



JNCC Report 788

**Impulsive noise in the Southern North Sea SAC
and other harbour porpoise SACs (2022–2024)**

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Summary

Guidance from Statutory Nature Conservation Bodies (SNCBs) ([JNCC 2020](#)) advises on the use of spatio-temporal thresholds for activities resulting in impulsive noise, such as seismic surveys, some sub-bottom profiling equipment, impact pile driving and explosives, to minimise disturbance in harbour porpoise Special Areas of Conservation (SACs). To assist with the management of noise and assess the effectiveness of the guidance, the [UK Marine Noise Registry \(MNR\)](#) helps monitor the occurrence of noisy events and understand their distribution, patterns, and potential for disturbance.

Activities' close out data (e.g. noise sources, location and dates) are submitted to the MNR, enabling retrospective analysis of the potential disturbance footprints. In this report, the prevalence of noise events, their distribution in time and space and the contribution of the different activities to the overall disturbance footprint are investigated, for all harbour porpoise SACs in England, Wales and Northern Ireland, in the winter of 2022–2023, the summer of 2023, and the winter of 2023–2024. More detail is provided for the Southern North Sea (SNS) SAC since this had by far the highest levels of noisy activity. However, the daily 20% and the seasonal average 10% thresholds were not exceeded in the SNS SAC in any of the three seasons.

The data are presented in the context of the SNCB guidance with the intent to illustrate the kind of outputs from MNR data that would be of interest to regulators and their advisors, industry and their consultants when checking for compliance retrospectively or when planning to avoid exceedance of thresholds in harbour porpoise SACs.

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1. Introduction

In June 2020, JNCC, Natural England (NE) and the Department of Agriculture, Environment and Rural Affairs in Northern Ireland (DAERA) published guidance for assessing the significance of noise disturbance against the Conservation Objectives of Special Areas of Conservation (SAC) designated for harbour porpoise in English, Welsh and Northern Irish waters (JNCC 2020). Figure 1 shows the locations of these SACs. The guidance focusses on activities that generate impulsive noise and have the potential to disturb or injure harbour porpoise. It introduces spatial and temporal thresholds to disturbance from noise within the sites to protect those important habitats for harbour porpoise:

- 1) a daily threshold, where no more than 20% of the site (or seasonal area) is subjected to disturbance in any given day, and
- 2) no more than an average of 10% of the relevant area of the site over a season (summer/winter).

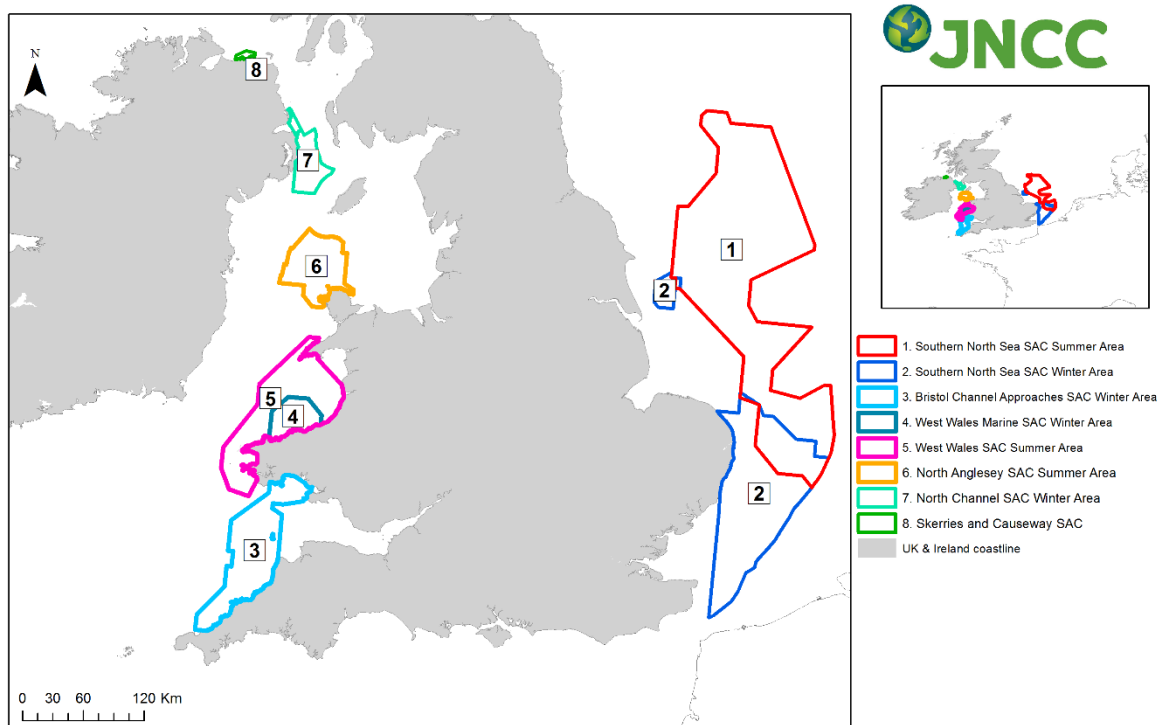
(Please note that some SACs have seasonal areas, identified due to observed higher densities of porpoise, either in the summer (April to September) or winter (October to March)).

To assist with the management of noise and assess the effectiveness of the Statutory Nature Conservation Bodies' (SNCB) guidance, it is essential to monitor the occurrence of noisy events and understand their distribution, patterns, and potential for disturbance. The [UK Marine Noise Registry \(MNR\)](#), established in 2015, is a custom-built database where data is collected on activities in UK waters resulting in impulsive noise (frequency 10 Hz – 10 kHz) such as seismic surveys, some sub-bottom profiling equipment, impact pile driving and explosives. Data for planned activities is usually submitted at the time of application submission and can be updated prior to the activity commencing and, once the activity has taken place, close out data (actual dates and locations the activity occurred in) are required to be submitted within three months or less of the end of the licence/consent. For activities occurring in multiple years, data is submitted for each year, no later than the end of March for previous year data. For geophysical surveys that have been deemed [exempt](#) from requiring a Marine Management Organisation (MMO) Marine Licence, this information is reported on a voluntary basis. Other impulsive noise activities that do not require a licence are also recorded on a voluntary basis, such as military sonar and acoustic deterrence devices. The data collected refer to the type of activity, the day it occurred and where, with parameters such as sound levels and frequencies being optional.

In 2023, the MNR received improvements to its functionality, which now includes an automated Disturbance Tool for estimating retrospective and future noise disturbance footprints in SACs, and a Cooperation Tool to enable users and regulators to resolve instances where noise thresholds could potentially be exceeded if no action is undertaken. JNCC (2024) used this future forecasting functionality with data for planned activities in the Southern North Sea (SNS) SAC to predict that, in a worst-case scenario and not accounting for spatial overlap between noise footprints nor conditions within consents enforcing coordination to ensure thresholds aren't breached, the daily 20% disturbance threshold would be slightly exceeded in the summer of 2023. Since then, the close out data has been received, enabling analysis of the disturbance footprints more accurately, in retrospect, to evidence that the thresholds were not exceeded. Further improvements to the MNR are planned over the next year, including increasing the accuracy of the Disturbance Tool's automated retrospective assessment. Until these improvements are implemented, the Disturbance Tool should not be used for final assessments. Instead, it should be used to identify cases with a high risk of the thresholds being exceeded, so that these cases can be

assessed manually in more detail, as is done in this report and in previous JNCC reports (JNCC 2022a, 2022b).

JNCC (2022a) investigated the disturbance footprint from impulsive noise in the SNS SAC in the years 2015–2020. For the same years, JNCC (2022b) then extended this work to include the other harbour porpoise SACs, namely those in the Irish and Celtic Seas and the North Channel – see labels 3 to 8 in Figure 1. In this report, we continue this work for all harbour porpoise SACs, looking at the three most recent seasons: the winter of 2022–2023, the summer of 2023, and the winter of 2023–2024. We investigate the prevalence of noise events, their distribution in time and space and the contribution of the different activities to the overall disturbance footprint. We focus on the SNS SAC in extra detail, as it had by far the highest levels of noisy activity. The data are presented in the context of the SNCB guidance with the intent to illustrate the kind of outputs from MNR data that would be of interest to regulators and their advisors, industry and their consultants when checking for compliance retrospectively or when planning to avoid exceedance of thresholds in harbour porpoise SACs.



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Figure 1. Harbour porpoise Special Areas of Conservation (SACs) in English, Welsh, and Northern Irish waters.

2. Methods

Raw data were extracted from the MNR on 31 July 2024 and filtered for activities that have been completed between 1 October 2022 and 1 April 2024 before being imported onto a Geographical Information System for further analyses. Information from both closed reports (for completed activities with no further data expected) and interim reports (ongoing activities with some data entered into the MNR) was used to undertake this retrospective analysis.

For completeness the analysis included all impulsive noise activity in the MNR, both licensed and exempt (i.e. low-risk geophysical surveys for industries other than oil and gas and certain small scale piling events such as for a small jetty extension in the area regulated by the MMO). This is consistent with reporting under the UK Marine Strategy and OSPAR Regional Quality Status Assessments. However, for the purposes of compliance with the SAC thresholds and Habitats Regulation Assessments, only the licensed activities should be considered. Therefore, the contribution the exempt activities make to the total disturbance footprints is calculated and presented.

The data stored in the MNR can include geographic information in points (latitude/longitude) or polygons (the oil and gas licensing blocks). Locations of piling and explosives are mostly recorded as points, whereas locations of seismic surveys are mostly recorded as blocks. Sub-bottom profiler locations are sometimes recorded as points and sometimes as blocks. The SNCB Noise Guidance (JNCC 2020) recommended the use of default 'Effective Deterrence Ranges' (EDRs), one for each activity type (Table 1). Areas within the EDR distance of the noise source are considered disturbed, whilst areas beyond this distance are considered undisturbed. For this report, we used the default EDRs specified in the MNR (see Appendix 1), which include more categories and sub-types, to further distinguish activities that are perceived to be quieter and therefore assumed to result in smaller disturbance footprints. For this report we added another sub-type, seismic surveys with airgun arrays with a total volume of 160 in³ or smaller and assigned it a 5 km EDR. This is likely more proportionate, given that the 12 km EDR is based on observations from significantly larger arrays: 470 in³ in Thompson *et al.* (2013) and 3,570 in³ in Sarnocińska *et al.* (2020), resulting in a reduction in acoustic activity within 10 km and between 8 km and 12 km, respectively. JNCC is currently commissioning a review of EDRs, which will inform future assessments.

Table 1. Recommended effective deterrence ranges (EDRs) (JNCC 2020).

