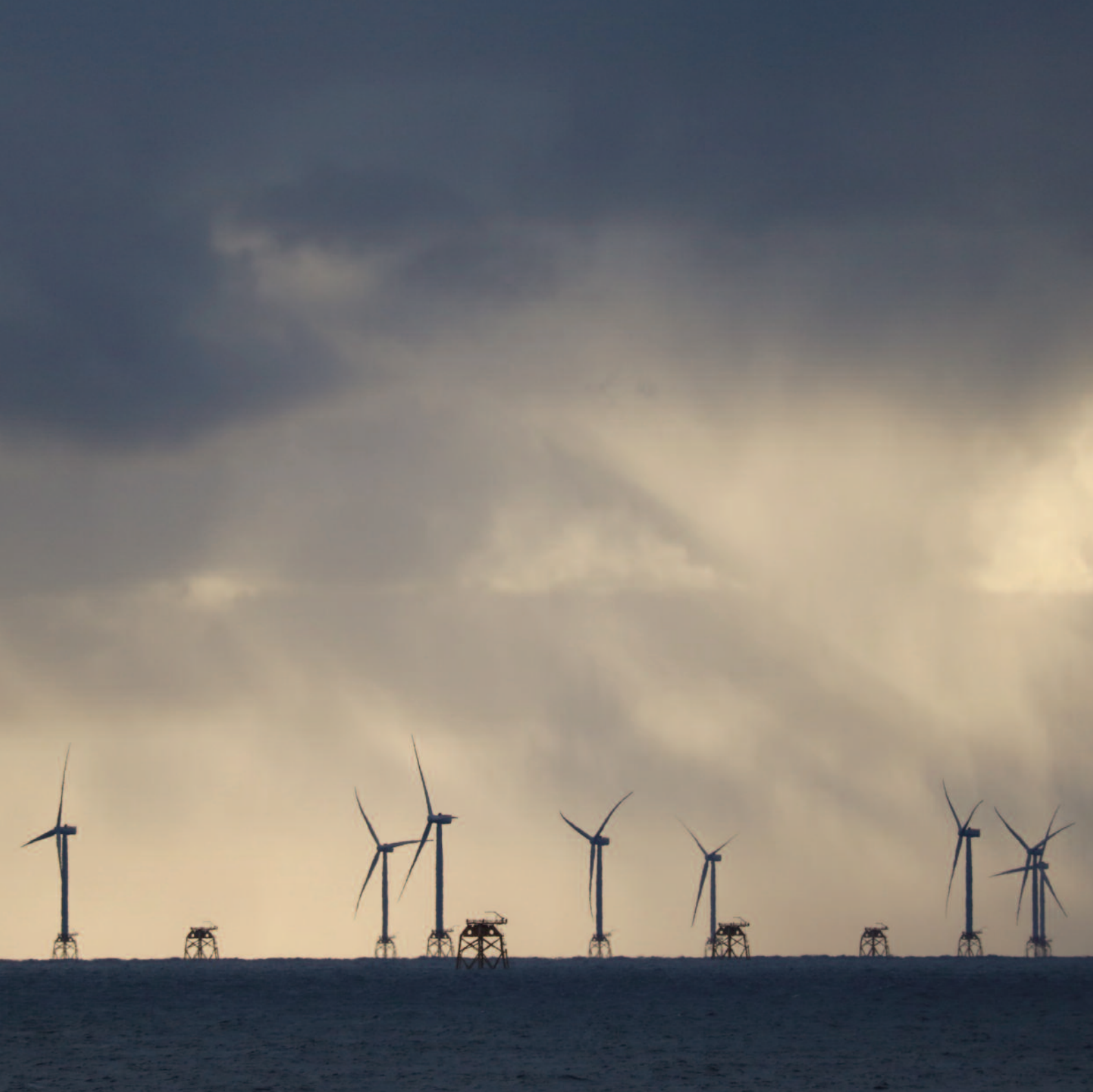
Irish Whale and Dolphin Group

IWDG Policy Document

IWDG POLICY ON OFFSHORE WINDFARM DEVELOPMENT



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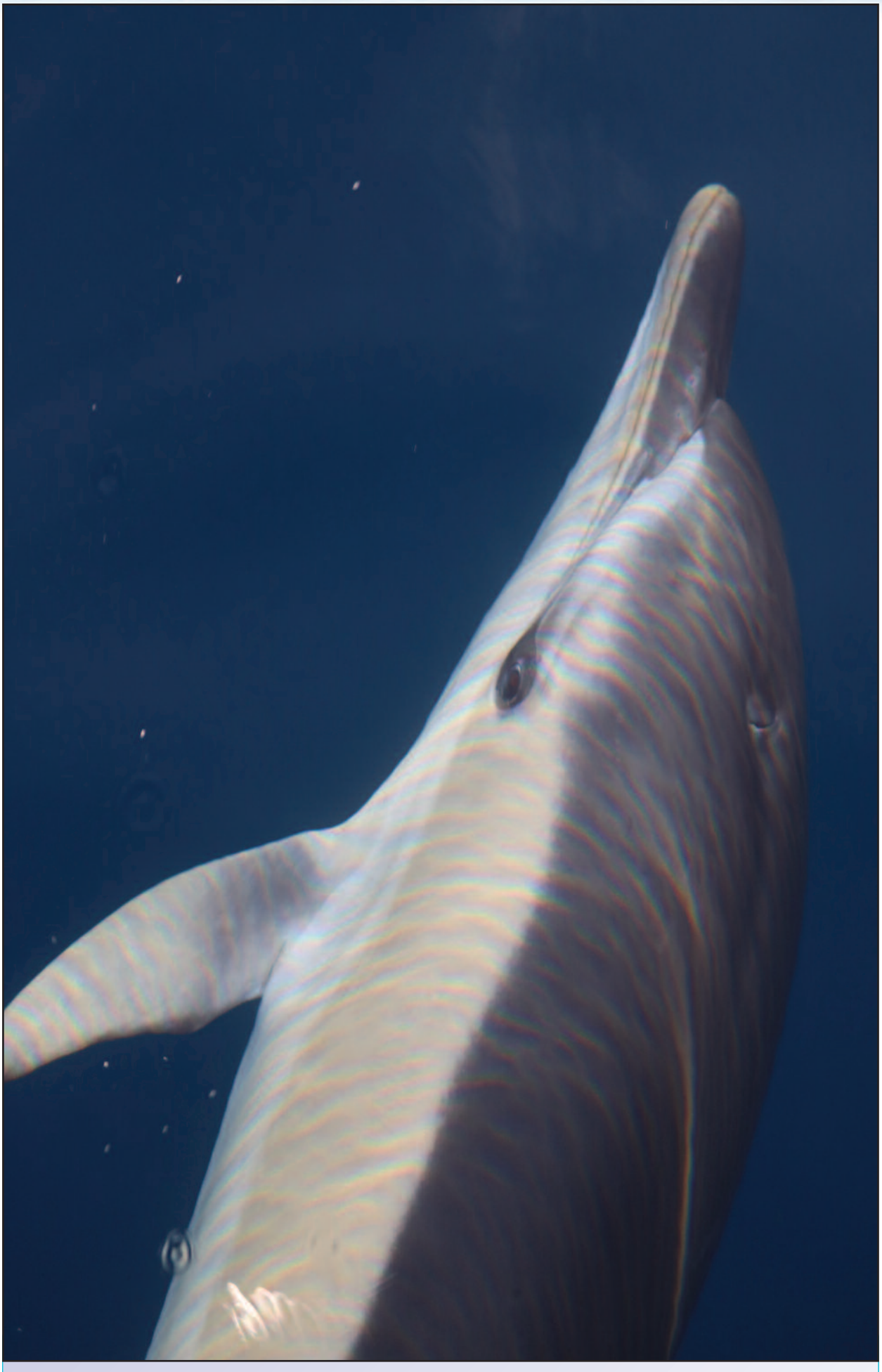


Common dolphin (Patrick Lyne/IWDG).

Introduction

The marine renewable energy industry is set for explosive growth in the coming years in Irish waters. The Irish government has a production target of 30GW of offshore wind energy by 2050, with a cumulative investment over that time of between €100 and €200 billion (SEAI, no date). Wind energy both onshore and offshore in Ireland is expected to contribute in the region of 400 to 450 Mt of CO_2 abatements by 2050 and targets are currently being revised upwards. The benefits of wind energy in terms of employment, exports, and CO_2 emissions reduction is without question, the impacts of building large windfarms offshore are however not without consequences. While the IWDG does not oppose offshore developments it has always been the policy of the group that development should be done within the framework of both national and international best practice and should have no significant impacts on whales, dolphins and porpoises (cetaceans) or their habitats.

