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Leveraging Protected Species Observer (PSO) data for conservation in offshore wind energy development

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The rapidly expanding offshore wind energy industry presents an unprecedented opportunity to collect valuable data on protected marine species, particularly the endangered North Atlantic right whale (*Eubalaena glacialis*), through required Protected Species Observer (PSO) programs. PSO data, gathered during industry activities by trained biologists in often remote and challenging offshore environments, can fill critical knowledge gaps regarding species distribution, occurrence, and interactions with development, informing conservation and management strategies. While challenges remain regarding data accessibility, standardization, and integration, ongoing initiatives by agencies like the US National Marine Fisheries Service and Bureau of Ocean Energy Management coupled with existing data-sharing efforts and open-source platforms, offer pathways to maximize the value of PSO data. Realizing this potential requires collaborative partnerships between industry, agencies, researchers, and other stakeholders to establish centralized, publicly accessible databases with standardized protocols and adequate funding for data management. Successfully leveraging PSO data will significantly enhance our understanding of marine species and contribute to their conservation in the face of increasing offshore development.

There is an unprecedented opportunity within the rapidly growing offshore wind (OSW) energy industry to contribute valuable data on sensitive marine species occurring in wind energy areas such as marine mammals and sea turtles, particularly the highly endangered North Atlantic right whale (NARW). Protected Species Observers (PSOs), also known as Marine Mammal Observers (MMO) are required aboard industry vessels in the United States (US) and overseas to mitigate impacts and report on protected marine species, including under US regulations like the Endangered Species and Marine Mammal Protection Acts. PSOs collect information that, beyond its regulatory purpose, can significantly expand our understanding of these species[1]. These data, often collected in geographically extensive and logistically challenging offshore environments where systematic surveys are limited, can address knowledge gaps in species occurrence, distribution, and potential interactions with OSW energy development[2–4], ultimately supporting more informed conservation and balanced management strategies. While the primary focus of this data collection is often region-specific due to regulatory and operational contexts, the methodologies and lessons learned hold significant relevance and transferability for informing protected species management in offshore wind development across diverse global settings. Highlighting the scale of this data collection opportunity, as of December 31, 2023, there were globally over 322 operational OSW energy projects representing more than 13,096 wind turbines, with the US. representing 63 OSW lease areas off the Atlantic, Pacific and Gulf of Mexico coasts including several operating windfarms and ongoing construction and site investigation surveys[5].

PSOs conduct continuous observations, typically day and night, collecting data as required by regulatory agencies to minimize impacts on vulnerable marine species[6]. Given the projected scale and pace of wind energy development in US waters[5], vast amounts of PSO data will continue to be collected, including from infrequently surveyed regions, providing a significant opportunity to strengthen our understanding of protected marine species. This is exemplified by the proactive conservation efforts surrounding the critically endangered NARW. As required by US regulatory agencies, OSW developers in the Atlantic have contributed to NARW conservation through near real-time data sharing of PSO sightings across vessels, federal agencies, research institutions and the public[7]. This information informs the US National Marine Fisheries Service (NMFS) in setting temporary Designated Management Areas and vessel speed restrictions around NARW sightings to minimize vessel strikes[7], and any individual identification photographs are submitted to a centralized catalog of NARW identification photographs[8]. Confirmed PSO sightings of NARW, reported to NMFS with standardized forms and photographs, contribute to long-term individual tracking and population monitoring. For example, at least 44 PSO sightings of NARW during 2019-2024 were reported to NMFS from OSW developers using the Mysticetus data software, with many more submitted for other projects not using Mysticetus[9] representing an important contribution for a highly endangered population of an estimated 372 NARW in 2023[10].

However, several hurdles exist for utilizing PSO data[3,4]. Public access is limited, with no centralized, publicly accessible data repository and only summary reports of PSO data available, typically in PDF form[4]. Inconsistent reporting practices hinder data synthesis[4] despite existing guidelines for

standardized data collection[11]. While PSO data are sometimes dismissed as opportunistic, they are collected by NMFS-certified, trained professionals and validated through quality management processes and can offer valuable insights, particularly for rare species like the NARW where every data point is meaningful. Dedicated systematic surveys, while providing more rigorous data, are expensive, less frequent, and less extensive geographically, highlighting the value of the continuous data streams from PSOs aboard tens to hundreds of vessels. The utility of PSO data is further emphasized by its collection in infrequently surveyed regions, its contribution to understanding the distribution of rare and endangered species, and the critical need for more 'eyes on the water' to detect injured, entangled, and dead NARW and other species including opportunities for disentanglement[12].

Initiatives to improve data standardization[4,11], technological innovations[13], collaborative data sharing across stakeholders[14] and centralized, publicly available databases are crucial[4,15]. Such efforts should be fostered through industry-agency partnerships and multi-disciplinary collaboration[13,16]. Existing open-source animal distribution data[17] and metadata repositories[18] could serve as platforms for shared PSO data following Findable, Accessible, Interoperable and Reusable (FAIR) data principles focused on free and open data exchange[19]. Regulators should require standardized data submission in a timely manner to a publicly available database as a condition of renewable energy leasing and permitting, with appropriate funding and guidance for data management. Industry could also collectively fund such an endeavor, as demonstrated by the successful Chukchi Sea Environmental Research Studies Program in the US Arctic, a multi-discipline, multi-year (2008–2014) collaborative research effort funded by oil and gas entities to collect scientific data to better understand impacts of offshore energy development[20–22]. BOEM's ongoing development of a centralized PSO database and standardized forms is a positive step, and its success will depend on continued collaboration. One key recommendation to enhance the utility of PSO data is the possibility of coordinating such observer work with other studies in the surrounding areas. This broader coordination would be very relevant for a more comprehensive understanding of the behavior and distribution of protected species within and adjacent to offshore wind installations. PSO data, combined with publicly available oceanographic data[16], can inform our understanding of climate-driven changes in marine mammal distribution[23,24]. Studies using PSO data have led to valuable discoveries, such as new insights into transient orca distribution[25], range extensions for Pacific leatherback turtles[26] and sperm whale mother-calf pairs[27], and increased understanding of habitat-use patterns[28,29], further demonstrating the value of this data source. The scale of OSW development and the corresponding increase in PSO data collection present an unparalleled opportunity to contribute to the conservation of marine protected species.

Data availability

No datasets were generated or analysed during the current study.

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Author contributions

M.C. and C.R. prepared the manuscript with the idea behind publishing this work provided by M.S. along with advice, review and guidance from M.S. M.S. revised the manuscript to address reviewer comments. All authors read and approved the final manuscript.

Competing interests

We do not believe we have competing interests. However, Smultea Sciences is a for-profit company that conducts research and marine protected species monitoring and mitigation services for various industries, including offshore wind, so we thought that would be important to mention to the editors. Wind developers are required by federal agencies to conduct monitoring and mitigation, and the content of this article would not influence the amount of that work available nor would it influence us receiving that work. Rather, the objective is to highlight an opportunity for data-sharing between industry and the broader conservation community, irrespective of which company collects the data.

Additional information

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