Cyfoeth Naturiol Cymru
Natural Resources Wales

# Position statement

# NRW's position on determining Adverse Effect on Site Integrity for marine mammal site features in Wales in relation to potential anthropogenic removals (mortality) from marine developments

**Reference number:** PS013

**Document Owner:** Marine Programme Planning and Delivery Group

## What is this document about?

This document sets out NRW's position on determining if Adverse Effect on Site Integrity (AEOSI) could occur/be ruled out as a result of potential anthropogenic removals (mortality) from marine developments for relevant Special Areas of Conservation (SACs) with marine mammal features; in Wales these are grey seal (Halichoerus grypus), harbour porpoise (Phocoena phocoena) and bottlenose dolphin (Tursiops truncatus). The position is based on the knowledge that animals associated with sites (SACs) are made up from individuals from the wider population that range widely. Thus, wider population estimates and effects are assumed to be relevant at the site level.

## Who is this document for?

The Position Statement is aimed at:

- Those within NRW who may be advising on Habitats Regulations Assessment (HRA) of SACs with marine mammal features
- NRW Marine Licensing Team, who may wish to understand how this advice should be applied
- Other Competent Authorities (CA) / regulators / UK Statutory Nature Conservation Bodies who may wish to understand our approach and consider its use in conducting HRA on sites with marine mammal features
- Developers and their consultants who wish to understand this approach and submit applications with enough information to allow the CA to assess sites with marine mammal features in the same way

## Development of this position

- This Position was developed following discussion of associated advisory and regulatory risks and benefits, at NRW's Strategic Marine Mammal Group (SMMG), Offshore Renewable Energy Programme (OREP) and Marine Planning and Policy

Delivery Group (MPPDG) meetings. The approach was approved and adopted in October 2020 by the Marine Programme Board (MPB) within NRW.

- This Position does not represent a legal opinion and should not be interpreted as such. Project developers and owners should be advised to seek their own independent legal advice on any matters arising in connection with this Position Statement in respect of a specific activity or development project.
- This Position does not prejudice any advice that NRW might provide in our capacity as a statutory advisory or regulatory decision maker.
- NRW will update this Position Statement as and when relevant new evidence becomes available.

## Contact for queries and feedback

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## Version History

| Document Version | Date Published | Summary of Changes |
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| 1.0 | 10-20 | Document published |
| 1.1 | 02-22 | Accessibility update. Following a review, there is no evidence that would warrant a substantive update of this document |

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To report issues or problems with this guidance contact Guidance Development

# Contents

# 1. Background

If a Habitats Regulations Assessment (HRA) is required for a marine development plan or project, then the assessment made in the Appropriate Assessment (AA) stage of the HRA is carried out to determine whether or not the plan or project could cause Adverse Effect on Site Integrity (AEOSI). Concluding that there may be AEOSI or it cannot be ruled out means that the project cannot be consented without a derogation under Art. 6(4).

'Anthropogenic removals' here refers to potential marine mammal mortality associated with marine developments, such as that resulting from animal collision with tidal energy devices, collision with construction vessels, entrainment mortality from power station intakes, physical kills from unexploded ordnance etc. Mortality that is associated with fisheries, i.e. bycatch, is not part of a plan or project and therefore not formally assessed through HRA (Art. 6(3)) but bycatch is considered in population modelling and is highly influential in this position statement.

Currently in Wales, a key potential impact pathway to anthropogenic mortality is from possible collision with tidal stream energy generation devices, especially from their rotating turbine blades and ground tethers. NRW is being consulted on several tidal stream projects in locations that pose potential risks to Special Areas of Conservation (SACs) with marine mammal features in Wales.

The likelihood that mammals might collide with a tidal energy device and the consequences of collision remain uncertain; assessments cannot exclude the possibility of an effect because there is a lack of evidence from existing deployments (ABPmer 2020). In absence of information on consequences of collision, a precautionary position is taken that collisions are assumed to result in mortality. However, NRW will continue to evaluate new evidence as it emerges and will keep its position under review.

In this document, we outline NRW's position on determining if AEOSI could occur/be ruled out as a result of potential anthropogenic removals (mortality) for relevant SACs with marine mammal features; in Wales these relate to grey seal (*Halichoerus grypus*), harbour porpoise (*Phocoena phocoena*) and bottlenose dolphin (*Tursiops truncatus*). The position is based on the knowledge that animals associated with sites (SACs) are made up from individuals from the wider population that range widely. Thus, wider population estimates and effects are assumed to be relevant at the site level.

# 2. Introduction

## Conservation objectives

The assessment of whether a plan or project could cause AEOSI requires reference to the site conservation objectives. A common conservation objective theme for all marine mammal Annex II species is 'population viability' and for potential anthropogenic removals (mortality) this is the principal objective on which to base an assessment of whether an effect is adverse or not. There are other conservation objectives, or aspects of them, that require consideration as well. For example, for grey seal, populations should not be reduced as a consequence of human activity; and for bottlenose dolphin, the population should be increasing (see Appendix 1).

## Spatial scale

Animals associated with SACs are thought to be part of much wider populations that occur at larger spatial areas. Wider population estimates and effects are assumed to be relevant at the site (SAC) level. Marine Mammal Management Units (MMMUs) are considered to be the most relevant and manageable spatial scale for marine mammal populations and for cetaceans, UK Statutory Nature Conservation Bodies (SNCBs) approved the use of MMMUs in conservation advice in 2015 (IAMMWG 2015). Appendix 3 outlines the evidence that describe these 'wider' populations. See also NRW's position on the use of Marine Mammal Management Units for screening and assessment in Habitats Regulations Assessments for Special Areas of Conservation with marine mammal features.

