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# *Ambassadors*

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## OF THE OCEAN

*As the amount of micro and nanoplastics in the ocean rises, what impact is this having on whale populations? A team of scientists and researchers set sail in the North Atlantic to find out.*

Words by Hugh Francis Anderson

Photographs by Conor McDonnell





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*“For the next 30 minutes, the 300-strong pod maintains our seven-knot speed as we race across the ocean towards Iceland. It’s 30 minutes of pure wonder, and we are all in awe of these magnificent creatures.”*



- | ABOVE: A humpback whale breaches the surface whilst feeding in Skjaldfandi Bay, just outside Husavik, Northern Iceland.
- | OPPOSITE: Barba in the midnight sun near Akureyri, Northern Iceland.
- | PREVIOUS PAGE: A humpback cow and her calf feed in Skjaldfandi Bay.

“Pilot whales,” cries Captain Andreas B Heide. “Hundreds of pilot whales off the stern.” Weary eyed and battling seasickness, I shuffle out of bed and climb up onto deck. A relentless 30-knot north-westerly wind has our expedition yacht Barba keeled over at almost 45-degrees, and the sporadic gusts threaten to launch us into the North Atlantic every few minutes. But it all fades to nothing when I see a pilot whale break the surface and rise high into the air, followed by another, and then another, until all that surrounds us is the graceful surging and diving of one of the most remarkable cetaceans on the planet. At 120 nautical-miles off the coast of the Faroe Islands, they’ve likely never seen a sailboat before. For the next 30 minutes, the 300-strong pod maintains our seven-knot speed as we race across the ocean towards Iceland. It’s 30 minutes of pure wonder, and we are all in awe of these magnificent creatures. But their very existence teeters on a knife’s edge.

For sailor, adventurer and marine biologist Heide, hardship at sea in pursuit of research is nothing new. Famed for freediving with Orcas in Norway’s High Arctic during the bleakest of winter months, and having guided Attenborough’s Blue Planet team during the Orca season, for Heide, whales are the “superstars of the ocean”. Using his expedition yacht Barba as the research vessel, the purpose of the Arctic Whale initiative is to “use whales as marine ambassadors, with a focus on marine plastic pollution”. It is well documented that some 8 million metric tons of plastic is dumped in the ocean each year, of which almost 240,000 tons are microplastics. In a report published by the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection

