



BirdWatchIreland
birdwatchireland.ie
protecting birds and biodiversity

BirdWatch Ireland submission/observation to Case MLA/2023/00113 (White Cross Offshore Wind Farm)

A submission by staff at BirdWatch Ireland

Submission date: 06/02/2025

Contact: Rochelle Streker, Marine Spatial Planning Officer,

BirdWatch Ireland Address for correspondence: BirdWatch Ireland, Unit 20 Block D, Bullford
Business Campus, Kilcoole/Greystones, Co. Wicklow.

Phone: + 353 87 4374401

Email: rstreker@birdwatchireland.ie

Introduction

BirdWatch Ireland is Ireland's leading charity focused on the conservation of wild birds. Established in 1968, we currently have over 15,000 members and supporters and a local network of over 30 branches nationwide. As an organisation, our conservation team is actively involved in seabird conservation, research, and monitoring. Our policy and advocacy team are active stakeholders contributing to marine conservation at a national and EU level. We are the Irish partner of Birdlife International and are members of the Irish Environmental Network, Stop Climate Chaos, and the Sustainable Water Network, and a founding partner of the Fair Seas coalition.

Our vision is that Ireland should become a world leader in marine conservation and the sustainable management of our marine environment. The protection and restoration of Ireland's biodiversity is vital, and rapid decarbonisation is an essential element of this process. BirdWatch Ireland therefore supports the production of renewable energy and offshore wind to help achieve this. However, offshore renewable energy (ORE) devices and infrastructure must be sensitively located to minimise negative impacts on marine and terrestrial ecosystems, and on seabirds in particular as these may be more impacted than other taxa.

Ireland's Seabirds

Ireland's marine environment plays host to a huge diversity of ornithological life year-round. In summer, our offshore islands and cliffs host seabird breeding colonies, many of which are of international importance or regional significance. In winter, our coasts and estuaries are of huge importance for wintering waterbirds. Seabirds, as top marine predators exposed to all threats affecting the ocean, are excellent biodiversity indicators, providing us with an insight into the health of, and pressures facing, our marine environment [1].

However, 23 of 24 breeding seabirds in Ireland are either Red or Amber listed Birds of Conservation Concern [2]. They are highly vulnerable, facing current pressures and future threats, including (ranked in order of frequency of occurrence) [3].

- Bycatch and incidental killing (due to fishing and hunting activities) [4]
- Desynchronisation of biological/ecological processes due to climate change
- Decline or extinction of related species (e.g. food source/prey, predator/parasite, symbiote, etc.)
- Other invasive alien species (other than species of Union concern).
- Potential impacts from wind, wave and tidal power, including the associated infrastructure

Even though Ireland has designated a network of Special Protected Areas (SPAs) at coastal sites aimed at protecting the most important areas for breeding seabirds, trends in population

and range for some species are declining [5]. At a European level, of the 24 seabird species regularly breeding in Ireland, nine are declining (Atlantic puffin *Fratercula arctica*, Black-headed gull *Larus ridibundus*, Kittiwake *Rissa tridactyla*, European herring gull *Larus argentatus*, European shag *Gulosus aristotelis*, Great black-backed gull *Larus marinus*, Little tern *Sternula albifrons*, Mediterranean gull *Larus melanocephalus*, and Fulmar *Fulmarus glacialis*) and an additional four have an unknown population trend (Black guillemot *Cepphus grylle*, European storm petrel *Hydrobates pelagicus*, Leach's storm petrel *Hydrobates leucorhous*, and Manx shearwater *Puffinus puffinus*) [6]. Nationally, of these 24 species, two are declining in Ireland (Atlantic puffin and Kittiwake) with an additional two species facing probable declines due to Highly Pathogenic Avian Influenza (HPAI) H5N1 since last census (Arctic tern *Sterna paradisaea* and Common tern *Sterna hirundo*); population trends for a further three species (Great cormorant *Phalacrocorax carbo*, European Shag, and Fulmar) are unknown [5 and Pers Comm Dr. Steve Newton, Senior Seabird Conservation Officer, BirdWatch Ireland October 8th 2024]. Due to the sensitive nature of these populations, special consideration should be given to the potential effects of offshore developments on these seabird species. In particular, the cumulative effects of multiple developments must be adequately assessed.

For many years BirdWatch Ireland has been working to gather data and information on the importance and usage of our marine environment for seabirds and waterbirds. Our work in the Irish Sea includes tagging and tracking of seabirds at key sites, Digital Aerial Survey (DAS) work and observations on the daily movements and flight lines of a range of species. The latter in particular has been part of our annual monitoring and management of key seabird colonies in the Irish Sea for more than 20 years (carried out largely under contract to the National Parks and Wildlife Service (NPWS)). BirdWatch Ireland therefore has a unique understanding of the importance of the Irish Sea for seabirds and the possible impacts of new offshore windfarm developments on their populations.