Activity	EDR (km)	References that informed the EDRs
Mono-pile	26	Tougaard <i>et al.</i> 2013; Dähne <i>et al.</i> 2013
Mono-pile with noise abatement	15	Dähne <i>et al.</i> 2017; Rose <i>et al.</i> 2019
Pin-pile and sheet-pile (with and without noise abatement)	15	Graham <i>et al.</i> 2019
Conductor piling for oil & gas wells	15	Jiang <i>et al.</i> 2015; MacGillivray 2018; Graham <i>et al.</i> 2019
UXO (High order clearance only)	26	based on mono-pile EDR
Seismic (airguns) surveys	12	Thompson <i>et al.</i> 2013; Sarnocińska <i>et al.</i> 2020
Other geophysical surveys	5	Crocker & Fratantonio 2016; Crocker <i>et al.</i> 2019

Figure 2 shows how the area disturbed by noise was calculated for each day in each SAC:

1. Buffers were added around each noise source, with the EDR as the buffer radius. For activities with locations given as blocks, the buffer was applied around the entire block, unless the activity type had an EDR of 5 km or less. In this latter case, to avoid overestimating the area, we simply used the oil and gas block, since the area of a block (~ 244 km²) is similar to the area of a 5 km radius buffer around a hypothetical geophysical survey line drawn diagonally across a block (~ 305 km²).
2. Activities on the same day then had their overlapping buffers merged, so as not to double count any area that was disturbed by more than one activity.
3. Finally, we computed the total area disturbed only **within** the SAC boundaries. Some SACs, such as the SNS SAC, have different boundaries for summer (April to September) and winter (October to March) due to observed seasonality in porpoise distributions (Heinänen & Skov 2015). Areas within the summer boundaries during winter, and the winter boundaries during summer, are assumed to have lower porpoise densities, comparable with non-SAC areas with the area-time management measures only applying in the high-density seasons.

To estimate noise disturbance footprints, we calculated the potential maximum disturbed area in any day for each SAC's seasonal area, as well as the average disturbed area for each SAC for each season. This seasonal average considers every day in the season, including those with no disturbance. For example, a daily footprint of 19% for 95 days out of a 183-day season and zero activity for the rest of the season would result in an average of $19 \times 95 / 183 = 9.86\%$. The contribution from exempt activities to total days with noise and total spatial footprint was also estimated.

Additionally, we calculated the relative contribution of each activity type to the disturbance footprint, providing insight into where to focus management efforts. For this, we accounted for areas with multiple overlapping activities in the same day, correctly counting these areas only once. For areas disturbed by overlapping different activity types, we split the contribution equally between activity types. This is an improvement upon the previous report (JNCC 2022a) which simply summed the area of each activity buffer, without accounting for overlaps. Figure 3 demonstrates how correctly accounting for overlaps is crucial for accurately identifying the activities with the largest disturbance footprints. Note that although the previous report did not account for overlaps when calculating relative activity type contributions, however it did account for them when assessing the overall disturbance thresholds.

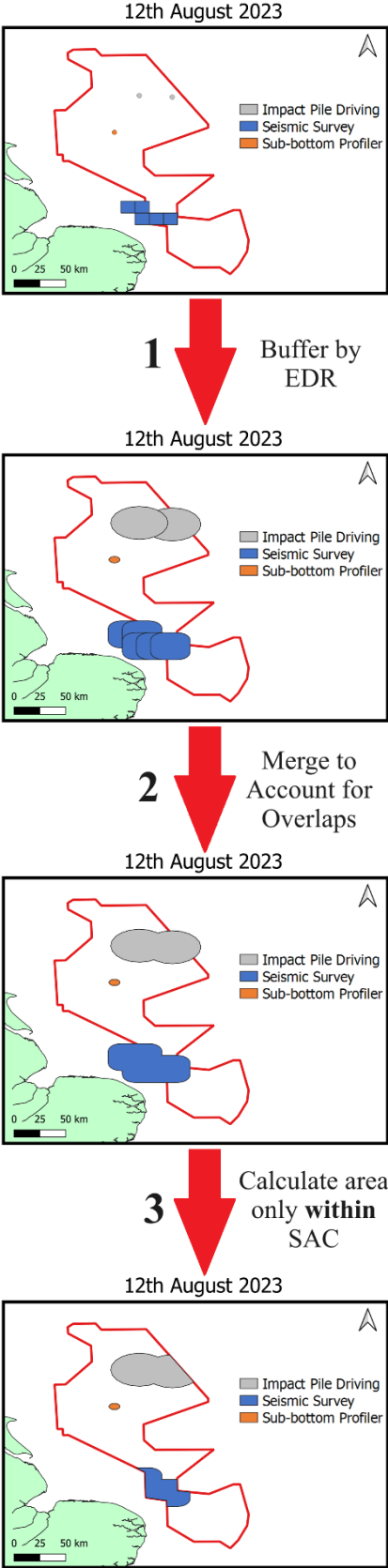


Figure 2. Schematic showing the method for using activity data, with corresponding EDRs, to calculate the daily disturbed area in the SAC seasonal area. This example is from the Southern North Sea SAC (Summer) on 12 August 2023, the day with the largest disturbed area of the season.

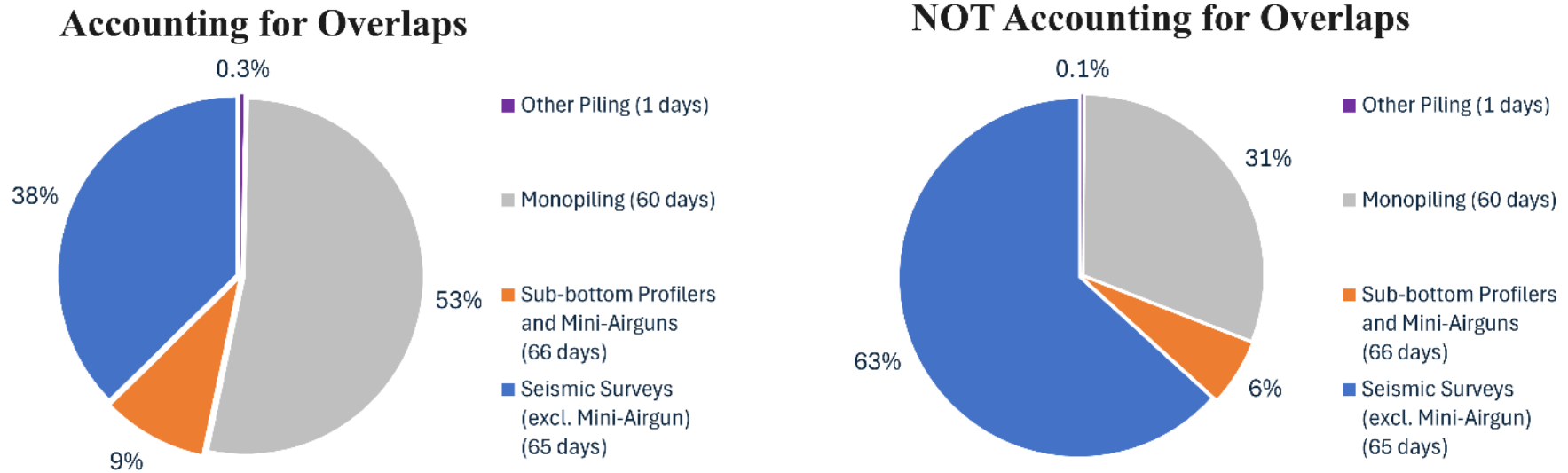


Figure 3. Comparison between accounting for and not accounting for overlapping activities' disturbance buffers when calculating the relative contributions of different activity types to the area disturbed by noise. This example is from data for the Southern North Sea SAC in summer of 2023.

3. Results and Discussion: Southern North Sea SAC

The daily 20% and the seasonal average 10% disturbance thresholds advised by the SNCBs in JNCC (2020) were not exceeded in the SNS SAC in any of the three seasons, as shown in Table 2 and Figures 4a–c.

Table 2. Total days with noise and estimated percentage area disturbed for each of the three periods in the respective seasonal SAC area.

Period	Total days with noise disturbance	Maximum daily area disturbed %	Seasonal average area disturbed (%)
Winter 2022–2023	18 (0)	4.92 (0)	0.33 (0)
Summer 2023	124 (29)	17.18 (2.62)	4.82 (0.07)
Winter 2023–2024	84 (1)	11.22 (0.0006)	2.06 (0)

Note: Numbers in brackets refer to the exempt activities in the area regulated by the MMO. For example, in the Summer 2023, of the total of 124 days with noise, 29 of those were from exempt activities, the maximum daily area disturbed by exempt activities alone was 2.62% of the seasonal area and 0.07% on average in the season. These are activities such as low-risk geophysical surveys for industries other than oil and gas and certain small scale piling events such as for a small jetty extension. Given the exemption, these are not considered for the purposes of compliance with the SAC thresholds nor included in Habitats Regulation Assessments.

Both winter seasons had fewer days of noise activity than the summer season, especially the winter of 2022–2023 which had only 18 days of activity, which were highly clustered in December and January. Of these days of activity, none had over 5% daily disturbed area. Whilst the winter of 2023–2024 had days of activity in every month, totalling 84 throughout the entire season, activity was most frequent in October and November, reaching above 5% daily disturbance in 25 days in those months. The summer of 2023 had the most days of activity, with daily disturbance levels also reaching above 5% consistently throughout the season. Nevertheless, the seasonal average disturbance for the summer season was 4.82%, below the 10% threshold. For the winter seasons, the seasonal averages were even lower (0.33% for winter of 2022–2023 and 2.06% for winter of 2023–24).

Summer 2023 saw higher peaks of disturbance. For winter 2022–2023 and winter 2023–2024, the maximum daily area disturbed was 4.92% and 11.22%, respectively – well below the 20% threshold. In contrast, for summer 2023, the maximum daily disturbance was 17.18% on 12 August as a result of mono-piling and one seismic survey. There were also 5 days with over 15% disturbed area.

The higher disturbance in the summer was due to the presence of mono-piling activity throughout the year 2023 within the summer SAC. Mono-piling has one of the largest EDR of any activity type, 26 km, and so even one event with its disturbance buffer fully within the SNS summer SAC will disturb around 8% of the area. For the winter SAC boundaries, which have a smaller area, such an event would disturb 17% of the SAC. This demonstrates that thresholds are extremely sensitive to activity: even a single mono-piling event in addition to another activity could have led to the 20% daily threshold being breached in any of the seasons. This not only highlights the success of regulation and management over the last three seasons that ensured that the thresholds were not breached, but it also motivates the need for continued coordination in the upcoming years, which are predicted to feature more piling activity as new wind farms are constructed. In addition to careful coordination and

scheduling, the impact of mono-piling can be significantly reduced using noise abatement (Brandt *et al.* 2018), which lowers the footprint of each individual event. Assuming the EDRs in Table 1, noise abatement could reduce the disturbance footprint of a mono-pile from around 8% to 3% in the summer SAC and from 17% to 6% in the winter SAC. The use of noise abatement during piling would allow for more activities to occur while remaining within the thresholds.

The activities reported to the MNR are subject to licences, except for certain low-risk geophysical surveys for industries other than oil and gas and certain small scale piling events (e.g. small jetty extension) in the area regulated by the MMO. In this case the data is submitted voluntarily to the MNR and, given the exemption, the MMO and OPRED do not include those activities in Habitats Regulations Assessments. Table 2 shows in brackets the contribution that those activities make to the total number of days with noise and the daily/average disturbance footprints. In winter of 2022–2023, no exempt activities took place. In the summer of 2023, sub-bottom profiling and mini-airgun surveys took place on 66 days in the summer area, accounting for 9% of the total area disturbed by all activities. Exempt surveys occurred on 28 days, contributing to 12.3% of the total sub-bottom profiling + mini-airgun disturbance. In addition, there was one day with exempt pin piling. The maximum daily area disturbed from exempt activities was 2.62% (from the pin-piling). In the winter of 2023–2024, all recorded sub-bottom profiling activity was exempt. However, it took place on only 1 day and overlapped 0.0006% with the SAC. Overall, this shows that the licence-exempt activities recorded on the MNR account for very little of the total area potentially disturbed by impulsive noise (there will be an unknown proportion of exempt activities that do not get recorded in the MNR).

