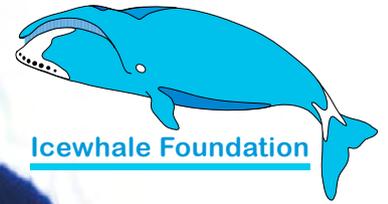


# ICEWHALE RESEARCH EXPEDITIONS



## BLANK SPOT ON THE MAP

There are still blank areas on the map of the earth. Such a blank area is the white Arctic sea-ice between Greenland and Spitsbergen. This is the remote area in which one of the most intriguing wildlife species of the world lives: the Bowhead Whale or Greenland Right Whale, *Balaena mysticetus*. We call it the *Icewhale* because it is not Greenland but the sea-ice that defines its distinctive character. Now that the Arctic ice is melting, the *Icewhale* not only faces the reduction of its critical habitat, but also the increase of shipping and seismic exploration. We need to know more about *Icewhales* in order to mitigate the challenges that they will face.

# ICEWHALE RESEARCH EXPEDITIONS

We are preparing a series of unique scientific expeditions, deep into the sea-ice during the darkness of the polar winter, where *Icewhales* are supposed to reside, mate and reproduce. This way we can learn about the life of the *Icewhales* and their interactions with the environment. In doing so, we turn the *Icewhale* from a scarcely known species into a well-known icon of the Arctic, a figurehead of sustainable conservation and development.

## ADMIRE

The research backbone of the polar winter expeditions is the science plan ADMIRE, (*Arctic Drift Multidisciplinary Icewhale Research Expeditions*). ADMIRE will encompass ecology, population dynamics and genetics, as well as research of the Arctic ocean, ice, atmosphere, contamination and acoustics. In the Netherlands multidisciplinary expertise regarding Arctic and marine systems is concentrated in universities and institutes such as the Royal Netherlands Institute for Sea Research-NIOZ, the Royal Netherlands Meteorological Institute-KNMI, Wageningen Marine Research-WMR and the Netherlands Organisation for Applied Scientific Research-TNO. Extensive support and cooperation from these institutes is essential to realize the Icewhale Expeditions' aims. Together with World Wildlife Fund-WWF, ADMIRE is coordinated with international cetacean specialists. Citizen-science will be mobilised to analyse data such as sounds and images.

## OBJECTIVES

We want to determine the exact location and size of the Spitsbergen population of the *Icewhale*. Is it still an isolated self-reproducing population? Why do *Icewhales* live in the ice? Is it to find shelter from winter storms or predation by Orcas? Why are they singing 24/7 and what do they communicate? What are the characteristics of the *Icewhale* habitat? Do *Icewhales* feed while wintering and does the sea-ice provide an adequate source of food? How do *Icewhales* affect the food web? How vulnerable are these highly vocal animals to noise from ship engines, sonar and seismic airguns? How do these big filter-feeding animals cope with microplastics? What conservation measures are feasible?

## THE ICEWHALE

*Icewhales* are huge baleen whales with thick rounded bodies, record large flukes, conspicuous black-spotted white chins and the biggest mouths in the world. These massive whales can weigh up to 100.000 kg, the second largest animal species next to the Blue Whale. They can reach lifespans of over two hundred years which makes them the longest-living mammals on the planet. Year-round bound to the sea-ice, the *Icewhale* is the only large whale endemic to the Arctic.

## SINGER-SONGWRITERS

Recordings with a fixed hydrophone at a location high up north in the Arctic show *Icewhales* displaying a great diversity of complex whale songs in the middle of the dark polar winter, year after year. It seems that *Icewhales* gather in open leads within dense sea-ice. The sophisticated whale songs presumably play a role in courtship and mating behaviour as a kind of singer-songwriter contest. Until now, hardly anything is known about *Icewhale* reproduction.