The main impacts of ORE windfarm projects on seabirds and waterbirds include displacement, disturbance, and collision risks. However, there are a range of other possible impacts, including:

- Barrier effects: wind turbines and structural development can interfere with birds foraging and migration routes, potentially increasing their individual energy expenditure and limiting the available habitat.
- Cumulative impacts: how are the cumulative impacts being examined? We are extremely concerned that the cumulative impacts of all current and future ORE projects in the Irish and Celtic Seas are not being adequately assessed.
- Wider ecological impacts on fish stocks/prey base and its impact on fishing effort and location: Knowledge of the impact on the prey base/fish stocks is essential to be able to fully assess the impacts on seabirds. How will fishing efforts be shifted and what is the likely impact of such a shift on seabird foraging opportunities? Particular consideration should be given during construction and post-construction on how the

additional disturbance and new structures within the marine environment may change prey location and numbers.

- Impacts on non-seabird species, waterbirds and other larger birds using the air space. The flight heights are not known for key species and this data has not been collected, as many digital aerial surveys do not collect height data.

BirdWatch Ireland submission/observation to Case MLA/2023/00113 (White Cross Offshore Wind Farm)

Despite the proposed windfarm development being located outside the territorial waters of Ireland's EEZ, we are commenting due to concerns of transboundary and cumulative effects on seabirds. There is no overall marine spatial plan for the Celtic Sea, but rather different plans from different jurisdictions at different stages of implementation. Along with our BirdLife International partner, the Royal Society for the Protection of Birds (RSPB), we would advocate for a strong commitment to a coordinated approach to strategic planning of ORE in the UK and Ireland. We would also jointly advocate for the need for discussion between the UK and Irish governments on plans for ORE and the protection of shared marine biodiversity in the Celtic Sea. As a whole, the Celtic Sea is a unique and interconnected ecosystem and should be managed as such, with the range and habitats of many seabird species crossing the territorial borders within it. Ensuring transboundary communication and collaboration as multiple governments look to increase and implement more offshore renewable processes is key to ensuring that the cumulative effects of multiple projects do not negatively impact important marine species, including seabirds, and that the marine plans for one region do not undermine the management or ecosystem health of another.

While we appreciate that transboundary and cumulative effects are assessed within the White Cross Offshore Wind Farm (henceforth referred to as WCOWF) Environmental Statement, we would ask for further assessment to be conducted in relation to the project's potential impacts on Ireland's seabirds and marine environment. We understand that data gaps do exist and it is difficult to access data from another country; however, the limited assessment done so far does not accurately represent the potential cumulative and transboundary effects to Ireland and Ireland's marine environment and biodiversity, particularly given the many proposed ORE developments in Ireland that are in advanced planning processes. This includes proposed development within the Irish portion of the Celtic Sea, which will begin the auction process this year, near to the proposed WCOWF location (more on this in a later section). In our response below, we have highlighted some issues which we would like to see addressed and more thoroughly considered. We stress that these issues may not be comprehensive, as additional concerns could arise as our knowledge increases and/or seabird populations change over time.

1. Potential transboundary effects on Irish birds moving through Wales' marine environment and WCOWF footprint

Many of the seabird species observed within the footprint of the site as part of the ornithological surveys for WCOWF Environmental Statement also occur in Irish waters, with some being of conservation concern. Those species which breed in Ireland include Kittiwake, Common guillemot (*Uria aalge*), Atlantic puffin, Northern gannet (*Morus bassanus*), Manx shearwater, European storm petrel, Razorbill (*Alca torda*), and Lesser black-backed gull (*Larus fuscus*); migratory or passage species in Ireland's waters include Balearic shearwater (*Puffinus mauretanicus*). Because the Celtic Sea is shared between Ireland and Wales, it is likely that these seabird populations are also 'shared' by the two countries. The Celtic Sea is a single biogeographic unit, with shared habitats and species occurring throughout, regardless of territorial borders [7]. The migratory nature of seabirds and the large size of their ranges means that conservation efforts to protect and improve their populations must be transboundary in scale and must seek to protect all seabirds occurring within the area, including those which may be passing through at certain times of the year on passage to breeding or foraging grounds elsewhere. For example, seabirds breeding in Ireland or using Irish waters for foraging may be passing through Welsh waters at different times of the year. Therefore, for ORE projects in the Celtic Sea, environmental assessments should include impacts on all seabirds passing through the area on their way to Irish breeding or foraging areas, as well as those known to be breeding or foraging in the footprint of a given proposal.

