Cyfoeth Naturiol Cymru
Natural Resources Wales

Underwater Noise & Marine Mammals

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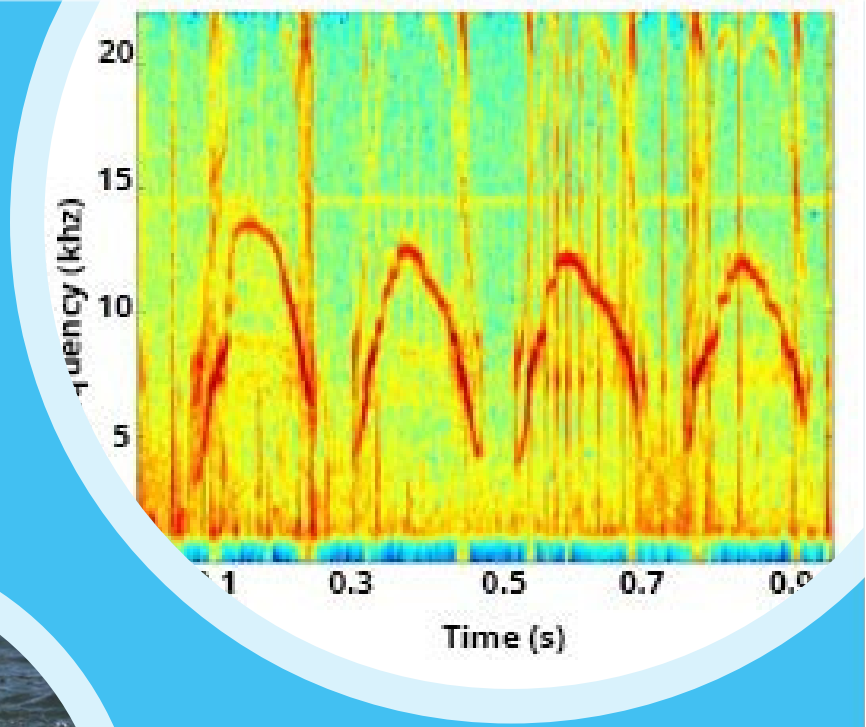
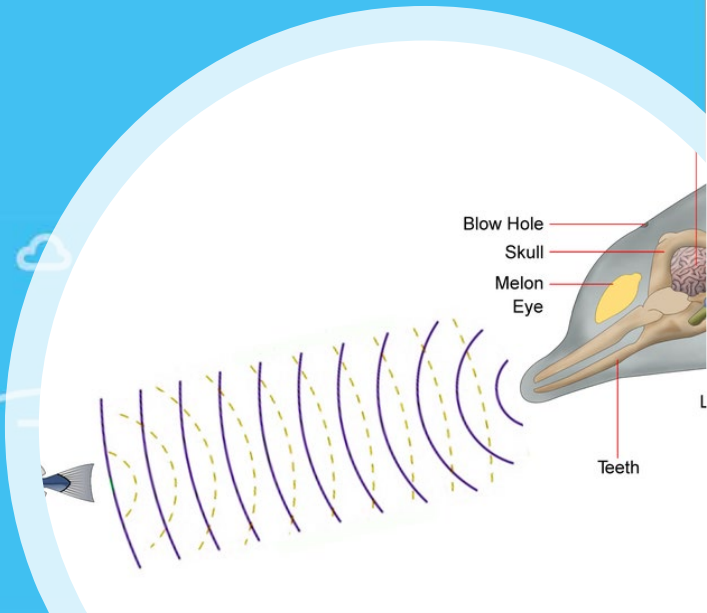
June 2021





Marine mammals in Wales

29 different species of whales & dolphins documented in the UK
18 recorded in Welsh waters since 1990
The most common marine mammals in Wales are:

Key legislation

- Wildlife and Countryside Act 1981 (as amended) – Sites of Special Scientific Interest (SSSI)
- Conservation of Seals Act 1970
- Marine and Coastal Access Act 2009
- Fisheries Act 2020
- Habitats Directive Annex IV European Protected Species (EPS); cetaceans but not seals
- Habitats Directive Annex II; Special Areas of Conservation (SACs); 3 species in Wales

