Sheringham Shoal and Dudgeon Offshore Wind Farm Extension Projects

Annex 4 - Auk Bycatch Reduction Feasibility Statement

Revision A
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Auk Bycatch Reduction Feasibility Statement

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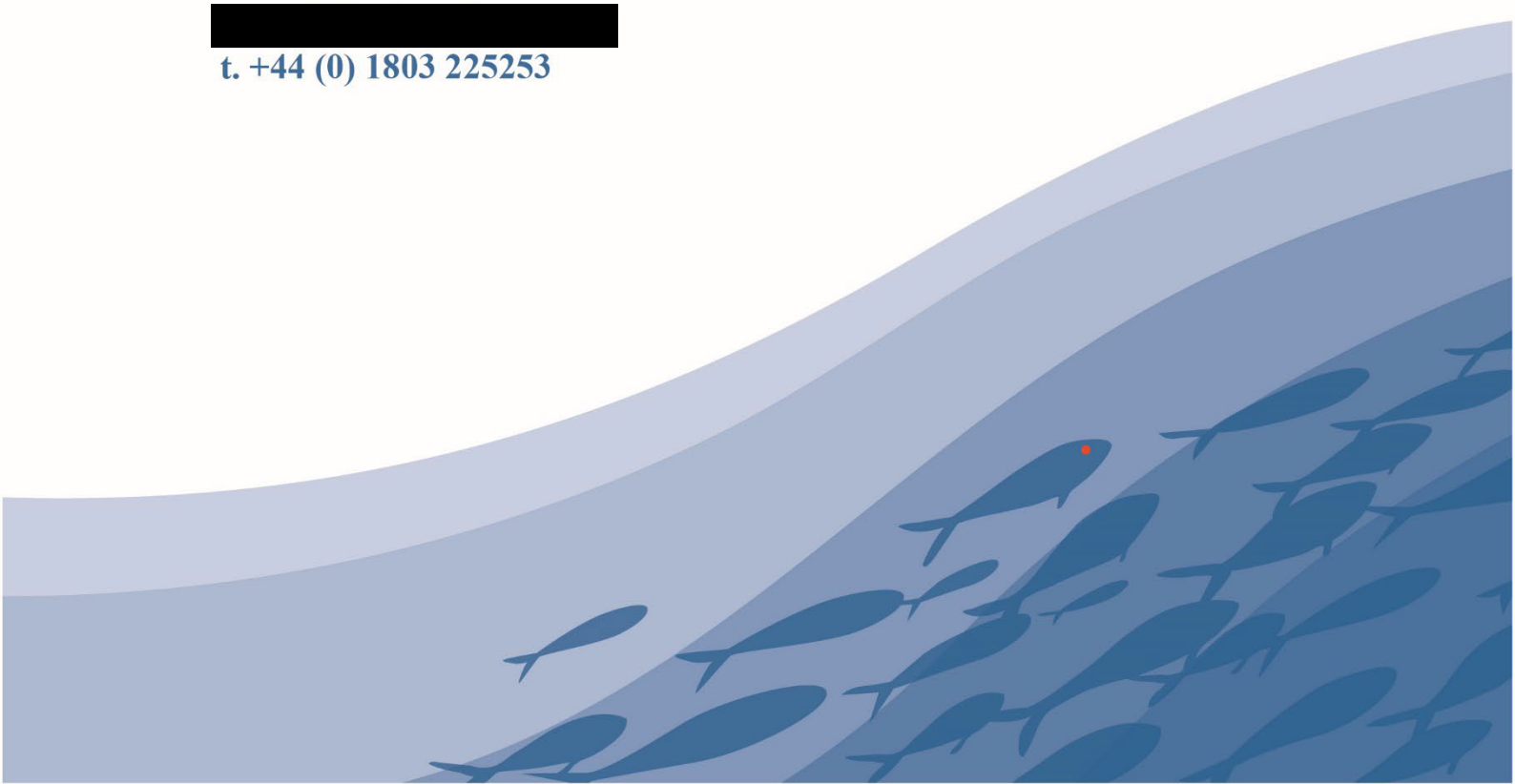

Acronyms

AWD	Above Water Deterrent
BMP	Bycatch Monitoring Programme
DCO	Development Consent Order
DEP	Dudgeon Offshore Wind Farm Extension Project
ETP	Endeared, Threatened, Protected
HRA	Habitats Regulations Assessment
IFCA	Inshore Fisheries Conservation Authority
LEB	Looming Eyes Buoy
LOA	Length Overall
REM	Remote Electronic Monitoring
SEP	Sheringham Offshore Wind Farm Extension Project
SMRU	Sea Mammal Research Unit