To access the east coast of Ireland and the Irish Sea, many species of seabirds will pass through the Celtic Sea and potentially through the WCOWF offshore footprint. While many of these individuals will be breeding and staying within the Irish Sea during different bioseasons, seabirds breeding within the Celtic Sea and Welsh waters will also move into the Irish Sea. Tracking studies on Northern gannets and Manx shearwaters from Wales show frequent movement of breeding Welsh seabirds into Irish waters, not only in the Celtic Sea, but also into and within the Irish Sea [8,9]. Additionally, SEATRACK data from Kittiwake colonies in Wales at Skomer and in Ireland at Rockabill show heavy use of both the Celtic and Irish Seas by both colonies throughout the year [10] (Figure 1).

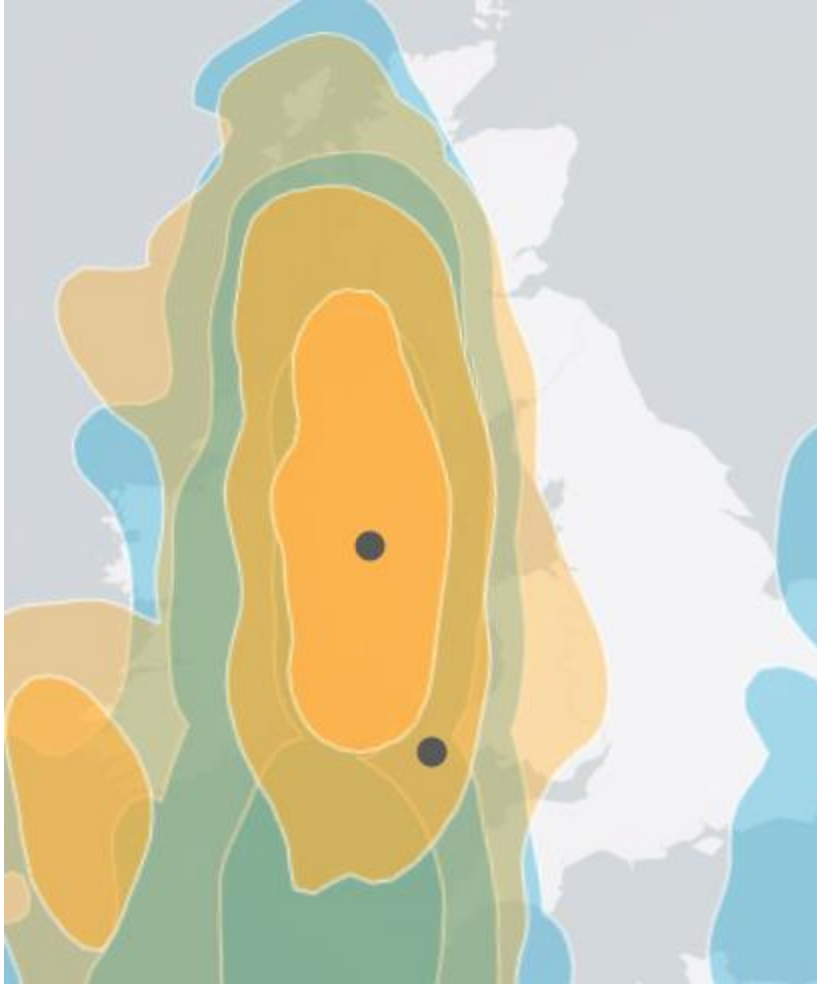


Figure 1: SEATRACK data on Kittiwakes from Rockabill (orange; 2018-2022 tracking data) and Skomer (blue; 2006-2010 tracking data) showing the usage of both the Celtic and Irish Seas by the species during all seasons with increasing colour intensity at the 25%, 50%, and 70% probability contours showing general to core use areas [10]

With increased ORE development in both countries and the associated disturbance and displacement of seabirds, the at-sea entrance to the Irish Sea could be made even narrower, limiting movement and migration. This could have effects on seabird fitness by making moving through this area more energetically difficult. In the long term, it could also potentially cut off foraging areas within the Irish Sea to seabirds in the Celtic Sea. It may also impact seabird population growth by constricting the movement of birds breeding in the Irish Sea. It is therefore important that impacts to seabirds not only utilising the Celtic Sea but also moving through the Celtic Sea on their way to other marine environments or passing through are fully considered throughout the WCOWF development and operation processes.

BirdLife International maintains a global database of Important Bird and Biodiversity Areas (IBAs), sites which are of particular importance for the conservation of wild birds and their

habitats [11]. While IBAs do not afford legal protection to a site, they are identified using a globally agreed standardised set of data-driven criteria and thresholds. In 2024, BirdWatch Ireland, working with BirdLife International, completed the identification of a network of marine IBAs in Irish waters. 24 marine IBAs have been identified, shown in Figure 2 (these sites will shortly be available on <https://datazone.birdlife.org/country/ireland/ibas>).