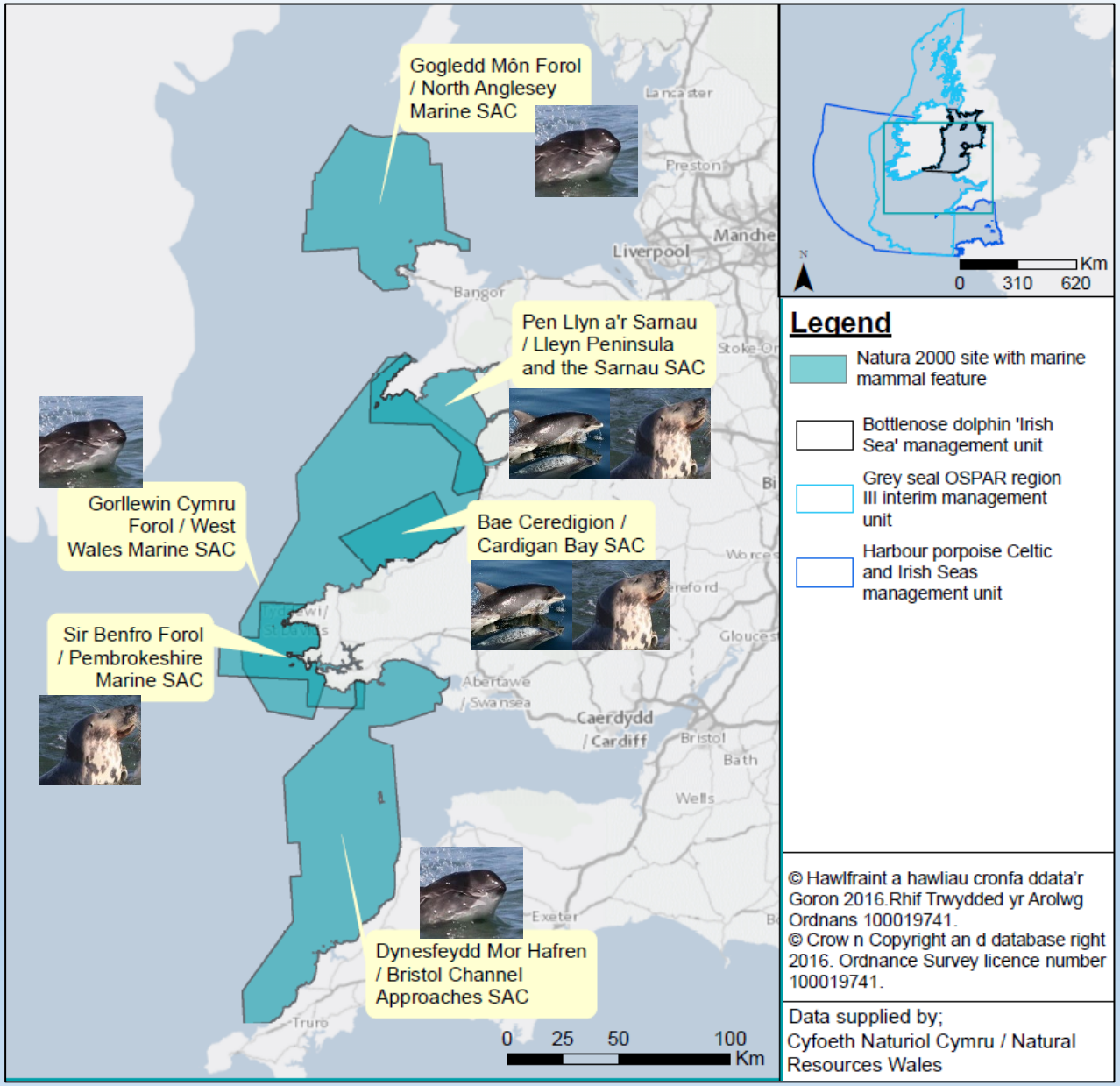
Conservation objectives (bottlenose dolphin & grey seal);

- Populations maintaining long term (size, structure, production)
- Natural range is not reduced
- habitats and species required to support the species are stable or increasing
- for bottlenose dolphin, populations should be increasing.

Conservation objectives (harbour porpoise);

- Harbour porpoise is a viable component of the site
- There is no significant disturbance of the species
- The condition of supporting habitats and processes, and the availability of prey is maintained

Marine Mammal SACs summary



Bottlenose dolphin

- Cardigan Bay/ Bae Ceredigion
- Pen Llŷn a'r Sarnau / Lleyn Peninsula and the Sarnau

Grey seal

- Cardigan Bay/ Bae Ceredigion
- Pen Llŷn a'r Sarnau / Lleyn Peninsula and the Sarnau
- Pembrokeshire Marine / Sir Benfro Forol

Harbour porpoise

- North Anglesey Marine / Gogledd Môn Forol
- West Wales Marine / Gorllewin Cymru Forol
- Bristol Channel Approaches / Dynesfeydd Môr Hafren

Marine Mammal Management Units & SACs

Why do we use them?

