Seal Tagging Feasibility

Ellena Consadine, North West Marine Futures Internship 2024

Cumbria Wildlife Trust- South Walney Nature Reserve

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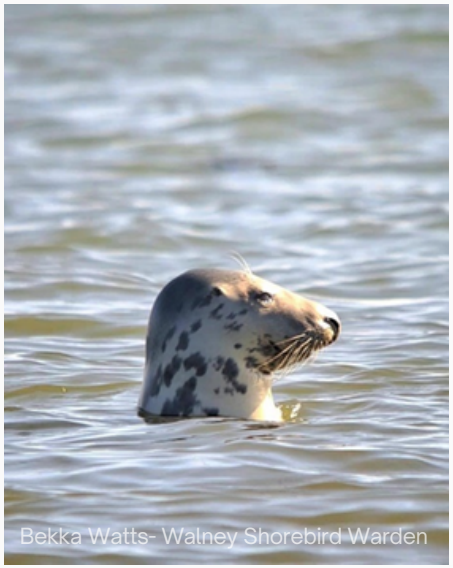

Bekka Watts- Walney Shorebird Warden

PREPARED BY

Ellena Consadine

PREPARED FOR

Cumbria Wildlife Trust
Ørsted
The Crown Estate
Natural England

In the face of increasing offshore developments in the Irish Sea, with the aim of decarbonising UK energy supply and reaching net zero targets, there is more demand for research to illustrate the impacts of the industry on marine biodiversity.

Grey seals (*Halichoerus grypus)* at South Walney Nature Reserve have the potential to interact with offshore developments off the Cumbrian coast, and throughout the Irish Sea. Annual monitoring of the colony by Cumbria Wildlife Trust, shows the population has increased significantly since the early 2000's. Speculation about the cause of this increase, and relationship with nearby wind farm arrays, has led Marine Futures Internship project partners to consider tagging studies as a way to investigate interactions.

Several considerations must be made before commencing such a study. These include; scientific justification of invasive research with a high potential of disturbance to the seals, the practicalities of deploying tags at South Walney, and possible alternative methods resulting in outputs to answer the research question.

This report contains discussion of the practicalities of a satellite telemetry tagging study, as described by the Sea Mammal Research Unit, St Andrews. Details of site-specific considerations as highlighted by Cumbria Wildlife Trust are described, as well as a risk assessment for the study. Alternative methods of research are compared, in response to the identified risks and to ethical concerns raised by The Seal Alliance, with guidance from their Key Principles for conducting research.

Background

Figure 1: Grey seals at South Walney, photograph taken from the angle at which Cumbria Wildlife Trust seal counts take place.

Grey seals (*Halichoerus grypus*) in the United Kingdom are protected under the UK Conservation of Seals Act (1970) and Marine Scotland Act (2010) . Both of these legislatures call for monitoring and maintenance of population data in order to address conservation concerns, and for use in marine spatial planning (Russel et al., 2019). Research into the effects of marine developments, such as offshore wind farms, on marine mammals has been particularly focused on noise disturbance during pile-driving and the construction phase in general. There is some existing research suggesting marine mammals may benefit from artificial reefs formed at the base of offshore wind farm arrays, with tagging studies showing patterns of grey seals following structures on the benthos in what is assumed to be foraging trips (Russell et al., 2014).

On the North West coast, the only recorded haul out site of grey seals is located on South Walney Nature Reserve (SWNR) on Walney Island, Cumbria (Figure 1). This population sits within 30km of nearby offshore wind farms in the Irish Sea, managed by Ørsted (Figure 2). The question of whether the increase in seals at South Walney (S.Walney) and the increase in nearby offshore wind developments are related is one that has been suggested as an area for investigation by Ørsted and project partners. As the Irish Sea continues to be a space used for offshore developments in order to meet renewable energy targets, it is important to understand the potential impact on marine mammals. While there is existing data showing movements of grey seals in relation to offshore wind arrays around the UK, the question of whether those interactions are occurring off the coast of Cumbria remains unknown. There are also questions from organisations around the Irish Sea about how interconnected numerous haul-out sites are. However, it needs to be considered whether answering those questions is enough justification for conducting a tagging study which would inevitably cause disturbance to the seals. Therefore, the risks to wellbeing of the seals, and the benefits to scientific understanding need to be weighed when considering the feasibility of conducting such a study.

