Arctic climate fugitives?

Hooray Hooray! A bowhead whale (*Balaena mysticetus*) was spotted off the Belgian and Dutch coasts during March and April 2017! It was probably the first bowhead whale ever recorded in the whole of the North Sea. Dozens of enthusiastic naturalists, including myself, hurried to the coast to observe this rare Arctic wanderer close to the beach. Some were lucky enough to catch a glimpse of the massive animal, or at least of its V-shaped blow, but many were disappointed, arriving a day too late. They shouldn't worry: the animal, or one of its conspecifics, might be back soon, in the coming months or years. Or perhaps they *do* need to worry? Our enthusiasm should also allow room for mindful uneasiness.

First of all, the possible way back home for this magnificent giant – and let's hope it *does* make it home - lies full of obstacles in the form of treacherous shores, areas with no suitable food, intense shipping, trash, lost fishing gear and killer whales (*Orcinus orca*), a predator from which it is relatively safe in ice-covered waters. But secondly, why did this animal venture this far south in the first place? It simply does not belong here. The Arctic lies thousands of kilometres further to the north. Its appearance in too southerly waters is not only an alarming signal for the species, but perhaps also for the whole ecosystem it lives in.

In the past we have often been confronted with wandering marine mammals not indigenous to the North Sea. These originate mostly from the nearby Atlantic Ocean, and we have embraced them as spectacular, once-in-a-life-time experiences and scientific opportunities. However, just a year before the appearance of the bowhead whale (the mammal with the longest life-span of all), another enigmatic species – and the inspiration for the medieval unicorn - popped up in our waters. In March 2016 a narwhal (*Monodon monoceros*) was observed in the River Scheldt in Belgian waters, having passed undetected through the Dutch part of the river. This unfortunate animal starved to death in unfamiliar waters without suitable prey, probably after a journey of many weeks or months. This was an exceptional find; it was not only the first record of this Arctic species for Belgium, and – if you wish – the second case for the Netherlands (although it was not actually observed there), it had also been almost 70 years since a narwhal had been recorded in the North Sea (Haelters et al., in press). We can only speculate if the unexpected appearances of the bowhead whale and the narwhal were related. However, in the last two years more Arctic species have been seen in unusual places: a solitary bowhead whale off the coast of the United Kingdom, France and Ireland (probably the same animal), beluga whales (*Delphinapterus leucas*) in Swedish, Northern Irish and English waters and a harp seal (*Pagophilus groenlandicus*) at the Dutch coast.

It is tempting to relate these observations to the universal, climate-driven, redistribution of life on earth (Pecl et al. 2017, Verboom 2014). In most cases, the redistribution of cold-water species is directed towards the poles. But for animals with a strong affinity for sea ice, which already live at the extreme north of our planet, there seems little alternative, even if travelling to warmer waters for these species appears counterintuitive. There has been a dramatic decline in sea ice in the Arctic since 1979 (IPCC 2013). The gradual melting of North Pole ice, predicted 30 years ago but apparently not taken seriously by everybody, has become a reality. Year after year, low ice coverage is recorded, both in summer and winter, with a long-term decrease that has become very pronounced in the last decades (Polyak et al. 2010). Record high temperatures in the north occur in rapid succession (Ricker et al. 2017).

Inevitably, a major change in sea ice dynamics will lead to a disruption in the functioning of the Arctic ecosystem, and it will probably influence the global climate. Rapid shifts in ice conditions are likely to have cascade effects through the food web of the Arctic (Hansen et al. 2002). There is concern about many species associated with sea ice, including narwhal and polar bear (*Ursus maritimus*; Evans et al. 2010). It is clear that polar bear depends on sea-ice, and killer whales are advancing north, well into narwhal habitats (Breed et al. 2017). The impact of climate changes on the bowhead whale is still unclear. This species might have had a distribution that extended further south in the 16th century – which was a relatively cold period, known as the Little Ice Age (Matthes 1939, Laidre et al. 2008). It might also take advantage of receding sea ice in spring to explore new feeding habitats (Heide-Jørgensen 2009) or might adapt to foraging in temperate shallow waters (de Boer et al. 2017).

Very knowledgeable people have calculated that limiting the increase in the global average temperature to 1.5 °C above pre-industrial levels would significantly reduce the risks and impacts of climate change (UN 2016). After that, things become tricky, and we lose some control. But have we not already lost control? We continue to deforest, we continue to massively burn fossil fuels and traffic jams are not getting shorter. Global trade - our need for raw materials and consumer goods – and our building and agriculture habits contribute to the process on a daily basis. Our short-term thinking and acting seem more destructive than ever. In the Arctic, disappearing sea ice opens doors for new shipping routes – *the Northwest Passage* – that will allow us to send or receive our goods faster and cheaper. And easier access to the Arctic creates opportunities for further exploration and exploitation of its natural resources.

So does the observation of a bowhead whale - possibly born long before climate change became an issue - and the stranding of a narwhal tell us the story of dwindling sea-ice? Can we consider them to be *climate fugitives*, wandering around, lost in an ice-free ocean? Frankly, at this moment, we cannot. *Statistically* such extremely rare records of marine mammals so far outside of their home ranges do not really demonstrate a change in their habitat: there are much better tools available for this. *Definite proof* is currently required whenever scientists send out warnings, especially when these warnings might entail the need for action. Moreover, the distribution of marine mammals is usually studied over relatively short timeframes, with little information about long-term natural change. In addition these changes may be confounded by continued exploitation or recovery from historical overexploitation. Seismic testing might also have an influence, as it profoundly alters the soundscape of the ocean environment and its inhabitants, some of which rely on that soundscape for their social interactions, feeding and receiving environmental information.

However, as ambassadors from the Arctic ecosystem, the southerly bowhead whale and narwhal do have a story to tell. They can help us in education about climate change, as they concern tangible and unexpected events that seem to indicate change. Fortunately climate education *is* slowly penetrating our schools. My five-year-old daughter recently surprised me with a request to use the bicycle instead of the car "*for the sake of penguins and polar bears*". We certainly will do so, "*but also for the sake of narwhal and bowhead whales*". Because while it is exciting to see such rare creatures close to our coasts, their arrival may be the portent of undesirable and perhaps irreversible changes.

Jan Haelters

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