

Risk Assessment in relation to European Protected Species and use of Deterrent Devices at a Marine Farm – Clashnessie Bay FS0933

As set out in a communication from Scottish Government to marine farm operators in July 2020, Loch Duart Ltd (LDL) have engaged with Marine Scotland in a process to assess the use of underwater sound-producing predator deterrents (ADDs) in relation to potential impacts on non-target species, namely cetaceans as European Protected Species (EPS).

In the interests of ensuring protection of EPS, and following guidance provided by Marine Scotland, a precautionary approach has been adopted for assessing and mitigating any potential impact on cetaceans due to the use of ADDs at our sites. The following document summarises the steps undertaken to assess potential impacts, identify mitigation and carry out a quantitative risk assessment in relation to EPS and proposed ADD use at the Clashnessie Bay site FS0933.

1. Baseline Information – Cetacean distribution

Following the approach outlined in Marine Scotland's (MS) guidance note, information on the presence, density and abundance of cetaceans has been derived from SCANS-IV (Gilles et al. 2023).

The relevant SCANS-IV survey block for the Clashnessie Bay marine farm site is Block CS-H (Minch) (formerly Block I in SCANS-III). The survey block area is 13,985km² relative to a consented farm area of 0.3km².

While there are concerns regarding the application of data from such a large study area to the very localised scale of marine farms, the SCANS-IV data has been used to identify which species potentially occur in the area and to provide density and abundance estimates for those species. In the absence of site-specific data, these are regarded as the best available data for the impact assessment. Given the assessment location close to shore within an enclosed bay at an active marine farm, it is expected that actual cetacean densities in this area would be lower than that estimated for Block CS-H.

2. Mitigation measures

As set out in EPS guidance, alternatives and mitigation measures have been considered, as follows -

Alternative siting of activity: The location this application relates to is an existing marine farm facility, located outwith areas specifically designated for cetaceans (MPA/SAC). Development of farm facilities considers many factors including hydrographic suitability, fish health management, environmental interactions, and other marine users. The site is considered to be suitable in these respects, having operated for many years. To relocate farming activity to an alternative site would not be preferable on many counts (including fish health management, benthic impacts and disproportionate economic costs) and would displace activity to locations potentially closer to protected areas such as the Inner Hebrides and the Minches SAC, for which the harbour porpoise is a primary feature. As such, alternative sites for the activity have not been considered further.

Alternative methods for carrying out the work: The purpose of underwater sound-producing devices is to deter seal interaction with farm livestock. Their use is part of a suite of predation-mitigation measures which include regular removal of fallen/moribund stock, low stocking densities, tensioned HDPE pen-nets and top-nets to reduce seal interest in the farm from the very start of the production cycle. These additional methods do not however provide a satisfactory alternative to deterring seal predatory interactions, rather they are complementary measures which help minimise the level of acoustic device use.

As an audible deterrent to seals these devices have a different mode of action to physical barriers and reduction of attractants (stocking density & removal of fallen/moribund stock), and function to help keep seals away from pen nets. This is a critical function, which as well as preventing direct predation events and reducing the likelihood of seals establishing a pattern of interaction with a farm, also mitigates the sub-lethal effects on livestock from seals. These sub-lethal effects are due to stress and flight behaviour caused by seal presence around a farm, and even if direct fish mortality from predation does not occur, seal interaction has been observed to have significant negative impacts on:

- farm productivity (reduced feeding, growth, and survival)
- fish health and welfare (physical damage, disease and parasite risk increased)
- sustainability through reduced productivity and challenging fish health management

As such, the use of underwater sound-producing devices to deter seal interaction with farm livestock is an important tool in a suite of predation-mitigation measures, and no satisfactory alternative to underwater sound-producing devices is available.

Alternative dates/timings: To function effectively in deterring seal interactions, devices need to be available for use whenever livestock are present on a farm. The Clashnessie Bay stocking cycle runs on a 2-year basis from March (year 1) to December (year 2) i.e., a 22-month cycle. During the fallow periods the system will never be used. Within stocked periods the overall suite of predation-mitigation measures, as outlined above, will allow for use of acoustic devices to be minimised. Further details are provided below regarding device settings and operational measures implemented to minimise use.

Frequency: Assessment has been completed for an acoustic device with frequencies centred at 1.15kHz. Full details have been provided to MS by the supplier, Ace Aquatec.

Duty cycle: The proportion of time that sound is being emitted (i.e., duty cycle) is adjustable for the devices, ranging from 0.7 – 5%. An Automatic Ramp-Down function which ensures reduction of the duty cycle back to zero after a period of maximum duty cycle use (5%) following a predation event will also be utilised.

Management and triggering: Seal deterrent measures are most effective where predation is prevented from the outset, and as such use of underwater sound-producing deterrents will be most effective, and the need for use minimised, if deployed prior to seal interactions with the farm becoming established. The triggers relevant to site FS0933 are:

- site is stocked with fish,
- seal interaction (attacks and sub-lethal impacts) is a known occurrence at the site from fish input, and
- seal activity is evident at the farm and/or stress-behaviours (such as reduced feeding) are seen in the fish.

