

SCOTLAND'S NOISY SEAS

Recent findings by the Scottish Association for Marine Science (SAMS) in collaboration with HWDT have shown that underwater noise pollution from the aquaculture industry has increased and is now widespread on the west coast of Scotland. Charlotte Findlay, one of the lead authors on the paper explains more.



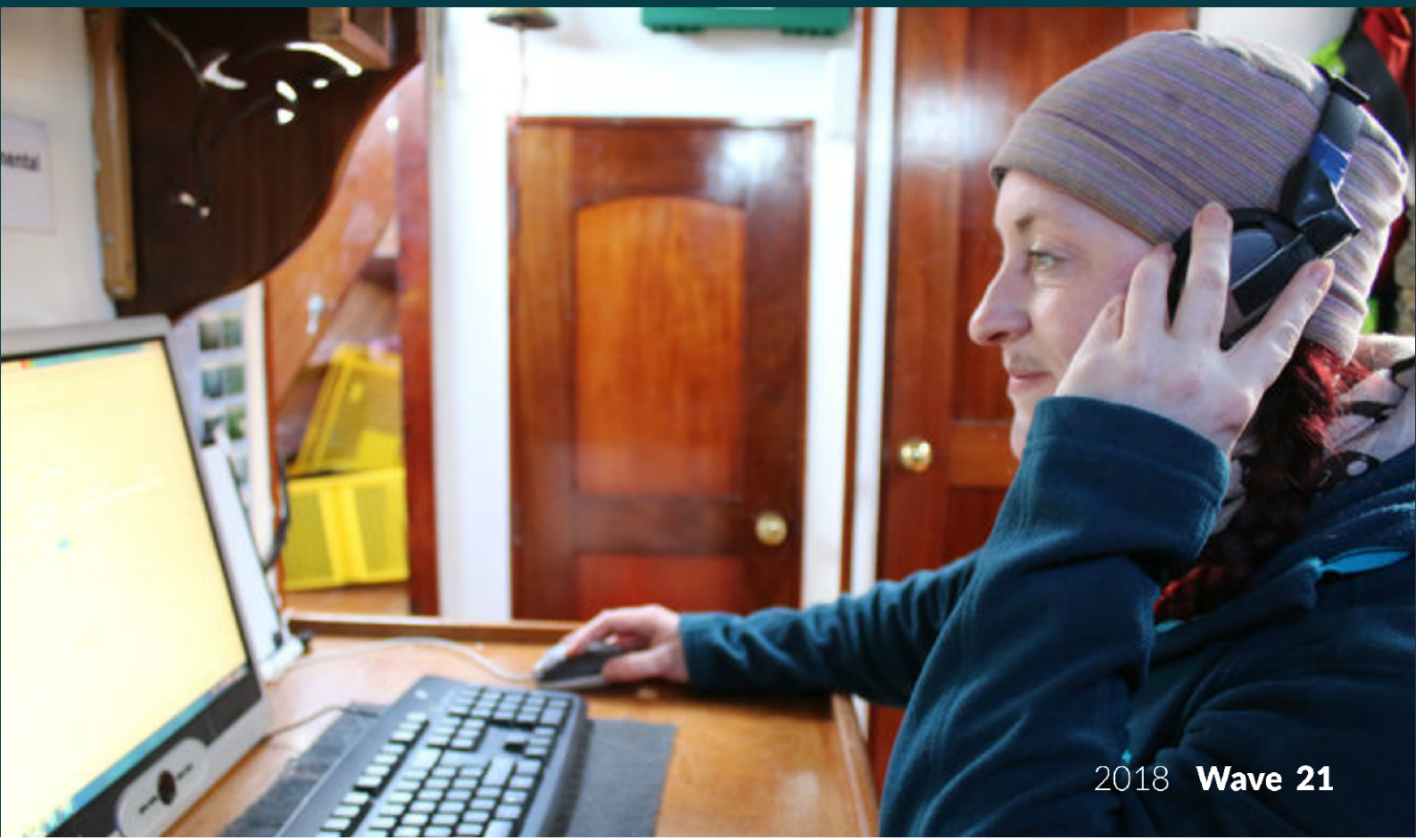
Aquaculture is a rapidly expanding rural industry along Scotland's coastline. Dominated by Atlantic salmon, Scotland is currently the largest producer in the EU and the third largest globally. Farmed salmon is Scotland's top food export, with fresh salmon exported to over 50 countries. As part of the Scottish Government's policy to increase economic growth, targets have been set to continue to increase production sustainably, doubling the output by 2030.

