphs (pollen and dinocysts) off the Brittany coast. All these studies allow a better understanding of the palynological signal variations from the continental to the marine domain, that depend on dispersion modes, pollen productivity rates, preservation capacities, hydrodynamic influence, etc...

The recent comparison of palynological sequences has shown that a strengthened SPG (North Atlantic sub-polar gyre) associated with sustained stormy activity in Brittany, and more generally in Northern Europe (positive NAO-like conditions), lead to the increase of anthropogenic taxa in sites constrained by inputs from the southern-Brittany catchments (GL3 core; Fernane *et al*., 2015). Conversely, the percentages of anthropogenic taxa decrease in areas associated with the Loire watershed (CBT-CS11 core; Penaud *et al.*, 2020). Such observations demonstrate that the palynological signal is closely associated with atmospheric and oceanic conditions that affect its transfer to the marine environment. This illustrates the difficulty of reading anthropogenic dynamics, in terms of human occupation dynamics, over the last thousands of years in coastal sedimentary archives. A comparison including coastal and marine palynological records between the north and south Brittany is envisaged within the framework of a doctoral thesis (Ophélie David, UBO-UBS thesis, « *Variations climatiques holocènes et dynamiques d'anthropisation des bassins versants depuis le Néolithique : comparaison Bretagne Nord / Bretagne Sud* »).

Impacts of agro-pastoral societies on biodiversity: palaeogenomic, palaeoecological and archaeological approaches

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The Mesolithic/Neolithic transition saw the emergence of a new way of life based on agriculture and stock management. With the arrival of Neolithic populations, new taxa appeared in Europe, profoundly reshaping the fauna and flora communities. These species, whether domesticated or synanthropic, were favored by the agricultural societies. The different climatic conditions encountered by these populations and associated taxa, as well as the rapid climatic changes experienced during the Holocene, may have locally influenced their adaptations. Archaeological, bioclimatical and geological contexts of several sites on the North Atlantic coast already provide some elements to understand past ecosystems and their exploitation locally by human societies.

In particular, the study of sedimentary archives and analysis of micro and macro botanical remains from North Atlantic coast environmental sites, have provided first keys to study the dynamics of biodiversity during this agro-pastoral transition. However, the use of these botanical remains can be complicated and some taxa are found with difficulty, if at all, in archaeological sites because of their poor preservation. The development of paleogenomics,

thanks to next-generation sequencing and enrichment-based methods, allow us to access to ancient DNA (aDNA) and use its information to complement previous studies.

Here, we propose an innovative approach based on aDNA and investigate an enriched capture method to test the possibility of tracking past changes of communities via sedimentary aDNA. We assess that mitochondrial and chloroplastic DNA can be successfully retrieved from ancient sediments and could characterize past biodiversity. Our results on Suscinio and Rohu-Pargo peatbogs bring evidences of the efficiency of aDNA as a complement to archaeological, biological and geological data, leading to new perspectives to investigate diachronic changes of past living communities. The comprehension of past ecosystems will help us to clarify the dynamics of biodiversity during the Neolithic transition in Armorica on the Atlantic coast.

Seaweed as food, fodder and fertiliser in the North Atlantic Islands

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Seaweed has long been neglected in coastal archaeological interpretations as a potential food-source and resource more generally, likely because archaeological evidence of seaweed presence on archaeological sites tends to be sparse due to its fast decay in most contexts. However, biogeochemical analysis of zooarchaeological and archaeobotanical remains may provide direct evidence of seaweed consumption by people and domestic stock or its use to fertilise cultivated soils. Recent research on the Orkney Islands (Scotland) has shown that around a quarter to possibly up to half of all tested Neolithic Orkney sheep skeletal remains delivered stable carbon isotope values ($\delta^{13}C$) consistent with the consumption of seaweed (ntotal = 117). Similar seaweed foraging practices by domesticated animals particularly in winter are known historically from France, Ireland and Iceland, among others, but further research is required to assess the occurrence of prehistoric seaweed-foraging outside of Orkney. Fertilisation of terrestrial crops with seaweed has also been suggested to affect markers, including $\delta^{13}C$, that allow for the identification of seaweed consumption. To investigate these effects, a field trial was conducted involving the fertilisation of bere barley with seaweed, which showed that $\delta^{15}N$, but not $\delta^{13}C$ was significantly affected by fertilisation with seaweed. This research into prehistoric seaweed consumption and use has great potential to improve present understanding of animal foraging ranges, human adaptation to local environments, and human land use.