Glossary

Dudgeon Offshore Wind Farm Extension Project (DEP)	The Dudgeon Offshore Wind Farm Extension onshore and offshore sites including all onshore and offshore infrastructure.
Sheringham Shoal Offshore Wind Farm Extension Project (SEP)	The Sheringham Shoal Offshore Wind Farm Extension onshore and offshore sites including all onshore and offshore infrastructure.
The Applicant	Equinor New Energy Limited. As the owners of SEP and DEP, Scira Extension Limited and Dudgeon Extension Limited are the named undertakers that have the benefit of the DCO. References in this document to obligations on, or commitments by, 'the Applicant' are given on behalf of SEL and DEL as the undertakers of SEP and DEP.

Scope of works

This note has been prepared in order to demonstrate the feasibility of implementing bycatch reduction technologies as a compensation measure for the Sheringham Shoal Offshore Wind Farm Extension Project (SEP) and Dudgeon Offshore Wind Farm Extension Project (DEP). The Applicant considers the measure to be capable of fully compensating for the predicted guillemot and razorbill (auks) displacement assessment upper 95% confidence interval mortalities of 6 and 3 respectively (based on an evidence-based and precautionary 50% displacement and 1% mortality rate) (see the Apportioning and Habitats Regulations Assessment (HRA) Updates Technical Note Revision B [REP2-036]).

It should be noted that the Applicant's proposals at Development Consent Order (DCO) submission (as set out in **Appendix 4 - Gannet, Guillemot and Razorbill Compensation Document** [APP-074]) focussed on the potential for bycatch reduction measures to be implemented on a project-led basis in the northeast of England. However, since submission of the DCO application, the Applicant has had further discussions with fisheries stakeholders in the northeast and has ascertained that the level of set net fishing activity and therefore auk bycatch is likely not of a sufficient scale to present a feasible compensation measure. Therefore, the Applicant has re-focussed efforts on the southwest coast of England where there is a much higher concentration of set-net fishing activity and therefore likely to be much higher incidences of auk bycatch.

This note addresses comments received within Appendix C of the Natural England Relevant Representation [RR-063] relating to the need to identify and quantify bycatch as part of the measure development and site selection process. Additionally, this note also addresses the Examining Authority first Written Question Q1.14.1.25 which is to" provide *further detail to demonstrate the feasibility of bycatch reduction measures represent an effective compensatory measure."* [PD-010] and the Issue Specific Hearing 5 action i.e. *"Applicant to submit an additional note as to effectiveness of proposed compensatory measures for auks."*

The scope of this Auk Bycatch Reduction Feasibility Statement is to:

1. Describe the distribution, extent, and seasonality of set-net fishing activity in the southwest of England.
2. Review recent evidence demonstrating that bycatch is an issue in the southwest.
3. Describe Remote Electronic Monitoring (REM) systems – explaining how this has been successfully implemented previously (see **Annex 1**).
4. Describe Looming Eyes Buoy (LEB) technology and its potential to reduce bycatch.
5. Outline the process and time-period for securing vessel involvement in a REM scheme for the purpose of delivering compensation for SEP and DEP.
6. Provide a Fishtek credentials statement (see **Annex 2**).

1 Description of the distribution, extent, and seasonality of set-net fishing activity in the southwest of England

1.1 Fisheries data

The following two southwest Inshore Fisheries and Conservation Authorities (IFCAs) were approached directly for information:

1) The Principal Scientific Office of Cornwall IFCA; and
2) the Chief Officer of Devon and Severn IFCA.

Vessel numbers with permits to fish (drift and set nets [gear codes 41,50,51,52 & 53]) for the previous calendar year (2022) were supplied. It is noted that the data provided differs in format depending on the IFCA it was provided by; however, is still considered to provide sufficient indication of the extent of netting activity.

1.1.1 Cornwall IFCA

The following information was obtained from Cornwall IFCA:

- 313 vessels <10m Length Overall (LOA) do or are capable of netting.
- 25 vessels >10m LOA do or are capable of netting.
- Key home ports: Newlyn, Mevagissey, St Ives, Padstow.
- Key season: netting year-round, limited/no potting January-May.

1.1.2 Devon & Severn IFCA

The following information was obtained from Devon and Severn IFCA:

- 178 vessels with netting permits fishing in 2022. Of these, 89 also had a potting permit.
- 89 vessels fishing solely nets (drift + unspecified + trammels + tangle).
- 89 vessels fishing pots and nets.
- Key home ports: Brixham, Plymouth.
- Key season: netting year-round, limited/no potting January-May.