Figure 2: Offshore Windfarm site agreements (polygons) and seal locations (Calf of Man, Isle of Man- yellow point and South Walney, Cumbria- blue point)

Partner involvement

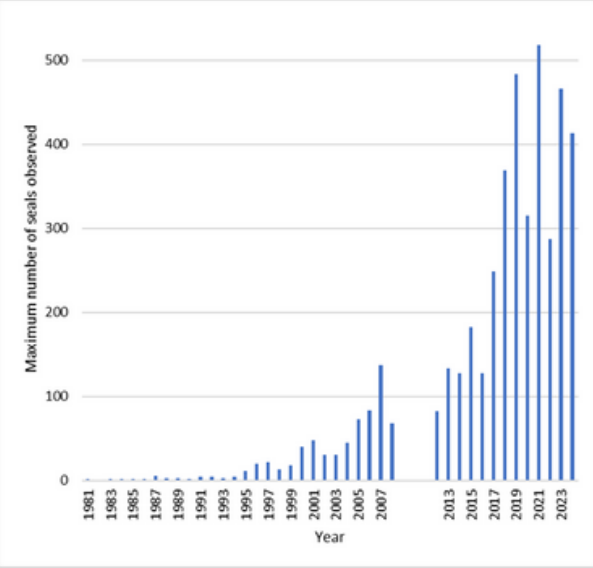

Figure 3: Historical annual maximum counts for grey seal colony at S.Walney- CWT population records. Data gap for 2010-2012. Drone surveys began in 2015 which may account for jump in population size.

The grey seal colony at SWNR, Cumbria, has been recorded as a resident population since the mid 1990s (Chenery 2017). This population has been managed by Cumbria Wildlife Trust (CWT) since 1993, with annual monitoring taking place between September and March, including the breeding season (annual maximums in Figure 3).

CWT conducts this monitoring with the aim of understanding the growth of the colony and recording the impact of disturbance, especially during the breeding season. Measures to reduce disturbance are in place such as a no access restriction for the beaches on the nature reserve. CWT also engage with the community and visitors to the nature reserve about the importance of minimising disturbance, and have a livestream camera facing the haul out site so that people can observe the seals without impacting their wellbeing. Sea-goers and visitors are encouraged to read and adhere to the Marine and Coastal Wildlife Code prior to visiting SWNR.

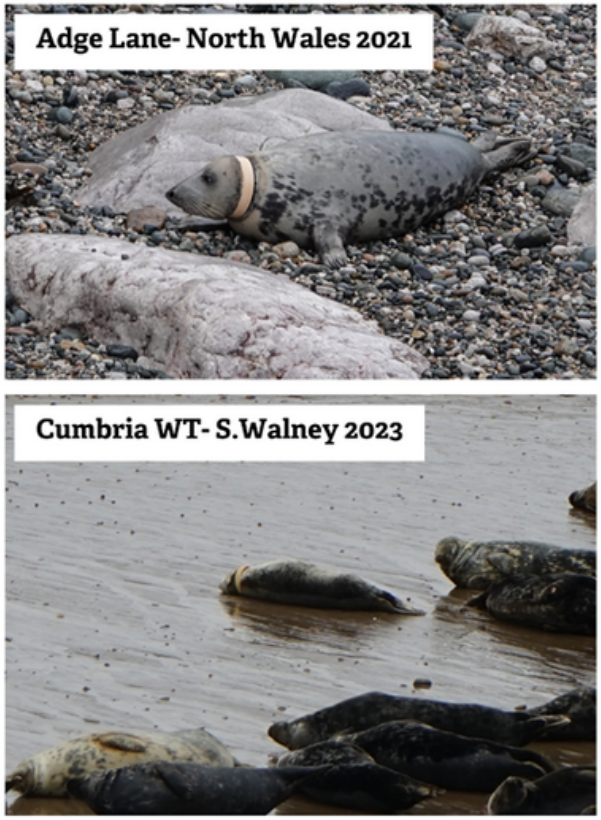

Figure 4: 'neck brace' photographed at Angel Bay, North Wales in 2021 (top image), and again at South Walney, Cumbria in 2023 (bottom image).

