Dee District Salmon Fishery Board

Dee District Salmon Fishery Board

Marine Licensing and Consenting Casework Officer
Licensing Operations Team
Marine Directorate
Scottish Government
Marine Laboratory
375 Vicotria Road
Aberdeen
AB11 9DB

By email to MD.MarineRenewables@gov.scot
22nd March 2024

Dear Iain,

REQUEST FOR SCREENING REPORT CONSULTATION FOR BUCHAN OFFSHORE WIND FARM LOCATED APPROXIMATELY 75 KILOMETRES OFF THE ABERDEENSHIRE COASTLINE

HABITAT REGULATIONS APPRAISAL SCREENING UNDER THE CONSERVATION (NATURAL HABITATS, &C.) REGULATIONS 1994, THE CONSERVATION OF OFFSHORE MARINE HABITATS AND SPECIES REGULATIONS 2017 AND THE CONSERVATION OF HABITATS AND SPECIES REGULATIONS 2017

In respect of the proposed application for section 36 consent (under the Electricity Act 1989) and marine licences (under the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009), Buchan Offshore Wind Limited have submitted a Habitats Regulations Appraisal ("HRA") Screening Report for the proposed Buchan Offshore Wind Farm.

The HRA Screening Report provides information to enable the screening of the Buchan Offshore Wind Farm with respect to its potential to have a likely significant effect on European sites of nature conservation importance.

On behalf of the Dee District Salmon Fishery Board (Dee DSFB) we welcome the opportunity to respond to the ***Buchan Offshore Wind Farm - Habitats Regulations Appraisal Screening Report Consultation***

Designations & Conservation Status

As a statutory body charged with the protection of Atlantic salmon and sea trout stocks within its district, the Dee DSFB has a duty to ensure that there are no significant adverse impacts upon the populations of these species.

The Dee has been designated as a Special Area of Conservation under the EC Habitats Directive 92/43 EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna for Atlantic salmon (the principal species for which it receives this designation). The Dee District also supports populations of trout, eels and brook, river and sea lampreys.

Sea trout, common to all the rivers within the Dee District, are a priority species under the United Kingdom's Biodiversity Action Plan (UKBAP).

All lamprey species are protected under the EC Habitats Directive whilst river and sea lampreys are additionally protected under the UKBAP priority list.

Eels are a UKBAP priority species, critically endangered under the IUCN red list and protected under CITES.

Wild Salmon Strategy and Conservation regulations

At the latest International Union for Conservation of Nature (IUCN) species reassessment of the Red List of Threatened Species, released at COP28 in December 2023, Atlantic salmon have been reclassified from 'Least Concern' to 'Endangered' in Great Britain (as a result of a 30-50% decline in British populations since 2006 and 50-80% projected between 2010-2025), and from 'Least Concern' to 'Near Threatened' in terms of global populations (as a result of global populations declines of 23% since 2006).

In January 2022, the Scottish Government released its Wild Salmon Strategy which gave a clear message that there is sadly now unequivocal evidence that populations of Atlantic salmon are at crisis point. The Strategy calls on government agencies, as well as the private sector, to prioritise the protection and recovery of Scotland's wild Atlantic salmon populations.

One of the key pressures identified in the strategy is marine development, with marine renewables highlighted as having the potential to impact salmon through noise, water quality and effects on electromagnetic fields (EMFs) used by salmon for migration.

Furthermore, the Conservation of Salmon (Scotland) Regulations 2016 has led to the production of stock assessments for all Scottish salmon rivers, based on catch data. The assessments estimate whether the number of adults returning to the river in each of the previous five years will produce enough eggs to keep the population size above a critical threshold.

For the Dee, like other north-east rivers, the assessments have shown a declining trend in catches since 2011. Nonetheless, the Dee has been categorised as a Grade 1 river, meaning that the stocks have most likely been above the critical threshold - the Conservation Limit - over the last five years. It is however apparent that specific stock components, such as the Spring salmon stock on the Dee are critically low.

Assessment of the juvenile salmon stocks in the Dee through the National Electrofishing Programme for Scotland (NEPS) has evaluated juvenile stocks in the Dee as Grade 2, suggesting that there are significant issues with recruitment and survival within the catchment (Malcolm *et al* 2020). With greater pressures on marine survival such that only approximately 3% of smolts return to the river as adults, we need to address any pressures within the freshwater and marine environments to protect Dee salmon stocks.

Position

The Dee DSFB welcomes the opportunity to respond to the HRA screening and would wish to be consulted further during this process with specific interest in the migratory fish species Atlantic Salmon and sea trout. We echo the comments of our representative body for Scotland's District Salmon Fishery Boards, **Fisheries Management Scotland (FMS)** and call for more research upon the impacts of this development on diadromous fish.

Under Scottish Marine Energy Research (ScotMER), the Diadromous Fish Receptor Group has identified evidence gaps related to the health, distribution, and impacts on Diadromous fish (salmon, sea trout, etc.). Scottish Government has published an 'evidence map' (available for download at the above link) which identifies and scores these evidence gaps according to a specific prioritisation process. It is important that the relevant evidence gaps are considered in full by the applicant, and developers should *contribute* to filling these evidence gaps as a **specific condition of consent**.

To properly assess Environmental Statements for developments, information on the use of the development area by diadromous fish should be provided. If such information is lacking then a suitable monitoring strategy should be devised, either for the area in question or through contributing to strategic projects undertaken through ScotMER. Any monitoring strategies must include pre-construction monitoring in order that baseline information on movement, abundance, swimming depth, feeding behaviour etc. can be collected.

Offshore developments have the potential to directly and indirectly impact diadromous fish. We would therefore expect developers to assess and, where necessary, mitigate the potential impacts of the development.