Total netting fishing effort from ports in Devon and Cornwall is therefore **516 vessels**.

It is noted that some vessels may fish solely with nets whilst others may use pots and nets. Fishers who use both pots and nets prioritise netting in the winter months which coincides with higher abundances of auks at fishing grounds and therefore potential auk bycatch. Given the extent of netting fishing effort in Devon and Cornwall, it is likely that bycatch of auks is occurring in these vessels and that by securing involvement of a small number of vessels in an appropriate bycatch mitigation scheme (e.g. the use of Above Water Deterrents underpinned by REM), the necessary levels of compensation for SEP and DEP could be confidently achieved.

The spatial distribution of netting fishing effort was extracted from Enever *et al*. 2017 (**Figure 1**).

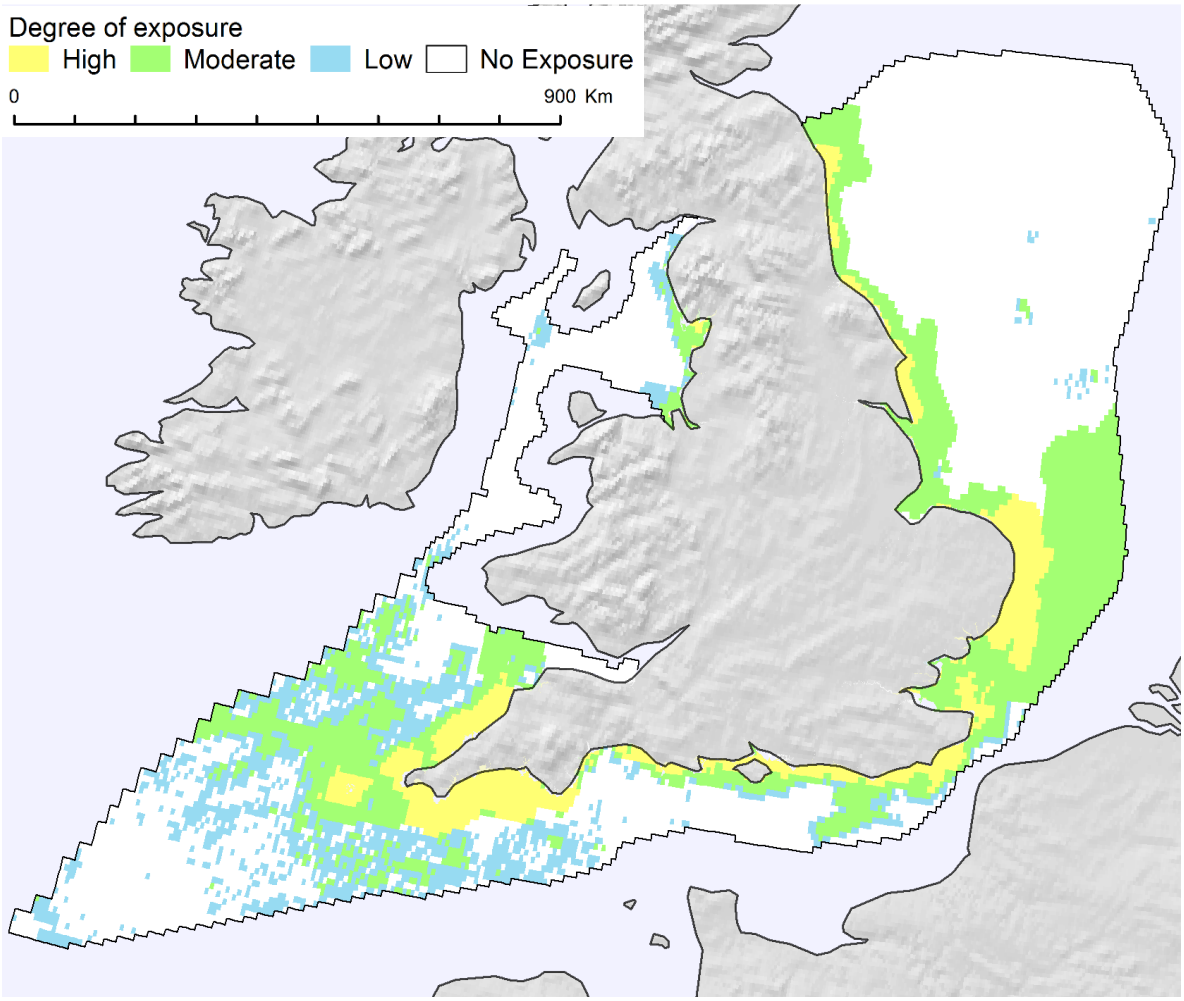

Figure 1 The spatial distribution of netting fishing pressure within English maritime territory. Pressure modelled using the methodology presented in Enever et al. 2017.

