**Unpath’d Waters, Undream’d Shores**

**Exhibition version - 0.21, doc c**

**Installation**

Download the zip file and extract. In the top level folder there will be a file called ‘UNPATH Exhibition.exe’. Run this and follow any on screen prompts.

**Use**

There are three different screens:

*Intro*

This contains some brief information about the simulation and the Unpath’d Waters project, along with the basic controls.

*Intro controls*

|  |  |  |
| --- | --- | --- |
|  | Gamepad | Keyboard |
| Exit |  | Esc |
| Left tab | X button | Left arrow |
| Right tab | B button | Right arrow |
| Regional map | A button | Space |
| Toggle font |  | O |
| Toggle high contrast |  | P |

*Regional map*

This shows the area around what is currently the North Sea. This map is based on the output of the models created by the BRITICE-CHRONO project. There is a seasonal cycle overlaid on the map which provides a coarse reflection of the environment. This is based on climate data, though climatic variation is too complex to be properly encapsulated by a simple indication of snowy areas throughout the year. Glaciers are shown between 20,000 BP (years before present) and 15,000 BP, after which they have melted over the British Isles. These are also taken from the BRITICE-CHRONO project’s data and the user can change between the minimal, optimal and maximal possible extent of the glaciers of the British and Irish Ice Sheet.

The topographical and sea level data is published in increments of 1000 years, but the simulation allows finer resolution by interpolating between these data points. It is possible to switch between three possible methods of interpolation. In ‘linear’ mode, the terrain and sea level change at a constant rate between the 1000 year data points. In ‘stepped’ mode, the data changes more rapidly, but with periods of equilibrium between thse changes. In ‘inundation/regression’ mode, the data changes forwards and backwards during the 1000 years. This allows the user to see the local effects of the possible different methods of downscaling the data. The reality was likely to have included periods of linear change, periods of punctuated equilibrium and periods of both inundation and regression, depending on both global, regional and local conditions.

The pink dot signifies the location to be selected for local simulation, the timeline in the lower left corner shows the date to be selected.

*Regional map controls*

|  |  |  |
| --- | --- | --- |
|  | Gamepad | Keyboard |
| Move camera | Left analogue stick | W, A, S, D |
| Tilt camera | D-pad | R, F |
| Zoom camera | Right analogue stick | Z, X |
| Change glacier mode |  | U |
| Change interpolation mode |  | M |
| Move time back 250 years | X button | Left arrow |
| Move time forward 250 years | B button | Right arrow |
| Move time back 10 years |  | Left shoulder button |
| Move time forward 10 years |  | Right shoulder button |
| Local simulation | A button | Space |
| Exit | Y button | Esc |

*Local simulation*

The regional map shows a relatively coarse representation of the BRITICE-CHRONO data. The local simulation takes this coarse data and constructs a more detailed local environment from this data. It separates the environment up into several categories:

Sea

This shows the area which is under sea level according to the BRITICE-CHRONO data. This sea level ignores short term variations caused by tides, weather and atmospheric pressure.

Intertidal zone

Although coloured to look like a beach, the actual nature of the zone between the average sea level and the maximum sea level would have varied, based on a number of different characteristics. It may have looked more like a salt marsh, series of low dunes or a rockier coastline depending on local geology and tidal energy.

Marsh/Wetland

As Doggerland was a mainly low lying area, marshland would have been common, and it is one of the environments which shows up in sedimentary DNA data analysis of plant species.

Grassland

Open grassland is also apparent in the plant data derived from sedimentary DNA.

Woodland

Trees such as alder, birch and willow are found in the sedimentary DNA data, with woodland likely to be thinned in some areas by browsing animals. The type and density of tree cover would have varied across time and place as the climate changed.

Tundra

Sparse and icy environments would have been common at the end of the last Ice Age and may have returned in some areas during the Younger Dryas period (12,900 – 11,700 BP).

River

Within the simulation, rivers are a combination of those which are visible in the seismic geophysics and those which are procedurally generated.

In addition to the environments generated within the simulation, animals and humans are also created. These are:

Boar

Wild boar tend to live in temperate, wooded areas. The forests, marshes and meadows of Doggerland in its warmer periods are likely to have been highly suitable for wild boar and they appear frequently in sedimentary DNA data.

Arctic Fox

Arctic fox are one of the few mammals that can thrive in a tundra environment. If an area is mainly tundra it will contain a single arctic fox, which will be quite hard to spot.

Aurochs

Aurochs are an extinct species of large bovine. They are ancestors of the modern domestic cow. This is another species that would have enjoyed Doggerland’s mix of wetland, forest and grassland and they can mainly be seen inhabiting the marshy areas of the local simulation.

Elk

Elk are at home in colder, wooded areas. They can be found within the simulation in the areas frequented by boar, but are more likely to be seen at colder times.

Beaver

Beaver are another species found in the DNA of cores taken from Doggerland and their ability to create changes in a landscape would probably have had significant effects in some areas. Within the simulation they can be found in river areas, though their tree felling and dam building activities are as yet unmodelled.

Humans

A small camp is created in areas which are not mainly sea or mainly tundra. Humans could have crossed areas of tundra and even glaciers but are likely to have lived in warmer areas with more resources.

*Local simulation controls*

|  |  |  |
| --- | --- | --- |
|  | Gamepad | Keyboard |
| Move camera | Left analogue stick | W, A, S, D |
| Tilt camera | D-pad | R, F |
| Zoom camera | Right analogue stick | Z, X |
| Exit to regional map | Y button | Esc |
| Move time back 500 years | X button | Left arrow |
| Move time forward 500 years | B button | Right arrow |

**Notes**

The terrain is based on the models produced by the BRITICE-CHRONO project. The animal and plant data are derived from the Europe’s Lost Frontiers project. It is important to note that this simulation is not a recreation but is instead a model, derived from selected data. The actual landscape of Doggerland will have been a much more complex environment, with many more types of plant and animal than depicted here. These will all have had an effect on each other, creating a land with many interconnected elements. As it is, this simulation exists as an accessible way of navigating the most up-to-date scientific data regarding the sea level and landscape deformation of Doggerland.

Detail regarding the primary data can be found in:

‘Growth and retreat of the last British–Irish Ice Sheet, 31 000 to 15 000 years ago: the BRITICE-CHRONO reconstruction’, by Clark et al. <https://onlinelibrary.wiley.com/doi/10.1111/bor.12594>

‘Europe’s Lost Frontiers, volume 1’, edited by Gaffney and Fitch: <https://www.archaeopress.com/Archaeopress/Products/9781803272689>

Further general reading can be found in:

‘Europe’s Lost World’, by Gaffney, Fitch and Smith: <https://archaeologydataservice.ac.uk/library/browse/issue.xhtml?recordId=1181573>

‘Doggerland. Lost World Under The North Sea’, edited by Luc Amkreutz and Sasja van der Vaart-Verschoof: <https://www.sidestone.com/books/doggerland-lost-world-under-the-north-sea>

**Licensing**

This software was produced as path of the Unpath’d Waters project, which is a part of the AHRC’s Towards a National Collection series of grants.

Unpath’d Waters: <https://unpathdwaters.org.uk/>

Towards a National Collection: <https://www.nationalcollection.org.uk/>

The software was produced by the Submerged Landscapes Research Centre at the University of Bradford: <https://submergedlandscapes.teamapp.com>

This software may be freely distributed but must not be modified or sold. Any queries or bug reports can be addressed to Phil Murgatroyd at P.Murgatroyd@Bradford.ac.uk