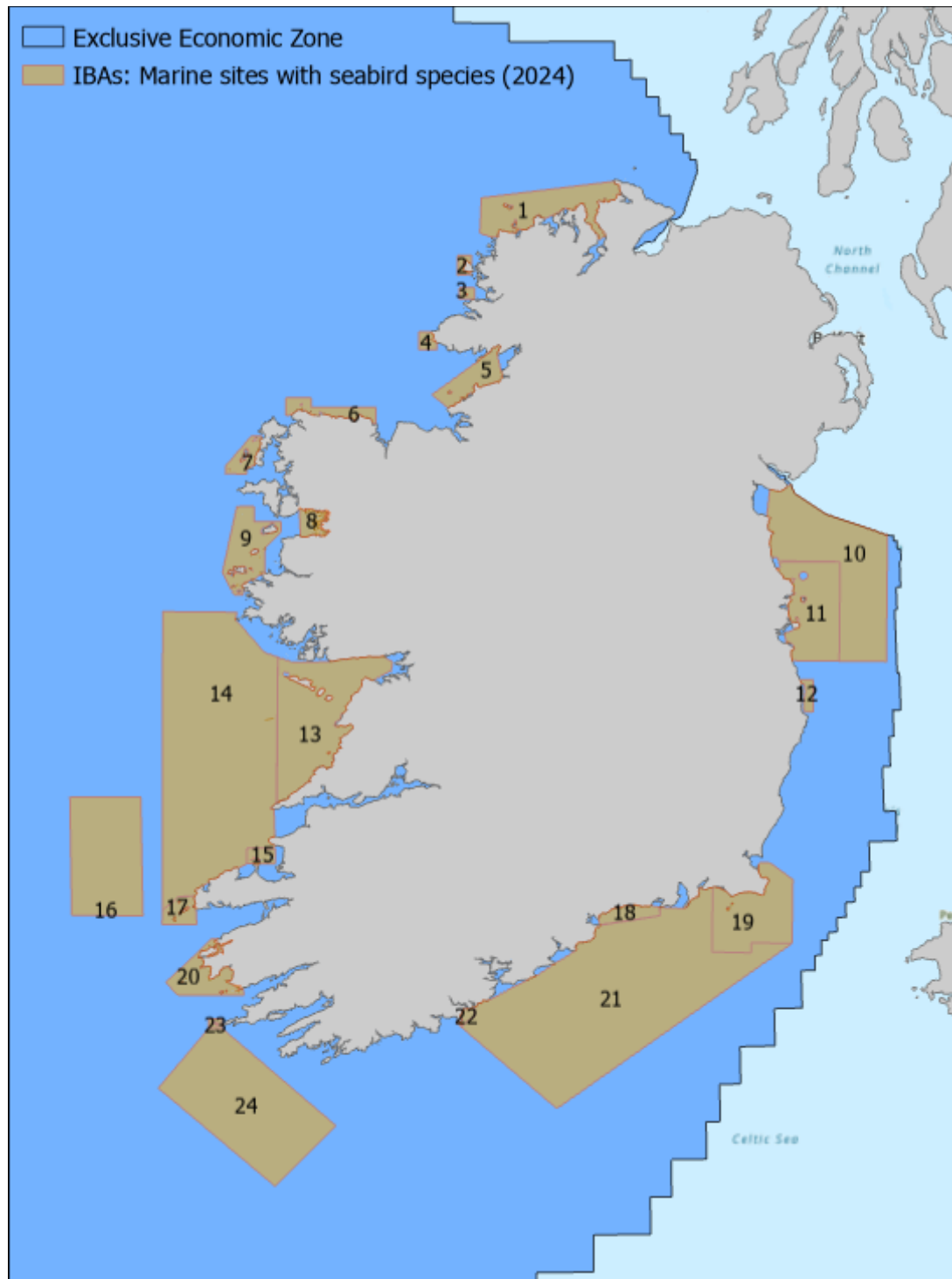


Figure 2: Ireland's marine IBA network of 24 sites.

Five of these marine IBAs occur along the southeast coast of Ireland in the Celtic Sea (Table 1).

