



EARLY WARNING SYSTEM TECHNOLOGY FOR DETECTION OF MARINE MAMMALS: Within the Saldanha Bay Aquaculture Development Zone



INTRODUCTION

On the west coast of South Africa, Saldanha Bay's Aquaculture Development Zone (ADZ) is one of the key strategic areas identified by the South African government to unlock an ocean economy.

This sea-based ADZ includes various economic activities from bivalve production sites such as a rope-grown mussel aquaculture farm to the iron ore terminal that accounts for roughly 96% of all iron export from South Africa.

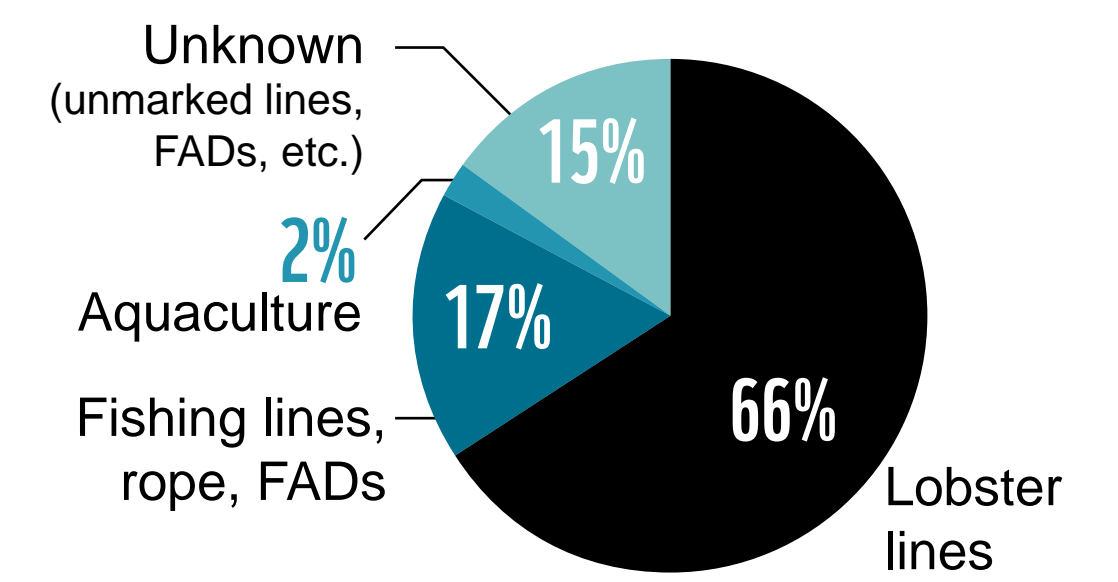
PROBLEM STATEMENT

Every spring, humpback whales and southern right whales embark on an annual migration from their winter calving grounds to summer feeding areas in the sub-Antarctic waters. These whales utilise the Southern Benguela as a primary foraging habitat, often spending several months near the coast. Their extended time in the area, including Saldanha Bay, increases the risk of entanglement in local mussel-farming ropes, leading to severe injuries or fatalities for these marine mammals.

According to the South African Whale Disentanglement Network (SAWDN), statistics in the Saldanha Area between 1992 and 2022 show there have been nine whale entanglements, resulting in two deaths. The leading cause of these entanglements can be attributed to various fishing practices in the area and interaction with aquaculture infrastructure. The majority of whale deaths however occur due to ship strikes.

Research has shown that dolphins also frequent the bay, with 2021-2022 data showing that dusky dolphins were present for about 60% of the days and the Heaviside's dolphin is present almost every single day in the bay. These dolphins feed within the mussel lines at these farming sites and the whales may be passing by, foraging or in the bay to rest with their calves.

WEST COAST WHALE ENTANGLEMENTS



Causes of whale entanglements along South Africa's West Coast. Source: SAWDN

SOLUTION

In 2023, WWF South Africa and Vodacom partnered to co-develop a bespoke early warning system (EWS) as an innovative solution to prevent whale engagements and ship strikes for these migrating whales.

Development of the EWS technology will help the relevant management authorities in timeous response to the whale entanglements and also reduce the economic and environmental impact of the entanglement in the Saldanha Bay ADZ.



METHOD

System design: Using a bespoke technology system, the EWS employs a combination of 24/7 thermal imaging and high-definition (HD) cameras, acoustic hydrophones (0-500kHz) for passive acoustic monitoring (PAM) and AI technology to monitor the movements of cetaceans in the bay. It is triggered through visuals and whale calls.

Installation: Two maritime HD/infrared camera systems will be mounted on the port control roof in Saldanha Bay offering 240° coverage. This camera system would make it possible to detect the cetacean's heat signatures, more specifically those of whales. The heat signatures are useful even in low light conditions and within a 5 km radius.

