Implementation of an AI-supported marine mammal acoustic detection system during installation of an offshore wind farm

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Installation of foundations on offshore wind farms involves the use of pile driving, where the sound levels produced have been determined by environmental regulatory agencies, including those in the United States and Canada to have the potential to impact marine protected species, like marine mammals. As a result, when these operations are undertaken, visual and acoustic monitoring must be performed by certified, and agency approved Protected Species Observers to identify any animals in the area and then implement mitigation actions to reduce or eliminate the potential impacts. To fulfill the acoustic monitoring permit requirements for the marine mammal species known to be present in the Atlantic, Tetra Tech deployed acoustic buoys that processed data on board the buoy using Artificial Intelligence supported by detectors for seven types of marine mammal vocalizations. Data was transmitted in near real time to shore-based Acoustic Analysts using an iridium satellite connection. Data transmitted included both spectrograms and sound files which allowed the Analysts to validate marine mammal detections or to confirm the presence of a false detection triggered by other non-biological noise. Acoustic data from the deployment of these buoys on two different Atlantic wind farm areas for over a year has been analyzed, and it has been confirmed that multiple species including North Atlantic right whales were detected in real time by the systems. Uniquely, there is also a large volume of visual monitoring and marine mammal visual detection data collected during the same period by PSOs stationed offshore to consider when evaluating the acoustic data collected. Many adaptations were made to the acoustic buoys throughout their deployment to improve data transmission, optimize energy consumption and increase operational efficiency where these lessons are directly translatable to supporting operations in Canada for offshore wind, as the species and environmental conditions are identical or similar.