Table 1: The five Irish marine IBAs near Welsh waters and the seabird species present at each IBA (species listed first are the species used in identifying and designating the marine IBAs; species in italics can also be found within these marine IBAs but did not hit criteria for use in designation)

Name of Marine IBA (Map reference)	Species Present
Old Head of Kinsale marine extension (22)	Black-backed gulls, Black-legged kittiwake, European herring gull, Herring-common gull <i>Common guillemot, European shag, Great black-backed gull, Lesser black-backed gull, Northern fulmar, Razorbill</i>
Northeast Celtic Sea (21)	Auks, Black-backed gull, Black-legged kittiwake, Herring-common gull, Large gull species, Manx shearwater, Northern gannet <i>Atlantic puffin, Black guillemot, Black-legged kittiwake, Common guillemot, European herring gull, European shag, Great black-backed gull, Great cormorant, Lesser black-backed gull, Manx shearwater, Northern fulmar, Northern gannet, Razorbill</i>
Skelligs-Doulus-Lamb's Head marine extension (20)	Atlantic puffin, Black-backed gull, Black-legged kittiwake, European storm-petrel, Manx shearwater, Northern gannet <i>Arctic tern, Black guillemot, Common guillemot, Common gull, European herring gull, European shag, Great black-backed gull, Great cormorant, Lesser black-backed gull, Northern fulmar, Razorbill</i>
Saltees-Lady's Island marine extension (19)	Arctic tern, Atlantic puffin, Auks, Black-backed gull, Black-legged kittiwake, Common guillemot, Common tern, Great cormorant, Herring-common gull, Little tern (<i>Sterna albifrons</i>), Manx shearwater, Mediterranean gull, Northern gannet, Razorbill, Roseate tern (<i>Sterna dougallii</i>), Sandwich tern (<i>Sterna sandvicensis</i>) <i>Black-headed gull, European herring gull, European shag, Great black-backed gull, Lesser black-backed gull, Northern fulmar</i>

Mid Waterford marine extension (18)	<p>Auks, Black-backed gull, Black-legged kittiwake, European herring gull, Herring-common gull, Northern gannet</p> <p><i>Black guillemot, Common guillemot, European shag, Great black-backed gull, Great cormorant, Lesser black-backed gull, Manx shearwater, Northern fulmar, Northern gannet, Razorbill</i></p>
-------------------------------------	--

Within these sites, the species identified as qualifying interests often occur in regionally or nationally significant numbers, during either the breeding or non-breeding season [11], highlighting the importance of the Celtic Sea marine environment for different species of seabirds throughout the year. Many of these species are also seen and scoped into the ornithological assessment of the WCOWF, further highlighting the importance of ensuring that conservation efforts are implemented on a transboundary basis. Therefore, given the potential for shared populations of seabirds, and Irish seabirds movement through Welsh waters and potentially within the WCOWF marine footprint, we at BirdWatch Ireland respectfully request that transboundary effects of the project on Ireland's seabirds are fully considered at every stage of the project, from construction to operation and eventually, during decommissioning.

2. Cumulative effects of multiple offshore projects within the Celtic Sea

Given the amount of offshore renewable development planned in the Celtic Sea, we at BirdWatch Ireland appreciate that transboundary and cumulative assessments were included in the WCOWF Environmental Statement but would ask for more substantial assessments to be completed before construction, especially as it pertains to Ireland's South Coast Designated Maritime Area Plan (SC DMAP) for Offshore Renewable Energy. The SC DMAP 'identifies four Maritime Areas in the Irish part of the Celtic Sea within which proposed future ORE projects may be located' specifically referring to offshore wind development [12]. The plan was published in 2024, and the first of the four Maritime Areas (Tonn Nua) is expected to be auctioned in early 2025. Given the timing of this auction, and future auctions for the other three Maritime Areas, it is extremely likely that construction and operation of wind farms within the SC DMAP will overlap temporally with the construction and operation of the WCOWF, which would increase the potential cumulative impact and disturbance from offshore wind development to birds utilising the Celtic Sea marine environment in both countries (Figure 3 is a map of the locations of the SC DMAP and four auction areas in Irish waters and the WCOWF and nearby windfarms in Welsh waters).

