Paper in Frontiers:
SAvE Whales by OceanCare is the first integrated sperm whale localisation system worldwide

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A now published scientific paper in "Frontiers in Marine Science" presents the results of OceanCare's successful three-year pilot project SAvE Whales. The system developed under SAvE Whales uses solar-powered high-tech buoys equipped with hydrophones to localise sperm whales by their clicking sounds, and transmits their position in real time to relevant marine traffic for the avoidance of ship strikes. It is the first system of its kind for sperm whales globally and a milestone in cetacean conservation, complementing further action to protect the last sperm whale population of the eastern Mediterranean.

Link to paper: A real-time acoustic observatory for sperm-whale localization in the Eastern Mediterranean Sea

- **SAvE Whales first integrated sperm-whale localisation system worldwide**
- **Solar-powered high-tech buoys localise sperm whales by their clicking sounds**
- **Real-time information to marine traffic can save whales from ship strikes**
- **Frontiers publishes paper presenting the results of the scientific pilot project**

Alexandros Frantzis, Scientific Director at Pelagos Cetacean Research Institute, says: "Now we know that saving the sperm whales is feasible thanks to the pioneer technology that we have developed collectively. It is time for both the Greek and the European authorities to use this technology locally, regionally and beyond, in order to allow sperm whales to live safely and survive."

Emmanuel Skarsoulis, Research Director, Underwater Acoustics Group, Institute of Applied and Computational Mathematics FORTH, says: "The development, deployment and operation of a real-time acoustic detection and localization system was an extremely challenging endeavour that we addressed with enthusiasm and care. I hope that the success of the SAvE Whales project paves the way for the use of underwater acoustics for the protection of sperm whales and for the good of the environment in general."

Nicolas Entrup, Director International Relations at OceanCare, says: "The pilot project has resulted in a system which can become the missing link for the effective protection of sperm whales from ship strikes, in particular where re-routing is not possible. Shipping should slow down anyhow, but by being alerted to the presence of sperm whales, vessel captains can and shall act to reduce the collision risk to the absolute minimum. The SAvE Whales system constitutes an important tool and know how available to relevant authorities in Greece as well as any maritime country, where sperm whales face similar risks."
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Pilot project SAvE Whales – the situation at the outset
No more than 200-300 sperm whales are living today in the entire eastern half of the Mediterranean Sea. Alarming results from Pelagos Cetacean Research Institute indicate that the population might have been halved to only 100-150 whales over the past 10-15 years. The main threat to this population are the more than 30.000 cargo vessels that annually cross their habitat at high speed. The International Union for Conservation of Nature (IUCN) assigned the 'endangered' status to the Mediterranean sperm whales.

International and regional agreements oblige Greece to take action to protect the sperm whales, including their habitat, the Hellenic Trench. With ship strikes constituting the main threat to sperm whales, OceanCare aims for the following decisive measures to protect the whales: (i) re-routing of shipping lanes, and (ii) using SAvE Whales technology where re-routing is not feasible and (iii) and slowing down, which would also have other additional environmental benefits, such as reducing noise and GHG emissions. The aim is to save the sperm whales in the eastern Mediterranean from extinction.

Milestone SAvE Whales – High-tech to save the last sperm whales in the Mediterranean

SAvE Whales is a milestone to secure a future for sperm whales in the Mediterranean. The system uses solar-powered high-tech buoys equipped with hydrophones that record the clicking sounds of the sperm whales, process them and send filtered data to a land-based analysis centre where computer models are used to detect, precisely localize the animals, and finally forward the localization fixes to nearby ships, all in real time. Specifically developed software combines localization results with shipping information from Marine Traffic, a leading ship tracking service provider, to assess collision risk. If a vessel is on a collision course with a whale, its captain can be warned well in advance, such that the ship slows down and/or changes course in time to avoid the whale(s).

SAvE Whales pilot project – results and challenges

The SAvE Whales pilot project was carried out in the three years from 2019 to 2021. The specially developed system, which has now been successfully tested, consists of three acoustic stations at distances of 1 to 2 km with hydrophones suspended from surface buoys to a depth of about 100 m. The data is transmitted to an analysis centre on land via mobile broadband. Combining the data from the three acoustic stations allows to detect and localise vocalising sperm whales. By combining this information with ship traffic data, vessels with a high risk of collision can be identified and notified.

During the deployment seasons of 2020 and 2021 the SAvE Whales buoys were deployed in the sea for 3 months each year and sperm whales were detected on a total of 46 days. The system proved to be effective and successful, with small localisation uncertainties at distances up to 7 km. The cited article discusses how the project met challenges of rough sea and weather conditions or why the redesign of the mooring system is necessary. It also discusses the need for more advanced solutions for energy consumption and storage capacity to enable operation in winter or at other latitudes when solar energy is limited. The system is particularly recommended for use between Kythira and Cape Tainaron in Greece, but the know-how can also be applied to other regions, e.g. in the Balears.

Background – Ship strikes are the main threat to sperm whales

More than half of the sperm whales that wash up dead on Greek coasts are victims of ship strikes. Ship strikes are the main threat and cause of death for sperm whales in the eastern Mediterranean. Collisions with ships are mostly fatal, while some animals are badly wounded by ship propellers. The Hellenic Trench, which stretches from the Ionian Sea to the south of Crete and the Sea of Rhodes, is a core habitat for sperm whales. The area is designated as an Important Marine Mammal Area (IMMA) for sperm whales at the global level. However, this area is also one of the world's busiest sea lanes. Reducing the speed of ships and moving shipping routes out of sperm whale habitat are the most important measures to avoid collisions. SAvE Whales was developed for areas where avoidance of sperm whale habitats through re-routing is not feasible.

"With the pilot phase completed, it is now important to move to a full scale application of the system. Such an application in Greece, with the collaboration of the relevant authorities, will open new conservation

opportunities for the endangered sperm whales where re-routing is not possible. If no action is taken, the last population of sperm whales in the eastern Mediterranean will be wiped out by ship strikes" says Nicolas Entrup, Director International Relations OceanCare.

Further information

Paper *A real-time acoustic observatory for sperm-whale localization in the Eastern Mediterranean Sea*: https://www.frontiersin.org/articles/10.3389/fmars.2022.873888/full

The abbreviation "SAvE Whales" stands for "System for the Avoidance of ship-strikes with Endangered Whales". The project was supported and funded by OceanCare. It was carried out by experts from the Institute of Applied and Computational Mathematics FORTH (Greece), the Pelagos Cetacean Research Institute (Greece), Marine Traffic, Green2Sustain and CINTAL at the University of the Algarve (Portugal).

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