1.2 Latent fleet capacity to undertake seabird bycatch mitigation discounting vessels already engaged in the Hornsea Project Four (HP4) scheme

The HP4 scheme is already engaged in seabird bycatch mitigation trials using Above Water Deterrents (AWD) from fishing ports around the UK. As described within Ørsted (2022a) [HP4: REP7-030], ten fishing vessels were engaged in the first year of trials undertaken between November 2021 and March 2022 (with only nine providing useable data). Ørsted (2022a) [HP4: REP7-030] notes that, at the time that report was finalised in July 2022, 22 vessels (including the nine vessels that provided data in 2021 / 22) were signed up for participation in trials from September 2022 to March 2023, however ongoing engagement with additional fishers with the aim of increasing the number of vessels engaged was being undertaken. Whilst the Applicant is not aware that the final number of vessels engaged in these trials has been published by Ørsted, it is estimated to be between 20 and 40 vessels. To this end, the latent capacity to undertake further seabird bycatch mitigation using set or drift net vessels from southwest ports is estimated to be between 476 to 496 vessels. This is far in excess of the estimated number of vessels (up to five) that would be required to deliver the necessary scale of compensation for SEP and DEP (see **Section 5**).

2 Review of any recent evidence demonstrating that bycatch is an issue in the southwest

After reviewing the primary literature and pursuing known UK bycatch work programmes, the Applicant concludes that there is no new publicly available evidence post Northridge *et al*. (2020) (cited within the Applicant's **Appendix 4 – Gannet, Guillemot and Razorbill Compensation Document (Revision B)** [document reference: 5.5.4]) demonstrating that bycatch is an issue in the southwest. However, nationally, there are several ongoing seabird bycatch projects that are due to report (some within 2023) which will provide new data describing levels of bycatch in the southwest – see **Section 2.2**. There are also some broader, national programmes (Clean Catch UK, UK Bycatch Monitoring Programme (BMP) and the Cefas Fisheries Observer Programme) that all operate coverage in the southwest. These are reviewed below.

2.1 Primary literature

Fishtek conducted a literature review for search terms related to bycatch and seabird at UK and regional levels. One paper of relevance which is cited within the Applicant's **Appendix 4 - Gannet, Guillemot and Razorbill Compensation Document (Revision B)** [document reference: 5.5.4] was identified titled 'Assessing bycatch risk from gillnet fisheries for three species of diving seabird in the UK (Cleasby *et al.* 2022)'. This paper highlighted the southwest as a "potential" bycatch hotspot based on a model incorporating seabird diving data from bio-loggers and overlapping that with spatial fishing effort data. The report did not provide any new bycatch figures or hard data on mortality events.

2.2 Key projects underway with potential to provide new evidence on seabird bycatch numbers in southwest

2.2.1 HP4: Bycatch Mitigation Project

Ørsted (2022d) [HP4: REP7-017], describes HP4's Guillemot and Razorbill bycatch mitigation trials using LEB for autumn / winter 2021 / 22. Ten vessels were secured for participation in trials in 2021 / 22 and at least 22 vessels (including those signed up for 2021 / 22) were signed up for participation in trials for autumn / winter 2022 / 23, all using REM (2 x Closed Circuit Television (CCTV) cameras per vessel). However, data on 2021 / 22 bird numbers by species were not presented by HP4 in order to protect the anonymity of the fishers. At the time of writing (April 2023) results of the 2022 / 23 surveys were not available.

Bycatch Reduction Technology Selection Phase Summary for 2021 / 22 data

Ørsted 2022e [HP4: REP5-068], describes the results from the bycatch reduction technology selection phase. This was carried out during the autumn / winter of 2021 / 22 and reports that LEBs have reduced the level of bycatch of guillemot within a commercial gillnet fishery by approximately 25% within a 50m radius which is the current effective range of the LEB technology (Rouxel *et al*., 2021). The distance between LEBs is based on the visual acuity of Canada geese *Branta canadensis*, which have one of the lowest acuities measured in birds (Rouxel *et al*., 2021). Rouxel *et al.,* (2021) predicted that this design could be detected by a seaduck at a distance of 80m during daylight, and at approximately 40m during twilight. The use of the LEB within gillnet fisheries, as proposed by HP4 as a primary compensation measure, is therefore considered to have the ability to save a large number of auks each year over the course of HP4's lifetime of 35 years. The Applicant recognises that within these trials no razorbill were recorded as bycatch, representing the lower abundance of this species in the southwest compared to guillemot and therefore there is uncertainty regarding the ability of LEBs to prevent bycatch of razorbill. However, Northridge *et al*. (2020) report bycatch of razorbills in gillnets so it is likely that implementation of LEBs would also reduce bycatch of this species relative to its abundance in the southwest. The SEP and DEP compensation requirements are for 6 guillemot and 3 razorbill per annum and therefore, given these low numbers, this is not considered to be a barrier to SEP and DEP delivering on its compensation requirements.