CWT are part of the Irish Sea Network, a partnership that recognises the need for a cross-boundary approach to management and conservation in the marine environment. Within the Irish Sea, grey seals are thought to move between haul-out sites and monitoring by Manx Wildlife Trust (MWT) and the Seal Welfare Organisation in North Wales has demonstrated this connectivity. Sightings of individuals with flipper tags, and subsequent traceable origins, as well as photo-identification using fur patterns have been used to record this connectivity. One individual with a ring around its neck (a distinguishing feature allowing for easier identification) has been photographed in North Wales and Cumbria within a 2 year period (Figure 4, personal communication, Adge Lane 2024).

Across the Irish Sea, MWT also carry out seal monitoring at the Calf of Man and have expressed an interest in conducting a tagging study to observe the ranges of seals found there. This is especially relevant as future offshore wind developments are being considered by Ørsted in Isle of Man waters, and MWT would like to better understand seal movements within the area ahead of construction (personal communication, Dr Lara Howe MWT 19.08.24).

Partner involvement

Ørsted developed and manage multiple offshore wind farms in the Irish Sea, including Walney (1, 2 + Extension), West of Duddon Sands (WODS) and Barrow- all within 30km of Walney Island (Figure 6). Construction for the first phase of these windfarms began in 2005 and the most recent development has been operational since 2018 (Figure 5). Each day multiple crew transfer vessels (CTVs) motor past the seals on the beach and in the waters around the spit (the haul out location on the reserve), and restrictions are in place for the speed of these vessels to minimise disturbance. During vessel based ornithological surveys, Ørsted biodiversity team have noticed seals in the water close to these CTVs and have raised the issue of potential disturbance. However, observations during CWT's monitoring surveys of the seals behaviour in relation to these vessels suggests the boats don't appear to disturb the hauled out seals (they don't become alert or flush into the sea) but the vessels may still pose a collision risk to seals in the water

Ørsted, and project partners are interested in finding out whether these offshore developments have contributed to the increase in seal population over the last 20 years. To gain this understanding the use of satellite telemetry tags has been proposed to observe the movements of grey seals throughout the windfarm arrays. By observing their movements in this way, Ørsted hope to determine whether the seals are using the location of the wind farms as foraging grounds.

