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Mr David Ainsley
Sealife Adventures.

28 May 2020

By email to: info@sealife-adventures.com

Dear David,

Application to vary a condition at a farm in Shetland, stipulating that ADDs may not be used.

Thanks for your email on this from the 14th of May. I have now sought input from colleagues and we respond below to the points you have raised.

The application referred to in your email is for a variation in planning permission to allow a trial deployment of the TAST system at an existing fish farm site at Swinning Voe by Grieg Seafood, Shetland.

We have reviewed our advice to Shetland Island Council and can confirm that this still stands. We disagree that the evidence available is not robust enough to enable this trial of the full TAST system in this location. As the application is pending consideration, the conditions to be applied to this variation are not yet confirmed; but we anticipate that monitoring, reporting and assessment will be conditioned in line with our advice, the results of which will inform future advice. The intended duration of the trial is 19 months, i.e. one complete production cycle.

We highlight that the use of the TAST system is in addition to the predator control measures already in place, and will be operated in line with the TAST deployment plan. This states that the system will only be switched on in the event that existing measures are not working, and that the system will be switched off after five consecutive days of no seal morts. Reporting is included in the plan.

Based on the evidence to date, our view is that this system is likely to be significantly less harmful/disturbing to marine species, and is one of the only ADD systems available that has evidenced a reduction in seal predation (Gotz & Janik, 2016[1]). A further trial in a different location is the next step in this assessment.

We have formed our response to your query as follows:

1. EPS Licensing.
2. The TAST system and its Development.
3. SARF.

[1] GötzT,JanikVM (2016) Non-lethal management of carnivore predation: long-term tests with a startle reflex-based deterrence system on a fish farm. *Animal Conservation* 19: 212-221. doi: 10.1111/acv.12248

1. EPS licensing

We highlighted in our response to your FOI request of June 2019 our process with regards to Regulation 39(2) and EPS requirement (copied below):

Q4. Please supply any information as to why SNH has not informed the other farms of the requirement to hold an EPS licence before ADDs can be used.

A4. For commercial activities in the marine environment, EPS licences are regulated and issued by Marine Scotland Licensing Operations Team (MS-LOT). SNH are formally consulted by MS-LOT as part of the licencing process, but it is not a statutory requirement for us to provide advice on whether or not a marine EPS licence is required. As marine EPS licencing is regulated separately by MS-LOT it is not directly relevant to the planning process and we do not routinely seek to provide the Planning Authority with advice in relation to the requirement for marine EPS licences.

Our advice to Scottish Government in 2017 still stands. We highlighted then our view that there is enough evidence in the literature to suggest a real risk of disturbance to cetaceans from certain types of ADD brands. This advice was based on available literature regarding specific ADD systems; we therefore called for management of ADD systems used in aquaculture to be put in place. Our advice does not call for a ban on any/all ADDs but seeks to control the type and use of ADD systems going forward.

We understand that Marine Scotland are responding to you on a related matter and will update you on progress in their work on ADD policy.

2. The TAST system and its Development

Science is rarely definitive; however, in this case we are satisfied that there is sufficient evidence to enable this trial to go ahead. We do not agree that the findings of Trites and Spitz (2016) 'strongly suggest' that TAST could disturb cetaceans.

Whilst the commercial development of the TAST system is relatively new, this system has been under development for over a decade; the system designed for seal deterrence is called 'Salmonsafe' which sits under the overarching 'Genuswave' brand, a Targeted Acoustic Startle Technology (TAST). Thomas Gotz first started looking at ADD systems for his PhD[2]. The idea arose from the concern regarding typical ADD systems, and the need to try to find a system that was effective for seals without negative impacts on non-target species. The PhD was completed in 2008, and was the basis for all work that has followed in the intervening years.