Through a co-ordinated approach by the MMO and the Offshore Petroleum Regulator for Environment and Decommissioning (OPRED), worst-case noise disturbance scenarios will be identified prior to any season when there is a risk of exceeding thresholds. For example, the MMO and OPRED closely engaged with each other and with industry to manage noise disturbance in the SNS SAC for 2023. This engagement was further extended by setting up a Development Coordination Forum (DCF) where industry demonstrated successful management of operations through a joint SIMOPS (Simultaneous Operations) and managed noise within the daily noise disturbance threshold for 2024. The DCF Forum has also been established for 2025.

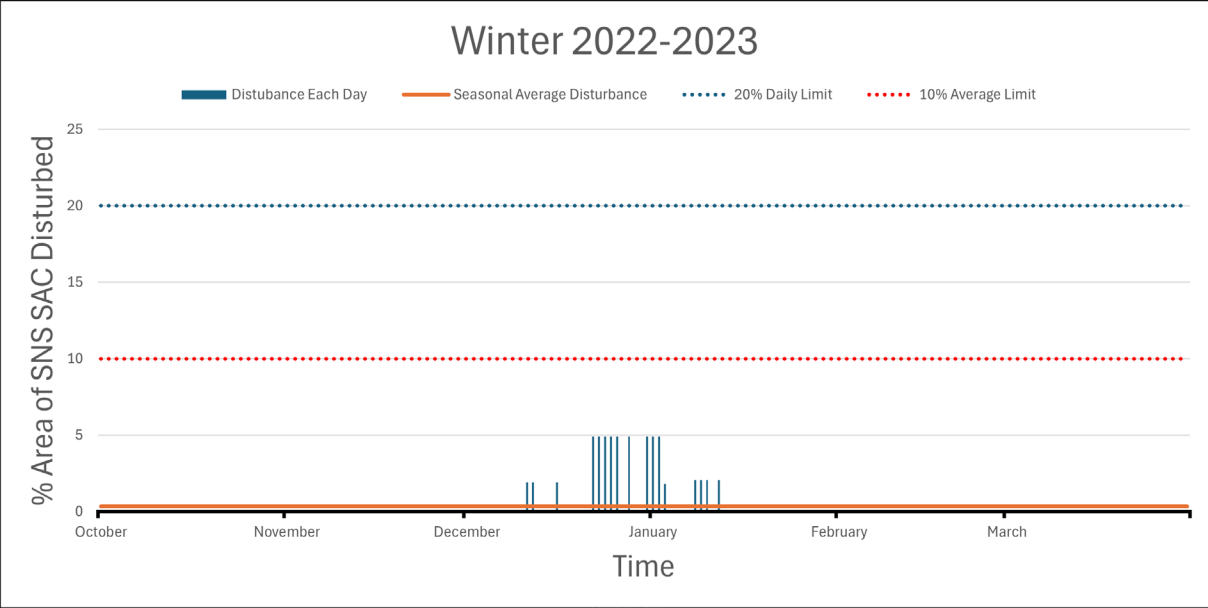


Figure 4a. Percentage area of Southern North Sea Winter SAC disturbed by impulsive noise (all licensed activities) for each day of Winter 2022–2023.

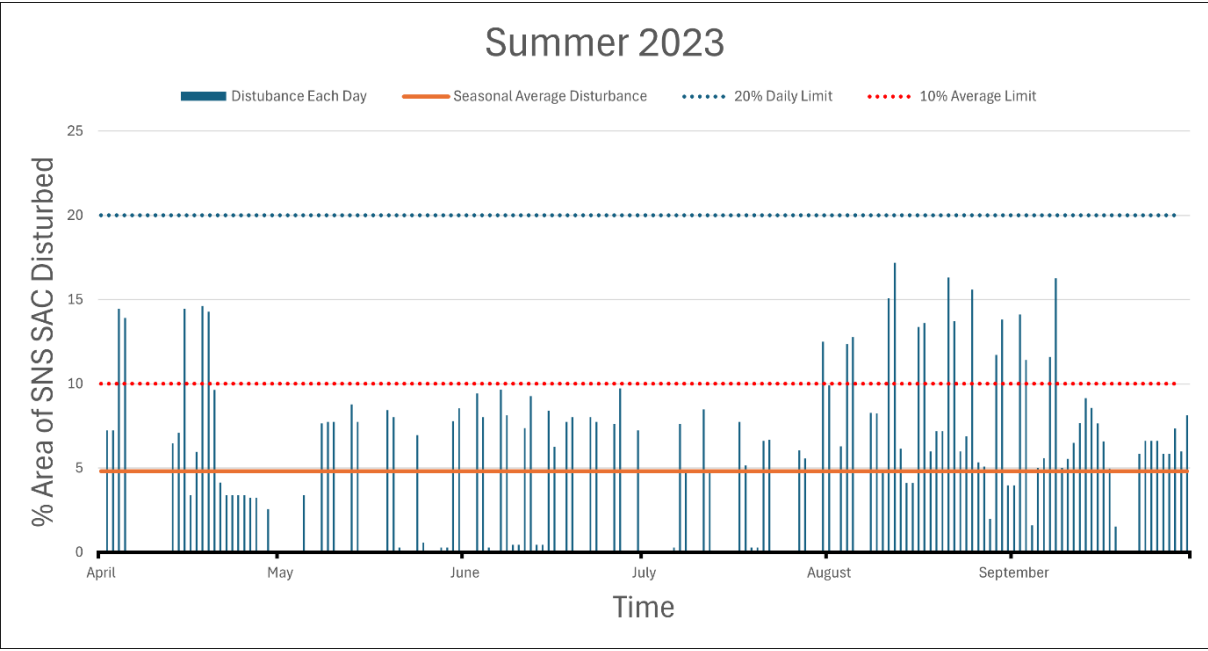


Figure 4b. Percentage area of Southern North Sea Summer SAC disturbed by impulsive noise (licensed and exempt activities) for each day of Summer 2023.

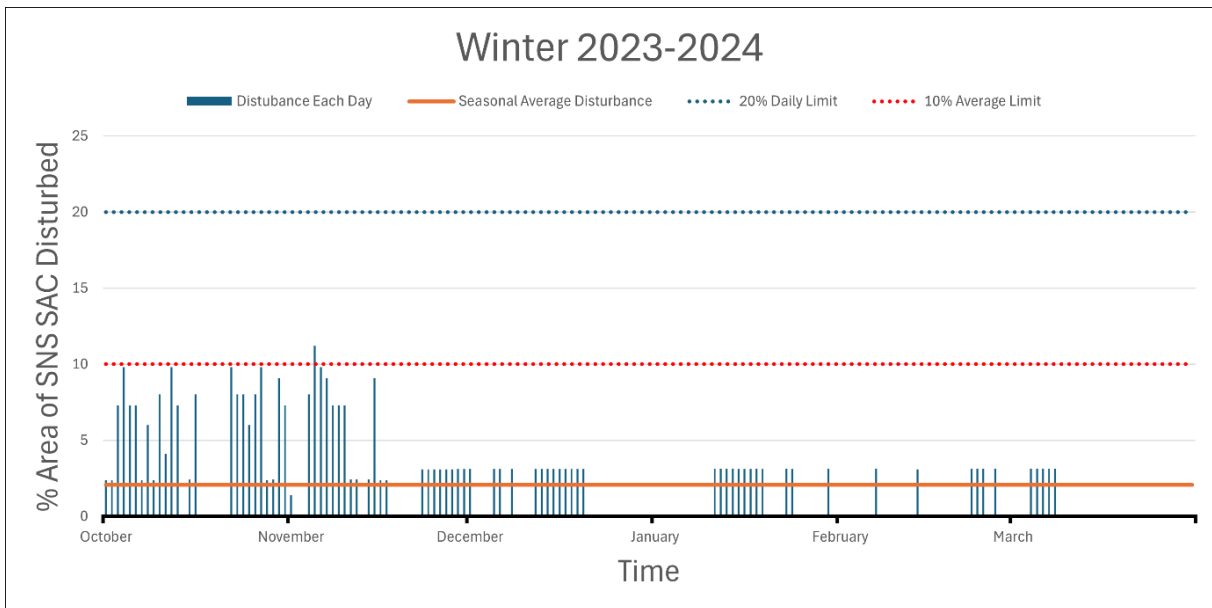
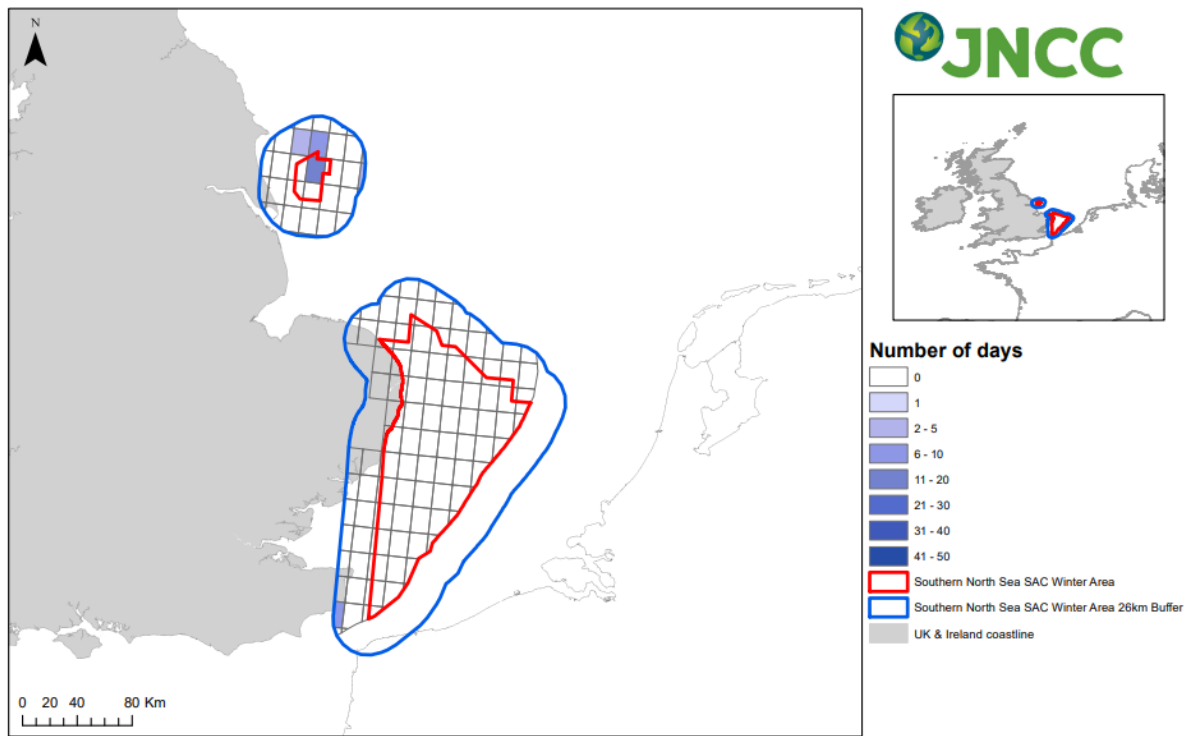


