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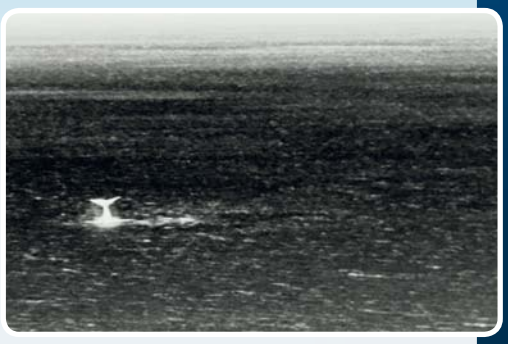
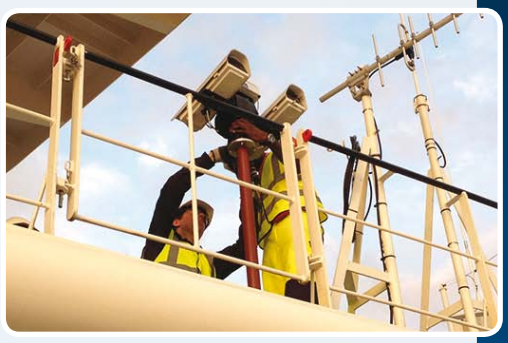
Seiche
Marine Acoustic Solutions

DETECTION OF BALEEN WHALES

Regulatory requirements for effective noise mitigation are increasing, particularly for the protection of baleen whales. Detection of baleen whales for baseline survey and mitigation requires visual and passive acoustic monitoring (PAM).





Baleen whales of the Eastern seaboard of the USA

The baleen whales (Order Cetacea, suborder Mysticeti) are currently considered to comprise 15 species. Of these, 8 occur in the waters around the Eastern seaboard of the USA and all are protected under the Marine Mammal Protection Act of 1972. There are several threats which potentially affect the species. These include: entanglement and fisheries issues, ship strike, whaling, pollution (physio and bio-chemical and noise) and disease and habitat degradation.

Underwater noise has the potential to interfere with communication between whales. It can mask environmental sounds that animals use for navigation, foraging and the sounds of predators. High intensity underwater sound, including some sources of anthropogenic noise, can result in physical injury that can be either temporary or permanent. Indirectly, whales may be affected by underwater noise if it changes the distribution and availability of their prey. As a response to these potential impacts, several mitigation techniques have been proposed.

Many mitigation plans include the detection of marine mammals (visually or acoustically) and modifying activities to avoid the detected animals, decrease amplitude, or turn off the sound source if the animals are within a critical distance. These methods usually require searching by ship-based marine mammal observers (MMOs) during daylight hours and in some cases, at night using night-vision devices and the use of Passive Acoustic Monitoring (PAM) systems.

> **The challenge for PAM is to detect baleen whales whose vocalizations are in the low-frequency range and may be masked by background and operational noise. For visual monitoring, poor conditions and night-time hinder marine mammal observation.**

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SEICHE SOLUTIONS

Seiche offers a range of technology for the detection of baleen whales. The approach chosen is closely tailored to the project and the specific marine environment.

Specialist Towed PAM System

Our most extensively used PAM system is robust, reliable, and available at short notice. The system is supported by PAMGuard software and offered in a number of configurations. For detection of low frequency species, specialist amendments include:

- **Extended array** – a longer cable of 400 metres distances the sensors from the operational sound of the vessel.
- **Digital Thin Line Array** – this new generation of highly sensitive digital hydrophones greatly improves signal-to-noise ratio. This advanced system enables full control of gain and filters in real-time.

Unmanned Surface Vehicles

Unmanned surface vehicles (USVs) offer a very quiet platform with the manoeuvrability to scope ahead for sensitive species such as baleen whales.

Fixed Buoy

A fixed buoy is a versatile solution that can be used for both baseline monitoring and/or mitigation. For true real-time mitigation monitoring, the Seiche wireless PAM transmission system can be fitted. The buoy can be deployed in harsh offshore environments and can be manually handled by two crewmen.

Seabed Mounted

For long-term baseline monitoring, the Hilo and Orca can be deployed on the seabed to record data for offline analysis.

Dual Camera System

Our dual camera system has thermal imaging and high definition to enable consistent visual 24-hour monitoring. Thermal imaging has proven capability for consistent detection of marine targets, such as dolphins, at up to 2 km distance. RADES-ARC software is integrated into the system for accurate range estimation at sea and automated detection of marine mammals.

RADES-ARC Software

Seiche's proprietary software has two components:

- **RADES** accurately assesses the distance and range of objects at sea and provides an overlay of a specified mitigation zone. This enables robust decision making on the position of an animal that is both objective and recordable.
- **Automated Recognition of Cetacean (ARC)** software builds on the RADES framework to provide automated detection of marine mammals and assists a visual observer in locating animals at the surface.

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