The HP4 bycatch reduction technology selection phase has provided evidence that the LEB has and can reduce auk bycatch in active fisheries, and as a result can prevent the accidental death of a large number of seabirds in the UK each year. HP4 is therefore confident that the LEB can be implemented as a compensation measure within active set / gill-net fisheries to compensate for impacts to guillemot and razorbill. However, the Applicant acknowledges the Natural England position on HP4 with regard to its bycatch reduction proposal *"Natural England do remain fully supportive of the ongoing LEB trial and hopeful that it will ultimately be capable of delivering quantifiable reductions in bycatch of auks and other marine birds. However, auk bycatch reduction is not currently demonstrated as being a viable compensation measure."* [HP4: REP7-104].

A summary of Natural England's and the RSPB's concerns regarding HP4's bycatch reduction proposals (which by association also apply to the Applicant's proposals) is provided in **Appendix 4 Gannet, Guillemot and Razorbill Compensation Document (Revision B) (Tracked)** [document reference 5.5.4.2].

2.2.2 Cornwall Seabird Bycatch Mitigation Project

Fishtek Marine contacted RSPB's bycatch programme manager and requested any recent bycatch information regarding southwest fisheries in Cornwall and Devon who confirmed that the Defra G7 Legacy Funded seabird bycatch project will report in June/July 2023 and will outline bycaught seabirds by species. The bycatch data collected during these trials are self-reported by fishers. Self-reporting data is limited in its use as, unlike REM, there are no means to subsequently verify or validate the data collected which could lead to erroneous conclusions on bycatch numbers, species caught, and the efficacy of the AWDs being tested.

2.2.3 Clean Catch UK

Clean Catch UK is a collaborative research programme that brings together scientists and fishermen, to monitor and help reduce the accidental capture of wildlife by commercial fishing vessels. REM and self-reporting studies have been monitoring Endangered, Threatened and Protected (ETP) species bycatch in southwest ports for the past three years e.g., at Mevagissey, Looe, St Austell, and Padstow. No reports on seabird bycatch numbers are currently available.

2.2.4 UK Bycatch Monitoring Programme

The UK Bycatch Monitoring Programme (BMP) has been operational since 1996 and is co-ordinated by the Sea Mammal Research Unit (SMRU) at the University of St Andrews. The project deploys observers on fishing vessels to record protected species bycatch in a range of fisheries around the UK.

2.2.5 Cefas Observer Programme

Having monitored catches of fishing vessels in England and Wales consistently since 2002, the Cefas Observer Programme samples around 250 trips and 1,200 hauls each year. The primary objective of the programme is to collect data on the scale of discarding. This programme collects data on the fishing gear deployed, fishing operations, species composition of catches and the quantities of catch retained and discarded; however. incidental bycatch data is also collected. A formal data request to identify seabird data specific to the southwest has been submitted to Cefas in April 2023.

3 Description of Remote Electronic Monitoring (REM) system – explaining how it has been successfully implemented

Seabird bycatch events (or indeed other ETP taxa) are generally rare and because of this, data collection methods should have high monitoring coverage to remove the huge uncertainty in bycatch estimates seen using low coverage survey methods. Self-reporting, catch applications or logbook data may be unreliable as they cannot be verified. Fisheries Observer data (whilst of high quality) is an order of magnitude more expensive (relative to coverage) than REM which leads to low sampling coverage and low precision data. REM equipment offers high coverage (100%) and a reviewable evidence base unlike the traditional monitoring methods currently used in the UK. REM is therefore the most appropriate and cost-effective means of capturing reliable seabird bycatch data over a long time period and from multiple vessels.

REM refers to equipment that is installed on vessels that enables the collection and review of information relating to vessel operations and location (refer to Figure A1 in Annex 1). This

includes the installation of Vessel Monitoring Systems, gear monitoring sensors (e.g., on trawl winches) and/or cameras. The latter has become of increasing interest within the UK for its role in the collection of data that can help address evidence gaps that include topics such as the bycatch of non-target species. A camera REM system comprises a series of digital CCTV cameras, a control box to house the electronics and storage device, a display monitor, and a Global Positioning System (GPS). The fixing of cameras is vessel dependent but are usually installed to the vessel's superstructure, with its primary requirement to enable an unobstructed field of view to the hauling bay/gunnel. When switched on at the control box, video and GPS footage are seamlessly collected without any further operational input by fishers, with data being stored on an encrypted removeable hard drive for easy access and review by the chosen party. An example of the fitted CCTV, and monitoring systems can be seen in Figures A2 and A3 of **Annex 1**.