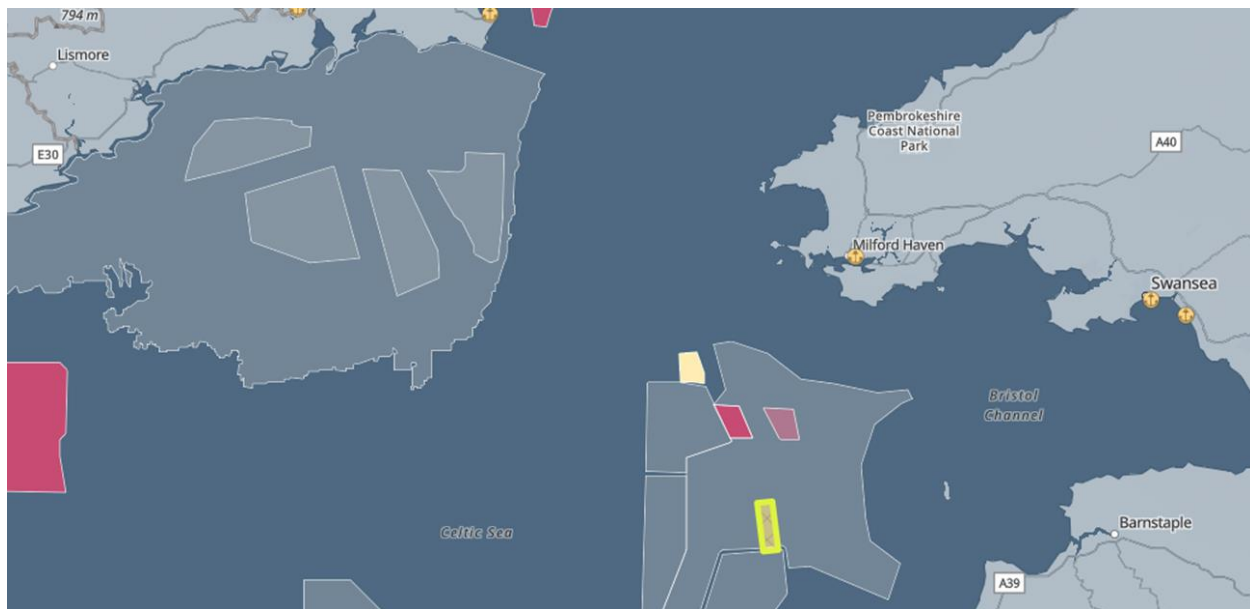


Figure 3: Map of the locations of the four Maritime Areas within the Irish SC DMAP (light grey polygons on left side of map) proposed for offshore wind development and the WCOWF location (highlighted yellow polygon on lower right side of map), as taken from the 4C Offshore website [13]

One central issue is whether the increase in turbines and expansion of windfarm development will have an effect where the birds are being squeezed into ever smaller areas within the Celtic Sea. To answer that we would need evidence on whether seabirds are avoiding other windfarm areas. Because of the uncertainty around seabird usage around offshore wind developments and the increased disturbance and displacement seabirds could be facing within the Celtic Sea, we at BirdWatch Ireland believe that increased caution should be exercised to limit the cumulative effects of these multiple ORE projects on seabirds. It is concerning that the cumulative impact assessment for the WCOWF does not consider cumulative impacts with the SC DMAP proposed areas. These proposed sites are not far from each other and, with displacement, there would be increasingly limited space for seabirds to utilise within and migrate through the Celtic Sea. As the Celtic Sea is also an entry point into the Irish Sea and other breeding colonies in both Ireland and the UK, seabirds affected and pushed into ever smaller areas could include birds who utilise Irish Sea as well.

Throughout the WCOWF cumulative impact assessments, there was a lack of consideration of Irish projects, mostly due to a lack of information available. While we understand that accessing data from different countries is difficult, many of these projects have done surveys and have environmental data available on the An Bord Pleanála website including Arklow Bank 1 and 2, which were mentioned within the WCOWF cumulative impact section of *Chapter 13- Offshore Ornithology*, and other projects in the Irish Sea in advanced planning phases, such as the nearby Codling Wind Park. Since Tonn Nua and other areas within the SC DMAP have not

gone to auction yet, there are no specific environmental assessments done for these areas; however, there was a Strategic Environmental Assessment Environmental Report and Natura Impact Statement done for the wider entirety of the SC DMAP area to identify the four areas for renewable energy development as part of the strategic spatial planning process, which could be used to assess potential cumulative and transboundary impacts. Academic studies on tagged birds also provide information on the use of Irish waters by Welsh birds and vice versa (some examples of which are provided in the following paragraph) and can also be used to address potential transboundary impacts of the WCOWF to Irish seabirds and cumulative impacts with Irish offshore renewable development.

Additionally, when stating which impacts would not be considered further within the Cumulative Effects Assessment, barrier effects for all project phases were not scoped in for further assessment under the presumption that there is a '*very low likelihood of any single individual encountering multiple OWFs (offshore wind farms) on regular commuting flights*'. We at BirdWatch Ireland do not agree with this statement, as the commuting and foraging flights of seabirds are large and the amount of OWFs in both the Celtic and Irish Seas is increasing. As mentioned before, studies have shown Welsh birds flying into the Irish Sea [8,9] and additional studies within the UK and Ireland have shown seabird foraging areas extending from the Celtic Sea into the Irish Sea [14,15]. With Wales, Ireland, and the UK all planning more renewable development within these close marine environments, we feel that there is an increasing likelihood of seabirds encountering multiple OWFs during regular flights. Also, with the relative closeness of the planned Welsh windfarms including the WCOWF and the Irish SC DMAP, which will have fixed OWFs constructed and operating at the same time, there is greater potential for seabirds to interact with OWFs in both countries while commuting through and within the Celtic Sea.