We agree that the following LSEs could not be ruled out for these sites: direct temporary habitat disturbance and long-term habitat loss; increase in SSC and sediment deposition; increases in underwater noise; increases in EMF and thermal impacts of cables; and secondary entanglement.

However, we believe that insufficient consideration has been given to the following issues, all of which are identified in the ScotMER evidence map for diadromous fish:

i. *Migration survival and delay through marine renewable areas.*
   Survival and progression rates in relation to passing through marine renewable areas. Is there increased mortality when migrating through marine renewable developments? e.g. due to shifts in predator distributions. Are fish attracted to developments for new feeding opportunities? Does predation risk increase if more time is spent at a development?

ii. *Electromagnetic fields (EMFs) arising from cabling.*

Electromagnetic fields from subsea cables have the potential to interact with European eels and possibly salmonids if their migration or movement routes take them over sub-sea cables. The Earth's magnetic field is a cue used for migration, so anything that interferes with this signal is an important consideration. All cables should be buried to at least a depth of 1.5m where possible,or covered with rock armour to an equivalent depth where burial is not possible. We are aware that Marine Scotland Science have undertaken some research to investigate electro-magnetic force impacts on adult and post smolt salmon and European eels. Whilst for salmon this work did not demonstrate any significant response to the magnetic field in terms of alarm, avoidance, accelerated or decelerated swimming, it did not provide any information on interference with the salmon's ability to detect and utilise the Earth's magnetic field.

Furthermore, with regard to EMFs, the document only considers behavioural responses to EMFs. However, the following evidence gaps have not been addressed: Does EMF effect the migratory patterns of fish? Does EMF reduce migration success due to interaction with fish navigation mechanisms?

iii. *Response to visual effects of turbine movement.*

We remain concerned that moving turbine blades above the surface of the water may have a range of effects on diadromous fish and may even present a potential barrier effect to migratory species. Moving turbine blades will be visible to fish over large areas near offshore windfarms, particularly in the case of epipelagic species like salmonids, which swim near the ocean surface. Broad visual effects can be direct (those associated with the perception of reflected light from turbines via the visual image represented in Snell's window - a phenomenon by which an underwater viewer sees everything above the surface through a cone of light of width of about 96 degrees).

Flicker effects from turbines are only expected to occur during the brief period of the day when receptor, turbine and sun are aligned, and therefore represent a sub-set of the larger potential effects arising from direct perception of movement above the surface. As fish are susceptible, and therefore highly sensitive, to predation from above, how they perceive and react to such movement requires further investigation. Previous attempts to explore this phenomenon have focussed on shadow flicker, and neglect the wider effects detailed above.

There is currently no information on the risk of visual effects of moving turbine blades. However, we would highlight that there is accumulating evidence for widespread avoidance of offshore turbines by large-bodied birds. If this is the case for migratory fish, then site-specific and cumulative impact studies will be required. We do not believe that there is sufficient grounds to scope this potential effect out.

Conclusion

We have no wish to prevent or delay any proposed development unnecessarily and we remain keen to work constructively with the developers and Marine Scotland to identify appropriate monitoring programmes which will allow us to be able to assess the acknowledged risks of this development, and other proposed developments in a more appropriate manner. There is a clear and urgent need to fund, plan and start strategic research on the movement, abundance, swimming depth, feeding behaviour and impact pathways relevant to diadromous fish. Such research would clearly feed into the potential mitigation measures that might be deemed appropriate, and the conditions under which such mitigation should be enacted. Developers should be required to work together to fund strategic monitoring, in order to allow more certainty for all involved.

Yours sincerely

Redacted

Jamie Urquhart
Fisheries Protection Manager, Dee District Salmon Fishery Board

Department of Agriculture,
Environment and Rural Affairs

From:	DAERA Marine Information Requests
To:	MD Marine Renewables
Subject:	RE: Buchan Offshore Wind Farm - Habitats Regulations Appraisal Screening Report Consultation- Response Required by 21 March 2024
Date:	21 March 2024 16:01:35
Attachments:	image002.png image003.png

Hi

This is a nil return from NI Marine and Fisheries Division. Kind regards

Eamonn

Eamonn Brady | Marine Plan Team | Department for Agriculture, Environment and Rural Affairs
Level 1 | Klondyke Building | Cromac Avenue | Belfast | BT7 2JA

From: MD.MarineRenewables@gov.scot <MD.MarineRenewables@gov.scot>
Sent: Thursday, February 22, 2024 11:05 AM
To: MD.MarineRenewables@gov.scot
Cc: John.Mckay@gov.scot; Kirsty.Black@gov.scot; Iain.Macdonald3@gov.scot
Subject: Buchan Offshore Wind Farm - Habitats Regulations Appraisal Screening Report Consultation- Response Required by 21 March 2024

Dear Sir/Madam,

BUCHAN OFFSHORE WIND FARM LOCATED APPROXIMATELY 75 KILOMETRES OFF THE ABERDEENSHIRE COASTLINE
HABITAT REGULATIONS APPRAISAL SCREENING UNDER THE CONSERVATION (NATURAL HABITATS, &C.) REGULATIONS 1994, THE CONSERVATION OF OFFSHORE MARINE HABITATS AND SPECIES REGULATIONS 2017 AND THE CONSERVATION OF HABITATS AND SPECIES REGULATIONS 2017

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The HRA Screening Report can be found at HRA Screening Report - Buchan Offshore Wind Farm | Marine Scotland Information

We would appreciate any comments you may have on the revised HRA Screening Report and your opinion as to whether or not you are in agreement with the European sites identified.