## Method used in determining population effects

NRW currently considers Potential Biological Removal (PBR) to be an appropriate method to inform a view on wider population level effects and AEOSI in relation to potential anthropogenic removals (mortality). This technique is widely used in conservation and environmental assessments (see Appendix 2 and forthcoming NRW review by Sparling et al.), for example, to define bycatch limits in US fisheries, and seal shooting quotas in Scotland. It was also the basis of defining mortality limits in the Adaptive Environmental Management Plan for the DeltaStream tidal development in Ramsey Sound. The approach is therefore well established and has precedence in consenting and use in informing assessments on AEOSI.

PBR is a simple formula that calculates the number of animals that could potentially be removed from a population each year without adversely affecting the long-term growth of the population (Wade 1998). In other words, PBR calculates a 'threshold' of sustainable mortality.

## Using PBR in defining population level effects and AEOSI

All anthropogenic removals - including fisheries bycatch - must be subtracted from the PBR value, and what is left over is the remaining 'allowable take' in that year. Estimates from wider population PBR (with bycatch subtracted where relevant) (Table 1) yields zero 'allowable take' for harbour porpoise and grey seal, and less than one bottlenose dolphin per year (0.7, which approximates to two dolphins over three years).

These wider population level PBR values imply that a single collision with an Annex II marine mammal, anywhere in the relevant spatial area (e.g. MMMU) might result in an AEOSI for each SAC in that area in that year. However, there are various uncertainties related to the use of PBR for determining population level effects and defining AEOSI.

For grey seal, the minimum fisheries bycatch level from recent estimates in the same spatial area that PBR is calculated for, exceeds the PBR value and has for many years (see Appendix 3). This results in a conclusion of zero take. Bycatch predominantly occurs in UK offshore waters around the Southwestern approaches and in Irish waters. Despite the high level of bycatch, the population is increasing in the region. This raises questions about the reliability of the input parameters for the PBR calculations for this species population and suggests that either the population estimate in the region of interest/area is wrong, the spatial scale of this area/population is too small, the bycatch estimate is inaccurate and/or that the population is not at Optimum Sustainable Growth (see Appendix 3).

Similarly, uncertainty in such estimates also applies to harbour porpoise, although we have a recent robust estimate of population abundance for this species (from SCANS III and ObSERVE surveys in 2016; see Appendix 3). For harbour porpoise, the estimate of bycatch in the relevant MMMU far exceeds the PBR. The bycatch estimate is uncertain (although even the minimum estimates far exceed the PBR) and there is also some uncertainty on the appropriate spatial extent of the relevant population (see Appendix 3).

For bottlenose dolphin there is more certainty on the input parameters for PBR calculations. There has been negligible to absent bycatch in the MMMU (Irish Sea) and we have good knowledge about the status, condition, range and connectivity of the bottlenose population in the Wales.

The implications of a 'zero allowable take' position based on PBR for wider populations of grey seal and harbour porpoise are significant and, as above, are derived from an evidence base with various uncertainties.

# 3. NRW's position on determining AEOSI

Due to the uncertainties in models and input parameters, particularly for harbour porpoise and grey seal, it is NRWs position that it is appropriate to take a risk-based approach based on expert judgement.

NRW considers that a risk-based approach is most appropriate where only a small number of additional marine mammal removals would be permissible in any year before being unable to rule out AEOSI.

Additional removals are reviewed against the best available evidence at the time (the population estimate and trend, bycatch data for that year, latest PBR model etc.) to inform expert judgement on the potential risk of being unable to rule out AEOSI for a relevant site.

Determining AEOSI is **reliant on expert judgement on a case by case basis** but will currently be based on the following:

- **Harbour porpoise:** less than 5 mortalities per year,
- **Grey seal:** less than 10 mortalities per year,
- **Bottlenose dolphin:** less than 1 mortality per year (no more than 2 over 3 years)

These numbers are a judgment subject to annual review and relate to anthropogenic removals, additional to bycatch, in the relevant MMMU rather than in each SAC; quantified site-specific thresholds above which AEOSI cannot be ruled out are not proposed as NRW feel they cannot be reliably defined.

This approach makes a judgement about the risk of being unable to rule out AEOSI, where we have more certainty about the likelihood of causing an AEOSI with increasing number of removals.

NRW acknowledge that there is a need to monitor potential removals (collisions) resulting from relevant plans and projects. Evidence from in-situ monitoring will be used to inform a review of this approach on a regular/frequent basis; as more information becomes available the level of uncertainty should also reduce.

## Table 1. Summary of population abundance and trend in the relevant Marine Mammal Management Unit (MMMU) or relevant spatial area, the Potential Biological Removal (PBR), bycatch estimate and the ‘allowable take’ based on PBR and bycatch of the wider population. NRW’s position on permitting a small number of additional removals (see reasoning in main text) before being unable to rule out an Adverse Effect on Site Integrity (AEOSI) is given and represents expert judgement.

| Species | MMMU / Area | Population abundance | Trend | PBR | Bycatch | ‘Allowable’ take per year (PBR minus bycatch) | NRW’s position on AEOSI: small number of additional removals per year |
|---|---|---|---|---|---|---|---|
| Harbour porpoise | Celtic & Irish Seas MU | 62,506 | Decrease | 560 | >620 | 0 | < 5 |
| Grey seal | SW UK & Ireland# | 10,250* | Increase | 283 | ~556 | 0 | < 10 |
| Bottlenose dolphin | Irish Seas MU | 293 | Decrease or stable$ | 0.74 | 0 | 0.74 | < 1<br>(2 over 3 years) |

# This is the best estimate for pup production in SW England, Wales and Ireland (from SCOS 2018) and is contained within the OSPAR Region III area

* based on pup production of 4,100 multiplied by 2.5. The minimum population used in PBR ($N_{min}$) is based on pup production multiplied by 2.3 (see Appendix 3 for details).

$ Decrease over the last decade. Stable over the long term.