Marine mammal species are often highly mobile with large populations that move between protected sites

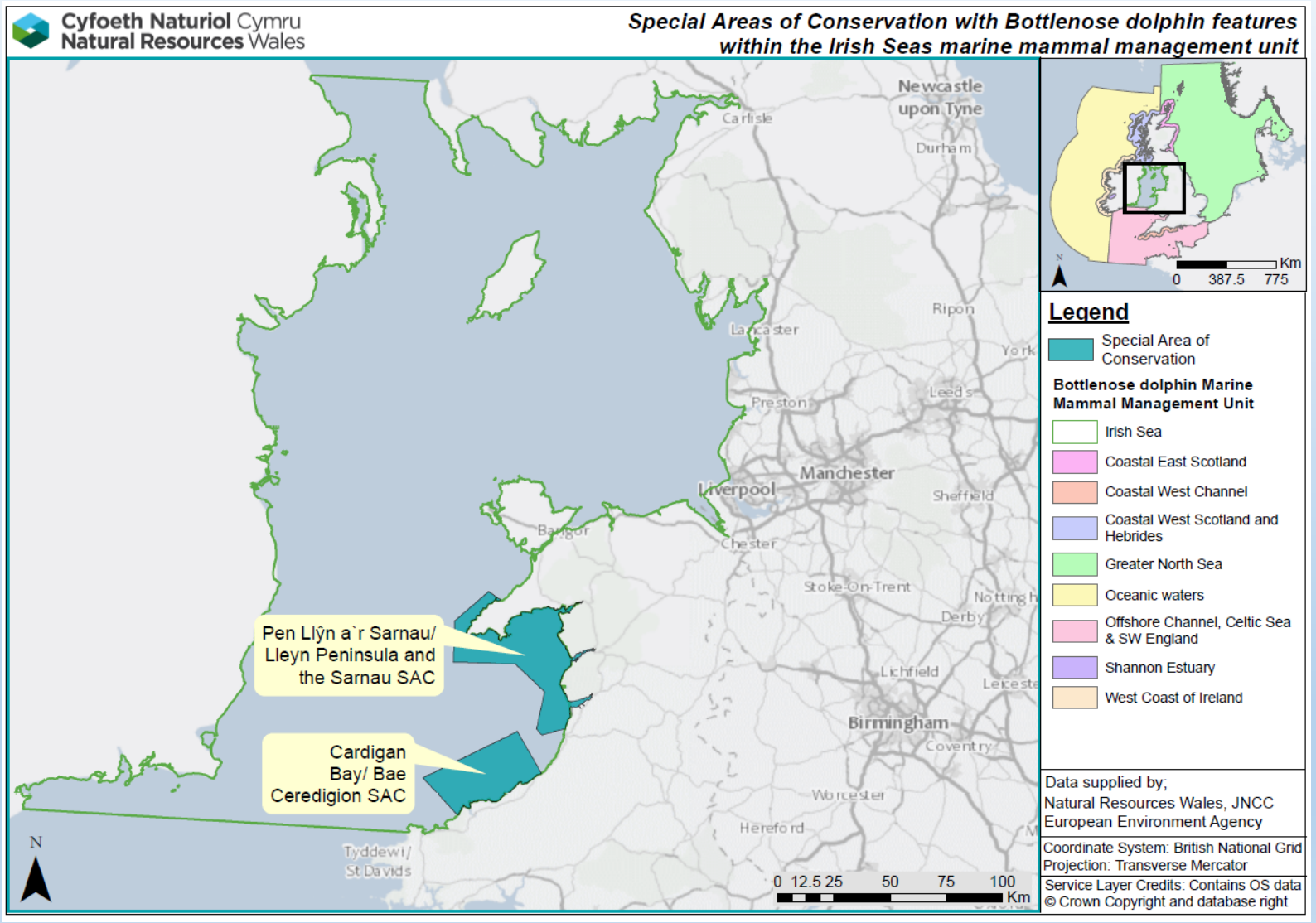
What is a MMMU?

A spatial region representing differentiation of mobile populations but also political or other boundaries relevant to the management of human activities

