

VULNERABILITY SCORING SYSTEM FOR MARINE MAMMAL SPECIES TO THE EFFECTS OF UNDERWATER NOISE

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The North Sea, a major shipping hub, is undergoing significant offshore wind farm expansion, posing threats to marine life and changes in noise pollution. In the Interreg North Sea project DEMASK^{*}, we adapt and apply a trait-based sensitivity assessment to estimate the potential relative sensitivity of key marine species in the North Sea to the effects of underwater anthropogenic noise. In our approach, we estimate the relative risk of species being affected by underwater noise, aiming to identify high-risk species suitable for use as indicator species. For our analysis, eight marine mammal species (one porpoise, four delphinid species, two pinnipeds, and one rorqual) were selected based on their abundance and importance in the North Sea ecosystem.

An extensive literature review and expert consultation provided information on the life history, habitat use, and exposure to underwater noise for each species. Specific attributes were used to estimate the sensitivity and resilience of the selected species in response to underwater noise. The sensitivity of each species to human activities that generate underwater noise is calculated by adding three factorial complexes (vulnerability scoring system): sensitivity to underwater noise (such as hearing range, sound production, and known effects of continuous and impulsive noise), individual-level aggravating factors (such as flexibility in habitat utilization [home range] and energy requirements/nutritional specificity), and population-level aggravating factors (such as population size, generation time, and threat status). Vulnerability scores ranging from low (Score 0) to high (Score 3) were assigned to each attribute based on the available information. Similarly, a score was assigned to the type and quality of information used to assess each attribute, allowing an assessment of data quality inputs for each species and identification of knowledge gaps.

Among the assessed species, the common minke whale received the highest vulnerability score, followed by the white-beaked dolphin and Atlantic harbour seal, whose scores were closely grouped. Lower scores were assigned to the Atlantic grey seal and harbour porpoise, followed by the bottlenose dolphin. The killer whale and Atlantic white-sided dolphin ranked lowest. Our analysis identified which of the eight species are potentially the most sensitive to the effects of underwater noise in the North Sea and highlighted knowledge gaps regarding underwater noise-sensitive species that may not be suitable as indicator species due to insufficient data.

^{*} Interreg North Sea project DEMASK: <https://www.interregnorthsea.eu/demask>