

## **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 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 quantitative risk assessment in relation to EPS and proposed ADD use at our 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-III (Hammond et al. 2017). Given the species that are known to occur in this region, the focus of this assessment is harbour porpoise (*Phocoena phocoena*) and minke whale (*Balaenoptera acutorostrata*), similarly as advised by MS (email communication with EIA/HRA Compliance Manager, 17<sup>th</sup> November 2020).

The relevant SCANS-III survey block for the Clashnessie Bay marine farm site is Block I. The survey block area is 13,979km<sup>2</sup> relative to a consented farm area of 0.3km<sup>2</sup>.

Both harbour porpoise and minke whale are identified as present within Block I, at densities of 0.397 & 0.02 individuals per km<sup>2</sup> respectively and a total respective abundance of 5,556 and 285.

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-III 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 I.

### **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 takes into account many factors including hydrographic suitability, fish health management, environmental interactions and other marine users. The site is suggested 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 and benthic impacts) 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, 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 will 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:* Two device types have currently been assessed for the site, with frequencies centred at 9.5kHz and 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 need for use minimised, if deployed prior to seal interaction 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 and top-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:

- site fallow,
- no seal interaction evident (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),
- emergency situation where a cetacean is present in the immediate area of the farm,
- evidence that devices have reduced efficacy in preventing seal interaction with the farm i.e. interactions are increasing over a period of time 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 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 Dr Jeff Lines (Silsoe Livestock Systems Ltd).

Assessment has been completed for the Ace Aquatec US3 and RT1 device types, given 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 Dr Jeff Lines 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 setups for the Clashnessie Bay site ('Clashnessie Bay FS0933\_Calculation Spreadsheet'). Disturbance has been calculated on the basis of 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 each of the US3 and RT1 setups. Maps presented in the appendices of this document illustrate the areas affected to the specified disturbance and PTS thresholds for each scenario; land

areas have been subtracted and a simple representation of sound shadow has been applied in relation to coastline features.

**Ace Aquatec US3 mid-frequency device**

- Sound level - 181dB re1uPa rms @ 1m average within a transmission; SPLpeak 190dB + 3 = 193dB re1uPa @ 1m
- Weighted SELs – 220dB VHF; 225dB LF
- Frequency – 8 – 11kHz
- Duty cycle – 5% (representing maximum duty cycle)
- 8 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 distance of 2154m and a permanent threshold shift (PTS) in hearing at distances of 379m & 25m 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 and minke whales has been derived following the example method in the MS guidance document, using data from SCANS-III, Block I. See appendix below for mapping.

Species	Disturbance			PTS		
	Area km <sup>2</sup>	# Individuals	% of Pop'n	Area km <sup>2</sup>	# Individuals	% of Pop'n
<i>P.phocoena</i> (Harbour porpoise)	5.44	2.16	0.039	0.421	0.17	0.003
<i>B.acutorostrata</i> (Minke whale)	5.44	0.11	0.039	0.00196	0.00004	0.00001

Table 1: Predicted disturbance and PTS ranges and impacts for US3 use at the Clashnessie Bay site

**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 distance of 2443m and a permanent threshold shift (PTS) in hearing at distances of 9m & 30m for harbour porpoise and minke whale respectively.

Table 2 summarises the calculated sea areas, from which an estimate of disturbance and PTS ranges for harbour porpoises and minke whales has been derived following the example method in the MS guidance document, using data from SCANS-III, Block I. See appendix below for mapping.

Species	Disturbance			PTS		
	Area km <sup>2</sup>	# Individuals	% of Pop'n	Area km <sup>2</sup>	# Individuals	% of Pop'n
<i>P.phocoena</i> (Harbour porpoise)	6.53	2.59	0.046	0.00025	0.0001	0.00000
<i>B.acutorostrata</i> (Minke whale)	6.53	0.13	0.046	0.00282	0.00006	0.00002

Table 2: Predicted disturbance and PTS ranges and impacts for RT1 use at the Clashnessie Bay site

In terms of cumulative assessment, Loch Duart Ltd is the operator of the nearest adjacent marine farms, within Eddrachillis Bay, Loch a Chairn Bhain and Loch Laxford. The nearest active farm, Calbha, is 7.9km to the north-east (direct-line distance, not taking into account intervening landform). An Animal License issued by Scottish Natural Heritage is in place for deployment and testing of TAST underwater sound-producing units at Calbha, Badcall, Reintraid, Torgawn and Laxford farm sites (License Number 210989). However, given the relatively small predicted radius of disturbance for both Ace Aquatec device types (under 2.5 km from the Clashnessie Bay site), and a potential 1.1km minke whale disturbance radius for TAST, it is concluded that there is no likely interaction between farms. Consequently, cumulative impact has not been considered further.

#### 4. Conclusion

Based on the quantitative assessment 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 2.6 individual harbour porpoise may be disturbed, which equates to 0.046% of the population, relative to SCANS-III, Block I. Disturbance of minke 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 cumulative PTS, exposure has been calculated for a 24hr period; as cetaceans are highly mobile species and the distances associated with PTS small (9 – 397m) 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. follow periods or device not switched on due to absence of cues/triggers)

#### References

Hammond et al. (2017). Estimates of cetacean abundance in European Atlantic waters in summer 2016 from the SCANS-III aerial and shipboard surveys.

Marine Scotland (July 2020). The Protection of Marine European Protected Species from Injury and Disturbance – Guidance for Scottish Inshore Waters.

Marine Scotland (December 2020). ADD disturbance and injury distances for use in EPS license application.

SCAN III block shapefiles: <https://synergy.st-andrews.ac.uk/scans3/files/2017/04/Shapefiles-for-SCANS-website.zip>

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

<b>Assessment:</b>	US3 Disturbance Potential	<b>Area minus land &amp; sound shadow:</b>	5.44km <sup>2</sup>
<b>Distance:</b>	2154m		



<b>Assessment:</b>	US3 PTS Harbour porpoise	<b>Area minus land &amp; sound shadow:</b>	0.421km <sup>2</sup>
<b>Distance:</b>	379m		



<b>Assessment:</b>	US3 PTS Minke whale	<b>Area minus land &amp; pen area:</b>	0.00196km <sup>2</sup>
<b>Distance:</b>	25m		
<i>Mapping not presented as no land / sound shadow applicable</i>			



<b>Assessment:</b>	RT1 Disturbance Potential	<b>Area minus land &amp; sound shadow:</b>	6.53km <sup>2</sup>
<b>Distance:</b>	2443m		



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

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