For these reasons, we at BirdWatch Ireland would request that cumulative impacts are fully addressed, and reduced whenever possible, so that the movement of seabirds through and within the Celtic Sea is not seriously inhibited by offshore wind development.

3. Cautionary and flexible approaches to new technology

Floating windfarms are a relatively new technology to be used within the marine environment, particularly in the Celtic Sea, and because of this, we would ask for extra caution and careful consideration of possible unknown or unforeseen effects on seabirds. Given the novelty of floating windfarms within the Celtic Sea, there could be other new and unknown threats that arise during construction and operation that are not addressed in the Environmental Statement so caution and flexibility are important throughout construction and operation. If it becomes clear that impacts on seabirds are more severe than expected, new threats should be addressed in a timely manner to limit disturbance and negative impacts.

The mooring lines that will be used to tether the floating wind turbines to the seabed represent a new type of entanglement risk to seabirds, particularly diving birds, though we appreciate that this threat is considered within the *Environmental Statement: Chapter 13- Offshore Ornithology* chapter. The novel use of remotely operated underwater vehicles (ROVs) to identify snagged fishing gear and other marine litter caught on the mooring lines that could entangle seabirds is welcome and we appreciate the use of innovative technology to try and address this new threat; however, we would also ask for a plan for the timely removal of debris and a recovery plan for any living seabirds picked up during the debris removal process. The mention of '*annual monitoring of anchor/moorings*' is not frequent enough to address the risk of entanglement of seabirds and we therefore suggest more frequent checks to remove debris and lower the potential threat to seabirds.

Conclusion

With an increase in the proposed amount of renewable development in the Celtic Sea, from within Ireland and outside Irish borders, transboundary impacts and the cumulative effect these projects may have on birds needs to be better understood and planned for. The migratory nature of seabirds and the large size of their ranges make it possible that the populations of seabirds within the Celtic Sea intermix and are inter-connected between the countries; this should be further studied in order to understand how transboundary impacts could affect the overall populations of seabird species utilizing these waters. In the Irish waters of the Celtic Sea, several windfarm developments are being proposed, and with the proposed WCOWF wind farm development in Welsh waters as well, there is a very genuine possibility that cumulative effects of all these new wind developments could be a serious threat to seabirds that utilise the marine environment. We fear that assessing each development individually and within a bubble without a cumulative assessment of the totality of all the proposed developments within the Celtic Sea risks missing or underestimating impacts to birds and the marine environment and could negatively affect seabirds in the entire Celtic Sea marine environment, regardless of country boundaries.

To better understand the inter-connected nature of seabirds utilising the Celtic Sea in both Ireland and Wales, and how seabirds are using the marine environment, increased tagging and tracking work should be done. We have worked on tagging and tracking projects with UK partners to show the movement of terns within colonies throughout the British Isles and would welcome the opportunity to collaborate on further tagging or tracking work, the results of which would further our understanding of how seabirds utilise our shared waters and could contribute to the seabird conservation strategies of both jurisdictions. Another possible mitigation we feel should be added to planning is that UK regulators should consider painting at least one turbine blade black as a collision-reduction measure [16], and request that funding is made available to find out if painting a blade black would lower any risk of collisions with seabirds in the Celtic Sea.

From the evidence presented to us in the supporting documents to the application and overlap in construction and operation of several windfarms within the Celtic Sea, we at BirdWatch Ireland advocate for caution and conservative approaches to be taken within the planning and development of the White Cross Offshore Wind Farm and that transboundary and cumulative impacts are considered more thoroughly throughout the lifespan of the project and addressed promptly and appropriately.