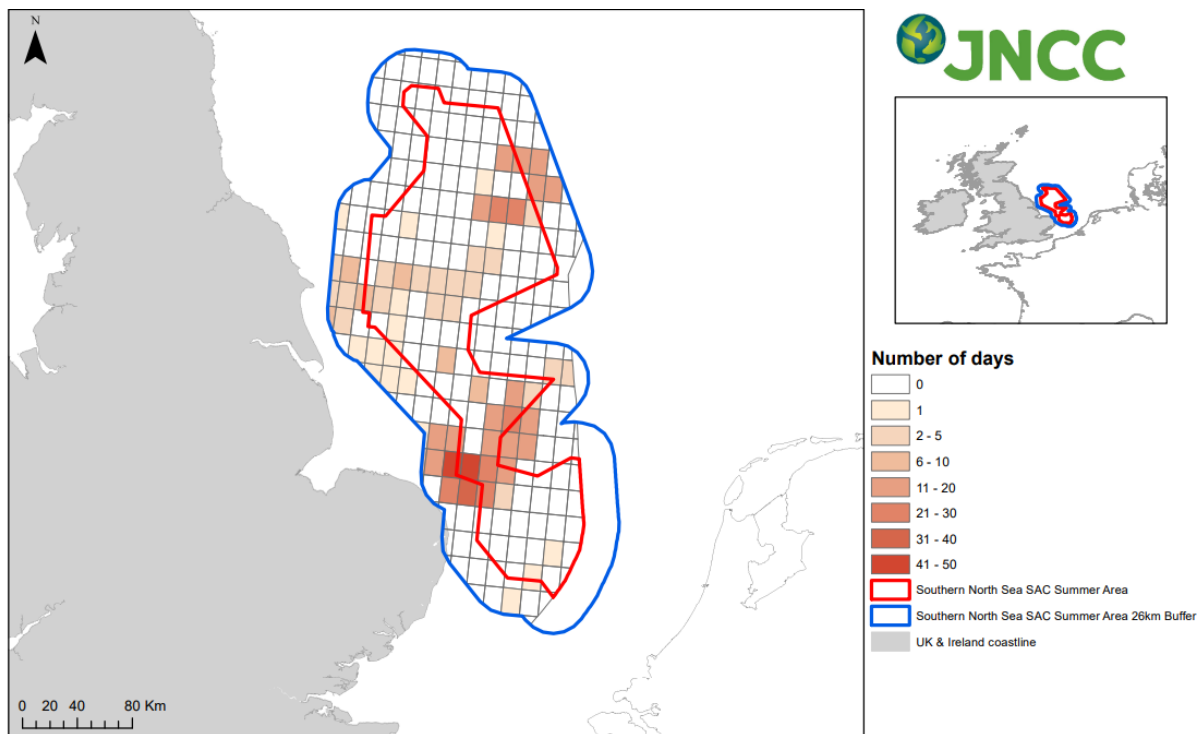
Figure 4c. Percentage area of Southern North Sea Winter SAC disturbed by impulsive noise (licensed and exempt activities) for each day of Winter 2023–2024.

Figures 5a–c show the spatial distribution of impulsive noise activity and the total number of noisy days per oil and gas block in each of the seasons. Similarly to the spread of activities in time, activities were highly clustered in space during the winter seasons, occurring only in the northwest of the SAC, including in the separated region of the SAC. Again, activity in the summer season contrasted this, by being spread throughout the SAC boundaries. Figures 6a–c specify the spatial distribution of each activity type. In the summer of 2023, geophysical surveys were spread across most of the SAC area, whereas piling activity was highly concentrated in the north-east, where it was used for the construction of a windfarm in the Dogger Bank.



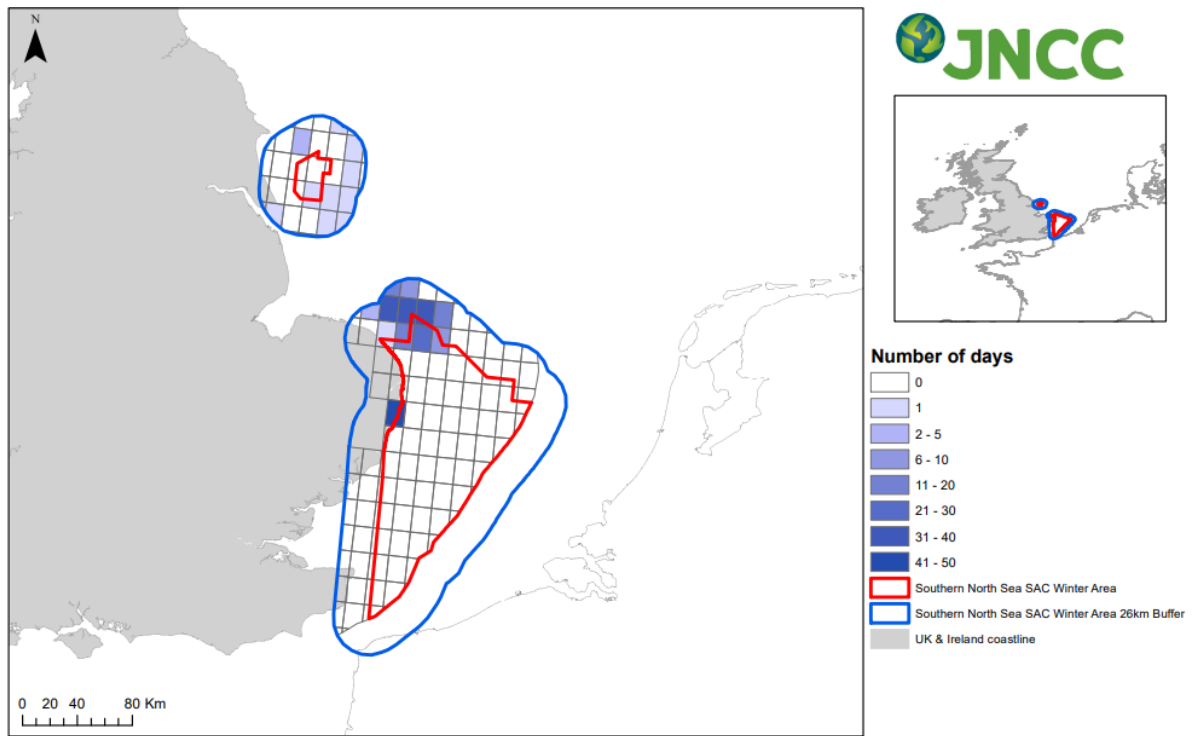
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Figure 5a. The distribution and prevalence of all impulsive noise events (all licensed activities) in and around the Southern North Sea Winter SAC, during the winter of 2022–2023.



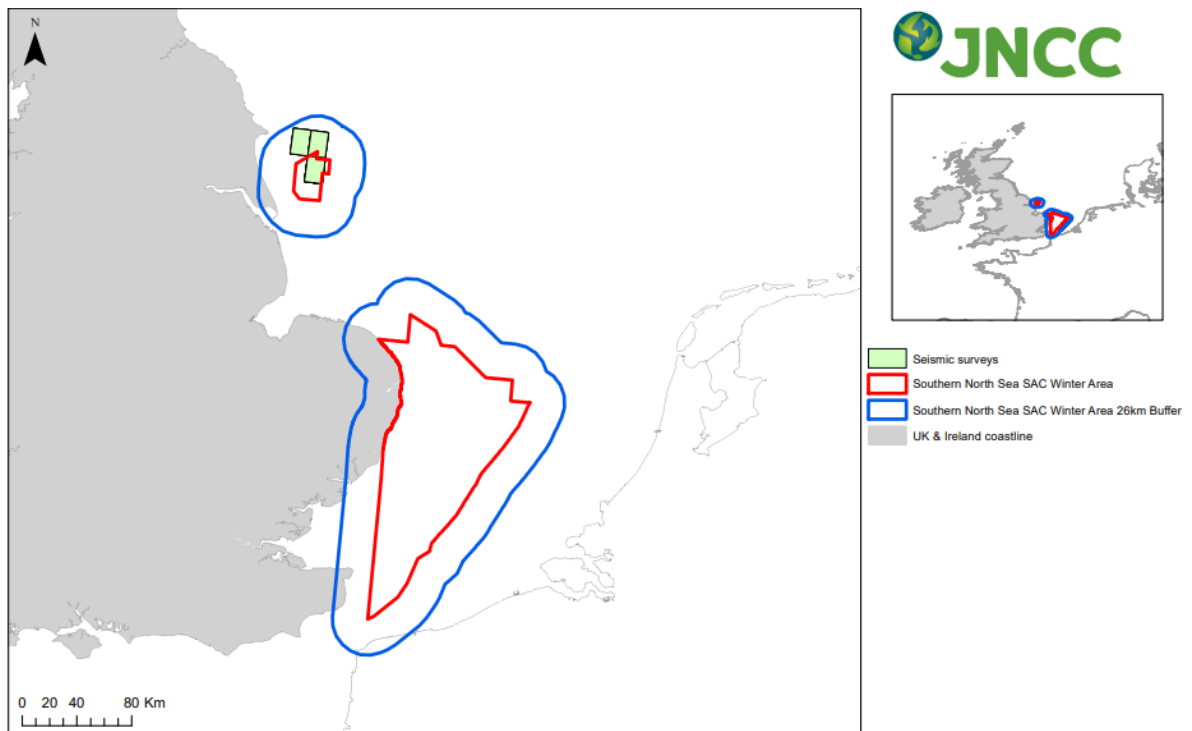
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Figure 5b. The distribution and prevalence of all impulsive noise events (licensed and exempt activities) in and around the Southern North Sea SAC, during the summer of 2023.



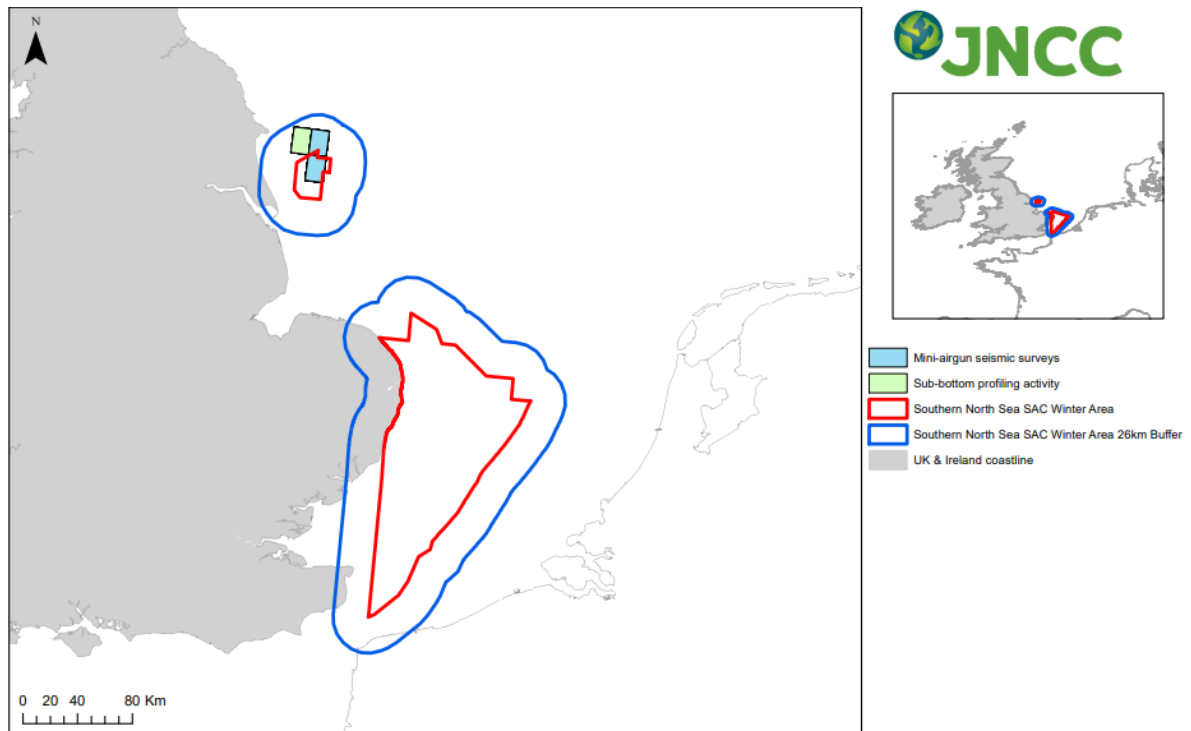
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Figure 5c. The distribution and prevalence of all impulsive noise events (licensed and exempt activities) in and around the Southern North Sea Winter SAC, during the winter of 2023–2024.