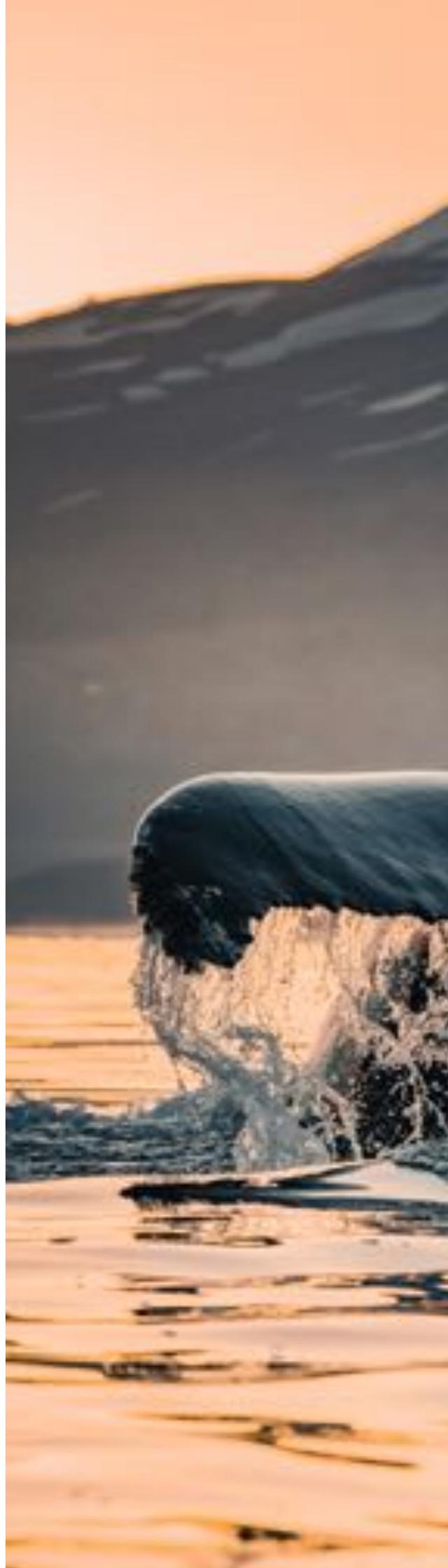
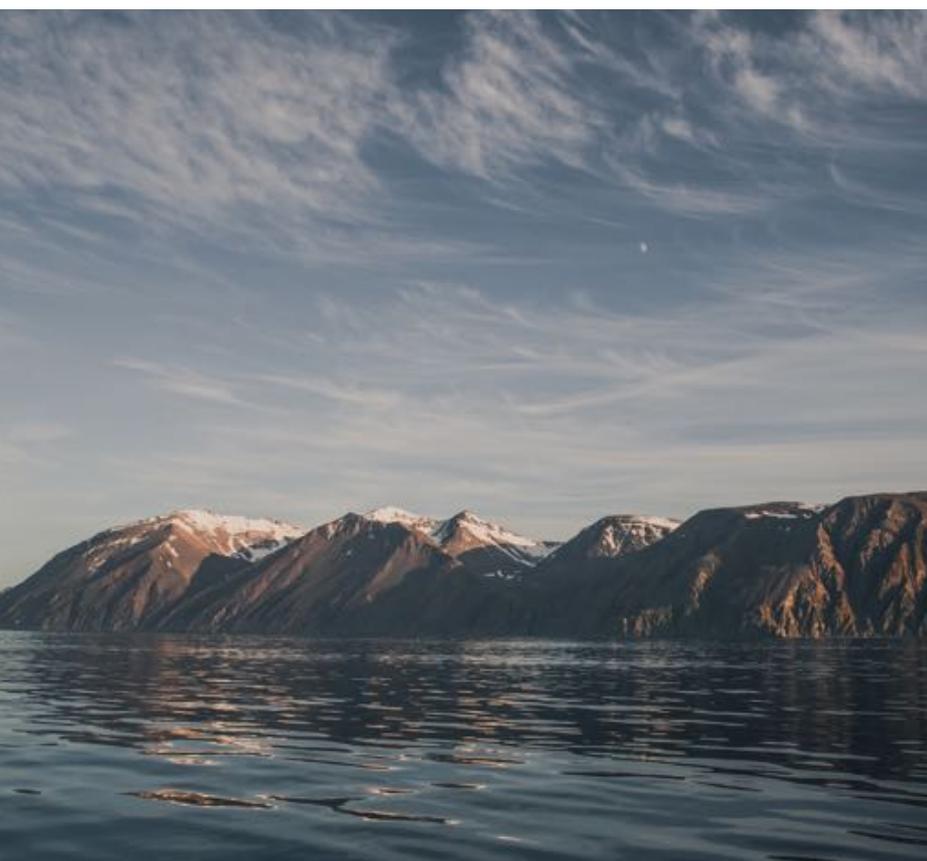
(GESAMP), microplastics have been documented in 100 species and impact organisms at numerous levels of biological organisation related to changes in gene expression, tumour promotion and death, alongside acting as a vector for invasive species, including harmful algae and pathogens. At a macro level, the hazards of plastics are alarmingly evident, and the result is the death of an estimated 100,000 marine mammals and turtles, alongside more than one million seabirds per year. Heide says: “The macro plastics in the ocean are eaten by whales and birds and they die. But what happens when it stays in the ocean? It will gradually become smaller and smaller until you can’t see it anymore. It’s just a soup of plastic, and no one knows how this plastic affects the marine environment.” Arctic Whale was conceived in partnership with Impact Manager Sandra C Ness, who is pioneering for change within the shipping industry. A few months after the initiative was launched, a specialist team was assembled, a route was plotted from Stavanger, Norway, to Húsavík, Iceland, via both the Shetland Islands and the Faroe Islands, and the exploratory journey began in earnest.