REM systems are currently used in the HP4 bycatch studies and have allowed Ørsted to collect data on the efficacy of the AWDs at mitigating seabird bycatch. Due to the high resolution of the camera systems installed, bycaught birds were successfully identified to species level without fishers altering their fishing practices, e.g. holding bycaught birds close to the camera. HP4 reported a 24.9% reduction in guillemot bycatch in experimental nets compared to controls. It was also described how all ten fishers included within the 2021 / 22 trial willingly participated in trialling REM, likely due to the ease of implementation and lack of required alterations to fishing practices.

4 Description of LEB technology and its potential to reduce bycatch

Escape or fear responses to looming stimuli have been observed in many taxa, ranging from invertebrates and amphibians to primates and birds (Carlile *et al.* 2006), and have been found to trigger a collision-risk signal in avian brains (Wang & Frost 1992). Conspicuous eyespots are more likely to evoke an aversive response in avian species than other stimuli (Stevens, 2005). Additional features that enhance behavioural responses from birds include a crescent-shaped reflection inside the pupil, which amplifies the illusion of a spherical eyeball (Blut *et al*. 2012), as well as a pupil-to-eye-ratio that was most effective in inducing tonic immobility in chickens (i.e. a natural state of paralysis) (Gagliardi *et al*. 1976). Moreover, a looming eye stimulus displayed on LED screens has been shown to be effective in deterring birds of prey and corvids from airports without signs of habituation. The RSPB and Fishtek Marine collaborated in developing a looming eye structure that was supported by a marine buoy for use at sea (Figures A4 & A5 in **Annex 1**).

AWDs are an emerging technology that have shown significant promise with regard to deterring diving birds from the proximity of set nets. The efficacy of these devices was tested in trials conducted in the Baltic Sea where the authors reported diving bird abundance to be significantly reduced (45-53%) in the proximity of the LEB (Rouxel *et al*. 2021). That said, these trials were not conducted in an operational fishery, and there is a need to understand if these findings could translate into reduced bycatch in an operational fishery.

As such, HP4 has since tested LEBs in an operational set-net fishery in the UK. The results from these trials (Ørsted 2022e) [HP4: REP5-068], as described above, reported that "*LEBs have reduced the level of bycatch of guillemot within a commercial gillnet fishery by approximately 25% within a 50 m radius"* and that *"the use of LEBs within gillnet fisheries, as proposed by the Applicant* [HP4] *as a primary compensation measure, could therefore have the ability to save a large number of auks each year over the course of the Hornsea Four project lifetime of 35 years*".

5 Outline of the process and time-period for securing vessel involvement in a REM scheme

If the Applicant is required to deliver bycatch reduction mitigation through the implementation of LEBs, the process that would be undertaken to secure vessel involvement would be as follows:

1) Liaise with relevant IFCA and identify skippers who will engage positively and for a long period, will be diligent with data collection, trustworthy with respect to data confidentiality and reliable with regard to data collection and reporting.
2) Make an approach to the skippers by phone outlining the key requirements and expectations of them in their involvement and outline the proposed remuneration for participation in the scheme.
3) On verbal agreement, contact the Maritime and Coastguard Agency to ensure all vessel safety certification is complete and up to date.
4) Meet fishers face-to-face with 'Participant Consent Form' for signature.
5) Install equipment.

The anticipated duration to undertake 1) to 5) above, assuming that up to five vessels are being secured, would be approximately one month. See **Appendix 4 - Gannet, Guillemot and Razorbill Compensation Document (Revision B) (Tracked)** [document reference 5.5.4.2] which explains why up to five vessels are considered to be sufficient.

6 Conclusion

This auk bycatch reduction feasibility statement demonstrates that the latent set-net fishery capacity in southwest England is capable of enabling SEP and / or DEP to deliver on its without prejudice compensation requirements for guillemot (6 adult birds per year) and razorbill (3 adult birds per year). If required, the necessary number of fishers / vessels (estimated requirement is for up to five) could be signed-up within a relatively short time period (approximately one month) for involvement in baseline data collection and the onwards implementation of the REM systems and LEBs. Based on trials undertaken by HP4, implementation by these fishers of LEBs could reduce bycatch of auks by up to approximately 25%.