# Appendices

## Appendix 1: Conservation objectives

### Harbour Porpoise

Harbour porpoise is a feature of three SACs in welsh waters, North Anglesey Marine (NAM), West Wales Marine (WWM), and Bristol Channel Approaches (BCA). All sites are single feature sites (harbour porpoise only) and have common conservation objectives. The sites were identified as having persistently higher densities of harbour porpoises (Heinänen and Skov 2015) compared to other areas of the MU. This is likely linked to the habitats within the site providing good feeding opportunities. Therefore, operations within or affecting the site should be managed to ensure that the animals' potential usage of the site is maintained. The relevant conservation objective for collisions/removals is as follows:

**Harbour porpoise is a viable component of the site**

This SAC has been selected primarily based on the long-term, relatively higher densities of porpoise in contrast to other areas of the MU. The implication is that the SAC provides relatively good foraging habitat and may also be used for breeding and calving. However, because the number of harbour porpoise using the site naturally varies (e.g. between seasons), there is no exact number of animals within the site.

The intent of this objective is to minimise the risk of injury and killing or other factors that could restrict the survivability and reproductive potential of harbour porpoise using the site. Specifically, this objective is primarily concerned with operations that would result in unacceptable levels of those impacts on harbour porpoises using the site. Unacceptable levels can be defined as those having an impact on the FCS of the populations of the species in their natural range. The reference population for assessments against this objective is the MU population in which the SAC is situated (IAMMWG 2015).

The harbour porpoise is also a European Protected Species (EPS) listed on Annex IV of the Habitats Directive and as such is protected under the Habitats Directive Article 12 and transposing regulations from deliberate killing (or injury), capture and disturbance throughout its range. In addition, Article 12 (4) of the Habitats Directive is concerned with incidental capture and killing. It states that Member States 'shall establish a system to monitor the incidental capture and killing of the species listed on Annex IV (all cetaceans). In the light of the information gathered, Member States shall take further research or conservation measures as required to ensure that incidental capture and killing does not have a significant negative impact on the species concerned'. Site based measures should therefore be aligned with the existing strict protection measures in place throughout UK waters.

## Bottlenose dolphins and grey seals

Bottlenose dolphin are a feature of Cardigan Bay (CB) and Pen Llyn a'r Sarnau (PLAS) SACs. Grey seal is a feature of PLAS and Pembrokeshire Marine (PM) SAC.

These species and sites have common conservation objectives, the first of which is the most relevant, but aspects of the other objectives are also important for considering impacts from collisions/removals.

**Populations**
The population is maintaining itself on a long-term basis as a viable component of its natural habitat. Important elements include:

- population size
- structure, production
- condition of the species within the site.
- for grey seal, populations should not be reduced as a consequence of human activity.
- for bottlenose dolphin and grey seal, contaminant burdens derived from human activity should be below levels that may cause physiological damage, or immune or reproductive suppression

**Range**
The species population within the site is such that the natural range of the population is not being reduced or likely to be reduced for the foreseeable future.
for bottlenose dolphin and grey seal:

- Their range within the SAC and adjacent inter-connected areas is not constrained or hindered
- There are appropriate and sufficient food resources within the SAC and beyond
- The sites and amount of supporting habitat used by these species are accessible and their extent and quality is stable or increasing

**Supporting habitats and species**
The presence, abundance, condition and diversity of habitats and species required to support this species is such that the distribution, abundance, and populations dynamics of the species within the site and population beyond the site is stable or increasing. Important considerations include:

- distribution
- extent
- structure
- function and quality of habitat
- prey availability and quality.

**As part of this objective it should be noted that:**

- The abundance of prey species subject to existing commercial fisheries needs to be equal to or greater than that required to achieve maximum sustainable yield and secure in the long term.

- The management and control of activities or operations likely to adversely affect the species feature is appropriate for maintaining it in favourable condition and is secure in the long term.
    - Contamination of potential prey species should be below concentrations potentially harmful to their physiological health.
    - Disturbance by human activity is below levels that suppress reproductive success, physiological health or long-term behaviour

**Restoration and recovery**
As part of this objective it should be noted that for the bottlenose dolphin, populations should be increasing.

# Appendix 2: Population modelling approaches used in assessments of effects on Annex II species

Several population modeling approaches can be used to inform consequences of anthropogenic removals of animals from a population. Four approaches are more commonly used in Environmental Impact Assessment (EIA) / HRA and are described here:

1. Interim Population Consequences of Disturbance (iPCOD) is a specific model that predicts what would happen to the population in the long-term if a defined number of animals were removed each year.
2. Population Viability Analysis (PVA) is a type of analysis, similar to PCOD, that predicts effects on population trajectory under competing scenarios. It can include many population parameters (if known) and allows density dependence to be modelled.
3. Potential Biological Removal (PBR) calculates a number of animals that could be removed from the population each year without adversely affecting the long-term growth of the population. In other words, PBR calculates a ‘threshold’ of sustainable mortality.
4. Simple Thresholds (ST) are arbitrary or well-reasoned percentages of the population, above which an effect is thought to occur e.g. 1% of the population.

Other modelling methods are also available e.g. International Whaling Commission’s Revised Management Plan Catch Limit Algorithm (CLA; IWC, 2012), Removals Limit Algorithm (RLA, Hammond et al 2019), but have more restricted use in EIA/HRA and are not considered further here. iPCOD and PVA do not provide ‘thresholds’ or limits above which effects would be considered un-sustainable. Instead, these methods simply predict what might happen to a population with a given number of removals. Simple thresholds, i.e. a percentage of the population, are widely used in conservation and environmental assessments (see review by Sparling et al in prep). Of the procedures outlined above, NRW currently considers PBR to be the most appropriate approach to support a view on AEOSI.