Devices will only be used with complementary predation-mitigation measures in place i.e., regular removal of fallen/moribund stock, low stocking densities, tensioned HDPE pen-nets, top-nets and secondary predator nets to reduce seal interest in the farm. These complementary measures are expected to ensure acoustic device use is minimised as seal attraction to the site will already be discouraged by difficulty of access to livestock. Devices will be deactivated in the following circumstances:

- the site is fallow,
- no seal interaction is evident (this application is to have equipment available for use during stocked periods; equipment may not be emitting sound if there are no cues such as seals swimming around farm, changes in fish behaviour or evidence of actual attack),
- divers operating at the site,
- a cetacean is present in the immediate area of the farm,
- in the event of a seal becoming trapped within a pen with fish
- evidence that devices have reduced efficacy in preventing seal interaction with the farm i.e., interactions are increasing over a period despite acoustic device use.

Seal predation and predation-mitigation measures, including acoustic devices, are reviewed on a weekly and monthly basis, and tracked as a Key Performance Indicator. A review is also performed at the end of each farming cycle to evaluate effectiveness and establish any changes proposed.

The above measures have been developed as part of this assessment process, and we believe represent a responsible application of mitigation and good practice in relation to use of underwater sound-producing devices to deter seal interaction with farm livestock.

3. Quantitative assessment

Based on the above information and device parameters a quantitative assessment has been completed for the Clashnessie Bay site in relation to potential hearing injury (cumulative permanent threshold shift (PTS)) and disturbance of harbour porpoise and minke whale. This follows the example method for determining cetacean disturbance and injury presented in the MS guidance document, with expert input from [Redacted] (Silsoe Livestock Systems Ltd).

Assessment has been completed for the Ace Aquatec RT1 Flex acoustic device, based on specific source level, frequency, maximum duty cycle, number of units and the relevant cetacean hearing sensitivities. The device criteria used in the assessment and the outputs are summarised below. A copy of the spreadsheet developed by [Redacted] and used to determine disturbance/injury threshold distances has been provided to MS by Ace Aquatec, and a copy is included with this application populated with details of the proposed setup for the Clashnessie Bay site (Attachment 11). Disturbance has been calculated based on determining the radius within which a 120dB threshold is exceeded for each device-type setup proposed. PTS threshold radii have been calculated for each relevant Functional Hearing Group (harbour porpoise: Very High Frequency; minke whale: Low Frequency), adding together the sound energy from the individual sound-producing units proposed for the RT1 Flex setup. Mapping presented in the appendices of this document illustrates the areas affected to the specified disturbance and PTS thresholds for scenarios where land areas have been subtracted and a simple representation of sound shadow has been applied in relation to coastline features.

Ace Aquatec RT1 low-frequency device

- Sound level - 182dB re1uPa rms @ 1m average within a transmission; SPLpeak 198dB + 3 = 201dB re1uPa @ 1m
- Weighted SELs – 191dB VHF; 226dB LF
- Frequency – 0.9 – 1.4kHz
- Duty cycle – 5% (representing maximum duty cycle)
- 6 units arranged around the single pen group making up the Clashnessie Bay site.

- Operating randomised sound patterns, with asynchronous controls to prevent multiple units sounding simultaneously.

These criteria generate a disturbance threshold distance of 2443m and a PTS in hearing at distances of 9m & 30m for harbour porpoise and minke whale respectively.

Table 1 summarises the calculated sea areas, from which an estimate of disturbance and PTS ranges for harbour porpoises, minke whales and additional species requested by NatureScot has been derived following the example method in the MS guidance document, using data from SCANS-IV zone CS-H (Minch). See appendix below for mapping.

Species	Disturbance			PTS		
	Area km ²	# Individuals	% of Pop'n	Area km ²	# Individuals	% of Pop'n
<i>B. acutorostrata</i> (Minke whale)	6.29	0.22	0.0450 %	0.002873	0.0001014	0.00002055%
<i>Ziphiidae</i> *All Beaked Whale Species Combined	6.29	0.02	0.0450 %	0.002873	0.0000098	0.00002055%
<i>P. phocoena</i> (Harbour porpoise)	6.29	2.46	0.0450 %	0.000278	0.0001089	0.00000199%
<i>T. truncatus</i> (Bottlenose Dolphin)	6.29	2.15	0.0450 %	0.000003	0.0000014	0.00000003%
<i>G. griseus</i> (Risso's Dolphin)	6.29	0.15	0.0450 %	0.000003	0.0000001	0.00000003%
<i>D. delphis</i> (Common Dolphin)	6.29	5.83	0.0450 %	0.000003	0.0000037	0.00000003%
<i>L. acutus</i> (White-sided Dolphin)	6.29	0.18	0.0450 %	0.000003	0.0000001	0.00000003%
<i>L. albirostris</i> (White Beaked Dolphin)	6.29	0.87	0.0450 %	0.000003	0.0000005	0.00000003%

Table 1: Predicted disturbance and PTS ranges and impacts for RT1 use at the Clashnessie Bay site. * Beaked whale species included in SCANS IV data are Cuvier's beaked whale (*Ziphius cavirostris*), Sowerby's beaked whale (*Mesoplodon bidens*) and unidentified beaked whale. These are shown as one data group.