Please submit your response electronically to MD.MarineRenewables@gov.scot by 21 March 2024. If you are unable to meet this deadline, please contact us as soon as possible to discuss the possibility of extensions to the consultation period. If you have no comments to make please submit a "nil return" response.

Kind regards,
Iain

Iain MacDonald
Marine Licensing & Consenting Casework Officer, Licensing Operations Team, Marine Directorate
Scottish Government | Marine Laboratory | Aberdeen | AB11 9DB
M: Redacted | E: Iain.Macdonald3@gov.scot
The Scottish Government

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Marine licensing and consenting: privacy notice - gov.scot (www.gov.scot)

Fisheries Management Scotland

From:	Alan Wells
To:	MD Marine Renewables
Cc:	John Mckay; Kirsty Black; Iain Macdonald; Jamie Urquhart (Jamie@riverdee.org)
Subject:	RE: Buchan Offshore Wind Farm - Habitats Regulations Appraisal Screening Report Consultation- Response Required by 21 March 2024
Date:	21 March 2024 19:06:19
Attachments:	image001.png

Dear Iain,

Thank you for contacting Fisheries Management Scotland with regard to the proposed Buchan Offshore Wind Farm. I would like to make the following comments.

We welcome the fact that the 12 SACs identified in section 4.5 have been screened in for further assessment. The following LSEs could not be ruled out for these sites: direct temporary habitat disturbance and long term habitat loss; increase in SSC and sediment deposition; increases in underwater noise; increases in EMF and thermal impacts of cables; and secondary entanglement.

However, we believe that insufficient consideration has been given to the following issues, all of which are identified in the ScotMER evidence map for diadromous fish:

- Survival and progression rates in relation to passing through marine renewable areas. Is there increased mortality when migrating through marine renewable developments? e.g. due to shifts in predator distributions. Are fish attracted to developments for new feeding opportunities? Does predation risk increase if more time is spent at a development?
- With regard to EMFs, the document only considers behavioural responses to EMFs. However, the following evidence gaps have not been addressed: Does EMF effect the migratory patterns of fish? Does EMF reduce migration success due to interaction with fish navigation mechanisms?
- We remain concerned that moving turbine blades above the surface of the water may have a range of effects on diadromous fish and may even present a potential barrier effect to migratory species. Moving turbine blades will be visible to fish over large areas near offshore windfarms, particularly in the case of epipelagic species like salmonids, which swim near the ocean surface. Broad visual effects can be direct (those associated with the perception of reflected light from turbines via the visual image represented in Snell's window - a phenomenon by which an underwater viewer sees everything above the surface through a cone of light of width of about 96 degrees). Flicker effects from turbines are only expected to occur during the brief period of the day when receptor, turbine and sun are aligned, and therefore represent a sub-set of the larger potential effects arising from direct perception of movement above the surface. As fish are susceptible, and therefore highly sensitive, to predation from above, how they perceive and react to such movement requires further investigation. Previous attempts to explore this phenomenon have focussed on shadow flicker, and neglect the wider effects detailed above. There is currently no information on the risk of visual effects of moving turbine blades. However, we would highlight that there is accumulating evidence for widespread avoidance of offshore turbines by large-bodied birds. If this is the case for migratory fish, then site-specific and cumulative impact studies will be required. We do not believe that there is sufficient grounds to scope this potential effect out.

Please don't hesitate to contact me if you wish to discuss any of these issues further.

Kind regards,

Alan Wells

Dr Alan Wells | CEO
Fisheries Management Scotland
11 Rutland Square, Edinburgh, EH1 2AS
Tel: 0131 221 6567 | Redacted
www.fms.scot

From: MD.MarineRenewables@gov.scot <MD.MarineRenewables@gov.scot>
Sent: Thursday, February 22, 2024 11:05 AM
To: MD.MarineRenewables@gov.scot
Cc: John.Mckay@gov.scot; Kirsty.Black@gov.scot; Iain.Macdonald3@gov.scot
Subject: Buchan Offshore Wind Farm - Habitats Regulations Appraisal Screening Report Consultation- Response Required by 21 March 2024

Dear Sir/Madam,

BUCHAN OFFSHORE WIND FARM LOCATED APPROXIMATELY 75 KILOMETRES OFF THE ABERDEENSHIRE COASTLINE

HABITAT REGULATIONS APPRAISAL SCREENING UNDER THE CONSERVATION (NATURAL HABITATS, &C.) REGULATIONS 1994, THE CONSERVATION OF OFFSHORE MARINE HABITATS AND SPECIES REGULATIONS 2017 AND THE CONSERVATION OF HABITATS AND SPECIES REGULATIONS 2017

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Please submit your response electronically to MD.MarineRenewables@gov.scot by 21 March 2024. If you are unable to meet this deadline, please contact us as soon as possible to discuss the possibility of extensions to the consultation period. If you have no comments to make please submit a "nil return" response.

Kind regards,
Iain

Iain MacDonald
Marine Licensing & Consenting Casework Officer, Licensing Operations Team, Marine Directorate
Scottish Government | Marine Laboratory | Aberdeen | AB11 9DB
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The Scottish Government

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Natural England

Date: 18/03/2024
Our ref: 467697

Marine Directorate – Marine Planning and Policy
Scottish Government
Marine Laboratory
375 Victoria Road
Aberdeen
AB11 9DB

Natural England
Lancaster House
Hampshire Court
Newcastle-upon-Tyne
NE4 7YH
0300 – 0603900
Consultations@naturalengland.org.uk

BY EMAIL ONLY

Dear Iain

Consultation details – Buchan Offshore Wind Farm - Habitats Regulations Appraisal Screening Report Consultation
Location – BUCHAN OFFSHORE WIND FARM LOCATED APPROXIMATELY 75 KILOMETRES OFF THE ABERDEENSHIRE COASTLINE

Thank you for seeking our advice on the Habitats Regulation Appraisal screening in your consultation dated 22/02/2024 which we received on 22/02/2024.

