Marine Renewables Research Programme

Part 2
2025 update and list of publications

MacArthur Green

PART OF SLR

Working with our clients to deliver a positive impact for our environment

Marine Renewables Research Programme

MacArthur Green's purpose is to *work in partnership with our clients to deliver a positive impact for our environment*. We achieve this by helping projects that are important to the environment succeed (such as renewable energy), supporting ecological research and guidance to inform sustainable development, and working within a carbon conscious and biodiversity positive business model. Our marine renewables research programme is a key part of our commitment to delivering a positive impact on the environment.

A lack of skilled human resource has been identified as one of the key constraints to offshore wind farm (OWF) consenting. MacArthur Green is helping to address this by supporting the training of postgraduate students with the appropriate skills. PhD students who have been affiliated with studentships supported MacArthur Green and research partners have gone on to work in posts related to offshore wind, including with NatureScot, with Scottish Government's Marine Directorate and the British Trust for Ornithology. Although the primary aim of PhD research is academic training, research outputs from these PhDs have also been influential in reducing consenting risk for marine renewable developments.

Work by **Helen Wade** and **Alex Robbins** helped to identify the seabird species most at risk from impacts of offshore wind and tidal stream turbines, allowing studies to focus on those priority species and scope out species at low risk. According to Google Scholar, the papers presenting that ranking have been cited in scientific research over 400 times and have also been much used in OWF EIA and HRA assessments.

Work by **Dan Johnston** focused on black guillemot, the seabird species considered most likely to be impacted by tidal stream turbines, but a seabird about which relatively little was known. His work showed that although black guillemots do specialise in feeding in tidal streams, they avoid streams with particularly high tidal flow so avoid the key sites where tidal stream turbine deployment is most likely.

Julie Miller's paper on modelling population consequences of OWF impacts on kittiwake populations identified the need to treat seabird populations as metapopulations and to consider effects of density-dependence. Her paper was selected as "Editors' choice" by Journal of Applied Ecology and Julie also won a Science Communication award during her PhD.

Chris Pollock developed an Individual Based Model (IBM) to assess impacts of OWF on gannets and used tracking data to show that risk differs considerably between adult and juvenile gannets because they differ in migration paths and speeds through the southern North Sea.

Work by **Lila Buckingham** deploying geolocator tags demonstrated the seasonal movements of common guillemots and razorbills, species of high concern in relation to displacement by OWFs. Her study showed that adult common guillemots tend to overwinter close to their breeding colony so segregate in UK waters by colony location. In contrast, razorbills from different colonies show stronger overlap in winter distribution, with many birds from west coast

colonies moving into the North Sea in winter. Quantifying these distribution patterns allows evidence-based apportioning of OWF impacts to appropriate populations. Her work also identified that energy budgets were similar across populations, but consistently increased to a peak in early spring, suggesting that, if there is an energetic bottleneck for these birds in the non-breeding season, it would occur in spring.

Aude Benhemma-Le Gall's PhD work investigated harbour porpoise occurrence and foraging behaviour in relation to both OWF vessel noise and construction activities. Pile driving is a recognised source of underwater noise and disturbance for harbour porpoises but vessel activity had not previously been investigated. Aude found that harbour porpoise occurrence declined in proximity to both vessels and pile driving and that this response to vessels reduced harbour porpoise presence prior to pile driving commencing.

Publications arising from PhD research projects

Benhemma-Le Gall, A., Thompson, P., Merchant, H., Graham, I. 2023. Vessel noise prior to pile driving at offshore windfarm sites deters harbour porpoises from potential injury zones. *Environmental Impact Assessment Review* 103. doi.org/10.1016/j.eiar.2023.107271

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