The commercial component has been developed from the academic. It is not true to infer commercial pressure and observational bias has influenced device testing and development. You also allude to the fact that 'one of the developers is a director of the company'. Whilst this is true, we do not agree that this means there is any untoward bias in the science. Professor Vincent Janik is an established and respected scientist, and currently is the Director of the Scottish Oceans Institute (SOI) at St Andrews. Both authors are transparent about the connection between the scientific studies and the commercial application. The scientific process is one of peer review and challenge. There is very little scientific research that does not include caveats and further unknowns. We therefore need to consider the evidence in a risk-based manner.

This Farm proposes to use 12 TAST transducers, spread across its site. The reason for this is that the startle response only works in the near field and therefore to protect the farm from all angles, devices are needed all around it. Only one transducer will fire at any one time (unlike other systems that potentially could overlap). The mention of 'random' relates to the pattern, or order of firing. There will not be occasions where two or more fire simultaneously

[2] Gotz. 2008 PhD thesis "Aversiveness of sound in marine mammals: psycho-physiological basis, behavioural correlates and potential applications. St Andrews

as this would negate the effect of a startle sound source. The duty cycle is representative of the pattern of firing, and can be altered so that the gaps between firing are reduced if required. This application cites up to 2% duty cycle. This is very low when compared to other ADD systems.

With regard to the noise level of this system (at ~180 dB re 1 µPa; centre frequency 1 kHz)), it might be useful to compare this to other man-made noise. For example, small boats' and ships' vessel noise is in the order of 160-180 dB re µPa rms at frequencies of 20Hz to 10kHz, with larger vessels emitting noise increasing in volume to ~190 dB re µPa rms[3]. Although vessel noise is continuous in nature rather than intermittent, it is useful for context. Also, fish finders or echosounders can operate at a range of frequencies dependent on the type. However, some are within marine mammal hearing and operate at levels around 200 dB re 1 µPa[4].

Gotz and Janik (2010)[5] looked in detail at different types of sound, i.e. white noise, sine wave, psychophysical sounds (sound roughness, dissonance) and typical ADD noise profiles. The signal for the Genuswave transducer builds on this and uses the roughness characteristic together with a short rise time to elicit a startle response. This is a different signal type to other brands of ADD system.

Götz & Janik (2015)[6] detailed work conducted in the west coast of Scotland, at Bloody Bay on the Isle of Mull. This was an assessment of the system over a two-month period on a fish farm (the same location as subsequently used in the SARF project). Observations were made over three distance categories, by vantage point methodology using binoculars and a theodolite. Seal presence decreased within 250m during active sessions, but was unaffected further away. There was no statistical difference in harbour porpoise presence in any of the distance categories. The differences in responses between the two species can be explained by the differences in hearing abilities at 1kHz.

Götz & Janik (2016)[7] presented a trial of the system, focusing on seal predation, and wider marine mammal responses to the system deployed at Shuna. As with the previous study, visual observations were undertaken using both vantage point methodology and theodolite, over a survey period of about a month. Here they found a slight reduction of seals within 100m, but no effect on porpoise presence. Analysis of fish farm morts, suggested seal predation was significantly reduced.

Both of these studies are published in peer-reviewed journals.

Götz & Janik (2016b)[8] responded to Trites and Spitz (2016) commentary in agreement with many of the issues raised, in particular that any one system should not be considered a panacea. This is worth a read, as it counters much of the criticism levelled at this work, i.e. absolute numbers were provided, statistical models were used to look at effect, and the work was conducted in areas of high porpoise presence. In our view, Trites and Spitz (2016) make reasonable points, but their critique of the Genuswave is not warranted in places.

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[3] OSPAR Commission (2009). Assessment of environmental impact of underwater noise. Biodiversity Series.