Whale species and their exploitation on the Atlantic shore in the Late Upper Paleolithic: the evidence from Santa Catalina (Lekeitio, Bizkaia)

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Compared to the earlier phases of the European Upper Paleolithic, the Middle and Upper Magdalenian culture (ca. 18-14 cal ka BP) yielded a rich body of evidence indicating the exploitation of seashore resources. One part of this evidence is related to large Cetaceans: whale barnacles, Sperm Whale teeth, worked objects made of whale bone all hint at a recurrent use of whale products at that period. The cave site of Santa Catalina, specifically, yielded—among other marine evidence such as marine mollusks, bones of seals, sea birds and sea fish—a number of unworked, highly fragmented bone fragments attributed to large Cetaceans. Most of them are from the lowermost layer III (Upper Magdalenian, currently dated ca. 15.5-14.5 cal ka BP) and probably come from vertebrae and ribs. As a part of the PaleoCet project (ANR-18-CE27-0018), the inventory of these bones was updated, and they were sampled for species identification by collagen peptide mass fingerprinting (ZooMS) and for radiocarbon dating. The dating program is ongoing, but the ZooMS analysis confirmed the identification of 56 bones as belonging to large Cetaceans, the overwhelming majority being Fin whale (Balaenoptera physalus): it is the first definite identification of this species in the European Paleolithic. This presentation will discuss the implications of this identification—and that of the other whale species that may be present in the assemblage—as well as the methods and motivations of whale acquisition and exploitation at this site.

A question of size!
When sieving increases the activities of fisher-hunter-gatherers

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Although the Mesolithic shell-middens were excavated as soon as the first half of the twentieth century, the interest in the composition of these shelly accumulations along the European Atlantic coast was still undeveloped at the end of this same century. Thus, while a list of animals has sometimes been published for this type of site, marine invertebrates are often overlooked or represent only a few lines in papers dedicated to them. The development of new disciplines in archaeology quickly showed the limits of past excavations. In fact, only the elements seen as useful to the excavator have been preserved, such as flint, large mammal bones and ornaments, with a focus on the components of the burials. Thus, despite the sieving of sediments, these past excavations gave us a very partial version of the food remains of these populations, where marine invertebrates are often the poor relations of the archaeozoological remains. Returning to the field in the 2000s made it possible, thanks to sieving combined with laboratory sorting, to increase our vision of the diversity of marine and terrestrial resources exploited by the Mesolithic coastal populations. Thus, the visible minority, represented by crabs, is now abundantly described in the shell-middens. The high yield of these crustaceans may even make them the key components of the diet of these seaside peoples. Moreover, this sieving applied to a specialization of the remains shows that these shell-middens are not homogeneous shelly layers. Thus, we would like to present some examples showing the distortion of our vision of the way of life of the fisher-hunter-gatherers of the European Atlantic coast according to the used excavation techniques. These field methods have a direct impact on our description of the activities of these coastal populations, which are not only focused on hunting huge mammals.

Determining a season of collect from oxygen isotopes of Patella vulgata shells: the case of Molene archipelago (Finistère, France)

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The analysis of stable oxygen isotopes ratio ($\delta^{18}O$) from carbonates is widely used as a palaeo-thermometers as the main driver of this ratio is the temperature and the salinity at which the carbonate precipitated. Marine mollusks shells are mainly composed of carbonate and these shells can be used as a palaeo-environmental proxy for past sea surface temperature (SST) conditions. Shell middens are archaeological deposits mainly composed of carbonated mollusks shells, constituting a unique archive of past exploited environments and human practices. In this context the SST at the margin of the shells can be interpreted as the season of the collect of the shell by the people who produced the midden.