This IWDG policy document seeks to describe best practice in the protection of whales, dolphins and porpoises during the development process for offshore windfarms. Many of the same policies can apply to any marine renewable energy installation.

Currently there is one offshore windfarm in the Republic of Ireland supplying to the national grid. The facility on the Arklow Bank has seven GE Energy 3.6 MW turbines that generate a total of 25 MW of electricity. The current government Climate Action Plan has a target of 1,000 MW electricity generation from offshore wind by 2025 and 5,000 MW by 2030 (Durakovic, 2020). This implies a huge increase in activity in the sector with development principally occurring in the Irish Sea initially, but the Celtic Sea is likely to see larger scale developments in the future.

The development of windfarms on the south and west coasts will likely see a change in technologies used. Traditional wind turbines have foundations embedded into the seafloor and are limited to water depths of 50m or less (IRENA, 2016). Floating foundations will allow wind turbines to be placed in water depths of 3000m or more, however, though such developments are likely to be in water depths of 200m or less (with notable exception's such as Norway's Hywind Project in 260 to 300m water depths).

This IWDG policy is intended to support development of offshore wind such that healthy populations of cetaceans are maintained into the future. This includes ensuring fish stocks and their breeding grounds, which are the food of a range of cetacean species, are not denuded in any way and that offshore ecosystems are maintained throughout the development, operational, and decommissioning stages of windfarms.

Bottlenose dolphins (Simon Berrow).

Underwater Noise

Underwater noise is generated in the construction, operation and decommissioning of wind turbines and will contribute to increased noise pollution in Irish waters. As wind turbines become larger the noise emitted by turbines will likely increase, as will the size of seabed fixtures. Floating and fixed wind turbines may act as fish aggregation areas or artificial reefs but may also serve to trap ghost nets and as such form an entanglement hazard for fish and marine mammals. Increased vessel traffic between shore and wind turbines will increase noise pollution and represents an increased risk of collision with marine mammals.

Knowledge of cetaceans in windfarm sites

Although our knowledge of the ecology and habitat requirements of cetaceans in Irish waters is still relatively poor, existing information shows that Irish waters support a rich diversity of cetacean species, both inshore and offshore, including both resident (breeding) and migratory populations. To date, 25 species have been recorded in Ireland, which is nearly one-third of all the known species of cetaceans in the world. Some species, such as harbour porpoise, are widespread and relatively abundant, while others, such as blue whales, are rare but migrate and forage annually along the western seaboard. Other species, such as beaked whales, have rarely been seen alive in Irish waters, with some species only known from carcasses that have become stranded on our shores. All cetacean species and their habitats are protected under Irish, EU, and international legislation and in order to protect all these species, and their habitats, we need to understand more about their population dynamics and ecology.

Humpback Whale and common dolphin (Michael O'Clery).

Recommendation 1

Increase the level of research to estimate cetacean distribution and abundance, population structure and stock identity in order to quantify the impact of windfarms on cetaceans in Irish waters. Site specific surveys must be completed, to establish baseline data on all marine mammal species occurring at windfarm sites. This typically involves monthly surveys for a minimum of at least two years and three years is recommended (SEAI, 2018) to establish annual, seasonal and geographical variables. Additionally, the relevant authority should seek and coordinate funding through the licensing process, to conduct regional visual and acoustic surveys in areas adjoining and distant from windfarm sites, to better determine and understand changes applicable to the windfarm and wider population changes, that may result from other factors such as climate change.

Recommendation 2

Static Acoustic Monitoring (SAM) is recommended, especially off the east coast where harbour porpoises are the principle cetacean species present and are difficult to survey visually. SAM can provide high quality temporal data. High frequency vocalisations, such as those of harbour porpoise, due to their limited detection distance, are spatially constrained. An appropriate number of sampling sites should be monitored to achieve good coverage of the area of interest as recommended by SEAI (2018). SAM using recording devices such as Soundtraps or SM2M should also be used to record low frequency vocalisations by baleen whales and dolphin whistles as well as ambient noise levels.