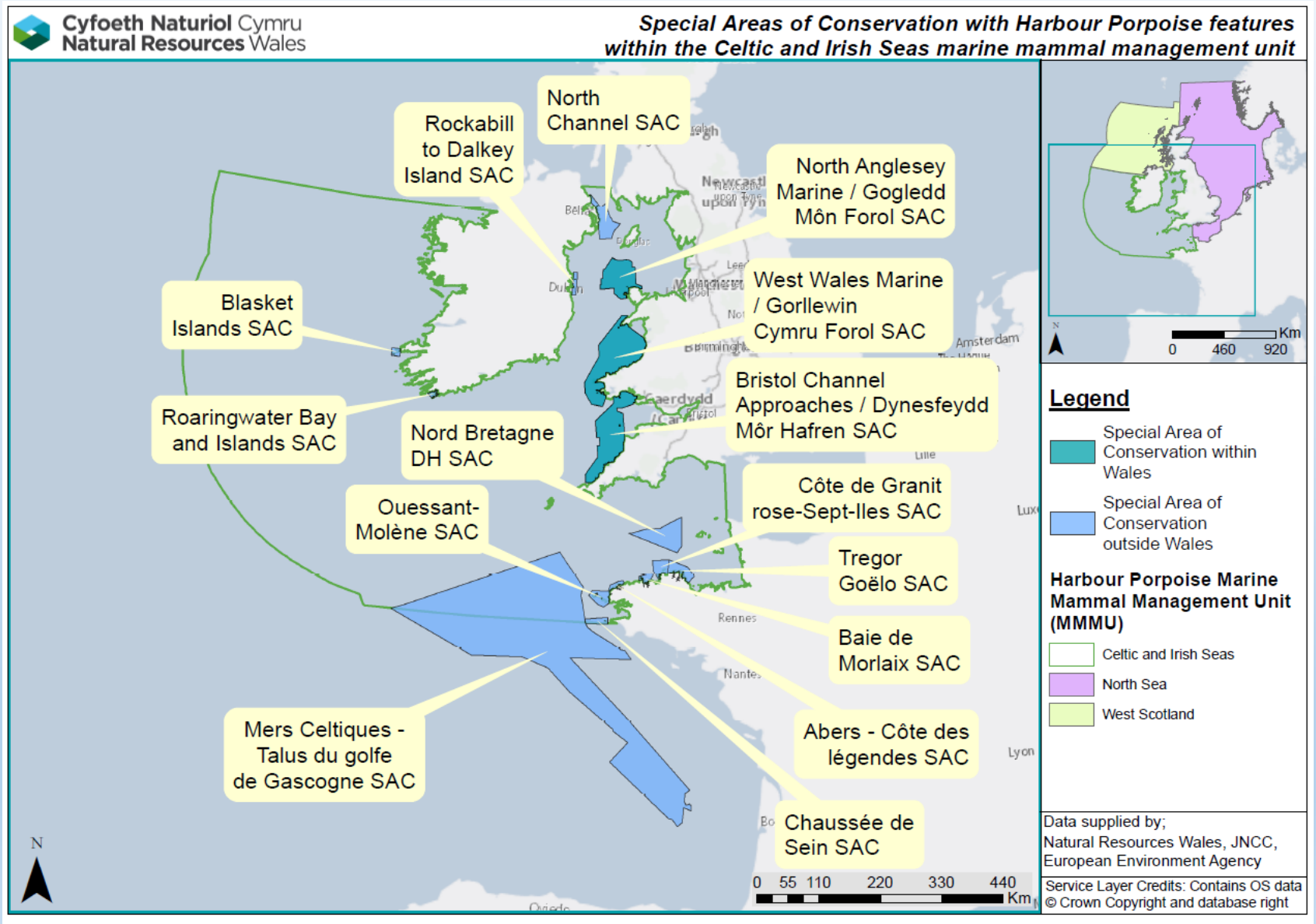
How do we use them?

NRW advise the use of MMMUs for screening in HRA but may consider other approaches where adequately justified.