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Annex 1

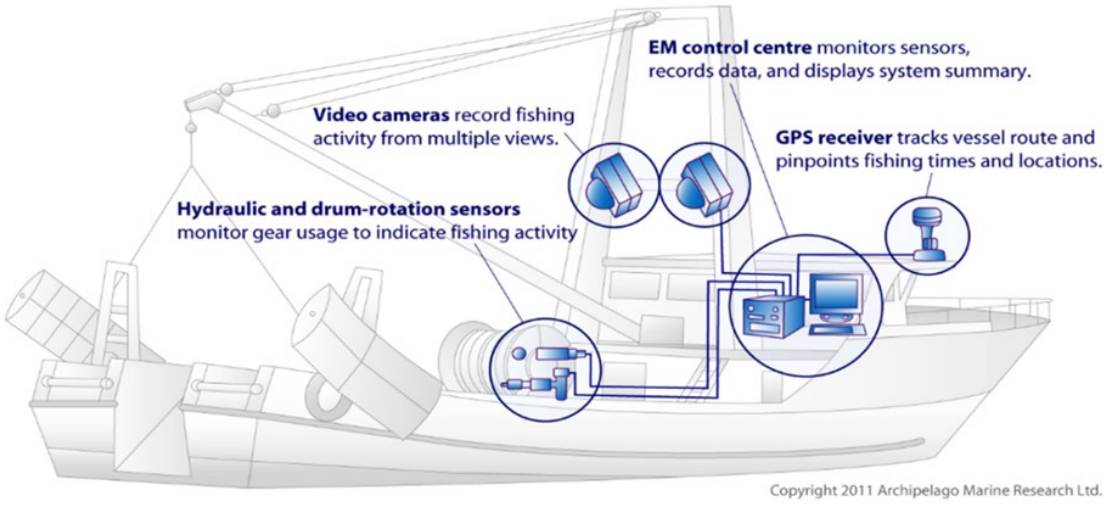

Figure A1 - General layout and components of a typical remote electronic monitoring (REM) system. With passive gears vessels such as netters not typically using powered equipment to deploy gear, hydraulic and drum-rotation sensors shown on the schematic aren't required.

Figure A2 - CCTV cameras installed on an inshore creeling vessel.

Figure A3 – The AMR V5 electronic monitoring system implemented on a small inshore UK vessel

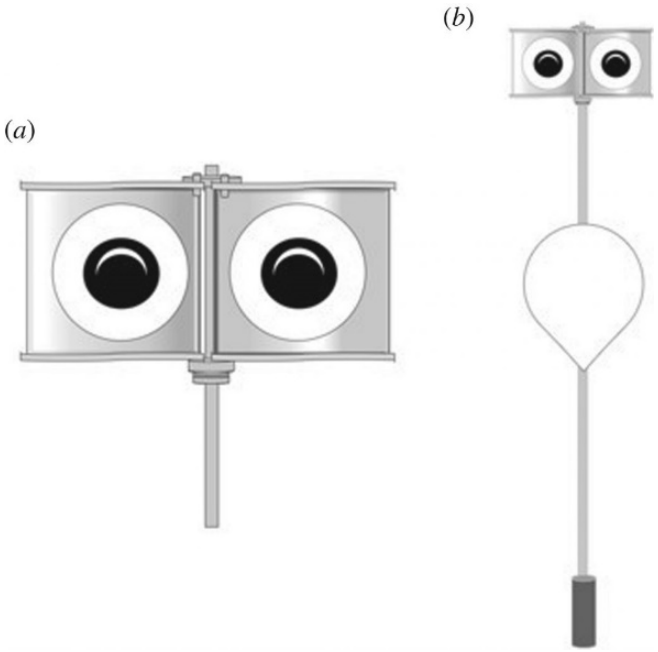

Figure A4 - (a) Looming Eyes Buoy rotating head unit; (b) unit fully assembled on dahn buoy with counterweight.