## iPCOD

iPCOD was originally designed to assess effects of disturbance on individual vital rates (such as survival, reproduction and other population dynamic parameters) and subsequent consequences at the population level; it was later adapted to also explore removals e.g. collisions (King et al 2015). The model predicts the long-term population consequences of removing animals and presents simulated trajectories of an impacted population against simulations of an unimpacted population. Where iPCOD is used for collisions only, the model is akin to a PVA but without density dependence. To predict and check the long-term population consequences of a certain level of removals each year, iPCOD requires the user to specify the number of annual removals, for example, the calculated PBR value, which is fixed for the duration of simulation. Our examination of iPCOD, however, revealed that PCOD appears to simply subtract the number of removals each year from the population so that by the end of the simulation period the population has declined by the number of removals multiplied by the number of years. Clearly, iPCOD currently does not appear to simulate a population response that one might expect; for example, where a population reduces at a faster pace than the level of removals due to depensatory density dependence, or that the population reduces at a slower pace or increases as a result of removals, as might be expected in compensatory density dependence. iPCOD does not provide a ‘threshold’ above which an effect would be considered un-sustainable. Instead, it simply predicts what might happen to a population with a given number of removals. Therefore, at present, we do not advocate using iPCOD for assessing consequences of removals as a result of impacts from developments/projects.

## PVA

PVA is a widely used modelling technique to predict the effect of certain actions on populations. It is routinely used in assessing anthropogenic effects on seabird populations where there is data rich information. For marine mammals, however, the reliability of population dynamics data is far more limited than for seabirds and the technique is not as widely used. For PVA, the ability to include a density dependence factor makes the technique advantageous. However, there is severely limited information on density dependence and carrying capacity in marine mammal species and estimating these factors for use in PVA is largely guesswork. PVA is also computationally intensive and requires specialist software which NRW do not currently have access to. Additionally, the use of density dependence in PVA requires an input value for the population at carrying capacity and simulations tend to converge on this population level despite removals and known population trajectories. For example, Lohrengel et al (2018) suggests a significant decline in Cardigan Bay bottlenose dolphin population over the past decade. A PVA of this population, however, suggested a sharp increase in early projected years, despite removals of up to 4 dolphins per year, to a maximum at the chosen carrying capacity. PVA does not provide a ‘threshold’ above which an effect would be considered un-sustainable. Instead, it simply predicts what might happen to a population with a given number of removals. More work is underway to examine PVA for marine mammal populations around Wales, but currently, NRW do not consider PVA to be reliable enough to inform consenting decisions and application assessments.

## PBR

PBR is a simple formula that, based on the present population estimate, predicts how many animals could be removed in the following year without unsustainably reducing the population (assuming that growth rate is optimal) (Wade 1998) (see Document Annex). The method is particularly useful for data poor scenarios/species and has much precedence in its use in managing marine mammal populations e.g. marine mammal bycatch in USA fisheries (MMPA, 2018), seal shooting limits in Scotland (Scottish Government, 2020), and developing mortality thresholds in consenting (it was used as the basis of defining mortality limits in the Adaptive Environmental Management Plan for the DeltaStream tidal development in Ramsey Sound). However, it does not give any long-term forecast of the consequences of anthropogenic removal – it simply calculates an annual number of removals that is thought to be sustainable. Given its simplicity and precedence in use and given the absence of robust population dynamic data for use in other modelling techniques, NRW suggest PBR could be used as the quantitative tool of choice for assessing the amount of removals that might be considered to cause significant population consequences and AEOSI.

In PBR, the population is based on the relevant reference population e.g. a Management Unit (MU: see Evans 2012; IAMMWG 2015; IAMMWG 2020 in prep). PBR is calculated annually and applied at the relevant scale. It gives a number of animals, in excess of natural mortality, that could be removed from the population and represents the level of all anthropogenic take that could be sustained within the relevant area, e.g. MU. Anthropogenic take, therefore, must be considered when using this approach and subtracted from the PBR value. Bycatch in fisheries is the biggest source of anthropogenic mortality for several marine mammal species. Once bycatch is subtracted from the PBR, any remaining take, represents the number of animals that might be able to be additionally removed from the population without significant or adverse population consequences. In a cumulative or in-combination assessment, this remaining portion might need to be proportionally allocated to projects/activities within that MU and it is unlikely that any one project would be allocated the entire PBR allowance; but this allocation is beyond the scope of this Position Statement and is ultimately something for the competent authority(s) to consider in post-consent management.

The PBR values for the three species considered (bottlenose dolphin, harbour porpoise, grey seal) are presented in Table A1. A range of values are generated by varying the Recovery Factor ($F_R$) which relates to a decision on how resilient the population is (0.1 not very resilient – small population, highly protected, vulnerable, to 1.0 very resilient – large, increasing population, not highly protected, not vulnerable) (see Wade 1998). No species under consideration has an $F_R$ greater than 0.5 because the species are all features of SACs.

## Simple thresholds (ST)

ST are widely use in environmental assessments to describe the magnitude of effects. They are also sometimes used as conservation targets. For example, ASCOBANS (the Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas) target for harbour porpoise in the NE Atlantic region suggest no more than 1.7% of best population estimate should be subject to anthropogenic removals; this includes bycatch and other forms of anthropogenic mortality. The target also suggests that no more than 1% should be as a result of bycatch, leaving 0.7% from other (non-natural mortality) causes.

A 1% threshold is frequently used in conservation assessments to infer significance (see Sparling et al in prep for review):
**1. Article 17 of the Habitats Directive**, individual Member States' report FCS using Favourable, Unfavourable-Inadequate or Unfavourable-Bad categories to which quantitative definitions/thresholds have been ascribed.  For example, a population's conservation status will be reported as "Unfavourable-Bad" if population declines more than 1% per year within the reporting period (normally 6 years).
**2a. OSPAR EcoQOs for indicator M3 (seal abundance and Distribution):** No decline in seal abundance of > 1% per year in the previous 6-year period (this is approximately 6% over 6 years).
**2b. OSPAR EcoQOs for indicator M5 (grey seal pup production):** No decline in grey seal pup production of >1% per year in the previous six-year period (a decline of approximately 6% over six years).

**3. Impact assessment for the Norfolk Vanguard Offshore Wind Farm**, defines a ‘high’ magnitude of impact as >1% of the reference population being exposed to permanent effects such as permanent auditory injury for FCS (see Sparling et al in prep).