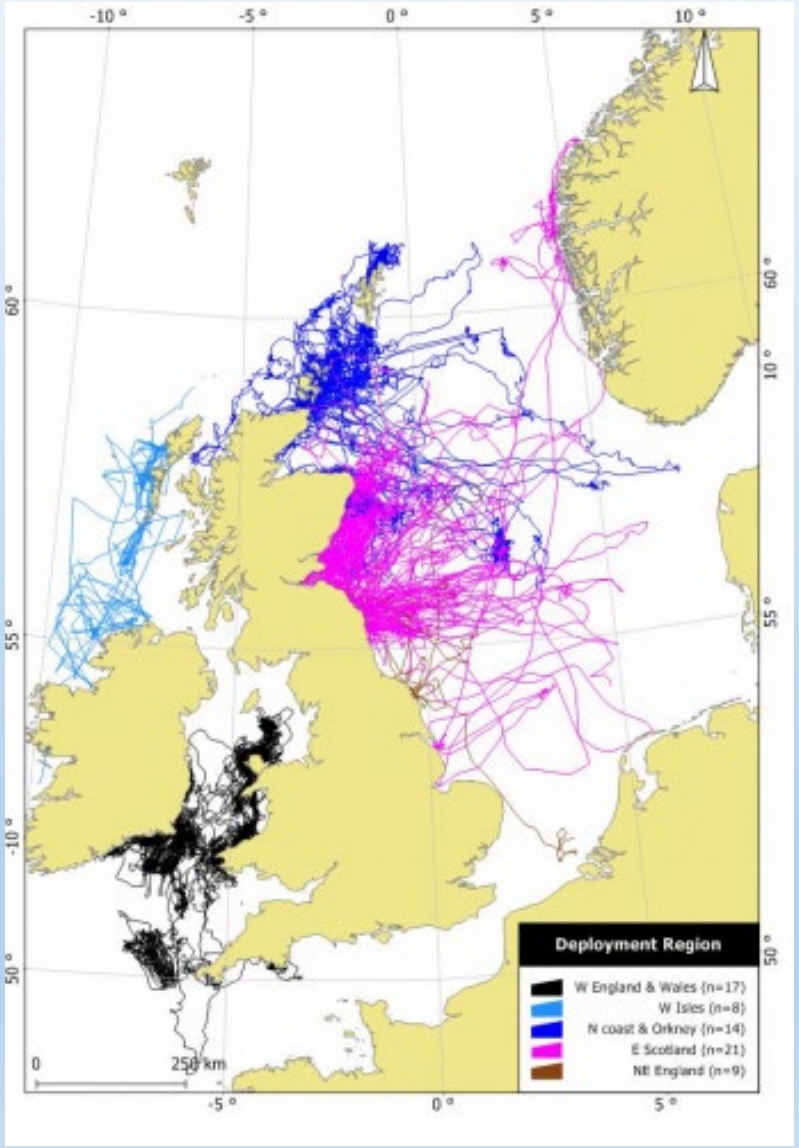
Marine Mammal Management Units & SACs: Bottlenose dolphin

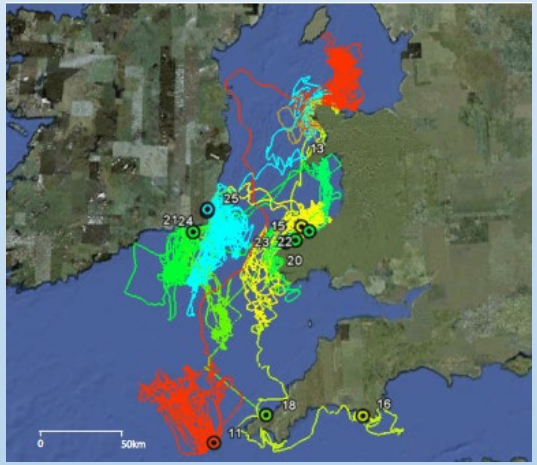


Marine Mammal Management Units & SACs: Harbour Porpoise



Marine Mammal Management Units & SACs: Grey seal





Impact pathways

- Bycatch (not project derived)
- Underwater Noise
  - Physical injury / hearing damage
  - Behavioural disturbance (displacement, masking)
- Pollution
- Collision
- Changes in prey availability or distribution
- Changes in the physical environment (sedimentation, deoxygenation, currents)
- Barrier effects – physical e.g. tidal arrays; disturbance e.g. underwater noise

Critical impact pathways

- **Bycatch (not project derived)**
  - Recent figures for relevant MMMU (year); 620-1391 porpoise[1], ~556 grey seal[2], 0 bottlenose dolphin
- **Behavioural disturbance from underwater noise**
  - Significant disturbance for a porpoise SAC defined as 20% of an SAC in one day or 10% over a season. Disturbance is undefined for other species
- **Physical injury from underwater noise** - National Marine Fisheries Service guidelines
  - Temporary threshold shift – temporary hearing impairment
  - Permanent threshold shift – permanent hearing impairment, generally believed to be fatal
- **Collision**
  - Can be with vessels or subsurface infrastructure