Environmental assessment for windfarm sites

Environmental risk assessments are performed to assess the potential impact of a development on species, habitats and the environment. Engagement with the public and stakeholders is required under the Aarhus Convention, implemented by EU Directive 2003/35/EC. Such risk assessments should assess the impact of activities on marine mammals including disturbance, displacement and acoustic trauma. For acoustic trauma, currently most assessments only use Permanent Threshold Shift (PTS) as the limit for injury. We strongly argue that Temporary Threshold Shift (TTS) should be considered as an injury and be mitigated accordingly. TTS has been shown to cause neural network degeneration that may result in future hearing loss (Kujawa and Liberman, 2009). Current demand for licenses to develop windfarms has led to many blocks being adjacent to each other and in some cases overlapping. These sites require baseline ecological surveys and in some cases have started site investigations. Often the same surveyors survey concurrent sites, using the same vessels and on consecutive days which leads to increased disturbance of marine mammals in a small area.

Recommendation 3

For acoustic trauma injury levels should be considered at the lowest predicted level of TTS and mitigation strategies should be designed to prevent TTS.

Recommendation 4

The impact of noise pollution on adjacent SACs, MPAs or cetacean hotspots and resultant behavioural disruption, habitat degradation and changes in use of these areas by cetaceans should also be considered.

Recommendation 5

IWDG recommends companies attempt to co-ordinate their site surveys, or share data, to minimize this activity in the interests of reducing disturbance.

Bottlenose dolphin (Mags Daly/IWDG).

Good environmental status

It is the goal of the EU Marine Strategy Framework Directive (MFSD) to achieve Good Environmental Status (GES) by 2020. This is described by eleven descriptors, which include Descriptor 1 – maintaining biodiversity and Descriptor 11 which ensures "Introduction of energy (including underwater noise) does not adversely affect the ecosystem". Offshore wind energy is a recent phenomenon and one which is rapidly evolving. Tougaard *et al.* (2009) showed that noise generated by operational wind turbines was mostly below 500Hz. While sound pressure levels were low, turbines could be audible by seals at several kilometres. The latest turbines, which produce up to 15MW from a single 220m rotor diameter turbine (Parnell, 2020), are now much larger and are starting to use different installation methods and consequently the noise produced underwater may be also quite different. Minke whales are frequently recorded in Irish inshore waters during the summer and autumn. Minke whale vocalisations occur mostly between 50 and 300 Hz (Risch *et al.*, 2013), which suggests that noise from wind turbines could lead to impacts on the ability of minke whales to communicate, navigate and find food. The extended life (around 20 years) and cumulative impacts of a network of offshore windfarms operating simultaneously could have significant impacts on minke whales foraging in Irish coastal waters.

An adaptive management plan should be in place that provides the opportunity to modify operating procedures in response to impacts. Historically most concern about offshore windfarms on cetaceans has focused on the acoustic impacts of the construction phase of the windfarm (piling). However, as more offshore windfarms become operational, acoustic data will need to be gathered to assess the cumulative noise impacts and noise levels generated by fully operational windfarms. Offshore windfarms may be operational for decades before decommissioning and few data currently exist on newer turbine models or on new deployment systems such as floating turbines.

Harbour porpoise (Randal Counihan/IWDG).

Recommendation 6

Noise levels pre-construction, during construction, and when operational, should be measured to assess the impact of increased noise levels on cetaceans. The register of licensed low and mid frequency impulsive sound activities carried out within the Irish EEZ set up by the Environmental Protection Authority (EPA) in 2014 needs to be updated to include offshore windfarm construction and operation and thereafter be regularly updated.

Windfarm site investigations and cetaceans

Windfarms affect cetaceans in different ways during their different development stages. During planning detailed seabed mapping surveys to evaluate the seabed for structures and cable placement as well as Unexploded Ordnance (UXO) are carried out using a range of geophysical equipment and underwater Remotely Operated Vehicles (ROVs). These use a range of frequencies operating both within and outside the hearing range of cetaceans, at high to medium intensity source levels from approximately 180 dB to 240 dB re 1mPa. This scale is roughly equivalent in air to noise levels experienced at a rock concert up to sound levels that can cause organ rupture.