In this study, we compared the seasonality data obtained from the shells of the limpet *Patella vulgata* from different protohistoric shells middens of Molène archipelago (Finistère, France). First, three shell layers from Béniguet Island were investigated, dated back to the Chalcolithic (2455-2200 cal. BC), the early Bronze age (2187-1960 cal. BC) and the early Middle Ages (640-675 cal. BC). Then, *P. vulgata* shells from the site of Beg ar Loued (1920-1761 cal. BC) were analyzed, to compare two shell middens from the same period (Early Bronze Age).

Our results demonstrated differences in the limpet harvesting patterns, with a year-long collect for the Chalcolithic deposit of Beniguet Island, while the shells of the Bronze Age period were mostly collected in spring, with no shells collected from late summer to early winter. Those results confirm for the first time the utility of oxygen isotopes to look over the seasonality of harvest in *Patella vulgata* shells, adding a new archive to investigate the annual distribution of human activities, adding a new tool to determine an eventual seasonal occupation of the archaeological site.

The site, the shell, the species: shifting analytical resolution and interpretation in shell midden archaeology

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Understanding the seasonal nature of coastal settlement and subsistence has been an essential part of shell midden archaeology in coastal environments. By identifying the seasonal timing of site occupation, it is possible to develop nuanced interpretations of past landscape use, the duration of site occupation and the management of coastal resources. However, the scale of analysis must be sufficient to be able to capture both environmental and cultural variations over time. This paper explores how interpretations of coastal activities change when the scale of analysis and analytical resolution also changes. Using case studies from shell midden sites along the Pacific Northwest Coast of Canada, we explore how variation in data collection, specifically stable oxygen isotopes and radiocarbon, can shift interpretations when the scale of analysis changes. By incorporating a multi-species approach, we show how understandings of seasonal-settlement patterns and subsistence practices shift when looking at a broader spectrum of resources.

How about 'maritime movement and interaction during the British Neolithic'?

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The ability to sail and to navigate was a crucial factor in the Neolithisation of Britain (and Ireland), because all the domesticated plants and animals that formed the basis for a farming economy had to be brought over from the Continent by boat. Recent DNA results confirm that people from the Continent did indeed migrate to Britain, bringing their domesticates with them. Thereafter, while very few people sailed back to the Continent, maritime movement and interaction persisted within Britain, and between Britain and Ireland, at different points around the Irish Sea. This presentation explores the changing patterns of that maritime movement and the types of maritime interaction that occurred over the course of the Neolithic. The question of how much pre-Neolithic maritime movement and interaction had taken place will be considered, challenging other people's claims for regular cross-Channel movement and interaction over the fifth millennium. Similarly, the claim that Britain was isolated and inward-looking during the Late Neolithic will be assessed critically. Basic questions about why people ventured out into the sea will be addressed. A rich and complex picture of maritime movements can be painted for the fourth and early third millennia BC, and this presentation will aim to convey a sense of that complexity, and of the reasons that underlay it.

New perspectives on old shores: current approaches on the Stone Age in Eastern Norway

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The coastal and inland areas landscapes of southeastern Norway offered resource rich environments for Mesolithic hunter-gatherers to settle in. This human activity has left an extensive dataset for archaeologist to study settlement and activity from the seashores to the high mountain areas.

In recent years, there has been a development in archaeological analysis of human activity in the region applying the large amount of data generated by recent archaeological excavations and surveys in novel ways, especially in the regions former coastal areas.

The use of archaeological big-data, such as radiocarbon dates and surveyed sites, has given new insights to past population dynamics, and coupled with environmental data this has offered us possible explanations to variation in settlement patterns. Further, detailed analysis of lithic technology have provided insight into raw material procurement, movement of people and shifting social networks. Moreover, the identification of some hinterland sites opens up for a better understanding of the importance and use of the coastal hinterland.

In this paper, we will look closer at the recent development in archaeological research on coastal societies in southeastern Norway. We will present current perspectives as well as which future avenues we will explore in order to increase our knowledge on hunter-gatherers settlement, mobility and economy in coastal areas.