NRW have not taken ST further in this position statement as it is considered too crude for purposes of defining AEOSI. Instead, PBR is considered to provide more population relevant information.

**Table A1. PBR (green) for bottlenose dolphin, harbour porpoise and grey seal with varying Recovery Factors ($F_R$, grey). The minimum estimates ($N_{min}$, blue) for the Marine Mammal Management Unit or region of interest (spatial scale) is based on the best available information at present (Scale and source). See Appendix 2 for definitions of $N_{min}$ and $F_R$. Values in bold represent the PBR that NRW considers to be the limit of all anthropogenic mortality in the MMMU above which would be considered a significant adverse effect on the population. Anthropogenic removals e.g. bycatch, must be subtracted from the PBR values. The remainder represents the additional mortality from other sources, e.g. tidal turbines, that might be 'allowable'; this is currently zero or less than one.**

| Species | Abundance | $N_{min}$ | PBR | PBR | PBR | PBR | PBR | Scale and source |
|---|---|---|---|---|---|---|---|---|
| $F_R$ | N/A | N/A | 0.1 | **0.2** | 0.3 | 0.4 | **0.5** | N/A |
| Bottlenose dolphin | 293 | 186.2 | 0.37 | **0.74** | 1.12 | 1.49 | 1.86 | **IS MU**; SCANS III (2016), IAMMWG 2020 in prep |
| Harbour porpoise | 62506 | 55948.1 | 111.9 | 223.8 | 335.7 | 447.6 | **559.5** | **CIS MU**; SCANS III/ObSERVE (2016) |
| Grey seal | 10250 | 9430.0 | 56.6 | 113.2 | 169.7 | 226.3 | **282.9** | **SW England, Wales, Ireland**; SCOS (2018) |

Minimum bycatch (see Appendix 3): bottlenose dolphin = 0; harbour porpoise = 620; grey seal = 556

The resulting 'allowable' removal (based on chosen $F_R$) is: bottlenose dolphin = 0.7; harbour porpoise = 0; grey seal = 0.

# Appendix 3: Annex II species of interest: Results of applying PBR to wider population information

The following section outlines the information used in the PBR modelling for Annex II marine mammal species relevant to Wales: Harbour porpoise, bottlenose dolphin and grey seal. A wider population level view is taken. Conclusion subsections describe NRW's (advisory) view on what might constitute significant population level effects and AEOSI.

As a result of the wider MU population connectivity, limited recent evidence on site-based population estimates, and lack of quantitative SAC conservation objectives, a view is taken to determine the level at which significant effects occur at the wider population level and that this is considered to potentially translate to an AEOSI at the site level.

When taking a view on AEOSI, it is noted that we shall consider the most up to date information as the reference point in time to determine effects rather than at the time the sites were designated. This is to ensure that the overarching aim of the Habitats Directive is met where sites (via their conservation objectives) contribute to maintaining or improving population Favourable Conservation Status.

## Bottlenose dolphin

There is strong evidence through photo-ID that coastal bottlenose dolphins in the Irish Sea do not tend to move into Celtic Seas or beyond and are relatively constrained to the Irish Sea Management Unit (Feingold & Evans 2014; Lohrengel et al 2018; Pesante et al 2008b). The largest population of coastal bottlenose dolphins in the UK is found in Cardigan Bay. The population ranges beyond the boundaries of Cardigan Bay and Pen Llŷn a'r Sarnau SACs (of which it is a feature of both) and has been observed throughout the wider management unit (Pesante et al 2008a, b). Photo-ID evidence shows that most individual dolphins move between the two SACs, strongly supporting the idea that the populations of the two SACs are highly connected, and that there is likely a single generic population across the management unit (although a few individuals appear to be faithful to one particular site).

Cardigan Bay SAC is the principal SAC for bottlenose dolphin and was designated primarily (Grade A) for this species, whereas bottlenose dolphins are a secondary (Grade C) feature of Pen Llŷn a'r Sarnau. However, there is no legislative reason why one site would be more important than the other, and given the strong evidence outlined above, we consider the entire Irish sea MU to be a single inter-connected unit. We therefore consider the population associated with PLAS SAC and CB SAC to be the same and that this is broadly equivalent to the population of the wider MU for purpose of assessment of site integrity.

### Latest population estimate:

The most recent estimate for the Irish Sea (IS) MU area (broadly equivalent to ICES Division VIIa) is calculated by IAMMWG (2020 in prep) and uses the SCANS III survey in

2016 where the population is estimated from survey blocks D (10.9), E (278.6) and G (3.6), (Hammond et al 2017) plus the ObSERVE survey around Ireland where the population in the Irish coastal waters of the Irish sea were estimated to be zero (Rogan et al 2018). These estimates are combined to give an updated estimate (from SCANS III only) of 293 (95% CI 108-793, CV 0.54) (IAMMWG 2020 in prep). This estimate is currently considered to be the most representative of the population in the MU. A previous estimate used for the IS MU was 379 (95% CI: 362-414) (IAMMWG 2015 [NB incorrectly stated as 397]) and was derived from composite data from Cardigan Bay SAC between 2001 and 2007 and calculated using a closed population mark-recapture model and adjusted for proportion of marked dolphins (Pesante et al 2008).

The wider Cardigan Bay area is part of the IS MU and the population estimate from this area should be smaller than the estimate for the entire MU. The latest estimate for the wider Cardigan Bay area (using PhotoID and closed population Mark-Recapture models) is 174 (95%CI 150-246) in 2016 (Lohrengel et al 2018). The latest estimate (2016) for Cardigan Bay SAC area only is 147 (95% CI 127-194) (Lohrengel et al 2018). No specific population estimate is possible for PLAS but is considered to host the same population as found in CB SAC.