Passive Acoustic Monitoring

Passive Acoustic Monitoring (PAM) is applied, along with Marine Mammal Observers (MMOs), as a standard mitigation tool during surveys and construction in most jurisdictions. PAM is used to detect animals which may be underwater. Some species may remain at depth for over an hour, where observers cannot see them.

Marine mammal vocalisations vary according to species and context. Some species vocalise frequently, such as dolphins, while others may vocalise primarily in their breeding areas (e.g. humpback whales) or may vocalise principally at depth (e.g. beaked whales). At present PAM remains the only widely available technology capable of detecting marine mammals under water.

Recommendation 7

Seabed surveys should apply standard mitigation practices as defined under the Convention on Migratory Species (CMS) ('Reference' 2017) COP12 Resolution that apply to airguns and alternative technologies where acoustic devices are operating within the audible range of marine mammals from 0 to 200 kHz. Such mitigation plans recommend 24-hour monitoring for cetaceans.

Recommendation 8

PAM should be adopted into standard mitigation protocols to allow detection of cetaceans in poor visibility during the hours of darkness and for detecting animals underwater where source levels are often highest. Where localisation of animals is not possible, a rule similar to that in New Zealand mitigation (DoC, 2013) should be applied where all animals with vocalisations over 30 kHz are assumed to be within 300m.

Recommendation 9

PAM operator qualification and system minimum requirements. PAM system suppliers should discuss system QA (Quality Assurance) with PAM operators and report monthly to the regulator on PAM system effectiveness.

Recommendation 10

Where PAM is deemed to be insufficiently adequate to mitigate against impacts to marine mammals then thermal imaging with adequate detection capability and range should be employed for night time operations.

Windfarm site construction and cetaceans

Windfarm construction will inevitably result in increased vessel traffic contributing to noise pollution in the area of operations and increased risk of vessel strike on cetaceans. Typically, placement of wind turbines requires the insertion of piles or pins into the seabed. The sound energy generated by piling depends partially on the composition of the seabed and the pile material, but source levels exceeding 220-250 dB re: 1 µPa (DAHG, 2014) have been identified. This currently represents the greatest environmental impact during windfarm construction and typically requires noise and marine mammal mitigation measures to be enacted. Based on the findings of Lucke *et al.* (2009), German regulations established noise-induced injury prevention thresholds that call for Sound Exposure Levels (SELs) not to exceed 160 dB re 1 $\mu Pa^2 \cdot s$ and a peak-to-peak sound pressure level not to exceed 190 dB re 1 µPa at a distance of 750 m from the piling. It is assumed that complying with these criteria will reduce the avoidance distance to ~8 km based on noised induced disturbance studies (Dahl *et al.*, 2014). This is typically applied in addition to shutdown and other mitigation criteria for marine mammals during pile driving.

Recommendation 11

Where possible UXOs should be removed for disposal ashore, where not possible and ordnance is to be detonated, deflagration is recommended with noise abatement to reduce noise impact. Standard mitigation practices should be applied for removal, in case of accidental detonation and for in-situ detonation with MMOs and PAM operators.

Recommendation 12

Noise levels should be actively monitored during static operations such as pile driving, and should apply the most up to date TTS levels in noise emission monitoring. As per best practice in Germany and other jurisdictions, where noise levels exceed control levels, operations must cease until lower noise levels can be achieved. Noise mitigation measures such as coffer dams, bubble curtains and other Noise Abatement Systems (NAS) should be implemented where appropriate to reduce noise emitted into the environment, taking into account the depth, current, seabed and environmental conditions of the site.

Recommendation 13

In general SACs (Special Areas of Concern), Marine Protected Areas and other areas of importance to cetaceans should be avoided by offshore construction but in certain instances it may be necessary to place some infrastructure in or adjacent to areas of ecological importance, e.g. cable laying. In such cases stricter mitigation should apply such as limiting construction activity to certain months and/or to daylight or periods of good visibility only.

Recommendation 14

Environmental Assessment and mitigation should be applied as defined under CMS (2017) (COP12 Resolution under EIA Guidelines for Construction Works, pages 20 to 22). This includes 24 hour detection capability, as well as soft start and shut down protocols during works. An urgent review of the current 2014 mitigation guidelines (DAHG, 2014) is required, to bring them in line with current best practice and international obligations.

