

Monitoring marine mammals

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PAMBuoy, a new instrument to detect whales, dolphins and other marine mammals, and provide immediate alerts during the development of offshore wind, wave and tidal installations.

A new instrument to detect whales, dolphins and other marine mammals, and provide immediate alerts during the development of offshore wind, wave and tidal installations, will be showcased to an international audience at the University of St Andrews on Thursday 27 September.

PAMBuoy was developed by SMRU Limited, a [marine mammal](#)

consultancy which is a commercial spin out from the world renowned Sea Mammal Research Unit at the university. PAMBuoy is a cutting edge autonomous passive acoustic monitoring system for marine mammals. It operates 24/7 to automatically detect and classify vocalising marine mammals – whales, dolphins and porpoises, providing high [resolution data](#) that can be used to identify species present and determine temporal patterns in use.

The units are being manufactured by Marine Instrumentation Ltd, and the team has just made its first commercial sale to an engineering consultancy in Australia.

This breakthrough in new technology is a major step forward in the race to construct [offshore wind farms](#) and wave and [tidal turbines](#), an industry with great potential for the economic future of Scotland. A recent government report claims that Scotland could produce 40% of the UK's energy from offshore installations making electricity from our greatest natural resource – the sea. And that we have the potential to produce 25% of Europe's [energy requirements](#) from wind. Thus helping us achieve our emissions reductions targets through greener sources of energy.

Dr Gordon Hastie, one of the scientists from the team which developed the new technology, said: "PAMBuoy is a revolution in [marine mammal science](#). It is a cutting edge, autonomous, marine mammal, passive acoustic monitoring device, which helps mitigate potential impacts from offshore activities.

"PAMBuoy 'listens' for marine life, then delivers information about what's swimming beneath, in real time back to a customer's desk top, mobile phone or other hand held device, and if mounted in a buoy, derives its power from the sun via solar panels. Data is checked automatically for quality, and made available to clients immediately

through secured parts of the [PAMBuoy website](#)."

Passive Acoustic Monitoring (PAM) is the term used to describe the process of passively listening for sounds emitted by animals. Small cetaceans such as harbour porpoises, and other dolphin species can be extremely difficult to observe in the wild as they spend the majority of their time underwater, generally occur in small groups, and often present a low profile at the surface. These species are much easier to detect acoustically, as they regularly produce sounds for orientation, navigation, foraging and communication. The blue whale makes a low frequency moan, dolphins whistle and harbour porpoises emit high frequency echolocation clicks, PAM can be used to collect data continuously whatever the weather, day or night, and is a research tool which is increasingly considered for monitoring and mitigation purposes during industrial and high risk activity in the marine environment as well as for behavioural and population research.

Dr Hastie continues: "This technology grew out of a scientific interest in the behaviour of marine mammals and was partly inspired by seal tagging technology which transmits information by satellite to shore when the seals surface. Technology like PAMBuoy is gold dust to offshore wind farm developers, who seek to minimise impacts on marine life during their developments of greener energy production."

The new system will not only support the offshore marine renewable energy industry, oil and gas companies, but also the regulators and academic researchers and help reduce the effects of potential operations on marine mammals. It can be placed in a buoy offshore, or placed onshore for example in a harbour application, and is clever enough to automatically recognise the species detected.

The PAMBuoy will be invaluable for environmental impact assessments which look at the activities of marine mammals around proposed

developments for wind and wave farms.

Professor Ian Boyd, Chief Scientific Advisor at DEFRA and formerly founding director of the Sea Mammal Research Unit said: "We are delighted to see fundamental research from the University of St Andrews, producing this very practical instrument. Cracking the problem of how to detect these animals reliably has taken many years. Efforts continue to develop the statistical methods that will result in estimates of marine mammal population size from the emerging data."

SMRU Ltd was founded in 2006 and today employs 12 scientists who apply their knowledge of marine mammals to the challenges faced by industry of developing in the marine environment. The company has opened offices in Canada, USA, Uruguay, and Hong Kong to meet growing interest and demand for its products and services.

Douglas Mundie, group commercial director, said: "PAMBUoy is designed to help companies to meet their obligations in monitoring the impact of their activities on marine mammals. We quickly realised there was a lack of reliable instruments available to us which could detect marine mammal presence in real time.

"We have invested three years of research into creating the world's first truly autonomous, real-time marine mammal detection and classifier . Using various power options including solar power and onboard computer, monitored remotely from our offices means that the unit can be deployed year round? with little maintenance. Because the detections the unit makes are sent wirelessly to the user, PAMBUoy minimises the risk of valuable data being lost in poor weather. We see a global market for this device which can operate remotely for months on end. Tests in Scottish waters and in the USA have been highly successful."

Initial prototyping trials with PAMBUoy began in St Andrews Bay in

May 2011 and most nights the system detected the movement of dolphins in the Bay. Night detection would have been impossible with conventional survey techniques for marine mammals which use human observation to search for animals at the water's surface, i.e. an individual with binoculars, hampered by bad weather and limited to daylight hours. A second Proof of Concept PAMBuoy unit was installed onshore, at the Lime Kiln Point State Park lighthouse on San Juan Island at Seattle in the USA. Its role was to listen for Southern Resident Killer Whales (orcas in the area during the late summer months. Both locations are now testing Mark II prototype PAMBuoy. You can see their data in real time on the [PAMBuoy website](#).

The team of scientists which is developing this new Scottish product is led jointly by bio-acoustician Doug Gillespie and software systems developer Andy Maginnis. They are supported by marine mammal biologists Dr Gordon Hastie and Dr Cormac Booth, and Richard Baggaley, Operations Manager of [Marine Instrumentation Ltd](#).

Also on display for the first time in the UK at the Showcase day, will be an application of PAMBuoy on Wave Glider. This is an unmanned autonomous maritime vehicle which can be programmed to travel from off the back of a simple fishing vessel, on its own, to monitor sea life in more remote locations using only the power of the waves for propulsion. A versatile platform, the Wave Glider is equipped with GPS and sophisticated computers for navigation and payload control, with satellite communication systems and state of the art ocean sensors to monitor and measure the environment around it. Its on board instruments are powered by solar panels making it an extremely versatile platform. Working in partnership with American firm Liquid Robotics, who developed Wave Glider, SOI Group Ltd has created a more versatile application for this ocean research.

More information: www.pambuoy.com

Provided by University of St Andrews

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