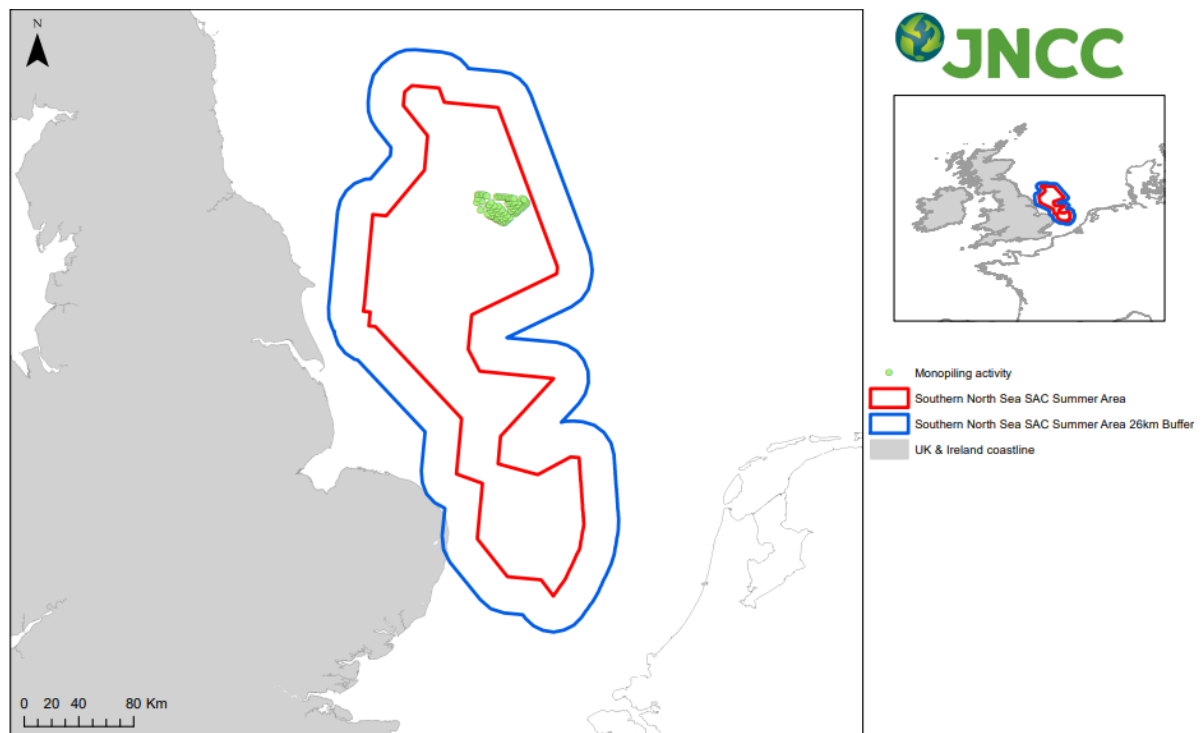
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Figure 6a(i). The distribution of seismic survey activity (all licensed) in and around the Southern North Sea Winter SAC, during the winter of 2022–2023.



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Figure 6a(ii). The distribution of sub-bottom profiling activity and mini-airgun seismic survey activity (all licensed) in and around the Southern North Sea Winter SAC, during the winter of 2022–2023.



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Figure 6b(i). The distribution of mono-piling activity (all licensed) in and around the Southern North Sea Summer SAC, during the summer of 2023.

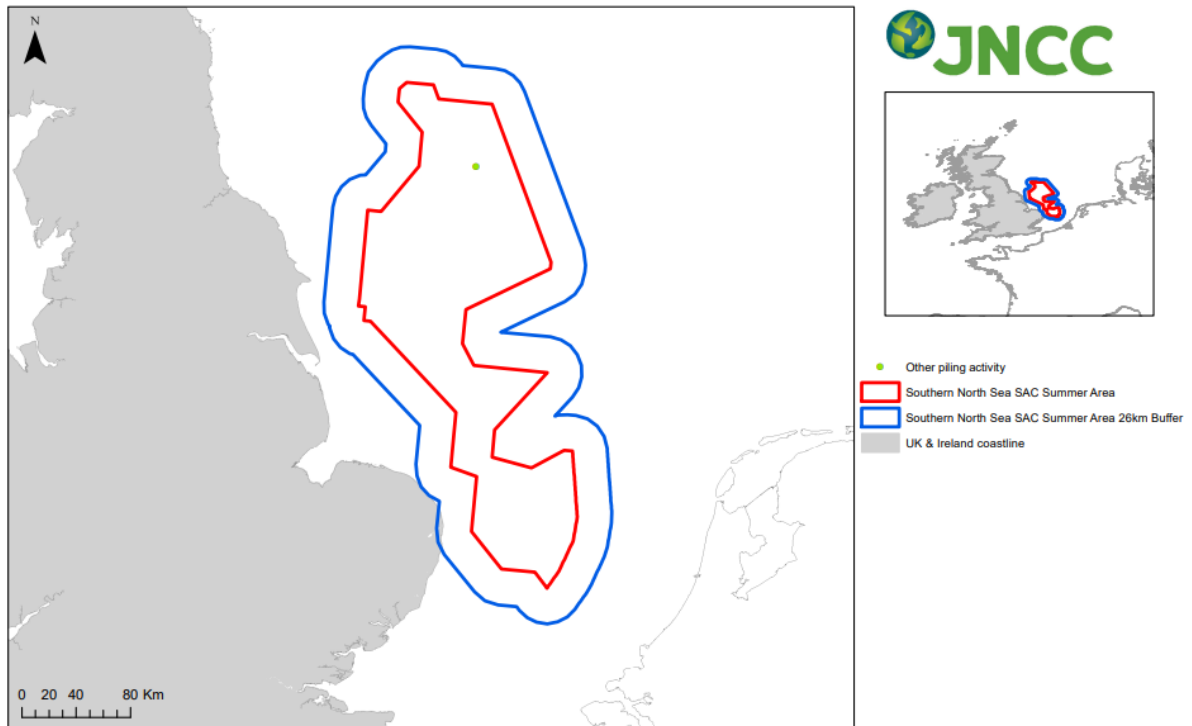


Figure 6b(ii). The distribution of pin-piling activity (exempt) in and around the Southern North Sea Summer SAC, during the summer of 2023.

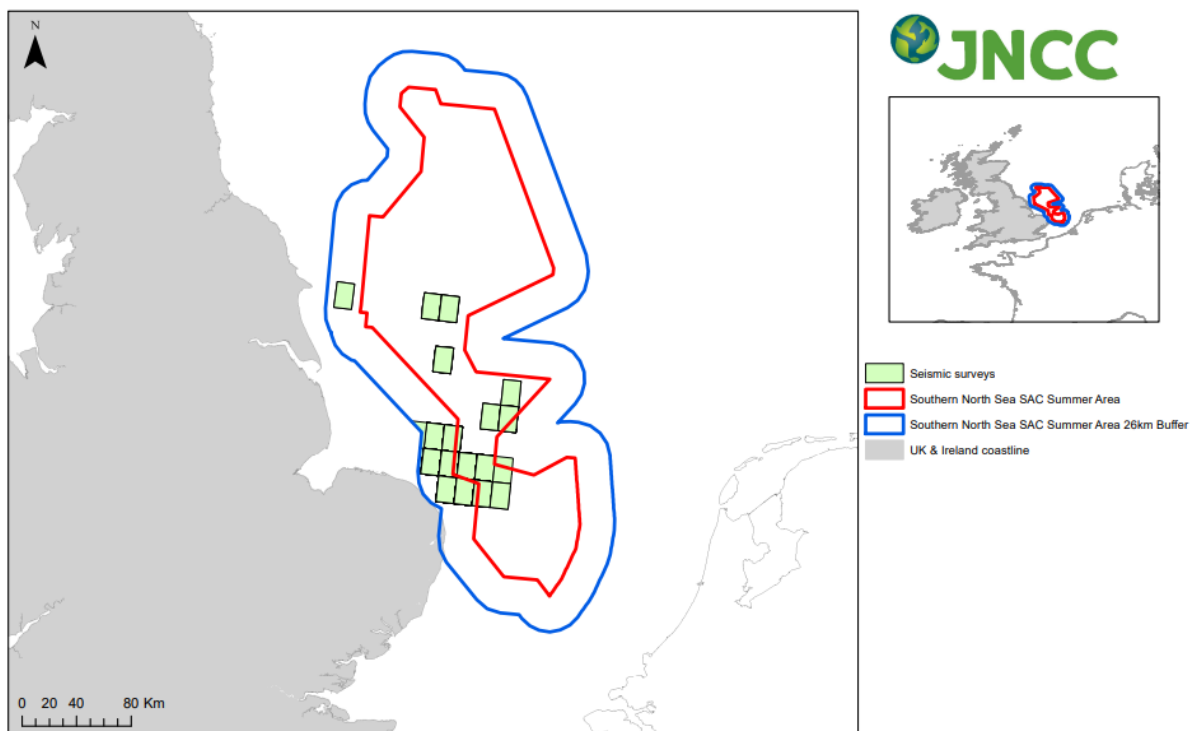
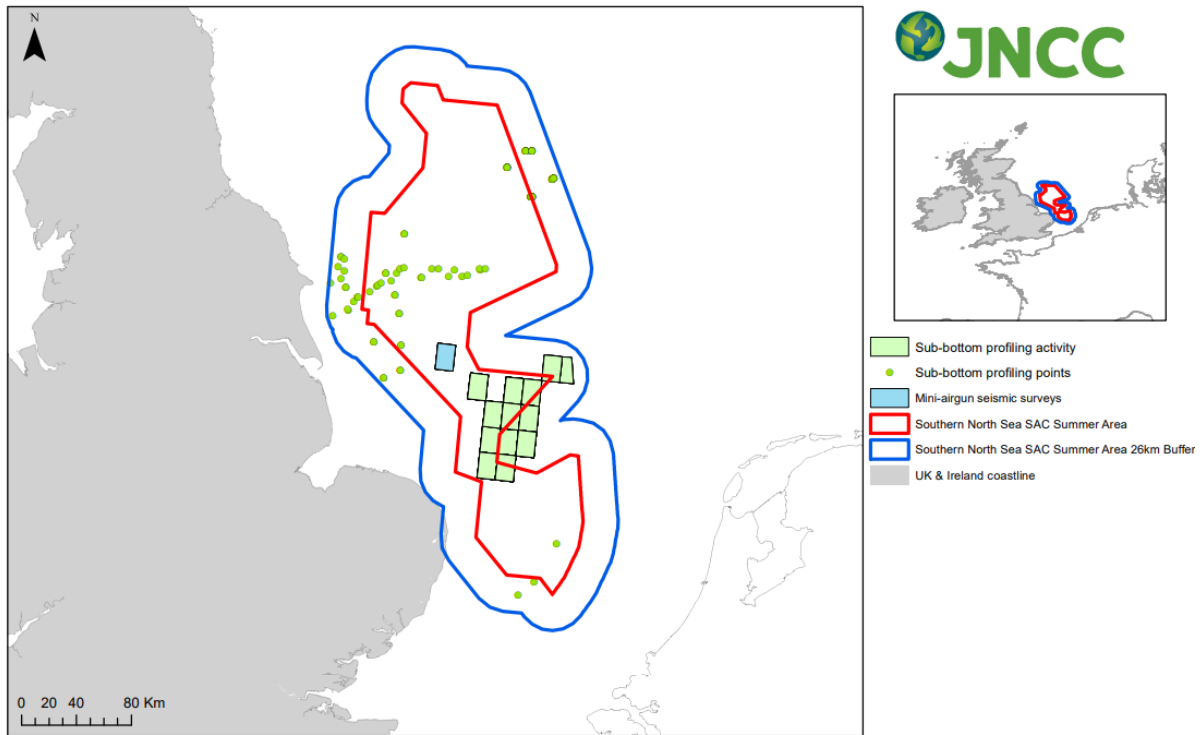
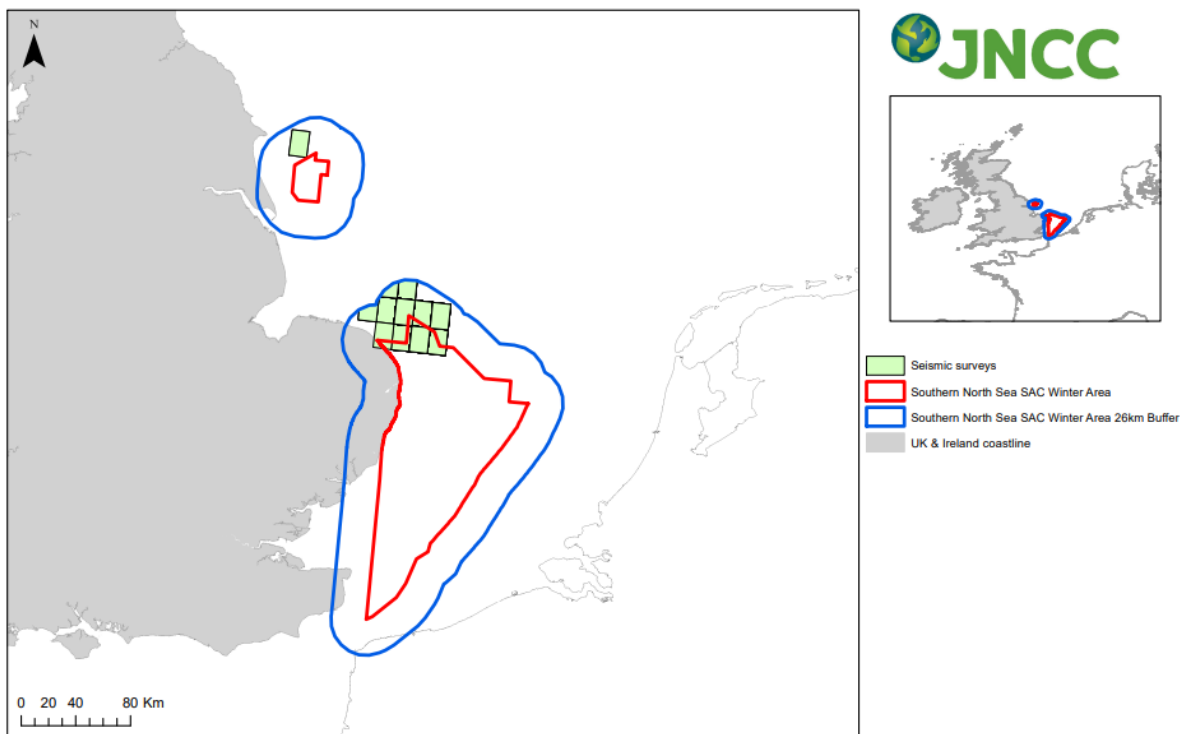