References

- [1] Lescroel et al. (2016) 'Seeing the ocean through the eyes of seabirds: A new path for marine conservation?', *Marine Policy*, 68, 212-220.
- [2] Gilbert, G, Stanbury, A., Lewis, L., (2021) Birds of Conservation Concern in Ireland 4: 2020–2026 *Irish Birds* 43: 1–22 Kilcoole
- [3] Cummins, S., Lauder, C., Lauder, A. & Tierney, T. D. (2019) The Status of Ireland's Breeding Seabirds: Birds Directive Article 12 Reporting 2013 – 2018. *Irish Wildlife Manuals*, No. 114. National Parks and Wildlife Service, Department of Culture, Heritage
- [4] Bycatch risk was based on an assessment of seabird bycatch in the UK, as there was very little data available on bycatch in Irish waters. For more details on methodology, see Cummins, S., Lauder, C., Lauder, A. & Tierney, T. D. (2019) The Status of Ireland's Breeding Seabirds: Birds Directive Article 12 Reporting 2013 – 2018. *Irish Wildlife Manuals*, No. 114. National Parks and Wildlife Service, Department of Culture, Heritage.
- [5] Burnell, D., Perkins, A. J., Newton, S. F., Bolton, M., Tierney, T. D., & Dunn, T. E. (2023). *Seabirds Count: a census of breeding seabirds in Britain and Ireland (2015-2021)*. Lynx Nature Books, Barcelona.
- [6] BirdLife International (2021) *European Red List of Birds*. Luxembourg: Publications Office of the European Union.
- [7] Allcock, L., Dr Breen, P., Conway, A., Prof. Crowe, T., Dr Dolton, H.R., Dr Haberlin, D., Heney, K. Prof. Johnson, M., Keena, T., Dr Maxwell, J., Dr Nolan, C., Dr Orrell, D.L., Dr Power, M., and Dr Tully, O. (2024). *Ecological Sensitivity Analysis of the Celtic Sea to inform future designation of Marine Protected Areas (MPAs)*. Marine Protected Area Advisory Group: Department of Housing, Local Government and Heritage.
- [8] Guilford, T., Meade, J., Willis, J., Phillips, R.A., Boyle, D., Roberts, S., Collet, M., Freeman, R., and Perrins, C.M. (2009). Migration and stopover in a small pelagic seabird, the Manx shearwater

Puffinus puffinus: insights from machine learning. *Proceedings of the Royal Society* 276 (1215-1223). doi:10.1098/rspb.2008.1577

[9] Carter, M.I.D., Cox, S.L., Scales, K.L., Bicknell, A.W., Nicholson, M.D., Atkins, K.M., Morgan, G., Morgan, L., Grecian, W.J., Patrick, S.C., and Votier, S.C. (2016). GPS tracking reveals rafting behaviours of Northern Gannets (*Morus bassanus*): implications for foraging ecology and conservation. *Bird Study* 63 (83-95). <http://dx.doi.org/10.1080/00063657.2015.1134441>

[10] *Black-legged Kittiwake - Distribution app*. SEATRACK Seabird Tracking. Available at: <https://experience.arcgis.com/experience/435f2df809324f858fc5e437cd035973/page/Page/?views=Selection-2> (Accessed: 4 February 2025). Species account page available at: <https://seatrack.net/species/black-legged-kittiwake/>

[11] Donald, P. F., Fishpool, L. D. C., Ajagbe, A., Bennun, L. A., Bunting, G., Burfield, I. J., Butchart, S. H. M., Capellan, S., Crosby, M. J., Dias, M. P., Diaz, D., Evans, M. I., Grimmett, R., Heath, M., Jones, V. R., Lascelles, B. G., Merriman, J. C., O'Brien, M., Ramirez, I., Waliczky, Z. and Wege, D. C. (2018) Important Bird and Biodiversity Areas (IBAs): the development and characteristics of a global inventory of key sites for biodiversity. *Bird Conserv. Internatn*. doi:10.1017/S0959270918000102.

[12] 'South Coast Designated Maritime Area Plan for Offshore Renewable Energy'. October 2024. Department of Environment, Climate and Communications. www.gov.ie/pdf/?file=https://assets.gov.ie/310010/93669478-1913-4c2e-b174-db4cdd59de42.pdf#page=null

[13] *4C Offshore Map*. Created by TGS using Esri software. Available at: <https://map.4coffshore.com/offshorewind/> (Accessed: 15 January 2025).

[14] Wakefield, E. D., Bodey, T.W., Bearhop, S., Blackburn, J., Colhoun, K., Davies, R., Dwyer, R.G., Green, J.A., Grémillet, D., Jackson, A.L., Jessopp, M.J., Kane, A., Langston, R.H.W., Lescroël, A., Murray, S., Le Nuz, M., Patrick, S.C., Péron, C., Soanes, L.M., Wanless, S., Votier, S.C., and Hamer, K.C. 'Space Partitioning Without Territoriality in Gannets'. *Science* 341, no. 6141 (5 July 2013): 68–70. <https://doi.org/10.1126/science.1236077>.

[15] Darby, J., Clairbaux, M., Bennison, A., Quinn, J. L., and Jessopp, M. J. 'Supplementary Material from "Underwater Visibility Constrains the Foraging Behaviour of a Diving Pelagic Seabird"'. The Royal Society, 2022. <https://doi.org/10.6084/M9.FIGSHARE.C.6070376>.

[16] May et al. (2020). Paint it black: Efficacy of increased wind turbine rotor blade visibility to reduce avian fatalities. *Ecology and Evolution*, 10: 8927– 8935. <https://doi.org/10.1002/ece3.6592>