



Distribution of Reported Impulsive Sounds

MSFD Descriptor 11 - Introduction of energy, including underwater noise

MSFD Criterion: 11.1 - Distribution in time and place of loud, low and mid frequency impulsive sounds



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Key Message Impulsive sound data from 2015 are available for a limited number of countries and sound sources. The predominant sources are: seismic survey activity in the northern North Sea and eastern Atlantic; explosions and pile driving in the Southern North Sea; and naval sonar activity in the Celtic Seas and western English Channel. The amount of these activities varies substantially within these regions.

Background

OSPAR endeavours to keep the introduction of energy, including underwater noise, at levels that do not adversely affect the marine environment. Sound is a by-product of human activities in the marine environment (e.g. shipping or construction) or is produced intentionally for the purposes of surveying the seabed or water column. Sound is referred to here as 'noise' only when it has the potential to cause negative impacts on marine life. The introduction of anthropogenic sound became widespread with the advent of motorised shipping, and now has a wide range of sources. Anthropogenic sound sources are categorised as impulsive or continuous. This assessment addresses impulsive sound sources, which include percussive pile driving for inshore and offshore construction (**Figure 1**), seismic surveys (using airguns) to inspect subsea oil and gas deposits, explosions, and some sonar sources.

Impulsive sound sources have been observed to cause temporary displacement of small cetaceans (e.g. harbour porpoise), increased physiological stress in some fish species (e.g. European seabass), and developmental abnormalities in invertebrate larvae. While effects on individual animals have been shown for a number of species, there is uncertainty over whether and how the effects of sound on individuals are translated to the population or ecosystem scale. The purpose of this assessment is to assess the amount and distribution of impulsive sound sources across the OSPAR Maritime Area. This is the first such assessment of anthropogenic pressure from impulsive sound for the OSPAR Maritime Area, and these data will enable future assessment of the risk of impact to marine life.



Figure 1: Pile driving operation with bubble curtain.
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Results

Data for 2015 were provided by Belgium, Denmark, Germany, the Netherlands, Sweden and the UK for four sound sources (seismic surveys, pile driving, explosions, and sonar and acoustic deterrents). The distribution of these impulsive sound sources is assessed in pulse block days, defined as the number of days in a calendar year in which impulsive sound activity occurred within a particular area (ICES statistical sub-rectangle). **Figure 2** (overleaf) illustrates the distribution of total pulse block days during 2015, based on the currently available data in the OSPAR Impulsive Noise Registry. This visualisation represents a partial assessment, since data were not available for all activities and Contracting Parties in this initial year of assessment. Impulsive sound sources were reported across the northern North Sea, to the Skagerrak, in the deep waters to the west of Scotland and to the south-west of England. Reported activity was sparser in the southern North Sea and Celtic Seas. In the northern North Sea there were areas where seismic surveys occurred on up to 227 days in 2015. In the southern North Sea explosions and piling for wind farms were more prevalent. Sonar was the predominant source type reported for the western English Channel.

In addition to recording the occurrence of specific types of sound generating activity, information on the intensity of the impulsive sources is also recorded where this information is available. Five intensity categories describe the relative intensity of sound sources (ranging from Very Low to Very High). This terminology relates to source intensity and not necessarily to impact. However all sources reported are above a specified intensity level considered to have the potential to impact marine organisms (including the Very Low category). **Figure 3** (overleaf) shows the proportion of activity corresponding to each intensity category for the Greater North Sea. There was only one occurrence of a Very High category sound source in the OSPAR Maritime Area – an explosion in the southern North Sea. However for 293 (29%) of occurrences no intensity information was provided. The use of standardised blocks (ICES statistical sub-rectangles) and information on the intensity of sources together enables an overview of where most reported impulsive sound occurred. It also allows the application of source mitigation measures to be included. Fluctuations in sound generating activity are anticipated from year to year. This initial assessment presents partial data for 2015, and it is expected that a more comprehensive dataset will be available for future assessments.

There is moderate confidence in the methodology used and low confidence in the data availability.