Soft Start

During planning, construction and decommissioning stages of a windfarm many operations that emit noise pollution will be required to soft start or ramp up noise levels in a gradual and consistent manner. This has been required to be in 6dB steps for seismic operations in Sakhalin, Russia where there is an endangered population of grey whales (IUCN, 2018). 6 dB steps represent a doubling of sound pressure levels in order to make the increase clearly audible and scare away animals that might otherwise suffer an auditory injury Using smaller stepped increases (less than 3dB) may be inaudible to animals and therefore potentially ineffective. Pile driving operations do not have the ability to emit controlled acoustic output from hammer blows, and a total of 5dB SEL (at 750m) change has been recorded between start of soft start and full power operations (Robinson *et al.*, 2012). Therefore a 40 minutes soft start where only a 5dB change in Sound Exposure Levels (SEL) received levels at 750m is possible implies a shorter soft start would serve equally well and reduce noise in the environment. In many jurisdictions Acoustic Deterrent Devices (ADDs) are used prior to pile driving operations starting and during operations to scare animals away from the area of operations. Each ADD has its own particular frequency and source level of operation and these have mixed results with different species in different contexts.

Loading wind turbines for installation (Patrick Lyne/IWDG).

Recommendation 15

Licensing of windfarm construction should be managed to reduce the cumulative effect of noise emissions from adjoining windfarm construction sites As per the Irish Offshore Strategic Environmental Assessments (IOSEA, 2015) and allow for low-noise channels between adjacent windfarms. It is recommended that a minimum distance of 100km should apply to concurrent piling operations on adjacent development sites, including international trans-boundary sites.

Recommendation 16

Noise level reporting and mitigation reporting should take place directly between monitoring contractors and the regulator and copied to all relevant third parties. This is a recommendation of CMS (2017) (COP12 Resolution under EIA Guidelines for Construction Works, page 21) which calls for *"Transparent processes for regular real-time public reporting of activity progress and all impacts encountered"*.

Recommendation 17

Soft starts or ramp-ups, while unproven in efficacy, should be used where possible, with stepped increases of approximately 6dB in pressure level. Soft starts should be of an appropriate length based on the number of steps and a duration (number of minutes) per step should be determined and reduce noise in the environment. The default 20-40 minutes currently for piling with only a 5dB change in received levels, indicates little opportunity for soft starts to be effective. Any soft start used in pile driving should be recorded acoustically and included in monitoring and mitigation reporting for evaluation and improvement of mitigation efficacy.

Recommendation 18

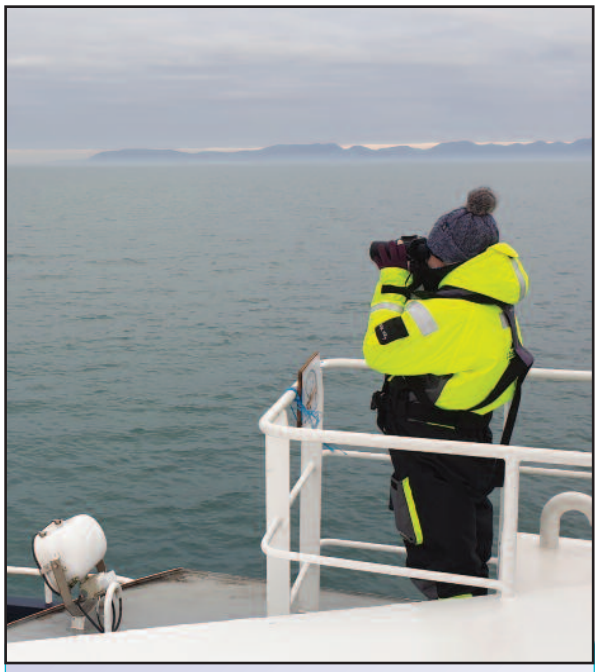
ADDs should be used to reduce the threat of auditory injury, where they are known to be effective for the species present. ADD use should not exceed the noise levels of the mitigated activity itself and be only used prior to commencing activities. ADD use should apply standard assessment practices as defined under CMS (2017) (Convention on Migratory Species) COP12 Resolution, EIA Guideline for Pingers (Acoustic Deterrent/Harassment Devices, Navigation), page 28, which will include details of source level and frequencies used as well as impact on species likely to be present.