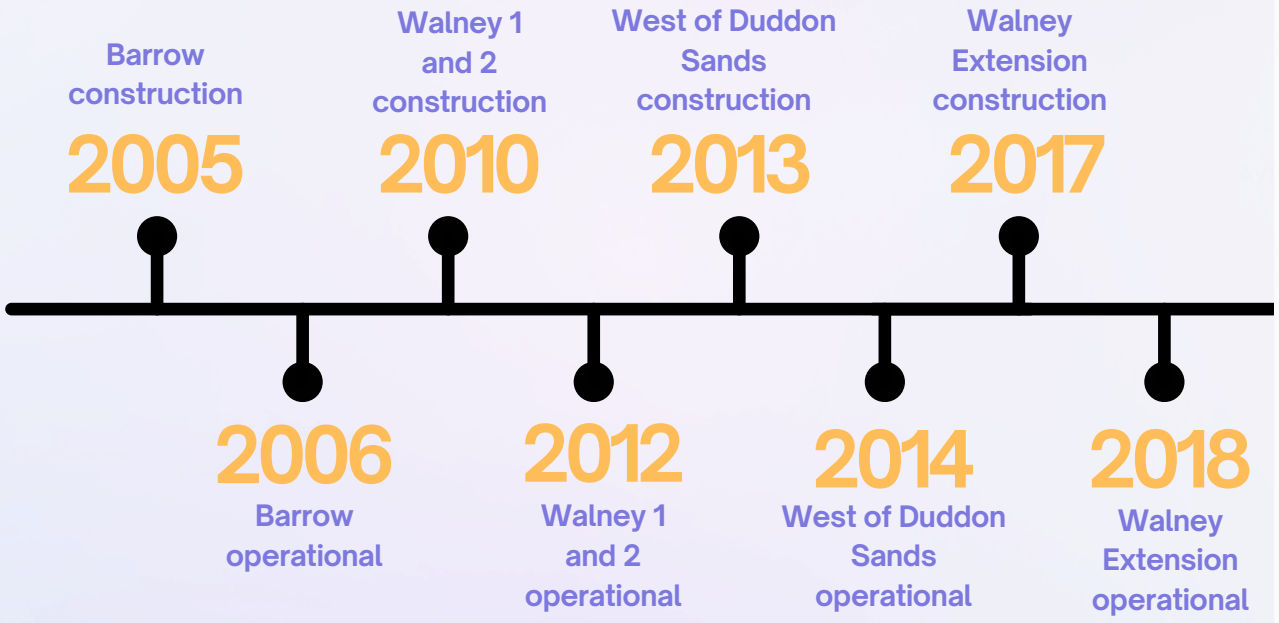

Figure 5: Timeline of offshore wind farms constructed and operated by Ørsted off the Cumbrian coast.

Figure 6: location of Walney, Extension, WODS and Barrow wind farms (purple polygons) and seal haul out (blue point).

Existing research and tagging method

Literature review

Existing tagging research has been conducted by the Sea Mammal Research Unit (SMRU), looking into the interactions of seals with offshore windfarms at other sites. One study found no significant effect of wind farms on seal behaviour and concluded the developments had no long-term effect on local seal population trends (McConnell et al., 2012). Meanwhile Russell et al., (2014) did find strong associations between tagged seals and subsea pipelines and windfarm arrays.
Information gained from satellite tagging can also reveal distances travelled by seals to offshore wind farms, with one study showing grey seals making trips lasting around 18 hours with a maximum distance of 14.45km away from their haul out site (McConnell et al., 2012). Speed of seal movements can also be picked up in tagging studies, and then used to determine the seals activities. For example, Russell et al., (2014) found that seals slowed to a speed associated with foraging when within 100m of pipeline on the seafloor. This pattern was repetitive and therefore thought to suggest successful foraging trips taking place along the pipelines.

Tagging method information from Gordon Hastie SMRU (personal communication 29/08/2024)

In order to tag seals, a team of 5-8 people using a 7m jet boat approach the shore with a support inflatable. Seine nets are set or a 'rush and grab' method is used with a bag net to catch the seals. Once seals are caught, a light sedative is administered and the seals are weighed using a tripod. Anaesthetic is then administered, with a reversal agent on standby in case the seal exhibits the 'dive-response' which can lead to fatality. Morphometric measurements and blood samples are then taken. Processing before the tag is attached usually takes around 15-20minutes. The tag is fitted to the back of the neck using super glue. If necessary, the seals are moved to an alternative location away from the haul-out site, to minimise disturbance to other seals. Once deployed, the tags transmit data which is saved until the seal comes within range of mobile transmission. Argos tags transmit while the seal is at sea or hauled out, however these are not yet available and have lower resolution data.

Implications for South Walney

In order to have a robust data set, it has been suggested that around 15-20 animals would need to be tagged as a ballpark number. However, as the number of seals at S.Walney during August (which would likely be the best time for tagging there- see Seasonal Restrictions section) only peaks at around 50 individuals, the impact of tagging such a large proportion of the group present would prove difficult. Therefore, it was suggested that the sample group could be split and tagged at two different locations, with the Calf of Man on the Isle of Man highlighted as a possible second tagging site. Deploying this many tags would likely take around 10 days to 2 weeks.

Seasonal restrictions

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Seal moulting												
Seal pupping												
Bird breeding												

Table 1: Seasonal restrictions for seal tagging at S.Walney. Orange months show seal moulting season, and blue show pupping. Purple shows the months that shore birds breed at the reserve, with the key months shaded more intensely, however chicks may be present later on in the season.

At SWNR there are a number of seasonal restrictions that need to be considered if conducting a seal tagging study, including seal moulting, seal breeding and bird breeding seasons (Table 1). Based on these restrictions, August would be the most suitable time for tag deployment, though issues of pregnant females on site and potentially low numbers of seals present should be weighed as factors. The possibility of splitting tag deployment between two sites (i.e. at The Calf of Man, IOM) could allow for a smaller sub-set of the population to be tagged at S.Walney, to mitigate these issues- though an additional risk assessment of that location would be necessary (see Risk Assessment section).

The grey seal breeding season of September- December (as shown in blue in table 1) at S.Walney is a period that should be avoided for tag deployment, as disturbance to colonies with pups may result in negative impacts such as trampling or abandonment of pups. Disturbance events at S.Walney, as well as the impact of storms, have severe consequences for new born seal pups and has resulted in some deaths at the site.