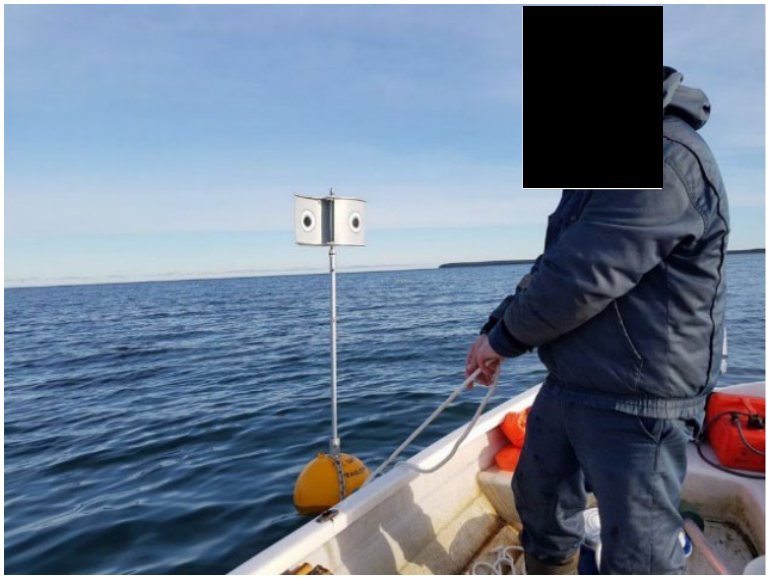

Figure A5 - Looming Eyes Buoy being deployed in the Baltic Sea

Annex 2

1. Fishtek Marine's credentials statement

Based in Devon, UK, Fishtek Marine brings together a team of award-winning engineers and fisheries scientists. We focus our expertise and energy on developing, engineering, testing and distributing a range of innovative and exciting technical devices proven to minimise incidental capture ('bycatch') of non-target/threatened species in commercial fisheries around the world.

Because of this, we have a strong track record nationally and internationally of working closely with fisheries stakeholders, albeit directly with fishers and their representatives or Government, Marine Managers and environmental non-governmental organisations.

Fishtek Marine are currently engaged in multiple projects in the southwest of the UK for various product/fisheries trials. The largest project, investigating the viability of a new low-impact scallop fishery in Falmouth and Dartmouth has involved close liaison with the fishers, their representatives, the management authorities, and Government. We have also designed, advised, manufactured, and subsequently monitored the operational performance of the LEB equipment currently being used in the bycatch compensation measures as part of the HP4 scheme.

Our fisheries Science team has ex-civil servants, and staff who have spent extensive time (10+ years) working at sea with fishermen, which we believe enables us to bridge any industry-science communication issues. We are often able to consider policy and science from the industry perspective and offer a level of pragmatism regarding effective implementation of policies and ideas. Not being funded or affiliated directly by government (e.g. Cefas, MMO, SMRU etc), we are frequently afforded a higher degree of trust by fishers and their representatives who will often confide in us knowing that there isn't the potential for future management reprisals often perceived when relaying sensitive fisheries information to government organisations. These relationships with the industry, combined with our engineering and sea-going expertise, enable us to recruit vessels readily to trials and furthermore, have productive and long-lasting relationships with the fishers we engage. Fisher-science collaborations are vital to ensure the fishers are part of the solution process. At Fishtek, we promote these collaborations and fishers work directly with our fisheries observers and engineers in suggesting improvements or alternative solutions.

Dr. Robert Enever

Role: Head of Science and Uptake.
Relevant expertise: Rob has a Ph.D. in bycatch mitigation and 20+ years' experience working in fisheries and marine conservation, both domestically and internationally. An invited expert to the International Whaling Commission Expert Panel on cetacean bycatch and ICES Working Groups on gear technology. Rob Enever has spent over 500 days at sea monitoring retained and discarded catch on small inshore and large offshore commercial fishing vessels. Previously, Enever worked as a Senior Specialist at Natural England, and was responsible for ensuring the objectivity, quality and transparency of the marine evidence used for designating, and subsequently managing, Marine Protected Areas.

Pete Kibel

Role: Managing Director and Co-Founder.
Relevant expertise: Pete has a background in fisheries science and technology with over 20 years' experience working in fisheries across the globe, identifying and developing technological solutions to bycatch issues in the commercial fishing sector. The Kibel brothers (Pete and Ben (Fishtek Marine's director of engineering & co-founder)) established Fishtek 20

years ago with the aim of developing technical solutions to resolve global marine bycatch issues and improve the sustainability of the fishing industry. Pete has in-depth of knowledge liaising with high profile fishing companies and governance which has enabled Fishtek Marine to be one of the leading fisheries bycatch mitigation companies globally.

Thomas Day
Role: Fisheries Support Scientist.
Relevant expertise: Tom is an experienced fisheries observer having been previously contracted by MRAG Ltd for deployment in the Southern Ocean, as well as being Fishtek Marine's inhouse observer responsible for several of the scallop potting trials currently being undertaken in UK waters. Since joining Fishtek Marine's, Tom has been involved in liaising with various IFCA bodies and Department of Environment, Food & Agriculture (DEFA), in the Isle of Man, to ensure the compliance of experimental trial designs.