Windfarm energy production and cetaceans

The issue of production noise has already been covered under Good Environmental Status. But it is important to realise that, in particular, deepwater floating wind platforms will be held in place by several chains. These represent a small to negligible entanglement risk of themselves, but where they trap drifting nets and lines, they may serve to become a larger entanglement risk to cetaceans and other marine life.

Floating Offshore Wind

The construction and establishment of Floating Offshore Wind (FOW) devices is an emerging area, with several pre-commercial arrays established in Europe including the Hywind project in Scotland. FOWs are a lightweight structure composed of a submersible tubular floater, a counterweight attached to the seabed with tendons, mooring lines with a drag anchor and a dynamic cable in a 'lazy wave' configuration. While this configuration may avoid construction noise from piling with the primary noise source being from vessel thrusters during the anchoring phase, there are entanglement risks to be considered. Additionally such deployments may result in dragging of anchors and considerable disturbance to benthic habitats and release of CO_2 from sediments.



Marine Mammal Observer on watch (Simon Berrow/IWDG).

Recommendation 19

Regular monitoring of anchor structures must take place, to check if they have been fouled with any fishing gear and to remove such gear when this occurs. All such issues should be reported to the regulator.

Recommendation 20

Noise and marine mammal monitoring should be carried out in line with SEAI (2018) recommendations and surveys should continue for 3 years post construction and preferably should continue at a reasonable time interval scale for the life of the windfarm. It is impossible to predict the noise output of future large wind turbines and of floating systems which are still being developed. However windfarm production non-impulsive noise should not exceed 120 dB re 1 µPa@ 1m which is defined as the point at which increased avoidance and behavioural effects have been observed in marine mammals (Southall *et al.*, 2007).

Windfarm decommissioning and cetaceans

To date few offshore windfarms have been decommissioned and windfarms generally have a lifetime of approximately 25 years. All material which can be removed should be, but any foundations may be cut at seabed level. At this stage it is not possible to know how such a removal process will be carried out or what impacts decommissioning may have on cetaceans, but increased vessel traffic and decommissioning related noise pollution are to be expected.

Recommendation 21

Environmental Assessment and mitigation, as defined under CMS (2017) COP12 Resolution under EIA Guidelines for Construction Works, Section VII page 20, should be applied to windfarm decommissioning works. This includes 24-hour cetacean detection capability, as well as soft start and shut down protocols.

Minke whale (Padraig Whooley/IWDG).

Reporting and Regulation

Currently in Ireland there are many regulators for the marine area. Fishing ports are regulated by the Department of Agriculture, Food and the Marine, the foreshore area out to 12 miles (outside fishing ports) is regulated by the Department of Planning, Housing and Local Government, Irish scientific research on Irish vessels is managed and regulated by the Marine Institute, foreign vessel research is regulated by the National Parks and Wildlife Service, Petroleum exploration is regulated by Petroleum Affairs Department within the Department of Climate Change and Energy Efficiency, while other work (non-research or petroleum related) outside the 12 mile limit is unregulated currently (July, 2020).

Recommendation 22

A system of Integrated Ocean Management (IOM) is required with one regulator responsible for marine environmental management. This regulator should be responsible for, and expert in, reviewing and approving environmental assessments and mitigation reports to ensure standards are adhered to and met, as well as updating requirements as necessary. This will better allow management of offshore petroleum, windfarm, communications cables, pipelines, research and fishing to occupy the same waters while maintaining biodiversity and regulatory standards.

Recommendation 23

Cetacean occurrence and mitigation data acquired during the windfarm development process should be entered into an open-access online database for research and future development assessment.

Recommendation 24

Mitigation guidelines should be reviewed and updated regularly and need to change as research and developments provide more up to date information and methods.

Minke whale (Patrick Lyne/IWDG).