Figure 6b(iii). The distribution of seismic survey activity (all licensed) in and around the Southern North Sea Summer SAC, during the summer of 2023.



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Figure 6b(iv). The distribution of sub-bottom profiling activity and mini-airgun seismic survey activity (licensed and exempt) in and around the Southern North Sea Summer SAC, during the summer of 2023.



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Figure 6c(i). The distribution of seismic survey activity (all licensed) in and around the Southern North Sea Winter SAC, during the winter of 2023–2024.

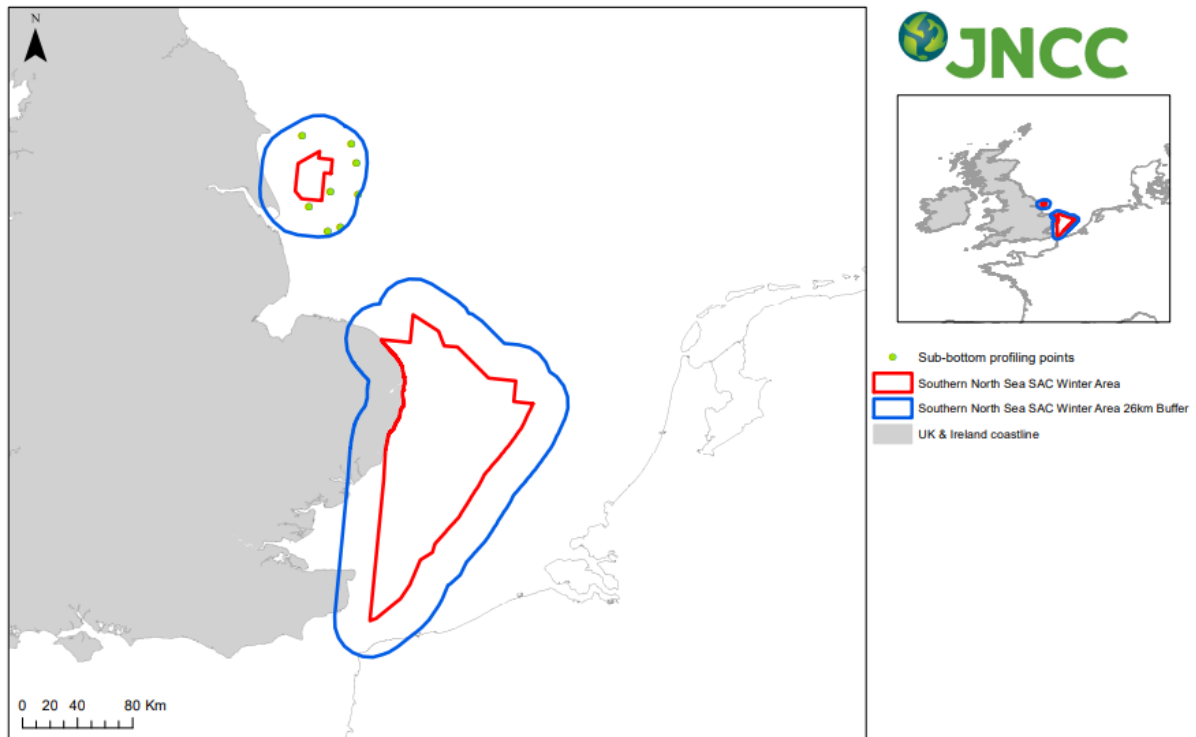


Figure 6c(ii). The distribution of sub-bottom profiling activity (licensed and exempt) in and around the Southern North Sea Winter SAC, during the winter of 2023–2024.

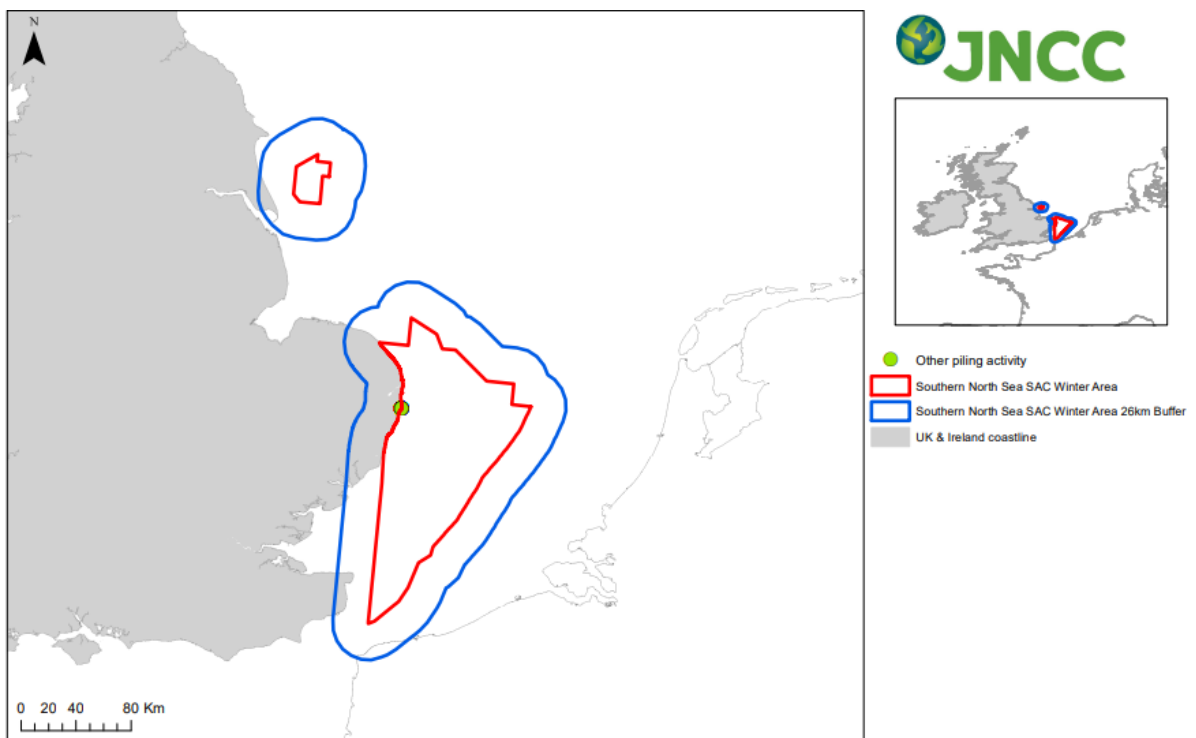


Figure 6c(iii). The distribution of sheet-piling activity (all licensed) in and around the Southern North Sea Winter SAC, during the winter of 2023–2024.

Figure 7 shows the relative contribution of different activities to the area disturbed by noise within the SNS SAC together with the total number of days in which the activities took place, for each season. Noise disturbance in winter 2023–2024 was primarily caused by seismic surveys and sheet-piling, with the former being the largest contributor. Similarly, in winter 2022–2023, seismic surveys were by far the largest contributor to disturbance because of their comparatively large EDR, despite sub-bottom profiling occurring over more days. However, in the summer of 2023, mono-piling accounted for most of the disturbed area, with seismic surveys being only the second largest contributor.

