

SUMMARY OF FINDINGS
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**Mapping the spatio-temporal distribution of
underwater noise in Irish Waters**

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Anthropogenic noise is considered an acoustic pollutant, and in recent years, noise from human activities such as shipping, seismic surveys, seabed drilling, and sonar has increased significantly in the Irish marine environment. Effects of noise on marine mammals have been detected tens of kilometres from noise sources. This research was needed to map the spatio-temporal distribution of underwater noise in Irish waters to determine potential negative impacts on the marine environment.

Key Words: Marine Strategy Framework Directive, MSFD, Noise, Shipping, Seismic surveying, Indicator 11.

Background:

Under the Marine Strategy Framework Directive (MSFD), Ireland should achieve Good Environmental Status (GES) by 2020. Research and technical progress is needed to support the further development of criteria in relation to Descriptor 11 'Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment' and its two indicators: 11.1 (impulsive loud, low and mid-frequency sounds) and 11.2 (continuous low frequency sounds). Multiple data sets capturing key environmental variables were combined with information on anthropogenic noise sources such as shipping and seismic surveying in the Quonops© modeling framework to produce the first verifiable quantification and visualisation of the spatio-temporal distribution of underwater noise to be published for Irish waters.

Key points/ Findings

- The report identified the crucial role of environment, particularly bathymetry, surface roughness and sediment type on the propagation of underwater noise.
- Noise maps, showing the distribution of noise in Irish waters were produced on a seasonal basis. Comparison of model outputs and in-situ recording of noise showed good agreement in the test area, such that further calibration of the model was not required.
- Seasonal effects of environment on natural noise levels were apparent, with noise generated by waves peaking in winter months

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- Ship traffic noise can spread over very large areas, well beyond the standard navigation routes. Despite a peak in recreational craft use in summer, there was no significant seasonal effect of anthropogenic noise from shipping (low frequency continuous sound – Descriptor 11.2.1) activities due to the prevalence of commercial shipping in Irish waters
- Long-term but short duty cycle acoustic monitoring is sufficient to capture continuous noise sources. Such configuration is compatible with data transfer in real-time
- The noise ‘footprints’ from seismic activity are very dependent on the location (depth/topography) and season of the survey, and cannot be predicted without using simulation techniques that can account for these key variables.
- Noise Risk Maps for high, medium, and low-frequency cetacean groups, as well as seals, based on hearing sensitivity and depth preferences were produced, based on real situations from surveys conducted in Irish waters between 2000-2011
- The potential risks to marine mammals posed by the sound fields associated with single shots are localized to the source itself. However, cumulative sound fields arising from multiple shots generate very large areas of potential risk
- While the ‘pulse days’ reporting approach is simple to implement, its appropriateness is questionable, since areas affected by cumulative risk are much larger, and much more variable than would be predicted by the current ‘pulse-days’ and associated grid reporting system.
- Dedicated prediction of noise footprint and biological risks should be mandatory in any EIA for seismic survey activities.

Conclusions:

This project was the one of the first in Ireland to undertake a systematic quantification and mapping of extent and intensity of underwater anthropogenic noise. Seasonal noise maps provide an intuitive and broadly accessible means to present the complex ambient sound fields experienced in Irish waters. Given the relative size of our marine territories, a robust modeling approach with strategically located in-situ recording of noise for verification of model outputs represents the only realistically cost effective and statistically verifiable alternative to broadscale direct monitoring involving large numbers of sound recording instruments deployed throughout Irish waters. This research provides a definitive contribution in terms of our National obligation to achieve Good Environmental Status under the provisions of the Marine Strategy Framework Directive.

For Further Information

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Check out the Project Website <http://oceansoundmaps.ucc.ie/>

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