Transformations of maritime and island landscapes in the western France over the last 8,000 years: a long story of the links between Human and Environment

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and Serge SUANEZ, Aurélie PENAUD, Clément LAMBERT, Muriel VIDAL, Yves-Marie PAULET, Stéphane BLANCHET, Clément NICOLAS, Gwendoline GREGOIRE, Axel EHRHOLD, Gwen JOUET, Pascal LE ROY, Thierry GARLAN, Henri GANDOIS
Background & Topics

Compilation of several works

PhD students and researchers

Interdisciplinary research team (10 lab.):
  Archaeology
  History
  Geography
  Geology
  Biology
  Chemistry

Interdisciplinary research device: Zones Ateliers

The central question:

**What are the socio-ecological processes that play out at Holocene time scale?**
Background & Topics

Numerous questions summerized in this conceptual framework
(adapted from Collins et al., 2010 for the Holocene period)
The Bay of Brest: presentation
The Bay of Brest: reconstruction of the Relative Sea-Level rise

Back-barrier lithostratigraphy

Four sediment sequences studied: hand-augerings, vibracores, sedimentology, AMS $^{14}$C datings

Back-barrier biostratigraphy

Salt-marsh foraminiferal assemblages, transfer functions development

History of the Relative Sea-Level rise

Periods of enhanced-storminess

SLIPs

Coastal changes in the Bay of Brest

- Loch gravel barrier
- Arun gravel barrier
- Troason gravel barrier
The Bay of Brest: Palaeogeographic changes (G. Grégoire PhD work)

Geometry of sediment bodies from 1200 km of seismic profiles

Nature and chronology of sediment infilling from 70 marine cores analysed
The Bay of Brest: Palaeogeographic changes (G. Grégoire PhD work)

Major flooding of the coastal plain occurred between the Late Mesolithic and the Bronze Age.
A possible explanation of the absence of coastal remains in the bay of Brest.
The Iroise Sea and the Molène archipelago: presentation
The palaeogeographic changes of the Molène archipelago

Great paleogeographic changes, reduction of terrestrial and foreshore area, fragmentation of insular territories
Archaeological background on the Molène archipelago

### Synthesis of analyses conducted on the main archaeological sites investigated

<table>
<thead>
<tr>
<th>Archaeological site</th>
<th>Island</th>
<th>Type</th>
<th>Period</th>
<th>Operation</th>
<th>Lithic material</th>
<th>Ceramic material</th>
<th>Macrofaunal remains</th>
<th>Anthropology</th>
<th>Archeological survey</th>
<th>Radiocarbon dates</th>
<th>Molluscs</th>
<th>Faunal remains</th>
<th>Fauna/vegetation</th>
<th>Molluscs</th>
<th>Fauna/vegetation</th>
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</thead>
<tbody>
<tr>
<td>Balânée (south)</td>
<td>Balânée</td>
<td>Midden pocket</td>
<td>Late Bronze Age</td>
<td>Sampling</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<td>x</td>
</tr>
<tr>
<td>Trieten north</td>
<td>Trieten</td>
<td>Midden pits</td>
<td>Late Iron Age</td>
<td>Archaeological</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<tr>
<td>Benâguet-3</td>
<td>Benâguet</td>
<td>Shell midden</td>
<td>Recent Neolithic</td>
<td>Archaeological</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<tr>
<td>Benâguet-129</td>
<td>Benâguet</td>
<td>Midden pit</td>
<td>Recent Neolithic</td>
<td>Sampling</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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</tr>
<tr>
<td>Hég ar Lœud 1</td>
<td>Molène</td>
<td>Shell midden</td>
<td>Late Neolithic</td>
<td>Rescue excavation</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<tr>
<td>Hég ar Lœud 2</td>
<td>Molène</td>
<td>Midden pits</td>
<td>Early Bronze Age</td>
<td>Excavation</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<tr>
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<td>Quéménès</td>
<td>Midden pits</td>
<td>Recent Neolithic</td>
<td>Excavation</td>
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<td>x</td>
<td>x</td>
<td>x</td>
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</tr>
</tbody>
</table>
Fishweirs discoveries