Unlike in the years 2015–2020 (JNCC 2022a), there was no unexploded ordnance (UXO) clearance within range of the relevant SNS SAC seasonal area in any of the three seasons. However, this is likely to change in the upcoming years, as UXO clearance is often necessary when preparing areas for wind farm construction. Traditional methods of high-order detonation for UXO clearance result in one of the loudest sources of underwater noise and therefore are given the largest EDR (together with mono-piling) of 26 km (JNCC 2020). Lower noise clearance methods such as deflagration methods, which slowly burn out the contents of the explosive, have been shown to substantially reduce the noise from UXO clearance, and are thus greatly preferable (DEFRA *et al.* 2022; Lepper *et al.* 2024); these have a default EDR in the MNR of 5 km.

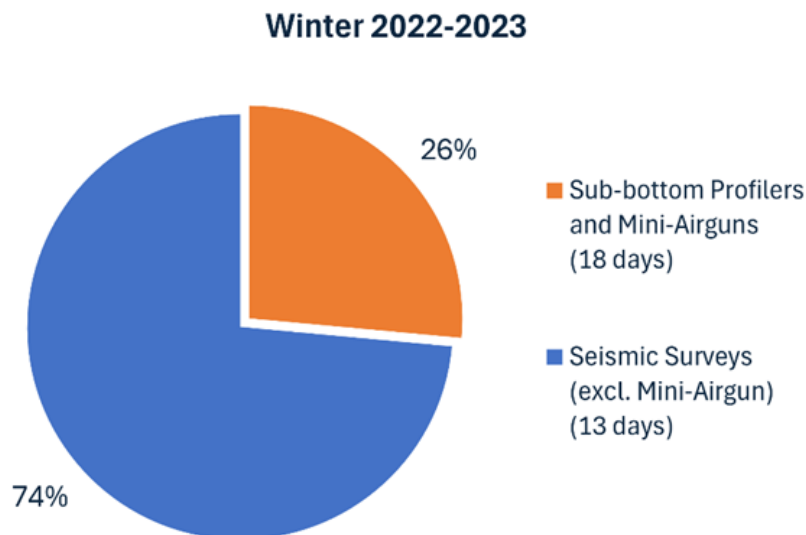


Figure 7. The contribution of different activities to the estimated area disturbed by noise within the Southern North Sea SAC for Winter 2022–2023, Summer 2023, and Winter 2023–2024, respectively. Total days of noise per activity also given in brackets.

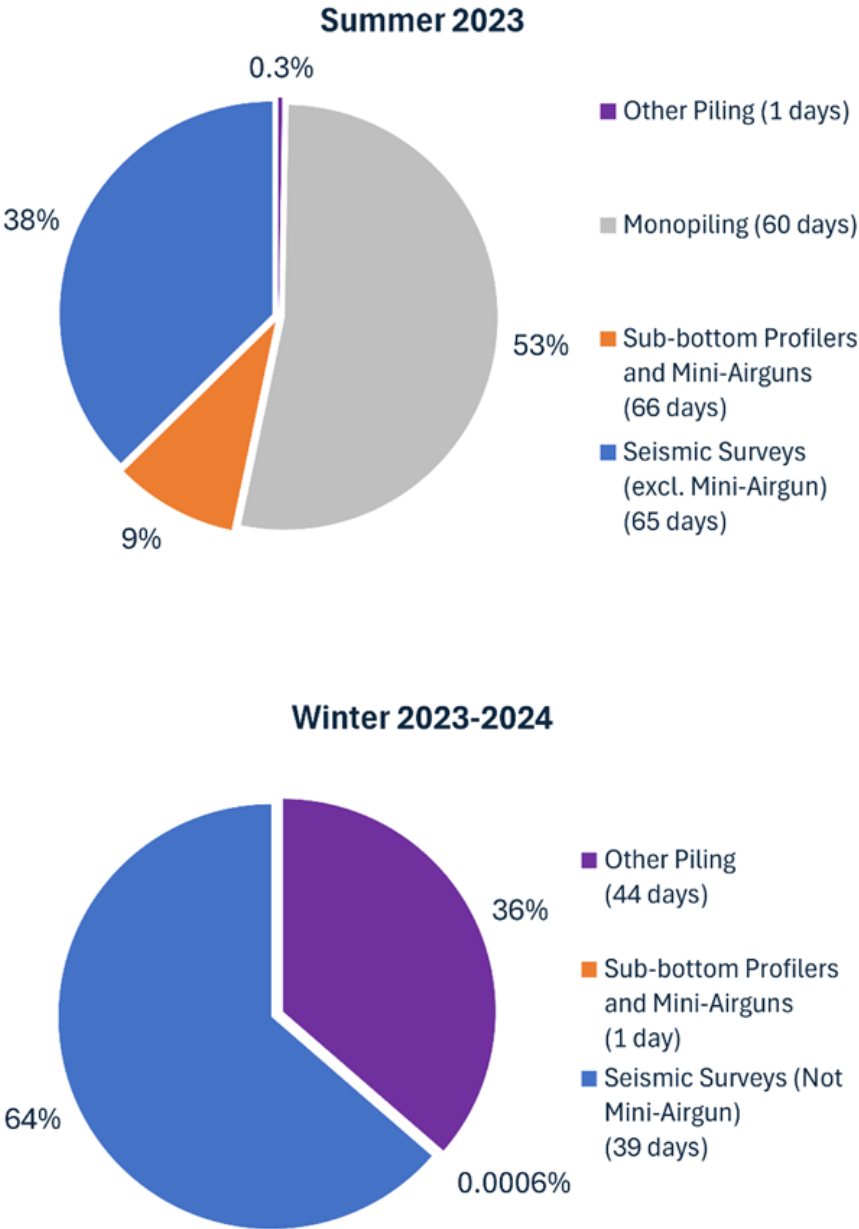


Figure 7 (continued). The contribution of different activities to the estimated area disturbed by noise within the Southern North Sea SAC for Winter 2022–2023, Summer 2023, and Winter 2023–2024, respectively. Total days of noise per activity also given in brackets. For Summer 2023, of the 66 days with noise for sub-bottom profilers, 28 days were from exempt activities and the one day contributed by ‘other piling’ was also from an exempt activity.

4. Results and Discussion: Other Harbour Porpoise SACs

In this section, results are presented for the harbour porpoise SACs which are located within the Irish and Celtic Seas and the North Channel, shown in Figure 1 with labels 3–8. The daily 20% and the seasonal average 10% disturbance thresholds advised by the SNCBs in JNCC (2020) were not exceeded in any of these SACs in any of the three seasons. In fact, Table 3 shows that the West Wales Marine Winter SAC, the North Anglesey Marine Summer SAC, and the Skerries and Causeway SAC had no recorded impulsive noise activity. The only recorded activity in the West Wales Marine Summer SAC and the Bristol Channel Approaches Winter SAC was military sonar, which does not require a licence and for which there is currently no EDR (see section 5).

The sole instance of licensed impulsive noise activity in these SACs occurred in the North Channel Winter SAC. This activity consisted of just four days of sub-bottom profiling in the winter of 2022–2023. This occurred in early October at the north-west tip of the SAC and did not result in any significant disturbance, as illustrated in Figure 8a, Figure 8b, and Table 4.

Despite the low levels of activity in these recent seasons, these SACs require continued monitoring and regulation, as due to their small areas, even one activity could lead to the thresholds being breached. Before the [SNCB guidance](#) was published and any management procedures were enacted) the maximum daily disturbance reached as high as 89% in the West Wales Marine SAC (JNCC 2022b).

Table 3. All recorded impulsive noise activity in the Irish and Celtic Seas and North Channel SACs for each season. Seasons and SACs with no recorded activity are marked with ‘x’. Only the North Channel Winter SAC in the winter of 2022–2023 had licensed impulsive noise activity, and this was sub-bottom profiling.

SAC	Winter 2022–2023	Summer 2023	Winter 2023–2024
West Wales Marine (Summer Area)	x	x	x
West Wales Marine (Winter Area)	x	x	x
North Channel (Winter Area)	Sub-bottom Profiling	x	x
North Anglesey Marine (Summer Area)	x	x	x
Bristol Channel Approaches (Winter Area)	x	x	x
Skerries and Causeway (All Seasons)	x	x	x

Table 4. Total days with noise and estimated area disturbed for the North Channel Winter SAC, the only SAC other than the Southern North Sea where there was licensed impulsive noise activity. No activity occurred in Summer 2023, nor Winter 2023–2024.

Period	Days with noise disturbance	Maximum daily area disturbed (%)	Seasonal average area disturbed (%)
Winter 2022–2023	4	1.32	0.03

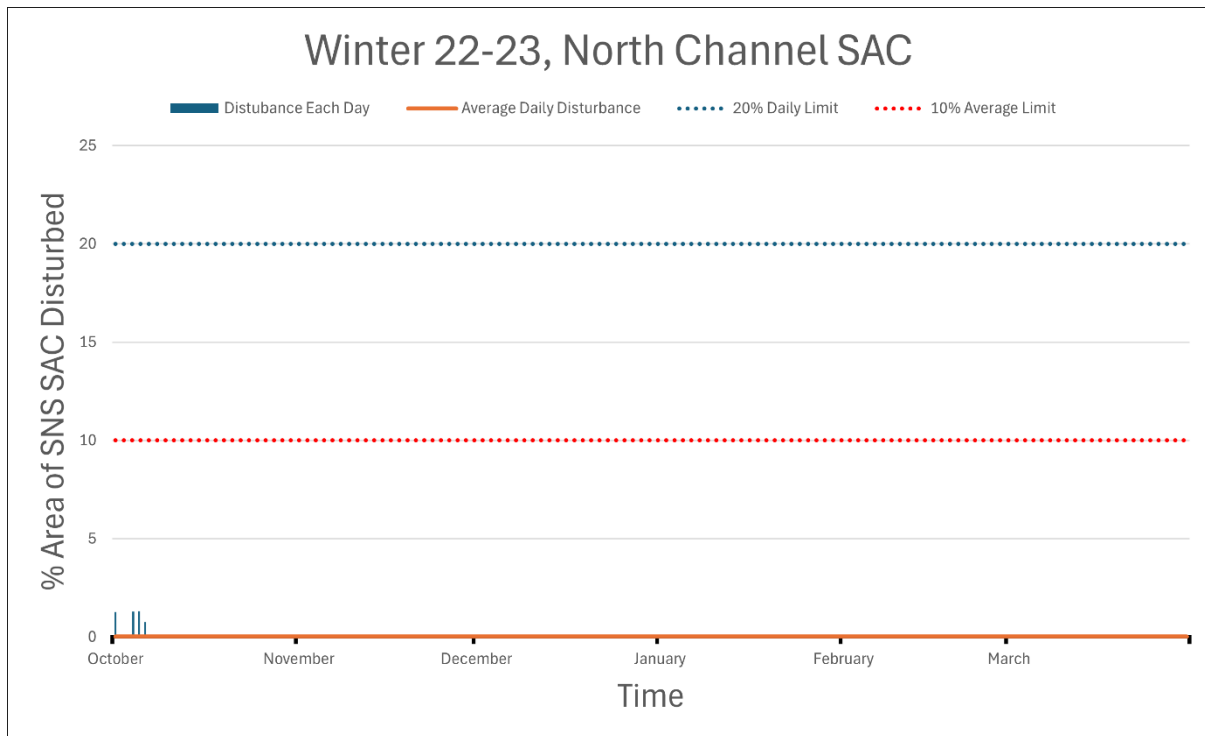
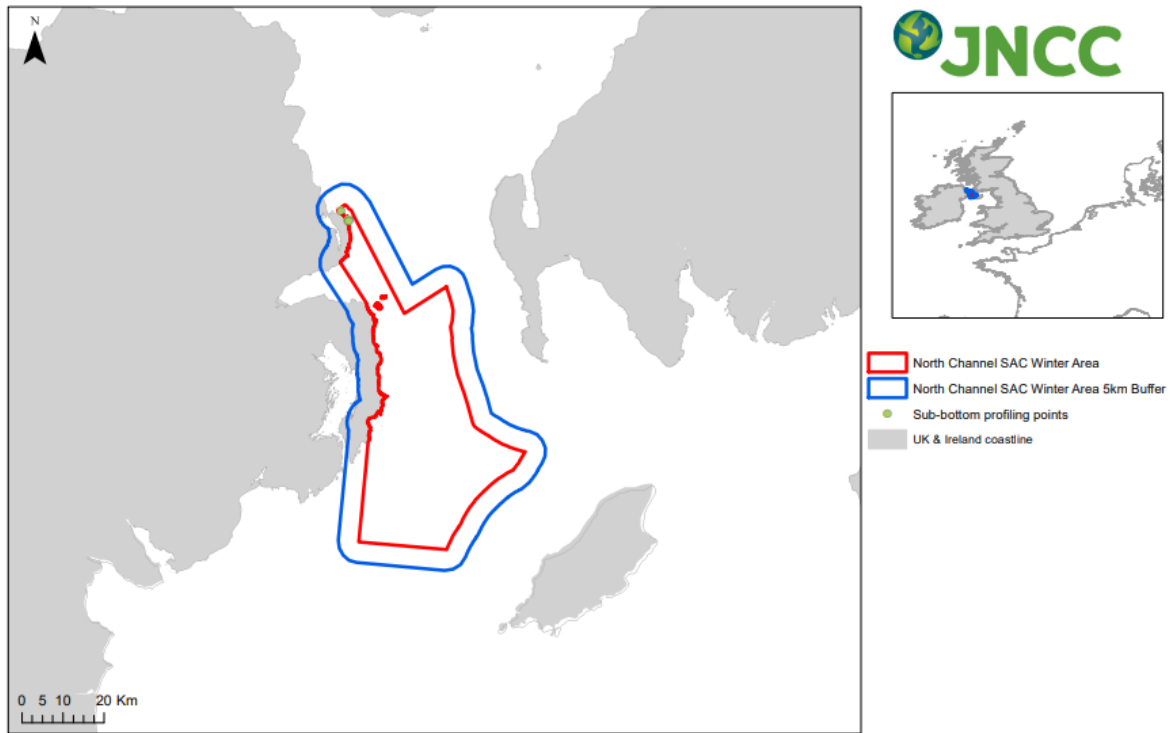