The grey seal moulting period from December to April (as shown in orange in table 1) should also be avoided as deploying tags on fur that is about to moult would result in a short period of data collection. Studies that have deployed tags during moulting have had high failure rates, with one study experiencing 9 out of 12 deployed tags falling off within the first month (Kirkwood et al., 2014). If tagging was to take place in August at S.Walney, the tags would likely be transmitting until January at a maximum. During this time any females tagged would likely be hauled out during the breeding season, if they breed at S.Walney, or may possibly move elsewhere before giving birth. SMRU have an ethical review process about tagging pregnant females, which would need to be consulted further in the event of a planned tagging study.

Seasonal restrictions- birds

On the reserve, a number of different shore birds nest and roost on the spit and surrounding beaches. At other, similar sites with seals and seabirds co-existing, tagging studies have been limited seasonally in when they can deploy tags, so as to avoid disturbance of the birds. At Ramsey and Skomer, both home to important shore bird colonies, fieldwork was limited from the start of May and along certain beaches and caves. Additional complications arose with poor weather and a later-than-expected seal moulting season, meaning that only 7 out of the 10 tags planned were deployed (Carter et al., 2020).

At S.Walney, shore birds are monitored and protected by wardens at the site (Figures 7 and 8), especially during the breeding months of March to July, however chicks are present on site until around mid August (see Table 1 for seasonal restrictions). Eider ducks roost approximately 5 meters away from the seals on the high tide and gulls breed and raise chicks in a fenced area close to where the seals haul out. Little tern (a category 1 protected species) also nest at S.Walney. Minimising disturbance to these birds would be an important consideration if undertaking a seal tagging study. (Information from personal correspondence with Bekka Watts- Walney Shore Bird Warden, 13.08.24).

See South Walney Nature Reserve Wardens Report 2024 (Watts, 2024) for more information on locations of these birds' nesting sites, impact of disturbance and ongoing work to resolve this. This report also includes discussion of documented seal disturbance events in 2024, capturing a snapshot of the scale of these events, which should be considered as context for the colony when deciding how much additional disturbance can be justified.

Figure 7: Ringed plover chicks in protected nest structure at S.Walney, showing part of the wardens' efforts in protecting vulnerable ground nesting birds on site- Jessie Prentice.

Figure 8: Trail camera image of gull feeding chicks, S.Walney- Bekka Watts, Walney Shore Bird Warden.

Risk assessment

Risk Matrix	Impact- how severe would the outcomes be if the risk occurred?				
Probability- What is the probability the risk will happen?	**Insignificant 1**	**Minor 2**	**Significant 3**	**Major 4**	**Severe 5**
5 Almost certain	Medium 5	High 10	Very high 15	Extreme 20	Extreme 25
4 Likely	Medium 4	Medium 8	High 12	Very high 16	Extreme 20
3 Moderate	Low 3	Medium 6	Medium 9	High 12	Very high 15
2 Unlikely	Very low 2	Low 4	Medium 6	Medium 8	High 10
1 Rare	Very low 1	Very low 2	Low 3	Medium 4	Medium 5

Table 2: risk matrix table, explaining assigned risk level for each potential hazard, based on impact and probability.

The Key Principles outlined by the Seal Alliance for conducting research acknowledge the importance of seal research for informing conservation, but also point out that this research should be carried out with minimal impact on the individuals. They also highlight the need to conduct a risk assessment for the seals and implement mitigations which would minimise the identified impact of risks to the seals. For this report, each risk has been assigned a risk level using a risk matrix (Table 2) which considers both impact and probability. Mitigations are considered and a new risk level assigned to each hazard in response to those mitigations. Below is the risk assessment (Table 3) of perceived hazards, specific to a seal tagging study (as outlined above) at the location of S.Walney.

Many of these risks can be mitigated by conducting a tagging study with experienced personnel. SMRU should be consulted and involved in any further research, as they have the experience of conducting tagging studies. They also hold a Home Office license which is required for conducting research like this, and would be difficult to acquire independently. Further guidance on the subject can be found in the article: *Best practice recommendations for the use of external telemetry devices on pinnipeds* (Horning et al., 2019). Their 15 recommendations for best practice are discussed and the 3 R's are highlighted as considerations for alleviating animal suffering in studies: reduction, refinement and replacement (Russell and Burch 1959).