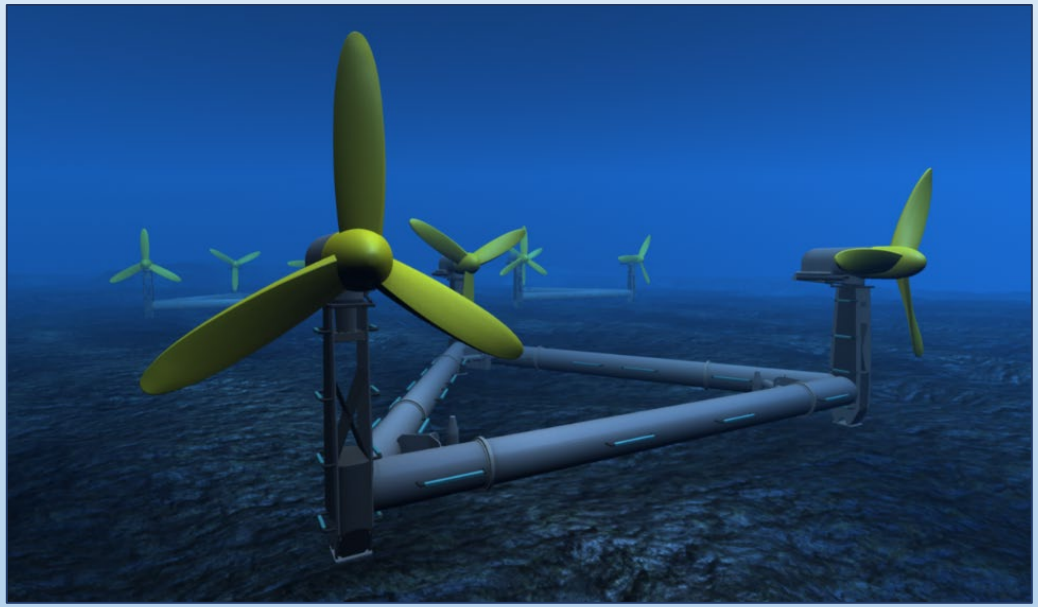
[1] ICES. (2018). Report from the Working Group on Bycatch of Protected Species (WGBYC), 1–4 May 2018, Reykjavik, Iceland. ICES CM 2018/ACOM:25. 128 p

[2] Northridge, S, Kingson A, Thomas L. (2018). Annual report on the implementation of Council Regulation (EC) No 812/2004 during 2017

Man-made underwater noise

Impulsive

Continuous



Potential noise impacts - Habs regs

The Conservation of Habitats and Species Regulations 2017, prohibits ‘deliberate capture, injury, killing or disturbance of any wild animal of a European protected species’

- ‘Deliberate’ = foreseeable even if not intended
- Injury = Permanent Threshold Shift
- Disturbance = Population scale effects – e.g. impairing fitness, or affecting local distribution

Assessment of noise impacts

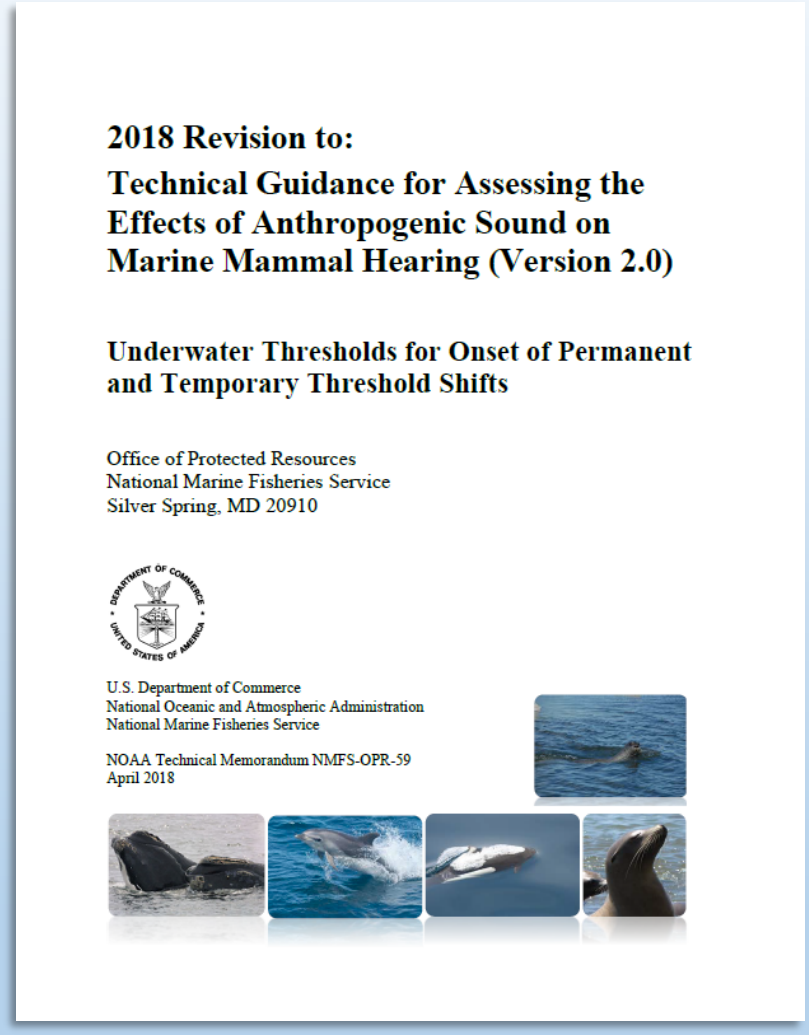
Injury

- NMFS (2018) a.k.a. Southall Criteria

Table ES1: Marine mammal hearing groups.