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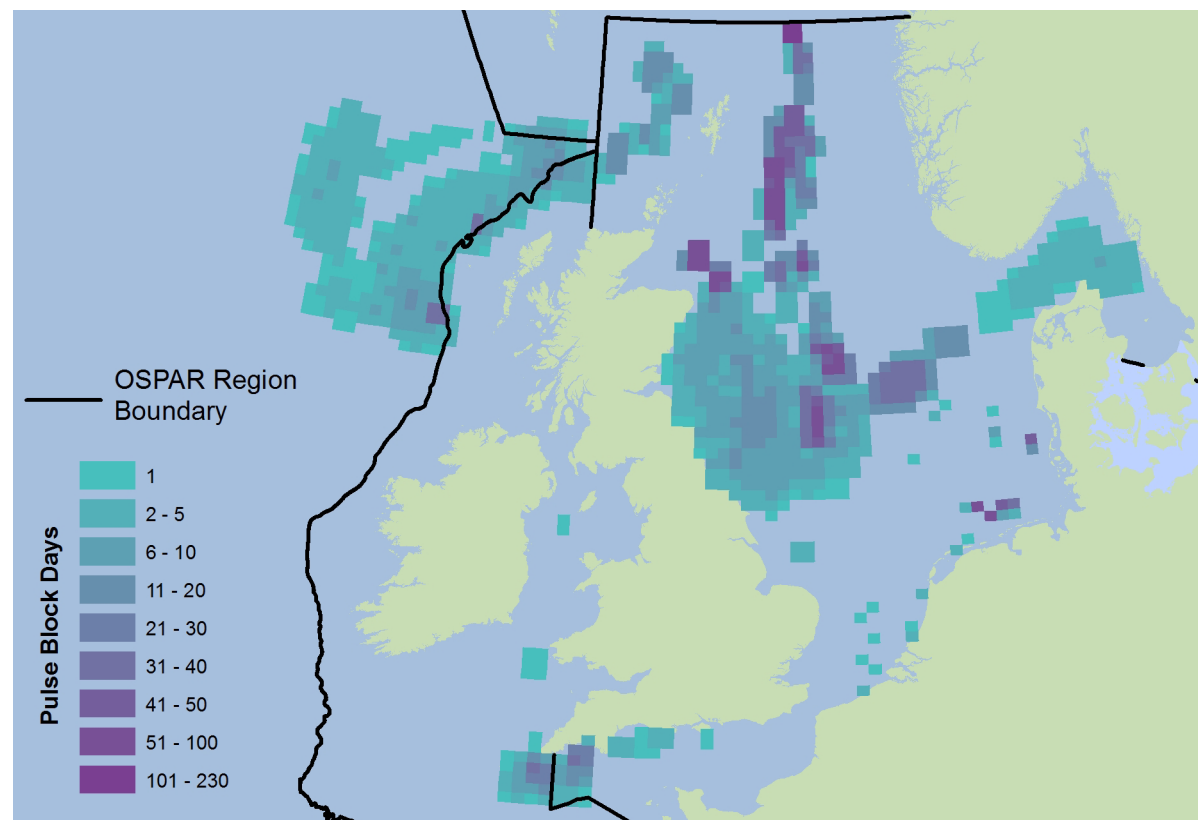


Figure 2: Total pulse block days reported for 2015

Conclusion

This first assessment of the OSPAR Impulsive Noise Indicator shows the distribution and intensity of reported activity in the OSPAR Maritime Area in 2015. The assessment provides the first detailed information on the distribution of reported impulsive sound sources at the regional scale. Reported activity was more prevalent in the northern and eastern North Sea, to the west of Scotland and in the Skagerrak, and was largely due to seismic survey activity. Sound sources categorised as Low or Very Low intensity were more common than higher intensity sources. This distribution is likely to vary year by year, depending upon the activities undertaken. More comprehensive reporting in future years should result in improved assessments of pressure from impulsive sound generation in the OSPAR Maritime Area. This assessment highlights the locations where marine animals, if present, may have been affected (in 2015), although the occurrence of effects would also depend on the distribution and susceptibility of the marine organisms to sound exposure. The likelihood and consequences of the effects of impulsive sounds are not assessed. However work to develop further Indicators to assess the risk of impact from these sources is planned.

Knowledge Gaps

To ensure consistency across source types the definitions of the source intensity categories should be reconsidered, including how to include a reduction in source intensity from source mitigation technologies. Improved reporting in the future will also allow the assessment of cumulative effects.

Understanding of the effects of anthropogenic sound on particular species has advanced in recent years. Nevertheless, obtaining direct observations of the effects of anthropogenic sound on ecosystems or particular populations is challenging. As such, there is uncertainty as to whether and how these effects of sound on individuals are translated to the population or ecosystem scale.

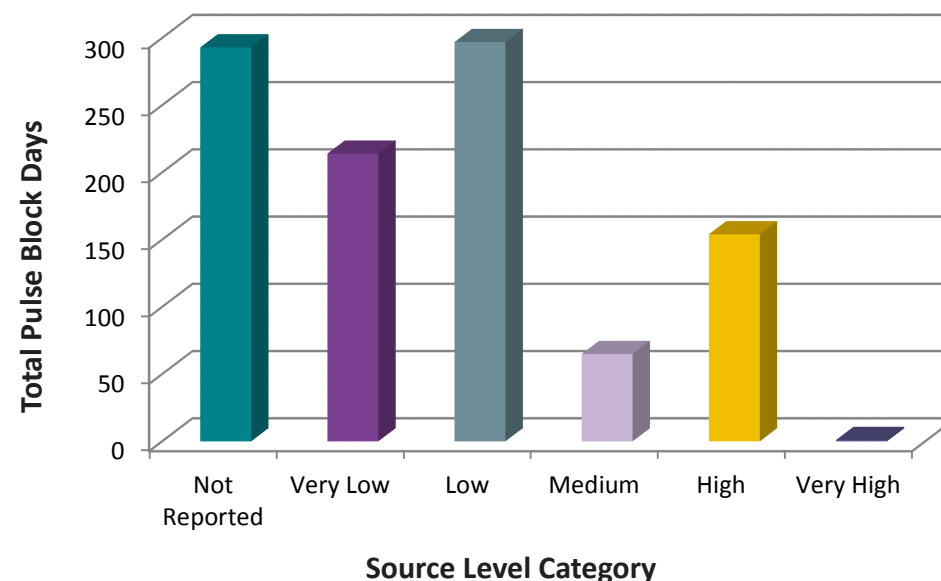


Figure 3: Pulse block days per source category for the Greater North Sea in 2015. The source categories describe the relative intensity of sound sources. Note that all sources included in the registry are above a specified intensity level considered to have the potential to impact marine organisms (including the Very Low category).