Cumulative Impact Assessment

Marine Scotland Science states that the guidelines require the impact of all the Acoustic Deterrent Devices in use by all fish farms within the same SCANS block be assessed, to predict the total number of individuals likely to be disturbed and / or injured within the same management unit. Clashnessie is within SCANS block CS-H (Minch).

LDL is the operator of the nearest adjacent marine farms to Clashnessie Bay, which are located within Eddrachillis Bay, Loch a Chairn Bhain and Loch Laxford (see Figure 1). The nearest active farm, Calbha, is 7.9km to the north-east (direct-line distance, not considering intervening landform). An Animal License issued by NatureScot is in place for deployment and testing of TAST underwater sound-producing units at Calbha, Badcall, Reintraid and Laxford farm sites (License Number 210989). However, this licence expires in July 2024. Given the timescales for anticipated consenting of the EPS application at Clashnessie Bay, the forementioned testing of devices under License Number 210989 is not anticipated to be active when ADD devices at Clashnessie Bay will be operational. Should LDL seek to reapply for a commercial or research EPS licence for ADD use at the farms within Eddrachillis Bay, Loch a Chairn Bhain and Loch Laxford, a cumulative impact assessment will be conducted at that time.

Marine Directorate Licensing Operations Team marine licence database indicates that, at the present time, no other commercial marine licences have been granted for the use of Acoustic Deterrent Devices on fish farms in the SCANS block CS-H (Minch) and that LDL are the only fish farming company currently pursuing a commercial EPS licence for ADD use. Furthermore, it is LDL's understanding that

information regarding current (active) EPS licenses' granted for ADD use for research purposes is not publicly available. Hence even if there are other fish farm sites within the SCANS CS-H block that are using ADDs under a licence granted for research purposes, LDL are not privy to that information or the associated data predicting the number of individual cetaceans predicted to be disturbed and / or injured by those specific devices. As such, we conclude that it is not possible to undertake a cumulative impact assessment as per Marine Scotland Science's and NatureScots response to the original application (see Attachments 1 & 2). However, going forward, cumulative effects of the use of ADDs would be considered in any subsequent EPS licence applications in the CS-H (Minch) area, should they arise, and these would include the devices at Clashnessie Bay if the EPS for their use is granted.



Figure 1 Loch Duart Ltd sites and the potential for site overlap in RT1 disturbance potential.

4. Conclusion

Based on the quantitative assessment carried out for Clashnessie Bay, the potential for PTS is negligible, with predictions of less than one individual in all cases. With respect to disturbance, the modelling predicts up to 5.8 individual common dolphin may be disturbed, which equates to 0.045% of the population, relative to SCANS-IV, Block CS-H (Minch). Disturbance of minke whale and beaked whale is predicted to be less than one individual.

It is important to note the worst-case scenario that has been adopted for the purposes of this assessment, in keeping with the precautionary principle:

- When considering onset of PTS, exposure has been calculated for a 24hr period. However, as cetaceans are highly mobile species and the distances associated with PTS are small (9 – 30m for the proposed 6 RT1 systems) it is unrealistic that a mobile cetacean would remain within such a small radius of a device for a whole 24hr period.

- In both PTS and disturbance assessments the worst-case in terms of device settings and use patterns have been assumed; this represents the maximum potential use level, which in practice would be reduced through use of lesser duty-cycle settings (including Automatic Ramp-Down features) and periods when the system is not in use (i.e., fallow periods or device not switched on due to absence of cues/triggers).

References

Gilles, A., Authier, M., Ramirez-Martinez, N., Araújo, H., Blanchard, A., Carlström, J., Eira, C., Dorémus, G., Fernández-Maldonado, C., Geelhoed, S., Kyhn, L., Laran, S., Nachtsheim, D., Panigada, S., Pigeault, R., Sequeira, M., Sveegaard, S., Taylor, N., Owen, K., Saavedra, C., Vázquez-Bonales, J., Unger, B., Hammond, P. (2023) Estimates of cetacean abundance in European Atlantic waters in summer 2022 from the SCANS-IV aerial and shipboard surveys

Appendix – Mapping to calculate sonified sea areas relevant to disturbance & PTS.



Assessment:	RT1 Disturbance Potential	Area minus land & sound shadow:	6.29km ²
Distance:	2443m		

Assessment:	RT1 PTS Harbour porpoise	Area minus land & sound shadow:	0.000025km ²
Distance:	9m		
<i>Mapping not presented as no land / sound shadow applicable</i>			

Assessment:	RT1 PTS Minke whale	Area minus land & sound shadow:	0.00282km ²
Distance:	30m		
<i>Mapping not presented as no land / sound shadow applicable</i>			