I join the team in the Faroe Islands, and as we sail out from Sørvágur and around the mighty islands of Drangarnir and Tindólmur, the team explain more about the multifaceted data collection undertaken thus far, and what is still to be done. Diane Seda, a sailor and Arctic Whale’s onboard scientist, takes the opportunity to show me the manta trawl, a bespoke net-system that samples the surface of the ocean for microplastics. By doing so, the team can find out how much microplastic is in some of the sub-Arctic’s remotest coastal and offshore



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*“Rasmussen tells me the primary objective is to catalogue blue whales in the hope of better understanding them, and that 148 different blue whales have been coming to Skjálfandi Bay since 2005.”*





*MAIN IMAGE: A humpback's fluke breaches the waterline prior to the whale descending to feed.  
TOP: Barba at anchor as the weather rolls in.  
BOTTOM: Landfall - a rare sight for the long-term Barba crew.*

waters. "Within 30cm of the water layer, about 70-80% of all plastic that is in the ocean is floating," says Seda as we prepare the trawl. "Plastics in the ocean [will] break down into smaller and smaller pieces with UV radiation and the force of the waves. There are two main problems: they can absorb chemicals from the surrounding waters, and they contain, from the beginning, certain endocrine disrupting chemicals such as bisphenol A (BPA), which then accumulate in the body." The impact? Not only is marine life adversely affected, causing a host of hormone and reproductive failures, but further up the food chain in our own bodies, exposure to endocrine disrupters includes heightened risks of heart disease, breast and prostate cancer, obesity, altered immune systems and, like our marine counterparts, hormone and reproduction difficulties too.

We set the manta trawl into the water and wait the allotted 20 minutes before extracting it. Collected in the small mesh container is a mass of what appears to be biological matter. "Most of this is zooplankton," says Seda. "They are the foundation of all life in the ocean." After primary visual analysis, the matter is held in 70% ethanol until we reach Húsavík, on the shoreline of Skjálfandi Bay, Iceland, where it can be analysed under the microscope. Húsavík also forms the culmination of the Arctic Whale's whale research itself. As the whale-watching capital of Iceland, for the summer months Skjálfandi Bay becomes a hotspot for marine life. Blue, humpback, minke, fin, sei, bottlenose, sperm, pilot and killer whales all feed here alongside white-beaked dolphins and the elusive harbour porpoise. It also attracts seabirds in the thousands, with puffins, gannets, Arctic terns, guillemots, skuas, kittiwakes, cormorants and fulmars, to name but a few. For this reason, it has become a site of immense research importance.

After the tough 40-hour crossing from the Faroe Islands, we greet the white-capped peak of Tóartindur in the Breiðdalur valley with welcome relief, and a few hours later we sail into the small harbour of Breiðdalsvík. The clouds part and the early-summer sun warms our faces as we sit on deck. Three days later, we round the easternmost point of Iceland and sail into Skjálfandi Bay under the escort of white-beaked dolphins. Puffins circle in their thousands as we pass the small island of Lundey, and on

the horizon the fluke of a humpback rises and falls as it dives deep to feed. Skjálfandi Bay is full of life. The reason for this? It's the confluence of three major currents: two that run around the coast of Iceland, and one that comes down from the Arctic. This causes upwelling, which when coupled with the nutrient-rich meltwater from the surrounding mountains, creates enormous plankton blooms that attract krill and fish, which are subsequently eaten by larger marine mammals and seabirds.

