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Floating Offshore Wind: Understanding Potential Impacts to Marine Mammals

Floating offshore wind looks set to develop rapidly, but it's still in its early stages. What questions should the industry be asking around marine mammal impact assessment?

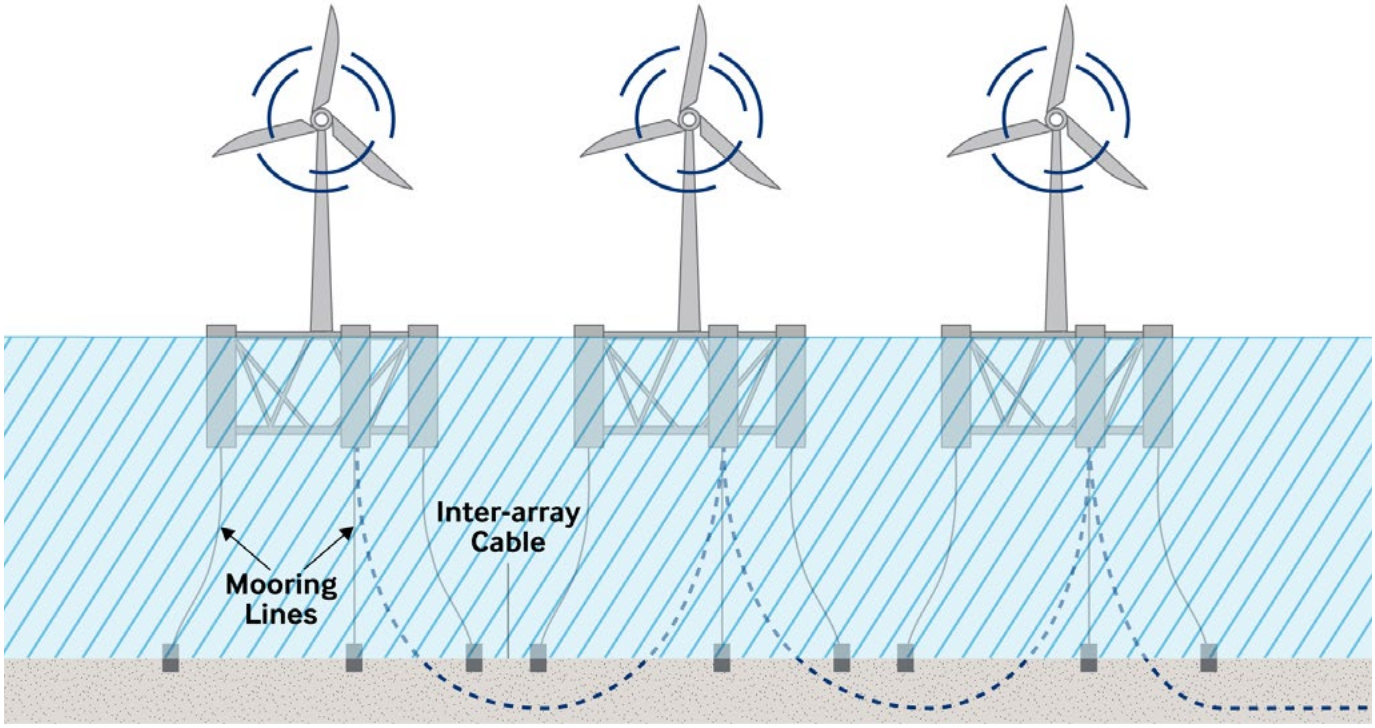
Dr Tessa Mcgarry
Principal Advisor Marine Ecology

The differences between floating and fixed offshore wind will mean different considerations regarding the impact on marine mammals, and how we assess these. What's needed is a robust understanding of the nature of how marine mammals interact with floating wind turbines, and the application of the expertise we have already gathered.

With only limited data on floating offshore wind available, there are, of course, some unknowns in terms of potential impacts and regulation – and how these will evolve in the future. In this article, Dr Tessa McGarry, a leading voice in marine mammal assessment in the UK, discusses possible challenges and solutions for floating offshore wind.

Entanglement risk

One key difference between fixed and floating offshore wind farms is the absence of a fixed foundation structure e.g. monopiles, replaced instead with a floating subsea structure that is anchored to the seabed via mooring lines and suspended cables. As floating offshore wind develops globally, the industry is looking to understand if such structures are likely to adversely affect marine mammals assessment in the UK, discusses possible challenges and solutions for floating offshore wind.



Entanglement risk is divided into two types:

Primary entanglement – would be the result of animals directly entangling with the various below surface elements of the wind turbine e.g. cables or mooring lines. Given the size, tension and spacing of these structures and the ability of many marine mammals to locate by sonar, this type of risk may be relatively small.

Secondary entanglement – refers to items such as "ghost" fishing gear or other lost, abandoned or otherwise discarded fishing equipment, already extant in the marine environment, becoming tangled around the moorings and cables. Animals, including marine mammals, fish and sea turtles, may suffer injury or mortality; even if the animal were able to break free there may be physical damage (e.g. tissue damage from abrasion or impairment of their respiratory systems).