Potential hazard	Risk level	Mitigation	New risk level	Comments
Pup getting crushed during stampede		Avoid tagging during pupping season.		Refer to seal pupping season. (Table 1)
Abandonment of pups		Avoid tagging during pupping season.		Refer to seal pupping season. (Table 1)
Stress response		Minimise number of seals caught and number in close proximity. Trained technicians with experience of deploying tags. Marine Mammal Observer in attendance could be on the look out for signs of stress.		There is little that can be done to reduce the risk of causing stress. It is a likely impact of any kind of disturbance to the seals at S.Walney but would vary in severity depending on duration of disturbance.
Disturbance which results in re-location of the colony		Aim to select a small subset of the colony to catch and tag- not an area with hundreds of seals in close proximity. Complete tagging in as short a timeframe as possible, to minimise the impact of disturbance event.		Possibility of splitting the population of tagged seals between 2 different locations (e.g. Calf of Man) to limit the number of individuals at one site that are impacted. It is difficult to predict the impact of this, and the cumulative impact of other sources of disturbance to the seals should be considered.
Infection/ injury from the tag		Care should be taken to glue tag to fur only, not the skin. Use appropriate equipment and trained handlers.		The risk of this cannot be significantly reduced as numerous factors could cause the tag attachment site to become infected or cause injury to the seal.
Drag caused by the tag		Modern tags used with small size to reduce drag.		Energy expenditure and drag have been reduced through the development of tags without an antenna.
Injury caused to seal during handling		Use tranquilisers to sedate seal and avoid thrashing.		Injury could also be caused to the handlers and a risk assessment for researchers carrying out tag deployment should be considered.
Tag inhibiting neck telescopic movement		Attach tag to the fur in an area that won't inhibit movement.		Follow guidance from existing tagging studies and best practice for this.
Seal fatality from anaesthetic.		Correct amounts of anaesthetic should be administered by trained individuals. Use anaesthetic with a reversal agent.		SMRU quoted a 1 in 2000 death rate during tagging, citing the anaesthetic process as the most risky due to dive response exhibited by seals (personal communication 29.08.24).

Table 3: Risk assessment for predicted hazards of seal tagging study specific to South Walney- refer to table 2 for risk matrix levels.

Additional considerations for deploying tags:

Onlookers

At S.Walney there is no access to the spit and the beaches on the reserve, however people can view the seals from two hide locations. Boat tours also operate in the channel and come close to the beach specifically to see the seals. Therefore, if tagging in August, there would likely be onlookers present when the tags are being deployed. Effective communication with the boat tour companies would need to take place prior to tag deployment to decrease the disturbance to the seals around those times. As the tag deployment is likely to cause significant disturbance and requires a very hands-on approach, onlookers may feel distressed by what they are seeing. Someone should be stationed at the viewing points to talk to onlookers about what is happening and explain that it is part of research being conducted. The livestream camera should be switched off on the day of tag deployment. CWT may need to prepare a public statement on the justification of the tagging study, explaining why it is taking place.

Scientific justification

The Seal Research Trust (SRT) Ethical Research Policy outlines key principles for conducting any research on seals. They highlight that research should have the objective of gaining new knowledge about seals and their environment that can contribute to their conservation. A decision would need to be made that the scientific outputs gained from this tagging study are robust, novel and informative, and would significantly better the conservation of seals. The ultimate questions are; what will tagging data reveal, enable or contribute to marine science? Would it be used to inform policy around offshore developments? Would it be applicable on a large scale or just reveal site-specific patterns of behaviour for a few individual seals? Seal Research Trust (SRT) highlighted that seal behaviour is highly variable, with some individuals found to exhibit small land-based ranges, while others complete repeated round trips of 900km just to have pups (personal correspondence Sue Sayer, SRT 19.08.24). Therefore a relatively small sample of 10 individuals tagged at S.Walney may have skewed data depending on the behaviour of individual seals. This then raises the question: how many seals can we justify disturbing in order to gain the data?