THE CONSERVATION (NATURAL HABITATS, &C,) REGULATIONS 1994

THE CONSERVATION OF OFFSHORE MARINE HABITATS AND SPECIES REGULATIONS 2017

THE CONSERVATION OF HABITATS AND SPECIES REGULATIONS 2017

(Collectively referred to as the "Habitats regulations")

Natural England is a non-departmental public body. Our statutory purpose is to ensure that the natural environment is conserved, enhanced, and managed for the benefit of present and future generations, thereby contributing to sustainable development. The following constitutes Natural England's formal statutory response.

The advice contained within this letter is provided by Natural England, which is the statutory nature conservation body within English territorial waters (0-12 nautical miles). We have delegated responsibility from JNCC to also advise on offshore wind farms in all English waters out to 200 nautical miles or the median line.

Should the proposal be amended in a way which significantly affects its impact on the natural environment then, in accordance with Section 4 of the Natural Environment and Rural Communities Act 2006, Natural England should be consulted again.

Natural England Discretionary Advice Service (DAS)
We would like to draw the applicant's attention to the opportunity to obtain further advice from Natural England under our Discretionary Advice Service (DAS). The DAS service provides additional non-statutory advice related to development proposals, in order to support sustainable development and achieve better environmental outcomes through the planning system.

Further information including charges and how to proceed with an application can be found at https://www.gov.uk/guidance/developers-get-environmental-advice-on-your-planning-proposals

The following document has been reviewed for this response

- Buchan Offshore Wind Offshore HRA Screening Report

Due to our remit we have restricted our advice to species from English Marine Protected Areas and designated species in English waters. We defer to NatureScot and JNCC for advice on Scottish matters.

Summary of advice

- Natural England advises that the majority of sites and features have been screened appropriately.
- Natural England advise that Berwickshire and North Northumberland Coast SAC is screened in for grey seal

There is evidence in Thompson *et al (2017)** that grey seals from the Berwickshire and North Northumberland Coast designated population travel into the proposed development area. Natural England, therefore, advises that Berwickshire and North Northumberland Coast SAC needs to be screened in for Grey Seal.

This report is provided in the email along with this response. Please see Figure 15 for the seal tracking evidence.

* Thompson, D., Russell, D. J. and Morris, V. 2017. Berwickshire and North Northumberland Coast European Marine Site: grey seal population status.: Sea Mammal Research Unit Report to Marine Scotland, Scottish Government.

We would like to direct the applicant to our advice on the environmental considerations and use of data and evidence to support offshore wind and cable projects in English waters. We recognise this will not all be applicable for all aspects of the project but will provide a guide for assessments concerning England

and any modelling / methodology for English sites. Our advice is available here: Environmental considerations for offshore wind and cable projects - Home (sharepoint.com)

For any queries relating to the content of this letter please contact me using the details provided below. For any new consultations, or further consultations on this development, please send your correspondence to consultations@naturalengland.org.uk.

Yours sincerely

Bethan Rogers

Role: Marine Lead Adviser
E-mail: bethan.rogers@naturalengland.org.uk

Report to Natural England:

SAC 2016_10

Berwickshire and North Northumberland Coast Special Area of Conservation:

grey seal population status.

Sea Mammal Research Unit
Report to
Natural England

February 2017

D. Thompson, D.J. Russell & C. Morris

Sea Mammal Research Unit, Scottish Oceans Institute, University of St Andrews, St Andrews, Fife, KY16 8LB.

1. Aims/objectives:

a) Collation of available population survey data collected to date and analysis of the current state of the population. To include consideration of the condition and importance of the various areas of the site for hauling out, breeding, feeding etc. and potential reasons for the changes seen within the data.

b) Comparison with trend data from other UK sites and put into the context of the wider grey seal population.

c) Assessment of current and perceived future impacts/threats to the population at an international and local level.

d) Assessment of the viability of the population and identification of specific issues requiring action to ensure maintaining/achieving favourable condition status. Recommendations for future monitoring to be included.

e) Assessment of the importance of fisheries bycatch and its potential impact on the SAC population.

2. Executive Summary

This report represents an evidence assessment to inform a condition assessment for the population of grey seals as a feature of the Berwickshire and North Northumberland Coast Special Area of Conservation (BNNC-SAC).

- The Berwickshire and North Northumberland Coast (BNNC) Special Area of Conservation (SAC) supports a large breeding population of grey seals.

- The Farne Islands have been a major breeding site since the 1940s. The population increased until the late 1960s when a series of pup and adult culls reduced the pup production by around 60%. The population began to grow again in the 1980s and now produces approximately 1800 pups p.a.

- Fast Castle is a colony on the Berwickshire mainland coast, lying partly within the BNNC SAC. It is a recently established colony that has grown rapidly at approximately 16% p.a. In 2014 it produced just under 3000 pups.

- The Farnes and Fast Castle colonies produced approximately 4800 pups in 2014 the most recent year for which UK wide pup production figures are available. This represents approximately 37% of the UK North Sea pup production, 8% of the UK pup production and approximately 2.8% of the world's pup production.

- The BNNC SAC population is part of the wider North Sea management unit which is the only management unit experiencing continued exponential growth in pup production.

- The southern half of the BNNC SAC is an important haulout area for grey seals. Numbers have increased dramatically and in 2014 the count of 6900 represented approximately 20% of the estimated haulout count for the UK. The northern section of the BNNC SAC does not appear to be a major haulout area, few seals have been seen north of Lindisfarne.