Figure 8a. Percentage area of North Channel Winter SAC disturbed by impulsive noise for each day of Winter 2022–2023. Only 4 days had any activity.

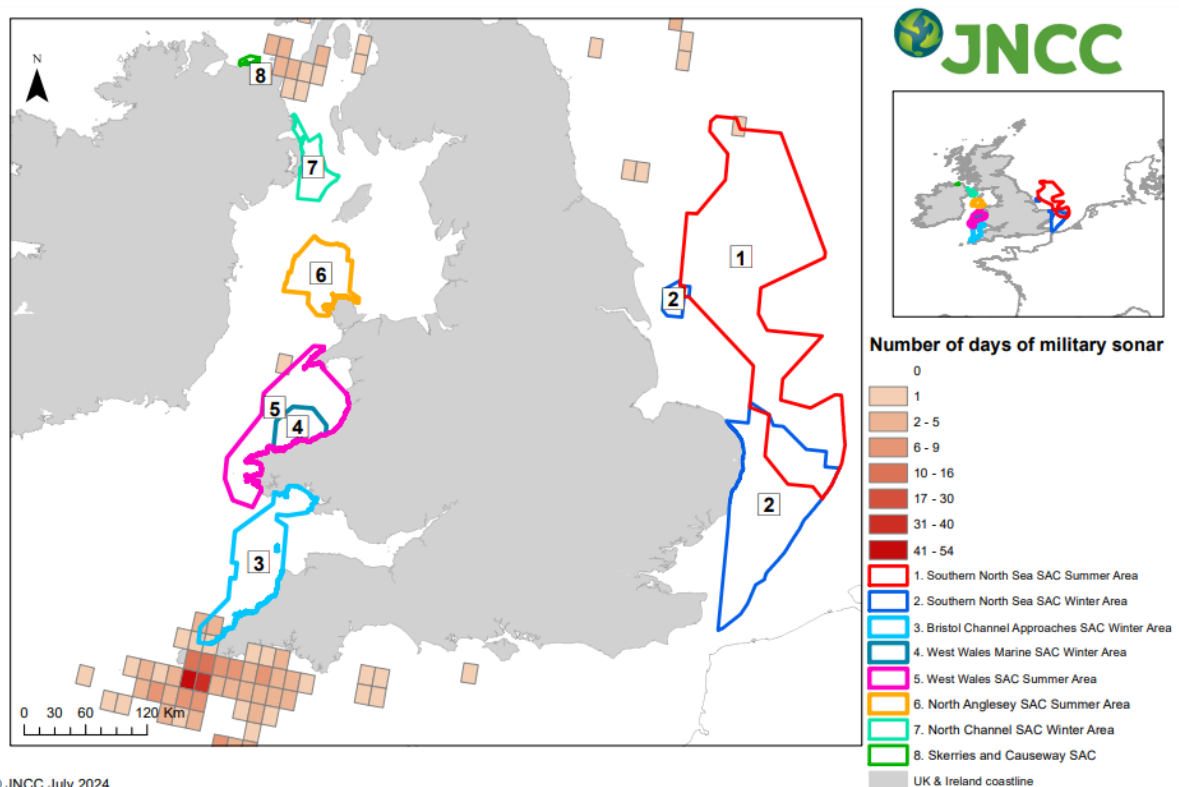


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Figure 8b. The distribution of impulsive noise activity in the North Channel Winter SAC, during the winter of 2022–2023. All activity was sub-bottom profiling.

5. Military Sonar Activity

Military sonar activity does not require a licence and is recorded on the MNR voluntarily, with currently no associated EDR. This makes it challenging to assess the potential disturbance footprint in the harbour porpoise SACs. Nevertheless, military sonar activity has been associated with cetacean strandings in the past (Jepson *et al.* 2013; Weilgart 2007), and so should be monitored where possible. Figure 9 shows the spatial distribution of the military sonar activity recorded in the MNR, with the number of days of activity in each oil and gas block between October 2022 and April 2024. Most of this activity occurred off the southwest coast of England, with some of it intersecting the Bristol Channel approaches Winter SAC. There also were instances of activity within the West Wales Summer SAC, as well as within 50 km of the Skerries and Causeway SAC. Although activity occurred in the SNS SAC summer area, this was during the winter, when the porpoise density is assumed to be low, comparable with non-SAC areas.



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Figure 9. The distribution and prevalence of reported military sonar in English, Welsh, and Northern Irish waters from October 2022 to April 2024.

6. Caveats and Limitations

The data input to the MNR has both fine and coarse spatial data. Whereas for pile driving the geographic information is provided in points (latitude and longitude), for most seismic surveys the location is given in polygons (the oil and gas licensing blocks, approximately 244 km²). This is because the blocks are used by the oil and gas industry for licensing and to report on survey location. During the development of the MNR this was chosen as a pragmatic spatial scale for inputting this data and for many of the MNR outputs. However, this results in an overestimation of the disturbed area when applying the 12 km EDR around the block. This footprint would only happen if there were several seismic lines in a day covering the whole block, which is unlikely. The upgraded MNR has a new function that allows the upload of p1/11 files which are a standard output from many (but not all) geophysical surveys, depicting the chronology of geolocations. It is expected that users will start to use this function preferentially, resulting in more precise locations along the survey lines being recorded instead of the coarse oil and gas blocks. This will allow for a more accurate estimation of disturbance once the EDR buffer is applied around the line rather than the block.

The EDRs used are those recommended in the SNCB guidance and were informed by the published ranges where the primary harbour porpoise disturbance effect (reduction in porpoise vocal activity or sightings) had been detected (JNCC 2020). They are not equivalent to 100% deterrence/disturbance in the associated area (i.e. some animals show greater reaction than others) nor do they represent the limit range at which effects have been detected. Most EDRs have been informed by matching a suite of generic activity categories (e.g. mono-piles, pin-piles, seismic surveys) to the study(ies) covering an activity with the most similar characteristics and sound levels. They are considered by the SNCBs to be precautionary but proportionate given the lack of a comprehensive evidence base. JNCC is in the process of commissioning a review of harbour porpoise disturbance, which includes considering more factors and variations in activity type, recommending updated EDRs, and potentially considering other frameworks to assess disturbance. This work will inform future assessments. Smaller EDRs are being considered for example for seismic surveys using air gun arrays smaller than 180 cubic inches, a much smaller size compared to the 3000 cubic inch airgun array on which the 12 km seismic survey EDR is based on.

Whereas the MNR captures the great majority of impulsive noise events, and after more than eight years of operation there is considerable confidence in the completeness of the data received, there are still gaps. The following events are those that might be missing and would be of relevance to the noise management:

- Non-licensable geophysical surveys (non-oil and gas surveys, e.g. some pre-installation surveys for offshore renewables). These are recorded in the MNR on a voluntary basis and therefore the MNR data is likely to represent only a small portion of all surveys (Royal HaskoningDHV 2021). However, for the purposes of verifying the impact on SACs from a HRA perspective, the MMO do not include non-licensable activities within the in-combination assessment, therefore, whether they have been included voluntarily or not will not have an impact on those HRAs.
- Some small-scale impact pile driving events where there is currently no licensing condition to submit data to the MNR, for example conducted by the oil and gas industry, and coastal pile driving events categorised as low-risk by the MMO (voluntarily submitted - licence applications to the MMO fall in different fee bands. So usually, small scale projects with little environmental impact will fall under lower-risk category bands – see [Make a marine licence application - GOV.UK](#) for further detail.).

- Other non-licensable impulsive noise activity that is only recorded on a voluntary basis, such as military sonar.
- Entries to the MNR whereby a close-out report was not completed by the deadline of 31 July 2024 given for inclusion in this report.
- Whilst quality assurance is an integral part of the MNR data input and output, it is not possible to ensure that every data entry is correct and there could be gaps in days or locations for some activities.

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Appendix 1: Effective Deterrence Ranges (EDRs) in the MNR

Table 5. Default effective deterrence ranges (EDRs, km) in harbour porpoise SACs for each noise source and the associated sub-types, as used in the UK Marine Noise Registry.

Noise source	Type	EDR (km)
Seismic Survey	Ocean Bottom	12
	Regional	12
	Reservoir	12
	Route	12
	Site	12
	Vertical Profile	12
	Mini-Airgun	5
	Other	12
Sub-bottom Profiler Survey	Boomer	5
	Chirp	5
	Parametric	5
	Pinger	5
	Sparker	5
	Imager	5
Multibeam Echosounder	All types	5
Piling (without abatement)	Mono-piling	26
	Pin-piling	15
	Conductor piling	15
	Sheet piling	15
Piling (with noise abatement)	All types	15
Explosives	Open water < 2 kg	5
	Open water > 2 kg	26
	Open water > 2 kg (with noise abatement)	15
	Within 100 m of mudline < 2 kg	5
	Within 100 m of mudline > 2 kg	15
	Within 100 m of mudline > 2 kg (with noise abatement)	5
	UXO High order	26
	UXO High order (with noise abatement)	15
	UXO Low order	5