## Population trajectory:

NRW monitoring of bottlenose dolphins in wider Cardigan Bay indicate that the population has declined over the last 10 years (Lohrengel et al 2018). However, it is unknown whether this apparent decline is related to movement of animals outside of the survey area or a real decline. Nevertheless, the conservation objectives state that the bottlenose population should be increasing. While it may be beyond NRW's control to ensure that the population increases, it is imperative that we do not allow any mortality via consented developments to lead to further decline.

## Population (MU) PBR:

The coastal bottlenose dolphin population is wider than just the SAC and NRW consider the MU level PBR to be the most appropriate scale for inferences made at the SAC level.

Given the small and potentially declining size of the population, the recovery factor ($F_R$, see annex for definition) is set to 0.2. A minimum population ($N_{min}$, 20th percentile of the estimate, see annex for definition) of 186 (based on the MU population of 293) gives a PBR value of 0.74 (see Table A1).

## Bycatch (population [MU]):

There has been limited bycatch of bottlenose dolphin in UK waters from observed fishing vessels. Stranding records also suggest few animals have been subject to bycatch (Deaville pers. comm 2019), indicating there is a potential risk of bycatch but it remains small. There is also no evidence, to our knowledge of bycatch occurring within the Irish Sea MU. For the purposes of modelling, we assumed a bycatch rate of zero.

### Conclusion – Population (MU) and SACs:

We have higher confidence in the use of PBR for bottlenose dolphin than for other species because we know most about this population: we have a good understanding of animal movements, distribution, seasonality and population dynamics; the population estimates (in the low hundreds) appear to be robust and relatively consistent between survey types (SCANS III, NRW monitoring); and bycatch is negligible to absent. The resulting PBR at the MU level is less than 1 dolphin and represents a population that is unlikely to sustain multiple removals per year.

Exceeding this threshold in assessments (0.7 dolphin) would be considered an AEOSI on both PLAS and CB SACs as well as a population level effect.

## Harbour porpoise

Satellite telemetry in Denmark and Greenland indicates that some animals range widely while others show a degree of site fidelity (Nielsen *et al* 2018). However, there are no studies of harbour porpoise movements in UK - there has been no tagging of wild cetaceans in UK waters, and individual identification e.g. through photo ID, is not effective due to the lack of identifying features and the small, elusive nature of the species. However, harbour porpoise are thought to be wide ranging (Read & Westgate 1997; Sveegaard et al 2011), and within the eastern North Atlantic they are generally considered to behave as a 'continuous' biological population that extends from the French coasts of the Bay of Biscay northwards to the arctic waters of Norway and Iceland (Tolley & Rosel 2006; Fontaine et al 2007). For conservation and management purposes, it is useful to divide this population into smaller units where distinct habitat or human pressures – such as bycatch – exist. As such, three porpoise MUs – Celtic and Irish Seas, North Sea, Western Scotland - have been agreed around the UK (IAMMWG 2015), and given the evidence underpinning the creation of MUs, we consider the population associated with each MU to form a single inter-connected unit that represents an appropriate scale for wider management of the population. Fontaine et al (2017), however, recently found some genetic and morphological differentiation in porpoise populations in the NE Atlantic. Around western parts of the British Isles and Bay of Biscay there is a mixing zone between Iberian and North Atlantic 'types' which has led the North Atlantic Marine Mammal Commission (NAMMCO) to propose separate stock identities for West Scotland/Ireland, Celtic Seas and Irish Seas (NAMMCO 2019; NAMMCO/IMR 2019). These stock assessment units differ from management units used by the IAMMWG (SNCBs) and the MSFD/ICES Assessment Units. Further work by the SNCBs is underway to examine these findings.

The three harbour porpoise sites around Wales are part of the Celtic and Irish Seas (CIS) MU (IAMMWG, 2015). The sites do not have site-level populations as such, but the population using the sites is that of CIS MU, as described in the conservation objectives/Reg 18/37 package. Unacceptable levels of impact – in this case removals from collision - can be defined as having an impact on the FCS of the populations of the species in their natural range. The reference population for assessments against the 'viability' SAC conservation objective is therefore the MU population in which the SAC is situated.

## Latest population (MU) estimate:

The abundance estimate of harbour porpoise in the Celtic & Irish Seas (CIS) MU in 2016 was 62,506 (95% CI 48,316 – 80,864, CV=0.13). Calculations are made from SCANS III (Hammond et al 2017) and the Irish ObSERVE (Rogan et al 2018) surveys undertaken in 2016 (IAMMWG 2020 in prep) and currently represent the best available information at the regional scale.

## Population (MU) trajectory:

From SCANS II survey in 2005 (as amended: see Hammond et al., 2017 for details of model revision) the population estimate of CIS MU was revised to be 98,807 (95% CI: 57,305-170,336) (IAMMWG 2015 as amended; IAMMWG 2020 in prep). The reduction between SCANS II and III surveys of 36,301 porpoises over an 11-year gap equates to a loss of approximately 3,300 porpoises per year or an annual decline of approximately 3.3%. However, it is unknown whether this apparent decrease is related to a range shift of animals relative to the survey area or a real decline.

## PBR population (MU):

Based on the latest estimate of harbour porpoise in CIS MU, the minimum population used in the calculation is 55,948 ($N_{min}$, 20$^{th}$ percentile of the estimate, see annex for definition) and the resulting PBR = 560 (see Table A1). This is derived using a conservative recovery factor ($F_R$, see annex for definition) of 0.5, which potentially could be revised downwards given the possible trajectory of the population and would result in a lower PBR value.

## Bycatch population (MU):

The best estimate of bycatch in the Celtic Seas region (ICES area VII – broadly equivalent to CIS) is 620 – 1391 and was estimated in 2016 (ICES 2018). Although there is a great deal of uncertainty in the estimates of bycatch, the lowest estimate (620) exceeds the PBR by approximately 11% and is approximately 1% of the population in the MU. The bycatch level used in the recent MSFD assessment, however, was based on 2013 bycatch estimates and is higher than that presented above: see Mitchell et al (2018). Additionally, the bycatch estimate for UK gillnet fisheries in 2017 (with no pinger use) was 1282 (95% CI: 718 – 2402) and the estimates for ICES Divisions relevant for CIS region (see Fig 1, seals) summed to 819 (see Table A2.4, Northridge et al 2017).