- Seals from the BNNC SAC have been tracked moving between the Farnes/Lindisfarne and sites throughout the North Sea. In addition, telemetry tagged grey seals from Donna Nook, Isle of May, Orkney, France and the Netherlands have been tracked to the BNNC SAC. However most trips return to the same haulout site.

- Grey seal diet in the central North Sea is dominated by sandeels (78.5% by weight) and to a lesser extent by gadoids (8.4%) and flatfish (8.8%).

- A wide range of potential anthropogenic and natural threats are presented and discussed. None are identified as currently representing a major threat to the grey seal population in the BNNC SAC.

3. Background, Grey seal biology

Two species of seal live and breed in UK waters: grey seals (*Halichoerus grypus*) and harbour (also called common) seals (*Phoca vitulina*). Grey seals only occur in the North Atlantic, Barents and Baltic Sea with their main concentrations on the east coast of Canada and United States of America and in north-west Europe. Harbour seals have a circumpolar distribution in the Northern Hemisphere and are sub-divided into five sub-species. The population in European waters represents one subspecies (*Phoca vitulina vitulina*). Other seal species occasionally occur in UK coastal waters, including ringed seals (*Phoca hispida*), harp seals (*Phoca groenlandica*), and hooded seals (*Cystophora crystata*), all of which are Arctic species. The grey seal is the only species occurring in significant numbers within the BNNC SAC, although one small group of harbour seals haul out regularly on the sands at Lindisfarne (SCOS 2016).

Grey seals are the larger of the two resident UK seal species. Adult males can weigh over 300kg while the females weigh around 150-200kg. Grey seals are long-lived animals. Males may live for over 20 years and begin to breed from about age 10. Females often live for over 30 years and begin to breed at about age 5.

They are generalist predators, feeding mainly on the sea bed at depths up to 100m although they are probably capable of feeding at all the depths found across the UK continental shelf. Their diet varies both seasonally and geographically but comprises mainly small demersal fish species, i.e. fish that live on or close to the seabed. In the UK, their diet is composed primarily of sandeels, whitefish (cod, haddock, whiting, ling), and flatfish (plaice, sole, flounder, dab). Food requirements depend on the size of the seal and fat content (oiliness) of the prey, but an average consumption estimate is 7kg of cod or 4kg of sandeels per seal per day. Details of grey seal diet are presented in section 10 below.

Grey seals forage in the open sea and return regularly to haul out on land where they rest, moult and breed. They may range widely to forage and frequently travel over 100km between haulout sites. Foraging trips can last anywhere between 1 and 30 days. Compared with other times of the year, grey seals in the UK spend longer hauled out during their annual moult (between December and April) and during their breeding season (between August and December). Tracking of individual seals has shown that they can feed up to several hundred kilometres offshore although most foraging probably occurs within 100km of a haulout site. Individual grey seals based at a specific haulout site often make repeated trips to the same region offshore, but will occasionally move to a new haulout site, often several hundred kilometres away and begin foraging in a new region. Movements of grey seals between haulout sites in the North Sea and the Outer Hebrides have been recorded. Details of movements of grey seals between the BNNC SAC haulout sites and foraging areas and movements into and out of the BNNC SAC are presented in section 9 below.

There are two centres of population in the North Atlantic; one in Canada and the north-east USA, centred on Nova Scotia and the Gulf of St Lawrence and the other around the coast of the UK especially in Scottish coastal waters, with smaller numbers along the European coast from Netherlands to Murmansk and around Iceland. Populations in Canada, USA, UK and the Baltic are increasing, although numbers are still relatively low in the Baltic where the population was

drastically reduced by human exploitation and reproductive failure probably due to pollution (Reijnders 1980). There are clear indications of a slowing down in population growth in UK and Canadian populations in recent years (SCOS 2016; Bowen et al. 2007).

Approximately 45% of the world's grey seals breed in the UK and 90% of these breed at colonies in Scotland with the main concentrations in the Outer Hebrides and in Orkney. There are also breeding colonies in Shetland, on the north and east coasts of Scotland and England, in south-west England and Wales. Although the number of pups throughout Britain has grown steadily since the 1960s when records began, there is clear evidence that the growth is levelling off (SCOS 2016). The numbers born in the Hebrides have remained approximately constant since 1992 and growth has been levelling off in Orkney and possibly at some colonies in the northern North Sea. A detailed description of the trends in pup production estimates for the two major breeding colonies in the BNNC SAC and nearest neighbouring sites is presented in section 4 below.

In the UK, grey seals typically breed on remote uninhabited islands or coasts and in small numbers in caves. Preferred breeding locations allow mothers with young pups to move inland away from busy beaches and storm surges. Seals breeding on exposed, cliff-backed beaches and in caves may have limited opportunity to avoid storm surges and may experience higher levels of pup mortality as a result. Breeding colonies vary considerably in size; at the smallest only a handful of pups are born, while at the biggest, over 5,000 pups are born annually. In general, grey seals are highly sensitive to disturbance by humans hence their preference for remote breeding sites. However, at one UK mainland colony at Donna Nook in Lincolnshire, seals have become habituated to human disturbance and over 70,000 people visit this colony during the breeding season with no apparent impact on the breeding seals. Indeed, all of the rapidly increasing colonies in the UK are all on relatively easily accessed sections of the mainland coast (see 11.9 below).

UK grey seals breed in the autumn, but there is a clockwise cline in the mean birth date around the UK. The majority of pups in SW Britain are born between August and October, in north and west Scotland pupping occurs mainly between September and late November and eastern England pupping occurs mainly between early November to mid-December.