Hearing Group	Generalized Hearing Range*
Low-frequency (LF) cetaceans (baleen whales)	7 Hz to 35 kHz
Mid-frequency (MF) cetaceans (dolphins, toothed whales, beaked whales, bottlenose whales)	150 Hz to 160 kHz
High-frequency (HF) cetaceans (true porpoises, *Kogia*, river dolphins, cephalorhynchid, *Lagenorhynchus cruciger* & *L. australis*)	275 Hz to 160 kHz
Phocid pinnipeds (PW) (underwater) (true seals)	50 Hz to 86 kHz
Otariid pinnipeds (OW) (underwater) (sea lions and fur seals)	60 Hz to 39 kHz

* Represents the generalized hearing range for the entire group as a composite (i.e., all species within the group), where individual species' hearing ranges are typically not as broad. Generalized hearing range chosen based on ~65 dB threshold from normalized composite audiogram, with the exception for lower limits for LF cetaceans (Southall et al. 2007) and PW pinniped (approximation).



Assessment of noise impacts

Table ES3: Summary of PTS onset thresholds.

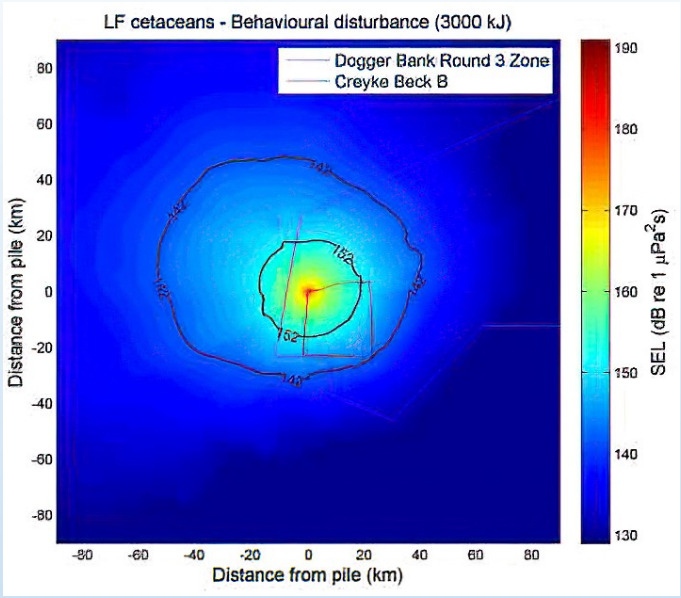
	PTS Onset Thresholds* (Received Level)	
Hearing Group	**Impulsive**	**Non-impulsive**
Low-Frequency (LF) Cetaceans	*Cell 1* $L_{p,0\text{-pk,flat}}$: 219 dB $L_{E,p,\text{LF,24h}}$: 183 dB	*Cell 2* $L_{E,p,\text{LF,24h}}$: 199 dB
Mid-Frequency (MF) Cetaceans	*Cell 3* $L_{p,0\text{-pk,flat}}$: 230 dB $L_{E,p,\text{MF,24h}}$: 185 dB	*Cell 4* $L_{E,p,\text{MF,24h}}$: 198 dB
High-Frequency (HF) Cetaceans	*Cell 5* $L_{p,0\text{-pk,flat}}$: 202 dB $L_{E,p,\text{HF,24h}}$: 155 dB	*Cell 6* $L_{E,p,\text{HF,24h}}$: 173 dB
Phocid Pinnipeds (PW) (Underwater)	*Cell 7* $L_{p,0\text{-pk,flat}}$: 218 dB $L_{E,p,\text{PW,24h}}$: 185 dB	*Cell 8* $L_{E,p,\text{PW,24h}}$: 201 dB
Otariid Pinnipeds (OW) (Underwater)	*Cell 9* $L_{p,0\text{-pk,flat}}$: 232 dB $L_{E,p,\text{OW,24h}}$: 203 dB	*Cell 10* $L_{E,p,\text{OW,24h}}$: 219 dB