With poor weather forecast for the next few days, we take the time to visit the University of Iceland Research and Academic Centre to study the manta trawl samples in their laboratory and meet its Director and our host, Dr Marianne H Rasmussen. A whale research professor at the University of Iceland, Rasmussen's preliminary specialism was concerned with the acoustics of white-beaked dolphins, but for the past two years her focus has been on blue whales. She tells me the primary objective is to catalogue blue whales in the hope of better understanding them, and that 148 different blue whales have been coming to Skjálfandi Bay since 2005. "However, in last few years the sightings of blue whales have been less, and we have started seeing them more commonly around Svalbard," notes Rasmussen. "We think this is because of climate change and that the blue whales are moving further north."

In the laboratory, Rasmussen carefully pours the manta trawl samples into petri dishes for closer examination. To our surprise, the samples taken in the waters of Norway, the Shetlands, the Faroes and Iceland appear, at first glance, to be comprised entirely of organic material. "Look closer and the microscopic particles begin to appear," says Seda. "These are man-made fibres, most likely from discarded nylon fishing nets." Indeed, when viewed at a microscopic level, it becomes clear just how small and invasive these particles are. With most fibres smaller than the zooplankton themselves, it becomes alarmingly obvious just how plastic particles are infiltrating the marine ecosystem from the bottom up. And this is just at a micro level. At a nano level, where particles measure less than 100-billionth of a metre, it becomes possible for them to pass through cell walls and penetrate organic tissue.

When the weather finally settles, we sail into Skjálfandi



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*“A drone with a cage holding a petri dish is flown over a breaching whale so that samples of its blow can be collected and tested for pollutants.”*



*Captain Andreas B Heide takes aim to collect blubber samples.*

*“A special dart pierces the skin of the whale and removes approximately 2cm of blubber, which can later be tested for pollutants.”*

Bay with Rasmussen as our guide. “We’re looking for blows that are ten metres high,” she says. “Those ones are from blue whales.” With years of experience, Rasmussen guides us across the bay, towards the small island of Flatey, some two hours from Húsavík by boat. Here, under a clear summer’s sky, we find both humpbacks and blue whales. “How does it feel to be five metres away from the largest animal to have ever lived?” says Heide, a wide smile entrenched on his face. But while the moment is more magical than one could hope, and their physical size is something to behold, there’s no detracting from the significance of the research to be done and the opportunity to collect data. For the Arctic Whale team, there are two primary ways this is done.

The first requires a tissue biopsy to be obtained. In partnership with the University of Iceland, and with the aid of Jessica Emily Roos, a scientist studying the effects of nanoplastics on marine organisms at the University of Oslo, Heide is tasked with firing a biopsy gun at a breaching whale. A special dart pierces the skin of the whale and removes approximately 2cm of blubber, which can later be tested for pollutants. “The sample is very small. It would be like getting pricked by a needle for us,” notes Heide. The samples will be examined further at the University of Oslo, where they can be viewed under an electron microscope to see if, at a cellular level, traces of nanoplastic can be found.

The second is a new technique whereby a drone with a cage holding a petri dish is flown over a breaching whale so that samples of its blow can be collected and tested for pollutants. Tom Grove, a PhD student from the University of Edinburgh and founder of Whale Wise, a group that aims to promote better harmony between the whale watching community and the whales themselves, leads the blow sampling. “Blow sampling is essentially collecting samples of whale exhale, its breath,” says Grove. “One of the good things about blow samples is that you can look at hormones from within the whale.” While Grove’s research is focused on discovering cortisol levels related to stress, the samples will also be tested for plastic-derived pollutants at a cellular level, from inside the lungs of the whales. Grove is aiming to collect 100 different samples by the end of the summer season.

As Barba glides over the ocean’s surface, we encounter yet more white-beaked dolphins, dozens of humpbacks and a few blue whales. Each time we spot one, the excitement grows, and as we approach, the entire team falls silent. It’s a subconscious moment of reflection and connection. All of us, in our own way. The scientist, the photographer, the writer. Heide’s mission to communicate the biggest ocean issues through the lives and plights of whales makes perfect sense in these moments: truly, they are the ambassadors of the ocean.