Female grey seals give birth to a single white coated pup which they suckle for 17 to 23 days. Pups moult their white natal coat (also called "lanugo") around the time of weaning and then remain on the breeding colony for up to two weeks before going to sea. Adult females mate at the end of lactation and then depart to sea and provide no further parental care. In general, female grey seals return to the same colony to breed in successive years and often breed at the colony in which they were born. Grey seals have a polygynous breeding system, with dominant males monopolising access to females as they come into oestrus. The degree of polygyny varies regionally and in relation to the breeding habitat. Males breeding on dense, open colonies are able to restrict access to a larger number of females (especially where they congregate around pools) than males breeding in sparse colonies or those with restricted breeding space, such as in caves or on cliff-backed beaches.

Within Europe there are two apparently reproductively isolated populations, one that breeds in the Baltic, usually pupping on sea ice in the spring, and one that breeds outside the Baltic, usually

pupping on land in Autumn and early winter. These populations appear to have been reproductively isolated at least since the Last Glacial Maximum (Boskovic *et al.* 1996; Graves *et al*. 2008). The vast majority (85%) of European grey seals breeding outside the Baltic breed around Britain.

On the basis of genetic differences there appears to be a degree of reproductive isolation between grey seals that breed in the south-west (Devon, Cornwall and Wales) and those breeding around Scotland (Walton & Stanley, 1997) and within Scotland, there are significant differences between grey seals breeding on the Isle of May and on North Rona (Allen *et al.* 1995).

4. Population Trends

We have little information on the historical status of seals in UK waters. Remains have been found in some of the earliest human settlements in Scotland and they were routinely harvested for meat, skins and oil until the early 1900s. There are no reliable records of historical population size but the Grey Seal (Protection) Act 1914 was introduced into UK legislation, providing the first legal protection for any mammal in the UK because of a perception that there was a need to protect seals. Harbour seals were heavily exploited mainly for pup skins until the early 1970s in Shetland and The Wash. Grey seal pups were taken in Orkney until the early 1980s, partly for commercial exploitation and partly as a population control measure. Large scale culls of grey seals in the North Sea, Orkney and Hebrides were carried out in the 1960s and 1970s as population control measures.
Grey seal pup production monitoring started in the late 1950s and early 1960s and numbers have increased consistently since. In recent years, there has been a significant reduction in the rate of increase in the populations in the Western and Northern Isles, but continued rapid growth continues in the North Sea.

Variation in the number of pups born in a seal population can be used as an indicator of change in the size of the population and with sufficient understanding of population dynamics may allow estimation of total numbers of seals. Each year, SMRU conducts aerial surveys of the major grey seal colonies in Britain to determine the number of pups born (pup production). The annually surveyed sites account for about 85% of all grey seal pups born throughout Britain. The remaining sites producing around 15% of the pups are surveyed less frequently. The total number of seals associated with the regularly surveyed sites is estimated by applying a population model to the estimates of pup production.

4.1 UK Pup production

Grey seal population trends are assessed from the counts of pups born during the autumn breeding season, when females congregate on land to give birth. The most recent synoptic census of the UK-wide pup production is from aerial surveys carried out in 2014 (SCOS 2015). Pup production estimates are then converted to estimates of total population size (1+ aged population) using a mathematical model (SCOS 2015).

The total number of pups estimated to have been born in the UK in 2014 was 60,500. Regional estimates at annually surveyed colonies were 12,700 (95% CI 10,800-14,600) at the North Sea

colonies (including Isle of May, Fast Castle, Farne Islands, Donna Nook, Blakeney Point and Horsey/Winterton), 4,100 (95% CI 3,200-4,900) in the Inner Hebrides, 14,300 (95% CI 11,300-17,300) in the Outer Hebrides and 23,800 (95% CI 18,800-28,700) in Orkney. A further 5,500 pups were estimated to have been born at less frequently surveyed colonies in Shetland and Wales as well as other scattered locations throughout Scotland, Northern Ireland and South-west England.

Overall, there has been a continual increase in pup production since regular surveys began in the 1960s (Figure 1). In both the Inner and Outer Hebrides, the estimated pup production in 2014 was similar to the 2012 estimate with annual percentage changes of less than 1% p.a. Production had been relatively constant between the mid-1990s and 2010, but between 2010 and 2012 showed an annual increase of ~10 and ~5% respectively, the first substantial increase since the 1990s. In Orkney the estimated 2014 pup production was again similar to the 2012 estimate, representing an annual increase of 1.8% p.a. As in the Hebrides, the rate of increase in Orkney had been low since 2000, with pup production increasing at around 1.8% p.a. between 2000 and 2009. However, again the rate increased to ~6%p.a. between 2009 and 2012.