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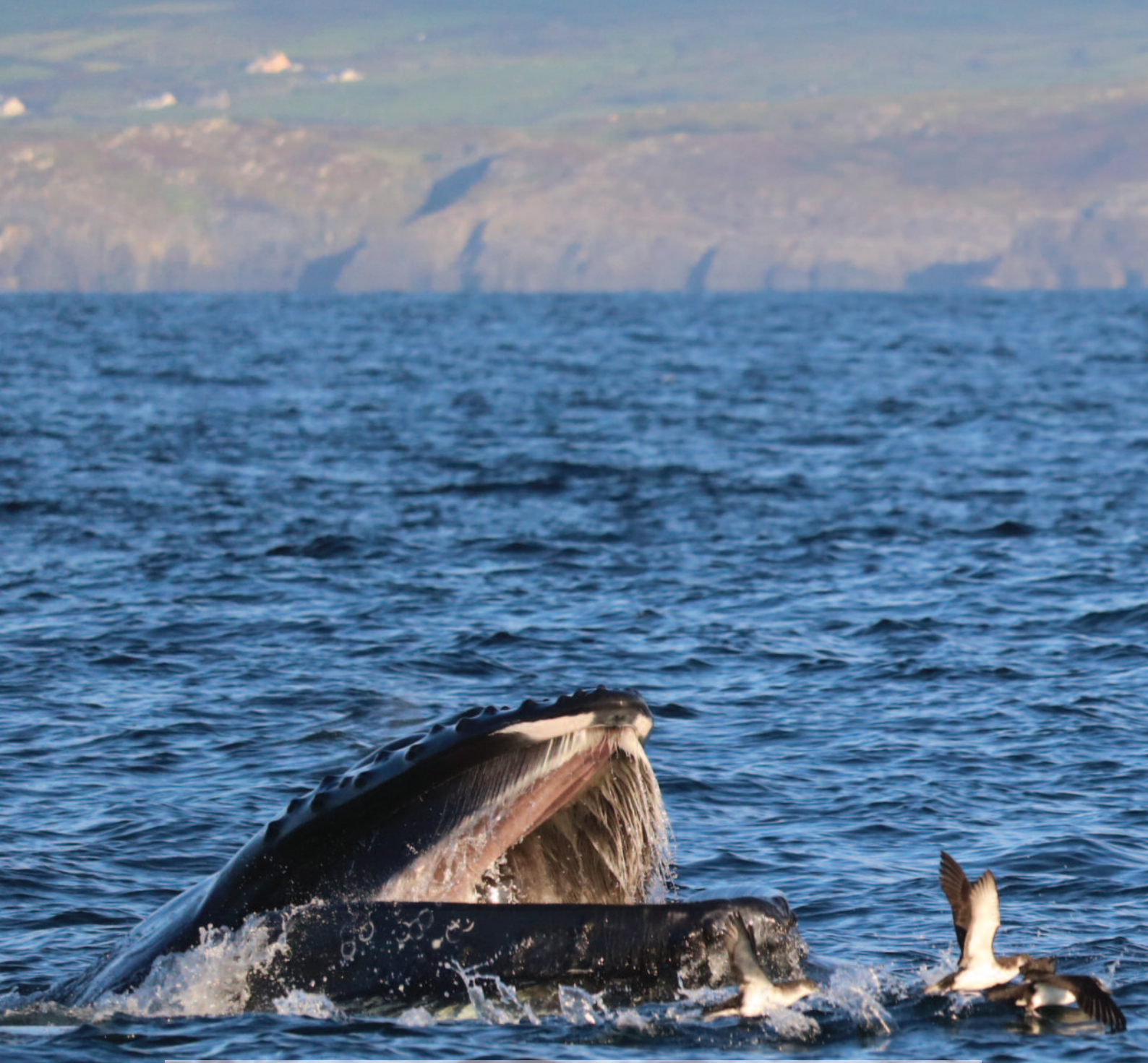

The **Irish Whale and Dolphin Group** (IWDG) was established in December 1990 as an all-Ireland group, dedicated to the conservation and better understanding of cetaceans (whales, dolphins and porpoises) in Irish waters through study, education and interpretation.
This document recognises the growing importance of offshore wind energy as a renewable energy source, but only without compromising the conservation of healthy, sustainable cetacean populations into the future

Irish Whale and Dolphin Group

The IWDG relies on members and partnerships to achieve its goals. Please visit **www.iwdg.ie** and join the IWDG to support our work.