However, the industry is causing widespread underwater noise pollution due to the use of acoustic deterrent devices (ADDs), also known as 'seal-scarers'. These devices are used on fish farms to scare away marine predators such as grey and common seals. A form of non-lethal deterrence, ADDs provide an alternative to the licenced shooting of seals which is allowed under the Marine Scotland Act. To deter the seals from approaching and damaging cages or fish, ADDs are attached to the cages underwater, where they produce an intense and aversive noise into the marine environment. This noise is within the hearing range of seals, making it uncomfortable for them to approach. Having said this, the long-term effectiveness of ADDs in preventing seal depredation has not been shown conclusively and remains a topic of considerable debate.



Fish farms do not currently need a licence to use ADDs, so their use in Scotland is largely undocumented. There is no formal evidence to show how many farms use ADDs, how many ADDs are used per cage or how many hours and days they are emitting sound into the marine environment. This is a worry, particularly as there is growing concern about the impact of ADDs on marine mammals. ADD noise has been shown to not only affect seals but also whales, dolphins and porpoises. The sound frequencies used by ADDs are similar to those that cetaceans use to communicate and to hunt, and at the noise levels produced they have the potential to cause both physical and behavioural effects, such as reduced hearing sensitivity and or exclusion from key habitats.

It was clear to both Hayden (joint lead author on the paper) and I that quantifying ADD noise across the area was vital to begin to understand how the use of these devices has changed over time and space. Addressing this for our masters' theses, we analysed the equivalent of over 800 days of acoustic data (19,600 hours) collected on board HWDT's research vessel *Silurian* between 2006 and 2016. The data provided us with a series of one-minute sound recordings, taken frequently whilst sailing across the Hebrides. HWDT collects these sound recordings by towing a hydrophone (underwater microphone) behind the yacht whilst conducting visual surveys for marine life. Volunteer citizen scientists listened to the sound recordings on board in real time, documenting any natural or man-made noises they hear.





By analysing Silurian data, we were able to measure the presence and absence of ADDs, their geographical spread and changes in use over time.

For the first time ever, we documented that noise from ADDs is widespread and has been steadily increasing across the west coast of Scotland over the last 11 years.

Notably, ADD noise was only present in the Sound of Mull back in 2006, however from 2009 onwards ADD noise could be heard up and down the west coast of Scotland across the Sea of the Hebrides, the Minch and sea lochs extending up to Cape Wrath. Three types of ADDs were identified, each producing different sounds, sometimes heard simultaneously. What our study shows, is that ADDs have become a chronic source of underwater noise pollution across the region, which is frequently overlooked.

With the Scottish west coast home to one of the highest densities of porpoises in Europe and sightings often reported close to fish farms, it has never been so important for further research to accurately assess the environmental

impact of ADD use. This is particularly relevant, as an area of over 13,800 km² ha been submitted to the European Commission as a candidate Special Area of Conservation (SAC) to protect porpoises and their habitats across the west coast of Scotland. This area includes a number of sea lochs with active fish farms.

Given the results of previous scientific studies we know that ADD noise could potentially be affecting animals, the increasing use of ADDs is therefore worrying. Cumulative effects could be causing harm to individual animals, which over time could threaten the population. So what is next? Personally, I am exploring the risk of injury and displacement of porpoises and seals from ADDs as the focus of my PhD. However, given the evident presence of ADD noise and the proposed SAC, there is also a clear requirement for industry to improve the reporting of ADD usage at fish farms, to enable better monitoring and awareness of Scotland's noisy seas.