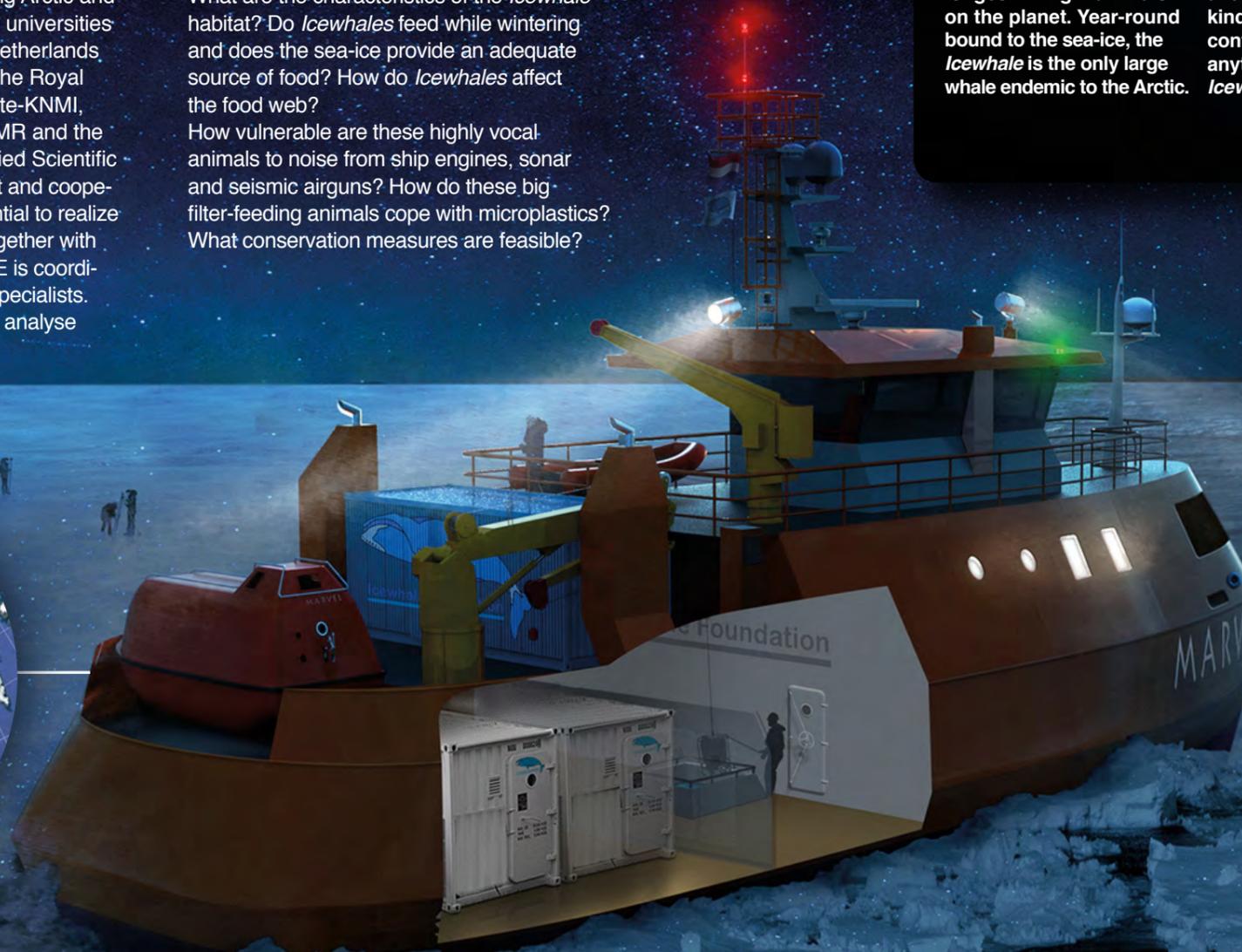


Photo: Martha Holmes



## POLAR WINTER ICE-DRIFTS

To achieve our scientific objectives, we organize a series of Arctic winter expeditions in which a research vessel performs multiple passive drifts through the western Fram Strait between Spitsbergen and Greenland, along with the sea-ice from north to south. This way the drift-ice zone can be explored in about four months over a vast area in a relatively silent undistruptive mode.



## STATUS AND DISTRIBUTION

Before Arctic whaling commenced, *Icewhales* were found in immense numbers along the entire coast of Spitsbergen. The species has been hunted extensively for their fat and baleens most notably by the Netherlands.

*Icewhales* have a near-circumpolar distribution around the ice shield covering the Arctic Ocean. After industrial whaling stopped mid-20<sup>th</sup> century the species was marked on the Red List as 'very rare'.