Detecting the displacement of the Baltic basin's ancient shorelines via clustering terrain and distance data along the glacioisostatic uplift axis

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The alternating developing phases of the Baltic Sea have affected offshore areas, resulting in several ancient shoreline landforms, but vaguely traceable in mainland Latvia. In order to grasp the dynamics between the ancient human and the ever-changing shorelines, a case study has been carried out in the ancient Ventspils lagoon, northwestern Latvia, where several Mesolithic and Neolithic settlements have been studied. Using an automated LiDAR data-processing method, a high-detail digital terrain model has been created, which has served as the main data source for detecting the ancient shorelines, firstly, for deciphering the most pronounced ridges, and, secondly, for combining elevation data with distance data along the glacioisostatic uplift axis. The data combination at the ridges were clustered (k-means clustering), and after manual cluster filtering, 9 ancient water levels were modeled as trend surfaces, which have been compared to modern-day terrain to acquire the ancient shorelines. To verify these modeled shorelines, field studies have been carried out to confirm the ridges on site and to acquire samples for optically stimulated luminescence (OSL) dating (8 outcrops, 21 samples). In the laboratory, sediments were wet-sieved and a 90-180 μm fraction was used for further chemical treatment as HCl, H2O2 and HF. Fast flow density separation at 2.62 gcm-3 was used to separate feldspars and quartz and this latter was used for further dating. Tests revealed that quartz shows good luminescence properties and is suitable for dating. Final date results show a modeled alternation of transgressive and regressive events during the period between 16 ka and 5 ka with few older outliers at 21–30 ka and 52–74 ka. These both latter are likely linked with a limited sunlight exposure and thus only partial sediment bleaching. Nevertheless, dates between 16 ka and 5 ka correspond well with the Baltic Ice Lake – Litorina Sea transgression in the region.

Archaeology of island economies: diachronic and paleo-economic approaches to island occupations through the contribution of ceramic analysis

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The study of economic systems is a central theme of anthropological and archaeological research. At the intersection of questions on human behaviour and issues related to material culture, this discipline opens up theoretical perspectives for reflection that can link artifacts, individuals and processes such as changes in livelihoods, intensified relationships or their impoverishment. This communication focuses on the development and adaptation of existing economic models to the diachronic and territorial issues of our research, focused on the islands of Brittany (western France; Gehres 2018a), through the petrographic and chemical analysis of the raw materials of pottery. It will be a question of observing over a long period of time the evolution of the island's economic and production systems, from the Middle Neolithic II (4200 to 3800 B.C.) to the Late Iron Age (450 to 42 B.C.). These environments are in fact strongly influenced by the ocean, the exploitation of the marine environment, both for food and for the production of goods, but also by displacement by cabotage or open sea shipping. These populations, have therefore been able to develop economic, production and distribution systems that are different from their fully continental neighbours. The question is whether existing economic models are receivable for these populations and whether new models adapted to more accurate data, and directly attributable to these groups, are likely to emerge. We will focus on the island complex Île aux Moutons / Glénan archipelago (Finistère, France). It has a series of archaeological sites that allow us to address our questions in a diachronic way. Thus, by determining the local and imported character of ceramics, we will identify the degrees of openness and retreat of island occupations, and the links that may exist between the different communities settled on the neighbouring islands, or on the near continent.

Technology of the maritime hunter-fisher-gatherers in the Cantabrian coast: preliminary results of the functionality of the knapped tools from El Mazo and El Toral III through the use-wears analyses

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The maritime hunter-fisher-gatherers populations of the Holocene period have delivered several archaeological contexts in the Atlantic European façade. In the northern Iberia, the Asturian “culture” it’s one of the rough evidences of the maritime economy of those populations. This particular environment, between mountains and an abrupt coastline, has been largely exploited by these human groups, consuming terrestrial and maritime fauna, gathering maritime resources, or even collecting a large variety of raw lithic material from the area, exploited for the production of knapped industries. Those tools, such as microliths or bladelets production, can be considered as the material link between the human groups and that particular biotope. In this work we aim to address the question of the maritime hunters-fishers-gatherers technological choices, through the functional study of the knapped industries from the shell-middens of El Mazo and El Toral III. By means of the methodology of the use-wear analyses of retouched and unretouched blanks, both lithic assemblages have been integrally studied. The preliminary results of the use-wear analyses provide some new clues to better understand the technical traditions of the maritime hunter-gatherers populations and to discuss about the adaptation to the coastal environments.