[4] Ocean Noise and Marine Mammals (2003). Committee on potential impacts of ambient noise in the ocean on marine mammals. National Research Council ISBN: 0-309-50694-8, 204pg

[5] GötzT, Janik VM (2010). Aversivness of sounds in phocid seals: psycho-physiological factors, learning processes and motivation. The Journal of Experimental Biology, 213, 1536-1548

[6] GötzT, Janik VM (2015). Target-specific acoustic predator deterrence in the marine environment. *Animal Conservation*, 18: 102-111. doi: 10.1111/acv.1214

[7] GötzT, Janik VM (2016). Non-lethal management of carnivore predation: long-term tests with a startle reflex-based deterrence system on a fish farm. *Animal Conservation* 19: 212-221. doi: 10.1111/acv.12248

[8] GötzT, Janik VM (2016b). RESPONSE. The startle reflex in acoustic deterrence: an approach with universal applicability *Animal Conservation* 19: 225-226. doi: 10.1111/acv.12295

In our view, Gotz *et al* (2020)[9] does not constitute evidence that the Genuswave will result in disturbance to bottlenose dolphins. Odontocetes can self-mitigate noise and can down-regulate their hearing when emitting echolocation clicks, so this work was looking at whether they have a flinch reaction to startle sounds. The 1kHz signal elicited a weak startle in bottlenose dolphin at 146-150 dB re 1 µPa. There was no avoidance reaction, but a brief and weak flinch. This study acknowledges that there is more work to do to find out where the sensitization level is in bottlenose dolphin, however, any behavioural response if it occurs would be at higher levels than required for a flinch. There is little concern that Genuswave would elicit a behavioral response from bottlenose dolphins.

3. SARF

The SARF project you mention did find reactions to both the high frequency and low frequency signal used. This study used an artificial signal at 8-18 kHz and at 1-2 kHz. The project did not use any commercially available ADD system signal, the artificial one was designed to replicate typical signal patterns such as for the Airmar and AceAquatec brands. These were pulsed sinusoidal waves, which are therefore different to the signal type used in Genuswave, also with a much higher duty cycle (at 50%) than Genuswave. The SARF project is a useful and interesting look at the different signal characteristics, however, there were issues (noted in the report). One was that when they conducted the study there were few porpoise sightings, although we think the general avoidance to both of these signals was reliable. One relevant criticism levelled at the low frequency signal was that, when the signal was activated, there was a broadband click (which included higher frequencies) on switch on, and switch off, which may have affected the results.

The SARF study to us suggests caution, that a low frequency *per se* may not have the target specificity as seen in Gotz and Janik's work, and this in turn suggests that it is not only frequency and level that is important, but signal type as well.

The draft version of the SARF report cited was just that, a draft which required review and editing before publication, and it is to be expected that the final wording might differ. Appropriate fish husbandry, good net tensioning, and stronger net materials are typically included in the predator control hierarchy to be used at finfish farms, with ADDs being used if predation events still occur. This draft recommendation did not therefore need to be highlighted.

We share many of your concerns regarding indiscriminant ADD use, and we are working towards improving the situation with Industry, Local Authorities and Government. There are existing knowledge gaps and as a result there is work ongoing to inform this issue. For example, the following research projects are now in progress, though the findings are not yet available.

- Scottish Government funded – Improving understanding of the use, efficacy and impact of ADD use in Aquaculture
- Crown Estate Scotland/ Marine Scotland funded – Investigation and testing of non-lethal measures to address seal predation at fish farms and river fisheries
- SNH funded (just let) Risk of auditory damage from simultaneous use of ADD systems in Aquaculture.

You highlight another concern we share with regard to compliance, and you give BDNC as an example. Their change in ADD use was observed; Argyll & Bute Council have notified MOWI of this breach in consent conditions and work is ongoing to rectify the situation.

Lastly, we highlight that although all acoustic deterrent systems come under the same umbrella term of "ADD", different systems have different acoustic characteristics. We

[9] GötzT, Pacini A.F, Nachtigall P.E, JanikVM (2020) The startle reflex in echolocating odontocetes: basic physiology and practical implications. *Journal of Experimental Biology*

therefore assess these, in our casework advice, on a case-by-case basis, and may vary our advice accordingly.

I hope this provides you with some clarity on the basis for our advice, as well as our role in relation to EPS licensing for ADD use. Should you have any further queries regarding this case please don't hesitate to get in touch.

Yours sincerely,

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