Lidar and multi-beam surveys

Digital Elevation Model
(0.7 x 0.7 m)

Geospatial analysis and treatments

Local Relief Model
Relief + slope
Rugosity

Hillshading
(45°)
Hillshading
(180°)
Hillshading
(315°)
Fishweirs discoveries

3D views of the underwater stone walls

Direct observations from dives
Fishweirs discoveries

Location of suspected underwater structures

Principles used to date the stone fish-traps
Archaeological results and questions

Limited human impact on the insular environment
- Fishing practices appear from the very beginning of the Neolithic using megalithic structures
- The livelihood of populations insured with a strong association between agro-pastoral and fishing practices
- Management of the forest despite the reduction of the terrestrial areas

Human settlements
- High frequentation of the islands during the Neolithic and Bronze Age periods
- Cultural links maintained with the mainland
- Perennial or seasonal settlements?

Chronology of settlements
- Disparition of archaeological remains during the Bronze Age
- Rapid or gradual?
- Linked to climatic factors?
Sclerochronological approach

Limpet shells within shell-middens were used to estimate the timing of human settlements.
Sclerochronological approach

Limpet (*Patella vulgata*) shells within shell-middens were used to estimate the timing of human settlements.
First results can be used to estimate the period of shell collecting

Ex: Temperature reconstructed from the isotopic signature of the two limpets sampled in the Bronze Age shell-midden
Sclerochronological approach

First results also raise questions about the climate conditions at the Early Bronze Age.

Sea Surface temperature at the early Bronze Age reconstructed from the limpet A

Sea Surface Temperature measured in the Iroise Sea (2013-2016)

SST was 4°C cooler at the Early Bronze Age?
Questions about climate conditions

Modification of the coastal marine currents?

Intense thermal front: the Ushant front

Cooler climate conditions?
Conclusion

Summaries

**Bay of Brest**: Despite an attractive environment (ressources, biodiversity), the low density of coastal archaeological sites was explained by the major coastal floodings from the Late Mesolithic to the Bronze Age.

**Iroise Sea**: High density of archaeological remains despite a relative repulsive environment. Numerous information about the livelihood of the human communities, relation with the mainland. A question about the apparent desertion of the islands at the Late Bronze Age.

Perspectives

> Develop the sclerochronology to estimate the duration of human settlements on the islands
> Integrate Ushant and Sein islands to the study
> Systematic post-storm archaeological surveys

**Compare these results to other coastal and marine environments**
Thank you for your attention
The Bay of Brest: vegetation landscape (C. Lambert PhD work)

8 marine cores located in the Bay of Brest and the Iroise Sea covering the last 8000 yr cal.BP

Cultural period

<table>
<thead>
<tr>
<th>Period</th>
<th>Gallo-Roman</th>
<th>Bronze Age</th>
<th>Neolithic</th>
<th>Mesolithic</th>
</tr>
</thead>
<tbody>
<tr>
<td>8000-5000 cal. BP</td>
<td>KS22</td>
<td>KS2</td>
<td>Core G</td>
<td>Core A</td>
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</table>

Stratigraphic subdivision

<table>
<thead>
<tr>
<th>Phase</th>
<th>Late Holocene</th>
<th>Middle Holocene</th>
<th>Early Holocene</th>
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<td>8000-5000 cal. BP</td>
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<td>KS2</td>
<td>KS24</td>
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</tbody>
</table>

Vegetation signal

- Pollen
- Dinokystes

First results

- Agricultural decline during the Gallo-Roman period
- Recovery of crops in the early Middle Ages
8 marine cores located in the Bay of Brest and the Iroise Sea covering the last 8000 yr cal.BP

### Cultural period

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**Carbonate concretion (maërl)**

First results

Peak of metal traces: link with metallurgy?
A gradual retreat of coastal barriers by rollover since 6000 yrs and several phases of intense erosion during periods of enhanced-storminess