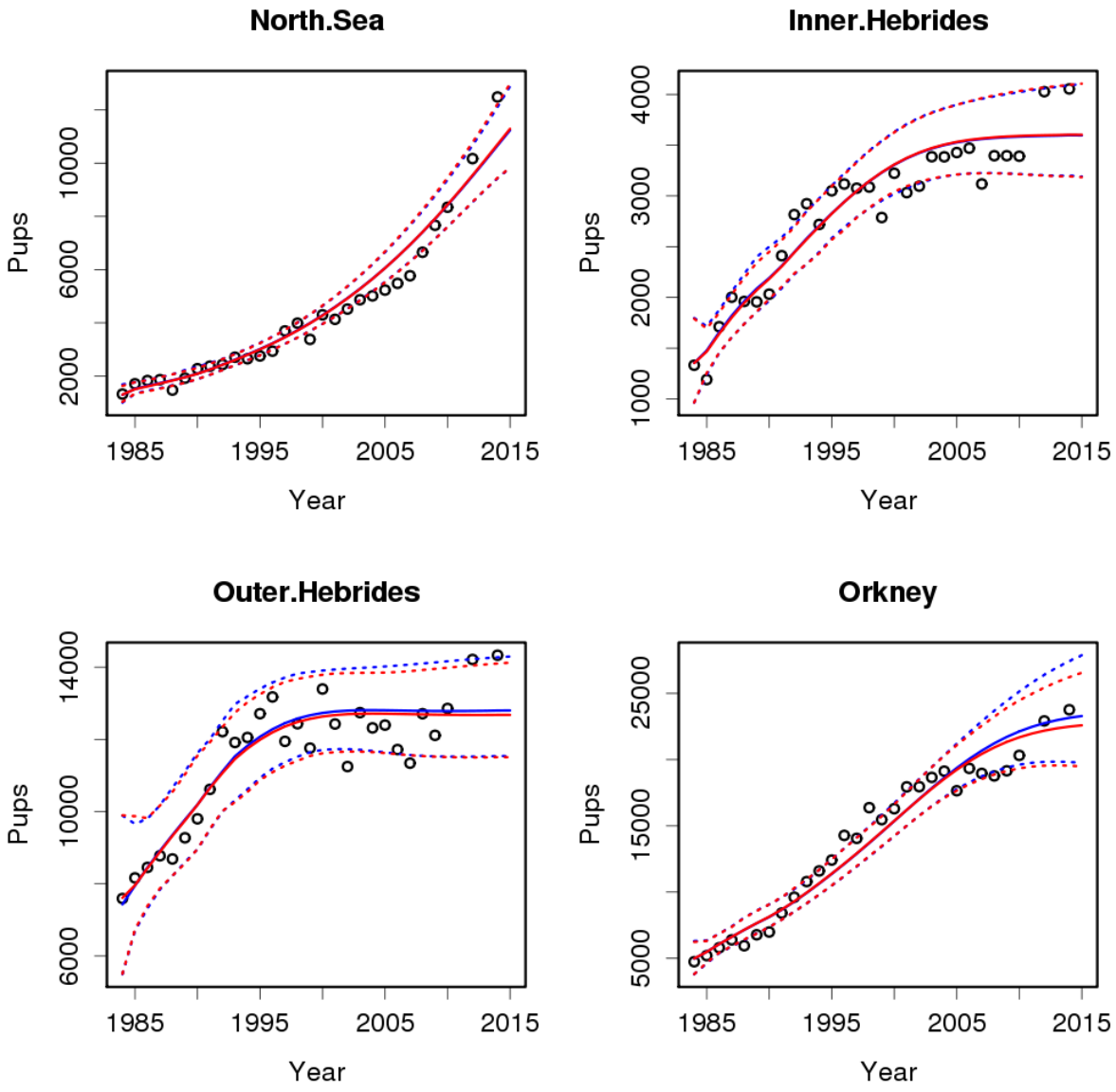

Figure 1 Mean estimates of pup production (solid lines) and 95% Confidence Intervals (dashed lines) from the model of grey seal population dynamics, fit to pup production estimates from 1984-2014 (circles) and two independent total population estimates from 2008 and 2015. Blue lines show the fit to pup production estimates alone; red lines show the fit to pup production estimates plus the total population estimates (taken from SCOS 2015).

Pup production at colonies in the North Sea continued to increase rapidly up to 2014, with an annual increase of 10.8% p.a. between 2012 and 2014, similar to the rate of increase between 2010 and 2012. The majority of the increase up to 2014 was due to continued rapid expansion of newer colonies on the mainland coasts in Berwickshire, Lincolnshire, Norfolk and Suffolk. Interestingly, these colonies are all at easily accessible sites on the mainland where grey seals have probably never previously bred in significant numbers. Although there was little change at the Farne Islands, the more southerly mainland colonies increased by an average of >22% p.a. between 2010 and 2014.

Estimates are available for the ground counted colonies on the English east coast (Farne Islands, Donna Nook, Blakeney and Horsey) in 2015. The 2015 counts suggest a much lower annual increase for the English mainland colonies, with the largest colony at Blakeney showing a slight decrease after 12 years of extremely rapid (>30% p.a.) increase. Interestingly the Farne Islands estimate increased by approximately 18% in 2015 after a period of little change since 2000.

4.2 Breeding sites in the BNNC SAC

Within the BNNC SAC there are two major grey seal breeding groups. The long established and well-studied population breeding on the Farne Islands and the relatively recently established breeding group on the mainland coast at Fast Castle. In addition, to the north of the BNNC SAC there is a major breeding colony on the Isle of May (Figure 2), traditionally thought to have been established by recruitment from the Farne Islands population (see below). There are smaller breeding groups to the west of the BNNC SAC on the small isles of the Firth of Forth particularly Inch Keith. To the south of the BNNC SAC the nearest significant breeding colony is at Donna Nook in Lincolnshire. There are also recently established and rapidly growing breeding colonies further south along the east coast at Blakeney Point in Norfolk and Horsey in Suffolk.