System monitoring: The EWS will trigger Saldanha Bay's ADZ emergency response protocol when whales are detected in the bay. Real-time alerts will be issued through SMS and email to the relevant authorities, such as the National Sea Rescue Institute, the Department of Forestry, Fisheries and the Environment and the SAWDN.



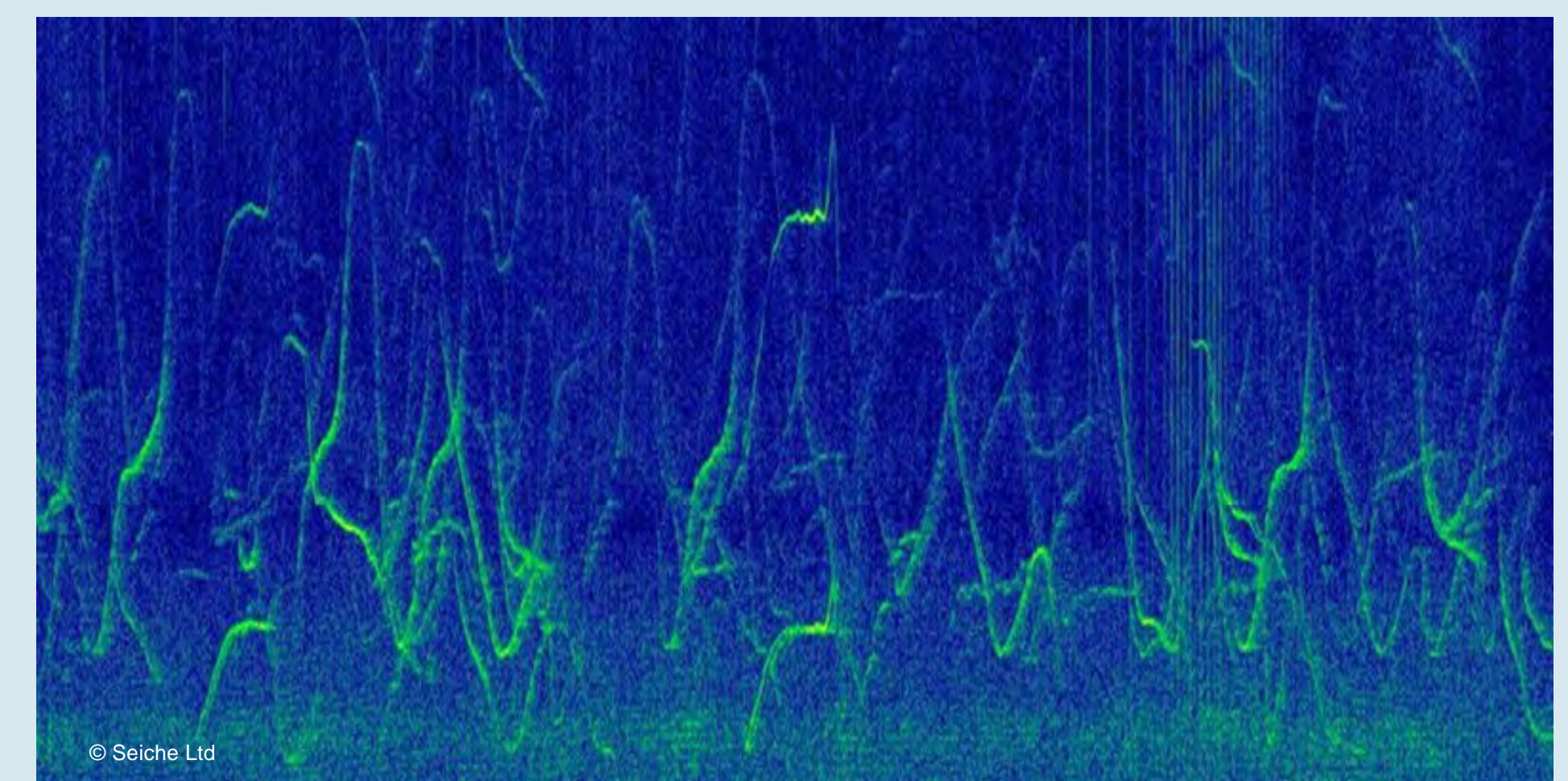
CAMERA AND HYDROPHONE



Example of dual camera system - sperm whale fluke on HD / thermal imaging camera



Gen 2 - Dual thermal imaging & HD visual detection system



Spectrogram of dolphin whistles and echolocation recorded by a Seiche PAM system

FUTURE TECHNOLOGY APPLICATION

This EWS pilot project presents the development of EWS technology as a solution to mitigate whale entanglements and ship strikes in the vicinity of the Saldanha Bay ADZ. Although aquaculture accounts for only 2% of the whale entanglements, the EWS technology could be used to prevent entanglements and ship strikes in other sectors outside the Saldanha Bay ADZ.



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