*Conclusion: population (MU):*
Based on the latest estimates of bycatch, which all exceed the PBR, any additional anthropogenic mortality of harbour porpoise might be considered unsustainable and could further contribute to population decline. If bycatch of harbour porpoise continues at levels seen in previous years, however, it will most likely exceed the PBR for this species in 2020 and beyond.

As the effective additional 'allowable' take is zero, because fishery bycatch exceeds the PBR, the allocation of potential mortality to other marine industries becomes problematic. NRW believe, however, that a small amount of additional mortality is unlikely to adversely compromise the population of approximately 62,000 or result in AEOSI. However, as the number of removals (e.g. predicted collisions) increases, so does the risk that AEOSI cannot be ruled out.

Determining AEOSI is thus reliant on expert judgement on a case by case basis. Specific quantified site-level thresholds above which AEOSI cannot be ruled out is not proposed, however, as NRW feel they cannot be reliably defined.

## Grey seal

- There is strong evidence (through photo-ID and tagging studies) that grey seals range among the three Welsh SACs and beyond throughout the regional seas (OSPAR Region III area: western coast of Great Britain and neighbouring areas) (Baines *et al*., 1995; Carter and Russell 2018; Cronin et al 2016; Jessopp et al 2013; Jones et al 2013; Keily et al 2000; Langley et al 2018, 2020; Pomeroy et al 2014; Russell et al 2017; Thompson 2011; Vincent et al 2005, 2017). The evidence shows that individual grey seals move between the sites, supporting the notion that the SACs are connected, and that there is likely a single generic population using the region. There is strong evidence that Pembrokeshire Marine SAC is the most important site in the region due to the highest numbers of pups being born there annually (Baines et al 1995; Keily et al 2000; McMath & Stringell 2006; Strong et al 2006).
- Grey seals show strong site fidelity during the pupping season (Langley et al 2018, 2020; Pomeroy et al 2000), when they give birth and nurse pups on land. The population can therefore be considered a closed population during pupping time and the notion of a SAC population makes some sense during this time. Outside of this season, seals still rely on land for moulting and resting but are less site faithful, with animals dispersed over a wider area (SCOS 2017). Thus, we see a difference in the grey seal population distribution at different times of the year, and animals may be more sensitive to disturbance during pupping and moulting times. Nevertheless, the conservation objectives of Welsh SACs relate to the species in general rather than any specific life stage. It therefore makes sense to consider the population level effects at a wider scale through the PBR process and consider site specific evidence where available. We only have recent (within last 5 years) estimates of SAC level pup production for PLAS SAC and describe a putative SAC population estimate for this site based on pup production. We have older data on pup production in Pembrokeshire Marine SAC and no relevant data for Cardigan Bay SAC. We assert, however, that effects on the wider population should be considered when drawing conclusions on AEOSI given the interconnectivity of the population in the region.

### Latest wider population estimate:

The UK's Special Committee on Seals (SCOS) 2018 report (SCOS 2018) provides a PBR value for SW England, Wales and Ireland, and here we use this as an interim measure for a reference population for the relevant region (part of the OSPAR Region III area which NRW currently considers to be the wider MU scale, see Figure A1). SCOS (2018) report on a pup production of 4,100 for this area which is approximately a minimum population of 10,250 (multiplying pup production by a ratio of 2.5 pups to adults (see Stringell et al 2013 for information on ratios)).

## Latest PLAS SAC estimate:

Robinson et al (2020, in prep) suggests a minimum of 96 pups were born in PLAS SAC in 2017, of which 80% are born on Bardsey Island. Multiplying pup production by a ratio of 2.5 pups to adults (see Stringell et al 2013 for information on ratios), an indicative SAC population during pupping time is estimated to be a minimum of approximately 240.

## Latest PM SAC estimate:

The most recent estimate of pup production for the majority of pupping sites in PM SAC is from Strong et al 2006. Although dated, it provides a basis of assessment and is the best available information currently at this scale as it represents pup counts from the whole of North Pembrokeshire coast including Ramsey Island and Skomer MNR. Total pup production here in 2005 was 679 (Table 10, Strong et al 2006). Multiplying pup production by a ratio of 2.5 pups to adults (as above), an indicative SAC population is estimated to be a minimum of approximately 1,698.

## Latest CB SAC estimate:

No reliable estimates exist for Cardigan Bay SAC; data from sites surveyed in Baines et al 1995 do not cover the full extent of CB SAC and are dated. In absence of data, we are unable to propose a site-based population estimate based on pup production.

## Wider Population trajectory:

Indications at the UK scale and in SW England, Wales and Ireland (SCOS 2018) are that the populations of grey seals are increasing.

## PLAS SAC trajectory:

Although we do not have an historical estimate for the number of pups in the whole of PLAS SAC, a recent pup census in North Wales region (Robinson et al 2020) indicated an approximate doubling of pup production (~200) since the previous censuses of the region in 2001, 2002 and 2004 – which all had approximately the same pup production (~100 pups). Data collected on Bardsey Island over the past 10 years suggests numbers there have also increased (NRW/RSPB data unpublished). At the time of SAC designation (around 2002), the population of pups was therefore likely to be about half of what it is today. The trajectory, therefore, is that the SAC population of grey seals has increased, although we do not know if it is continuing to increase.

## PM SAC trajectory:

At monitored sites in Wales (Skomer Island and MNR Mainland: Bull et al 2018a, b; Ramsey Island: Morgan et al 2018), pup production has increased. However, there is a great deal of variation among sites in close proximity (Engbo et al 2020) with some broad areas stabilising (Skomer) while others are increasing (e.g. Marloes, Ramsey).