Maritime and material connections in the later Neolithic of Ireland and Northern Britain

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The paper will build on recent work we have been undertaking to examine the character of later Neolithic societies in Ireland and northern Britain. This period sees an apparent diminution in contacts with the European mainland, and an intensification of links between different regions within Ireland and Britain. Much work to date has focused on recognizing this interconnectedness of regions within an island world, but it has tended to underplay the actual diversity of regional social processes and practices in the later fourth and earlier third millennia BC. In regional terms we will focus on Brú na Bóinne, Ireland which features as a 'core area' in much recent discussion, and the archipelago of Shetland, the most northerly part of Scotland, which often tends to be left out of wider considerations of this period and is perceived as being on the so-called 'periphery'. In material culture terms we will focus on maceheads as a characteristic and distinctive aspect of this period. How do we understand the range of material evidence for contact and communication across the sea and what does it mean in terms of society and in the lives of people living in different regions?

Empty Edges? 10 Years of Searching for Prehistory on the Atlantic Coasts of Scotland

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This paper synthesises ten years of fieldwork in the islands and western mainland of Scotland, across three different projects. It highlights the successes and failures of the survey techniques employed, and the contribution that the results have made towards a better understanding of prehistory, from the Mesolithic to the Bronze Age, in this remote and under-investigated region. Finally, the issues of coastal erosion and heritage protection are raised.

Maritime Societies? A diachronic view from two Baltic Fjords

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In which specific way does a maritime environment shape societies? How do the characteristic mixture of resources and the thread by environmental events influence the society? How doe societies change by the integration in different maritime networks and which role does technology and technology transfer play in maritime societies?

We are addressing these questions by applying a diachronic view, interdisciplinary research including natural sciences and underwater-archaeological praxis. This approach which is based on traditions of archaeology in Kiel will be applied to the two fjords, the Schlei and the Kiel Fjord. The development of the city of Kiel from a small harbour site via big navy base towards the current shape of the city answers all questions in the light of written sources and archaeological evidence. Stepping back in time, we pick up case studies concerning navy wrecks and fortifications, transport vessels from modern times, Wiking Age and Medieval ships from Schlei regions between Haddeby and Maasholm, and a Mesolithic site from the Kiel Fjord. We also need to address the lack of archaeological evidence in some periods (Bronze Age, Iron Age and Late Medieval Times).

Methodological stakes upon Inuit material heritage under coastal erosion

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The French ANR project "InterArctic" gathers several researchers of various and complementary skills. They aim to address conservation stakes regarding the local Inuit heritage in the Nain region (Nunatsiavut, NL, Canada). The seascapes and landscapes of the Nain archipelago are deeply marked seasonally by the freezing and thawing of the extensive winter sea-ice cover. The perception of these landscapes by the inhabitants affects their patterns of seasonal mobility. Paleogeographical and archaeological approaches focus both on long-term seascape and landscape shifts, along with the local post-glacial marine regression dynamics, and on medium-term shifts, by investigating the patterns of seasonal mobility. In addition to those interests, the concern of documenting the local heritage is rooted on contemporaneous preoccupations regarding coastal erosion of the remains currently located close to the seashore. The current degradation of the coastal permafrost leads to an acceleration of their erosion through the undermining of micro-cliffs by waves. One of the goals of this project is to carry out an inventory of the state of conservation of the archaeological sites in the region, and to excavate some of them. The project also aims to set up a monitoring station which combine drone photography, DGPS topography, and gathering of continuous meteorological data with a fixed station, close to a site in erosion.

This project is developed in partnership with the Nunatsiavut government's department of archaeology. The main challenge of this approach is to make sure it is rooted on tools and methods locally implemented, adapted to logistical constraints inherent on a large territory, often hardly accessible from a southern perspective. In this context, the academic resources mobilized, as cartography and monitoring, complete local resources, owing to the proximity, knowledge and experience of the inhabitant involved.

Along with the erosion of the archaeological coastal heritage, a large part of the material memory of the past Inuit dwelling practices is damaged. It happens to be a memorial stake in a context where those archaeological remains allow to document the past of people whose recent history has been written in the archives only through the eyes of the colonizers. This presentation

proposes an experience-sharing regarding research postures, collaboration, and technical and logistical means mobilized in order to address the stakes of local heritage erosion.