Fishing for fossils in the North Sea

Palaeontologist Natasja den Ouden on how fossils from the marine environment are shedding light on big mammals in the last ice age.

Lucas Laursen

23 September 2015

Palaeontologists who attend the annual International Cave Bear Symposium (ICBS) can usually count on at least one expedition to a bear cave. The meeting allows scientists to report the latest fossil findings of Pleistocene animals such as cave bears and big cats — whose best-preserved samples are often found in caves.

But the 2015 meeting on 10–13 September took place instead near the North Sea coast in the Netherlands, with no caves in sight. Palaeontologist Natasja den Ouden of the Naturalis Biodiversity Center, a museum in Leiden, tells *Nature* how fossil samples from the North Sea are shedding light on mammals' movements during the last ice age.

Steven McCarron

Natasja den Ouden, with a reconstruction of a *Homotherium* (sabre-toothed cat).

Why hold a cave-bear meeting near the North Sea?

The Netherlands doesn't have many caves. But fossils are turning up from the bottom of the North Sea. They include lots of massive mammals from the last glacial period (around 100,000 to 12,000 years ago), when what is now the North Sea was a dynamic landscape of inlets and dry land, called Doggerland. The marine fossils from Doggerland complement the fossils from continental caves. For example, a mandible from a sabre-toothed cat (*Homotherium*) found in the North Sea in 2000 has been dated and shown to be 28,000 years old[1] — around 270,000 years younger than the previous youngest *Homotherium* example in Europe.

These findings are helping to establish a more complicated picture of mammals in the last ice age. We are learning from the combination of marine and dry-land fossils that what we once thought was a rapid transition from the era of the big mammals — the Pleistocene — to their dying out in the Holocene, is a very drawn-out process.

How are these fossils turning up?

Ships dredge up sediment from the sea bed to build dikes and new land, and bring up fossils as well. Fishermen also often accidentally bring them up in their nets. But because the fossils are coming from the bottom of the sea, they are recovered without the context of upper and lower sediment layers that could help us to estimate their age.

How do you work out their age?

We are using radiocarbon dating, and also trying different isotope methods. Oxygen isotope ratios in animal bones correlate roughly with the climate that existed during the animal's life — they cannot be used to give a date directly, but they help one to select warm or cold periods within a narrow radiocarbon date range. And the fossils may be encrusted by marine shellfish, the identity of which can help to date the fossils to which they are attached. We are also trying to find correlations between the ages of big mammals and those of small mammals or other microfossils that are dredged up in the same sediment. The smaller mammals evolve much faster than the big ones and we know their ages more precisely from other experiments in which boreholes are drilled deep into sea-floor sediment. We do keep in mind that nothing is really for certain.

Natural History Museum Rotterdam

The fossilised mandible of a *Homotherium*.

What is the latest finding from the meeting?

The first work analysing DNA from that North Sea *Homotherium* mandible was presented at the meeting. Because there was a 270,000-

year gap between it and the next-youngest European *Homotherium*, people thought that maybe the mandible had come from North America or Asia. But researchers who analysed the mandible's mitochondrial DNA suggested that the *Homotherium* specimen could have descended from a continuous European line: that is, sabre-toothed cats may have survived in Europe all that time, as they did in North America.

What other questions arise from the marine-fossil finds?

One of the strange things about the Netherlands' marine fossils is that we have mammoths, cave hyenas, lions, wolverines, foxes — but we are not finding cave bears. Cave bears lived in Germany, in Belgium and in the British Isles and we are right in the middle of that. Are they really not here, or are we not finding them, or should we look at other specimens currently identified as brown bears? It's a mystery.

Nature | doi:10.1038/nature.2015.18409

References

1. Reumer, J. W. F. *et al J. Vertebr. Paleontol.* **23** 260–262 (2003).