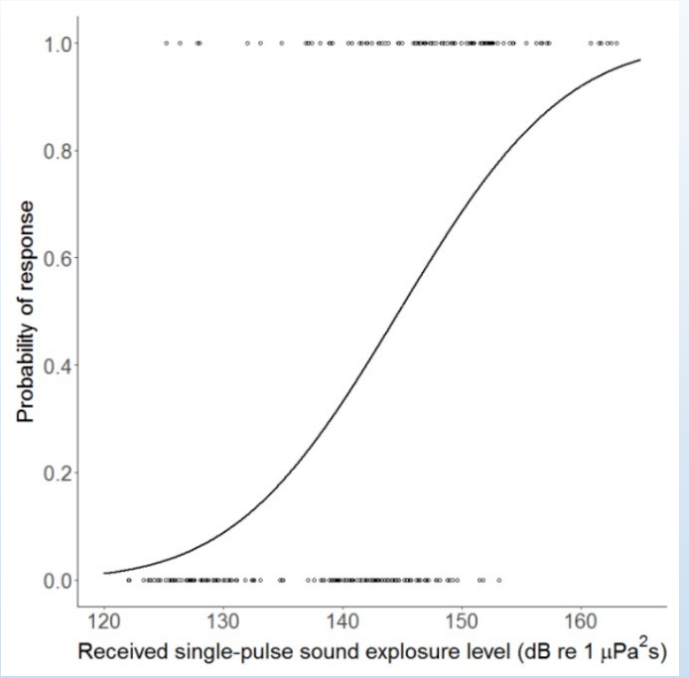
* Dual metric thresholds for impulsive sounds: Use whichever results in the largest isopleth for calculating PTS onset. If a non-impulsive sound has the potential of exceeding the peak sound pressure level thresholds associated with impulsive sounds, these thresholds are recommended for consideration.

Assessment of noise impacts

Carrying out an assessment

❑Source level i.e. How loud is it?
❑ Frequency i.e. can animals hear it? Is it within sensitive hearing range?
❑ How far does the noise/impact propagate?
❑ How does that relate to background ambient noise?





Assess likelihood of injury

- ❑ If injury can't be ruled out may need Species licence for injury
- ❑ Population level impact?

Assess impact of disturbance

- ❑ Area disturbed? Relevant for some SAC Cons Obj.
- ❑ Outside SACs… qualitative judgement

Noise Disturbance

❑Standard deterrent radii (aka EDRs)

❑Noise thresholds (e.g. TTS & PTS [NMFS, 2018]; 120 dB for behavioural disturbance [Southall *et al.,* 2007]; 160 dB for level B harassment [NMFS,1995])

❑Dose-Response curves

Mitigation for injury and behavioural effects

Standard Mitigation for injury

- Protocols to ensure marine mammals are at a safe distance before commencement e.g.
  - Marine Mammal Observers (MMO)
  - Passive Acoustic Monitoring (PAM)
  - Acoustic Deterrent Devices (ADD)
  - But they do nothing to reduce noise or mitigate disturbance!

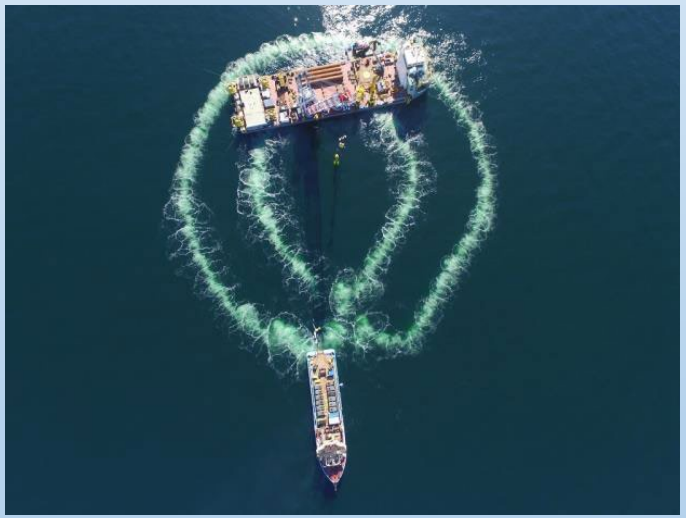
Noise abatement

Primary Methods

- ❑BLUE piling
- ❑Vibratory hammer

Secondary methods

- ❑Far from pile
  - Big bubble curtains (BBC) / Double BBC
- ❑Near-pile
  - IHC noise mitigation system
  - HydroNAS
  - Hydrosound damper
  - AdBM noise abatement system



Current work

- **Bycatch (not project derived)**
  - Clean Catch - UK research programme
  - UK Bycatch monitoring scheme
  - Cetacean Strandings Investigation Programme

- **Sensitivity analysis of population models**

- **Review and Recommendations on assessment of noise disturbance for marine mammals (with SMRU)**

- **Improving accuracy of bycatch estimates in Welsh waters**

- **Noise modelling and parameter sensitivity in Welsh waters**

Wally the Walrus

Sunning himself on the RNLI lifeboat slipway in Tenby

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Wally the Walrus takes a nap on Isles of Scilly fishing boat

1 day ago

Wally took some time out on a fishing boat moored off St Martin's

Wally the Walrus's adventures have continued with the latest sighting showing him resting on a fishing boat.

The Arctic walrus was **first seen on the Isles of Scilly last Thursday**, and seems to have taken a liking to the islands having boarded a boat off St Martin's on Tuesday.

Diolch - Thank You