The current IUCN-status of the species is 'least concern' because global population size increased. However, two of four recognized populations, Spitsbergen and Okhotsk, are still listed as 'endangered'. Notwithstanding the species overall status 'least concern', the current estimated number of *Icewhales* is a faint reflection of pre-whaling population sizes, while new threats arise.

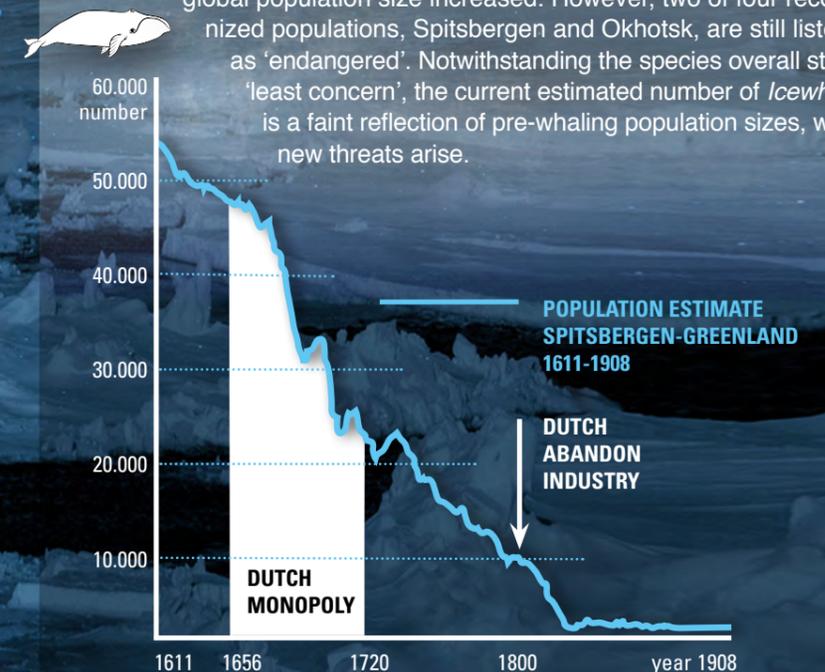
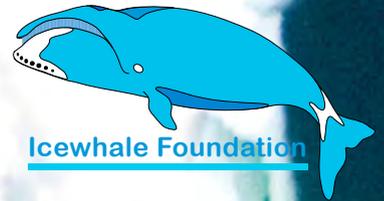


Illustration: Sikko Valk



## MARVEL

Backed by a grant from the Netherlands Organization for Scientific Research (NWO) and in cooperation with Delft University of Technology, Royal Netherlands Institute for Sea Research and Conoship Naval Architects, we produced a feasibility study and basic design of MARVEL. This Modular Arctic Research Vessel is especially designed and equipped to investigate the hardly accessible drift-ice zone and to safely withstand the dynamic pressures of drifting ice under harsh weather conditions. This strong and compact vessel will operate autonomously during four to five months throughout the polar winter night, with a limited crew of scientists, engineers and navigators. The crew operates like astronauts in a space station: *Iceonauts* who will be supported 24/7 by a Ground Control Station.

## LABS, DRONES AND SUBS

MARVEL accommodates up to four hi-cube 20 ft containers that serve as research laboratories for various scientific disciplines.

The principal methods to access the environment above and under the ice cover are drones and the moonpool. Aerial and underwater drones are used for sampling and observations and to set out instruments for acoustical recordings. The moonpool offers access from the sheltered interior of the vessel to the underwater environment and the underside of the sea-ice. Scientists can lower a wide variety of sampling, measuring and observation instruments through the moonpool, as well as scuba divers and submersible robotics.

## FUNDING AND PUBLICITY

One important aim is to engage the public in the challenges posed by the warming of the Arctic. Awareness and enthusiasm will be generated through the combination of the impressive *Icewhale*, intriguing scientific questions, challenging expeditions under Dutch flag and the increasing interest for wildlife conservation and climate change. This constitutes the sound and rational basis for private-public funding of the Icewhale expeditions, involving government, industry, NGOs, charities and the public at large.

 TU Delft



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