Funding

Funding for a tagging study would need to be carefully considered and possibly a joint approach from the developer (Ørsted) as part of their project operations and maintenance monitoring, and The Wildlife Trusts (through raising research grants) if they deem the data to be important for their conservation efforts. Alternative methods to tagging may be considered as more cost effective ways of increasing seal monitoring capabilities (refer to Tag Specifics & Costs).

Alternative methods

There are multiple alternative methods that could be used to better understand the movements of the grey seals at S.Walney. These methods vary in their ability to answer the original research questions, and also vary in cost and practicality. All of them remove direct contact with the animals, fulfilling the 'replacement' aspect of the 3 R's principle for humane experimentation (Russell and Burch 1959).
See table 4 for comparison of each alternative method.

Tag Specifics & Costs

GPS/GSM tags: high resolution location & activity data, transmitted via mobile phone system. Cost ~ £4,300 each.

Argos tag: lower resolution (temporally and spatially) but are cheaper (~£1,350 each + £500/tag for transmission charge)- not yet available.

Personal correspondance- Debbie Russell, 05.07.24

Method	Specifics	Pros	Cons
Acoustic monitoring	Audiomoth recording device, serviced every 4 months, deployed for 2 years. Trial by Celtic Sea Power and Cornwall Seal Research Trust- personal communication 23.10.24.	Low cost- ~£100 per device, can be attached to a lobster pot or similar.	Currently in trial phase (matching vocalisations to behaviours and habitat use) so not yet a developed method.
Thermal imaging	Thermal imaging camera used in a helicopter-based or drone survey.	SMRU already developed a method for aerial surveys. Can identify animals to species level.	High cost for helicopter and thermal imaging camera use. Weather dependent method (not suitable in rain). Only detects animals at the surface of the water.
Sonar	TritechGemini720 kHz multibeam Sonar	Used by SMRU around tidal turbines. Detects, tracks and classifies moving animals. No measured responses to signals by seals.	Would need multiple sonar devices placed throughout windfarm to capture movement within the arrays (maximum range 120m).
Photo ID	Develop a catalogue of identified individuals around Irish Sea to build up network of connectivity and understand movements on a larger scale.	Low cost in terms of technology. Already done to some extent by organisations around Irish Sea- would just need to share data.	Time consuming for volunteers or staff to catalogue seals. Won't show specifics of seals moving within windfarms.

Table 4: Alternative seal monitoring methods, specifics and pros/ cons of each method.

Next Steps

Collaboration between partners and the contribution of expert opinions on the topic of seal tagging have been vital to the production of this report. This co-ordination would need to continue when considering the next steps of progressing with research, as valuable insights from interested parties will be key to any successful programme of study.

This report touches on a few of the considerations for a seal tagging study, but as research is updated and technologies continue to evolve more information will come to light to inform next steps and any decisions made.

01 **Review stakeholder involvement**

Once this report is available to all partners, the opportunity should be taken to review each stakeholders' interests and priorities in relation to the project. These may have changed since the original project scoping meeting and any updates may be relevant to the projects' progression. Once these are discussed, a decision can be made on whether the project will move forward. This could simply be acknowledging a need for further research to answer feasibility concerns and fill any knowledge gaps.

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02 **Consider alternative methods**

Alternative methods should be weighed and assessed to decide whether a less invasive approach can be taken to obtain an understanding of whether the seals are interacting with the wind farm arrays.

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03 **Propose study**

If the decision is made that scientific justification has been met, and alternative methods have been discounted, a study proposal, including method and intended outcomes for seal tagging should be submitted to SMRU. Information on cost of personnel for tagging dates, as well as cost of data analysis should be acquired in order to assess the feasibility of the complete project ahead of securing funding.

Thank you!

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Laurence Browning- Natural England
Tom Brady- Ørsted

External Contributions:
Adge Lane- Seal Welfare Organisation
Dr Debbie Russell- Sea Mammal Research Unit
Dr Gordon Hastie- Sea Mammal Research Unit
Dr Lara Howe- Manx Wildlife Trust
Harrison Smith- Celtic Sea Power
Neil Farrington- Celtic Sea Power
Sue Sayer MBE- Seal Research Trust

Thank you for taking the time to read this feasibility study, if you have any questions please feel free to get in touch.

07534012926
ellenaconsadine@gmail.com
LinkedIn- Ellena Consadine

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Detecting and tracking marine mammals around tidal turbines: development of a dual multibeam sonar system [presentation]

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