Understanding the potential risks and effects of entanglement on marine mammals is uncertain due to lack of data. What does this mean for developers, regulators and stakeholders? In reality, because floating offshore wind is a relatively new discipline, consultants will focus on risk-based assessments until more empirical data is available to inform the industry. The potential for entanglement is a key area for future research.

One mitigation option is adaptive monitoring to inspect and remove nets and similar detritus from the wind farm area – with intensity of monitoring tailored to the risk at an individual floating offshore wind farm, and over time. Technological advancements in remote monitoring can facilitate such programmes.

Other types of potential risk to marine mammals

There are a number of factors for consultants, developers and regulators to be mindful of when assessing risk to marine mammals as part of floating offshore wind developments.

Here are some of them:

Piling noise

Floating offshore wind must consider the potential for the sound created by pile-driving from moored anchor lines to cause injury (i.e. permanent hearing damage) and/or behavioural disturbance (e.g. affecting animals' communication or potentially displacing animals from important habitats). As turbines, and the equipment used in construction, has increased in size, suitable mitigation to reduce potential effects must be considered..

Operational noise

Sound created by the rotation of the turbine itself, or the 'pinging' or 'snapping' noises during slackening and tensioning of mooring lines requires consideration. There isn't enough data yet to support a definitive answer and, whilst the risk of injury is considered to be very low, such sources of operational noise are likely to elicit a disturbance response in animals as they navigate around the many structures within a wind farm array..

Vessel Noise

The contribution of offshore wind farm construction and operation and maintenance (O&M) vessel traffic to the underwater soundscape merits consideration since maritime traffic is recognised as a key source of marine noise pollution. A 2016 study [1] predicted a doubling in global shipping noise by 2030. The risks are difficult to quantify as there is no understanding of where the "tipping point" lies for different species. As with other sources of noise, the effects will be largely determined by the environmental context and previous experience of animals inhabiting the area (for example, are mammals in the proposed region already acclimatised to this?)

A note on all underwater noise sources: reducing underwater noise pollution is listed as one of the criteria in achieving Good Environment Status (GES) under the Marine Strategy Framework Directive. GES is defined as "The environmental status of marine waters where these provide ecologically diverse and dynamic oceans and seas which are clean, healthy and productive (Article 3).

Electromagnetic fields (EMF)

Occurring naturally in the marine environment, EMF may be used by marine mammals, amongst other species groups (including fish and sea turtles), to navigate, orient and hunt for prey. Cables from marine energy projects can add EMF to the environment; since floating offshore wind inter-array cables will be suspended in the water column, not trenched, the potential impact on marine mammals is also worthy of further investigation.

Barrier effects

With a large number of chains and suspended cables, barrier effects could arise from the physical presence of subsea structures (mooring chains, cables etc) at the operational wind farm. Barrier effects may also occur because of elevated noise during construction when sound may prevent marine mammals entering the area or may lead to long detours to avoid the area.

There is limited information on such effects and further evidence is needed about how marine mammals use the wind farm and navigate between the structures. The scale of effects is likely to depend on how an animal detects and perceives the subsea structures. In addition, studies of fixed foundation wind farms have demonstrated some potential for positive effects on marine mammals: animals have been recorded foraging around the turbine foundations where prey aggregate.

What mitigation support is available?

In terms of project risks, there isn't a huge difference between fixed and floating wind at present. Concerns such as timelines, costs and design aren't affected by any new floatingwind specific regulations related to marine mammals, although it would be wise to consider mitigation and monitoring when costing O&M for the operational phase. As yet, mitigations specifically for floating offshore wind projects (such as regular inspections for presence of ghost nets) aren't mandatory, but this could change as the industry evolves.
In supporting the design phase, our team follow a project design envelope approach. This looks at different possible elements (for example, pile diameters and hammer energies required to install piles or numbers of cables and different mooring options) to understand potential impacts and the ranges of those impacts. The team then advise on how to reduce, mitigate or avoid potential impacts.

Marine mammal expertise for floating offshore wind

Our marine mammal team guides clients through the consenting process, from the very start of the project design phase to getting consent and advising post-consent. They support the entire offshore wind lifecycle, designing surveys, conducting impact assessments, writing chapters of project Environmental Statements (ES) and performing data analysis, as well as developing post-consent monitoring plans, reporting on compliance and liaising with regulators and stakeholders.

We provide permitting / consenting / approvals support to offshore wind projects globally from our hubs in the UK, the US, Australia and South Korea. Our teams have many years of experience in offshore wind, providing technical assessments for major projects. They comprise EIA project managers and subject matter experts (including expertise in, for example, benthic habitats, fish and shellfish, marine mammals, ornithology, coastal processes, commercial fisheries, etc). The breadth of our expertise means we can take a holistic and seamless view across the whole project. As the floating offshore wind industry looks to grow with high standards, expertise and a consistent approach, we're proud to be able to say that we can offer our clients all of these things in-house.

If you have questions about marine mammal assessments and mitigation for floating offshore wind, please contact Tessa McGarry, Associate Director, Marine Ecology and Habitats Regulations Assessment
tessa.mcgarry@tetratech.com

[1] Kaplan, M.B. and Solomon, S., 2016. A coming boom in commercial shipping? The potential for rapid growth of noise from commercial ships by 2030. Marine Policy, 73, pp.119-121.