## CB SAC ‘population’ trajectory:

No reliable estimates exist for Cardigan Bay SAC, but we suspect pup production is also increasing here as it is in other parts of the region.

## PBR for wider population:

Based on a $N_{min}$ (see appendix for definition) of 2.3*pup production of 4,100 = 9,430 (taken from SCOS 2018) and a conservative recovery factor of 0.5, the PBR for SW England, Wales and Ireland = 283.

## Bycatch in wider population:

The best estimate of bycatch in SW England, Wales and Ireland is approximately 556, which is derived from 369 in UK (Northridge et al 2018; SCOS 2018 adjusted) and 187 from Ireland (Cosgrove et al 2013) (see Fig 1). This bycatch estimate is highly uncertain, however, because Irish data is at least 4 years older than the UK data and represents an historical view. Most, if not all, fishery bycatch occurs in UK and Irish offshore waters, particularly in the southwest approaches and Celtic seas. Estimates in UK are for UK vessels only fishing in UK waters. The majority of seals caught are juvenile grey seals whose origin are unknown but likely to be within the MU. Further details can be found in the annual DEFRA bycatch and SCOS reports. Nevertheless, bycatch is undoubtedly larger than PBR and this bycatch estimate exceeds the PBR by approximately 96% and is approximately 5% of the population in the region. Just using the UK bycatch estimate exceeds the PBR by 30% and is approximately 3.6% of the population in the region. If bycatch of grey seal continues at levels seen in previous years, it will most likely exceed the PBR for this species for the foreseeable future.

## Conclusion – Wider Population:

Despite the level of bycatch, even at a minimum, being considerably larger than the PBR, the population of grey seals in the region is increasing. This suggests that the population is not of ‘conservation concern’ (SCOS, 2018). As such, the reliance on PBR on its own for this species population is questioned and its use for evaluating the risk of removals in consenting advice requires supplementary professional judgement.

As the effective additional ‘allowable’ take is zero, because the PBR is exceeded by fishery bycatch, the allocation of potential mortality to other marine industries becomes problematic. NRW believe, however, that a small amount of additional mortality is unlikely to adversely compromise the increasing population of approximately 6,000 or result in AEOSI. However, as the number of removals (e.g. predicted collisions) increases, so does the risk that AEOSI cannot be ruled out.

Determining AEOSI is thus reliant on expert judgement on a case by case basis. Specific quantified site-level thresholds above which AEOSI cannot be ruled out is not proposed as NRW feel they cannot be reliably defined.

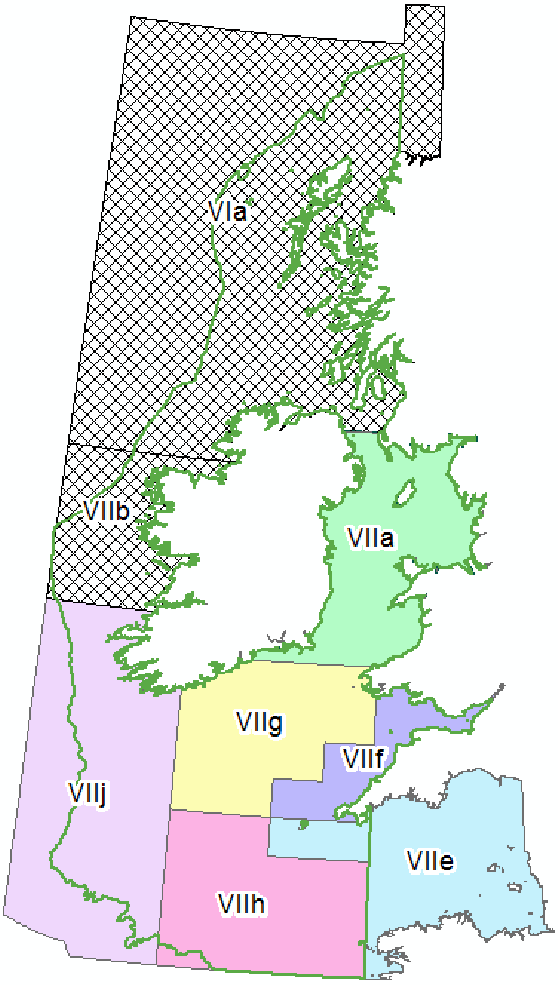


***Figure A1***. *OSPAR Region III area (green continuous line) and overlapping ICES areas (VIIa etc) where grey seal bycatch estimates in net fisheries exist. Grey seal bycatch is estimated to be 556 in the non hatched/coloured ICES areas (187 in Ireland [Cosgrove et al 2013] plus 369 in UK [Northridge et al 2018, Table A2.11, and SCOS 2018, Table 8 p54 minus ICES Division 8abcd: estimates for 2017]. The hatched ICES areas VIa and VIIb do not have bycatch estimates reported in Northridge et al (2018)*

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# Document Annex: The PBR calculation

$$PBR = N_{min} \cdot \left(\frac{R_{max}}{2}\right) \cdot F_R$$

Where:

$PBR$ is the number of animals considered safely removable from the population.

$R_{max}$ is the population growth rate at low densities (by default set to 0.12 for pinnipeds and 0.04 for cetaceans), this is halved to give an estimate of the growth rate at higher populations. This estimate should be conservative for most populations.

$F_R$ is a recovery factor, usually in the range 0.1 to 1. Low recovery factors give some protection from stochastic effects and overestimation of the other parameters. They also increase the expected equilibrium population size under the PBR.

$N_{min}$ is a minimum population estimate (usually the 20$^{th}$ percentile of distribution, equivalent to the lower limit of a 60% 2-tailed confidence interval).

If $N_{min}$ is not known, it can be approximated using the following formula:

$$N_{min} = N \cdot e^{(Z \cdot CV_N)}$$

Where:

$N$ is the abundance estimate

$CV_N$ is the Coefficient of Variation (CV) of N

$Z$ is -0.84.

Adapted from:

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