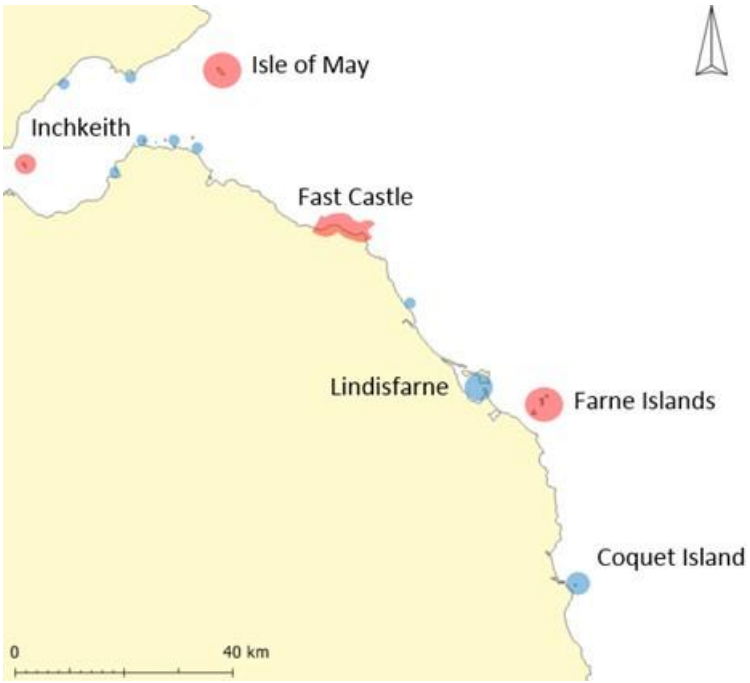

Figure 2. Main grey seal sites in and around the BNNC SAC. Red marks indicate major breeding sites; blue represent significant haulout sites. NB all breeding sites are also non-breeding haulout sites

4.2.1 Farne Islands breeding colony

Grey seals have bred on the Farne Islands since historical records began with the early Christian saints in the 7th Century. Throughout the medieval period seals were exploited in the Farne Islands and exploitation continued at un-recorded, but apparently low levels until the middle of the 19th century. There appear to be no records of exploitation at the Farnes from the mid-19th Century and seals were effectively protected from the early 20th century.

There are no good historical records of pup production, but commercial exploitation for oil was recorded in the late 18th century at which time the minimum annual pup production must have equalled or exceeded the 72 pups reported killed. Anecdotal information suggests that the population declined after this date and reached very low levels during most of the 19th and early 20th Centuries. The colony gradually recovered and by 1934 there were at least 84 pups born in the islands, but this was most likely under-estimated. By the late 1940s and early 1950s the pup production was approximately 500 pups p.a. and by 1960 had reached 1000 pups p.a.

Since the late 1950s a continuous programme of ground counting has provided one of the most consistent and detailed time series of population data for any pinnipeds population. The time series of counts for the Farne Islands sub-population is presented in Figure 3. The most recent pup production estimate available for the Farne Islands was 1876 in 2015. In the previous status report the pup production was recorded as having been stable for the preceding decade, up to 2008. Since 2008 there has been a sustained increase with pup production increasing at an average rate of 4.5% p.a.

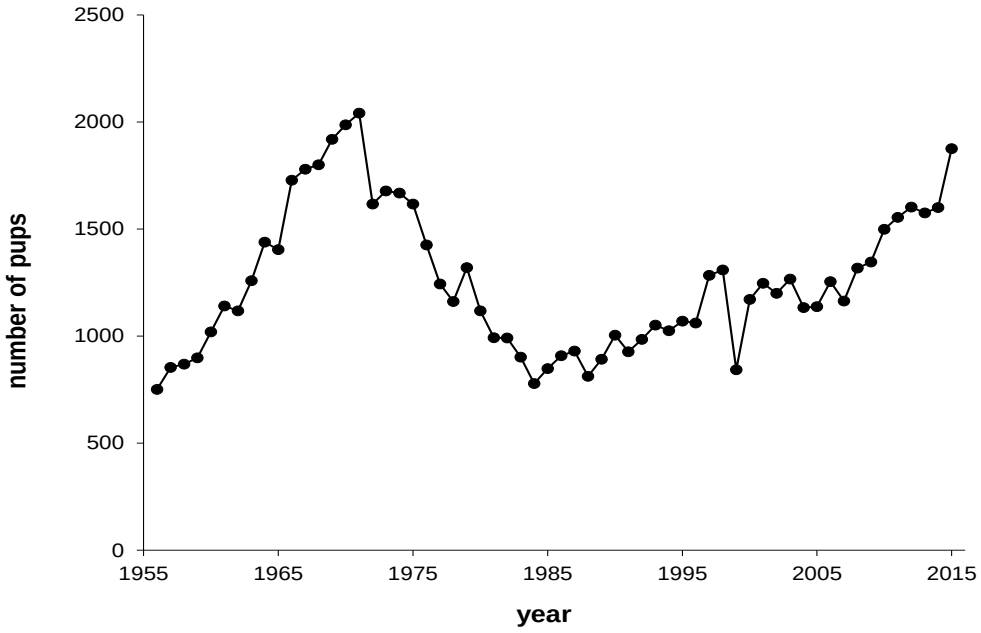

Figure 3 Pup production estimates for the Farne Islands 1956 to 2015.

The trends in pup production at the Farne Islands show interesting variations (Figures 3 & 4). From the late 1950s the pup production increased at an average rate of 7.3% p.a. reaching a peak of 2041 in 1971. A series of culls instigated as population control measures, were carried out in the 1960s, 1970s and 1980s (table 1). This represented a major effort to reduce the population. At its most intense, a total of 1571 adult females and 1605 pups were killed over a six year period between 1972 and 1977. Between 1962 and 1983 a total of 2005 adult females and 3121 pups were killed. The effects of a culling program are clearly visible as the pup production subsequently declined at an average rate of 6.2% p.a. to a minimum of 778 in 1984. The pup production in the mid-1980s was therefore similar to the pup production in the late 1950s. Since 1984 pup production has gradually increased at approximately 2% p.a (Figure 3). This growth rate may be increasing, over the last decade the fitted exponential growth rate has been approximately 4.5% p.a.

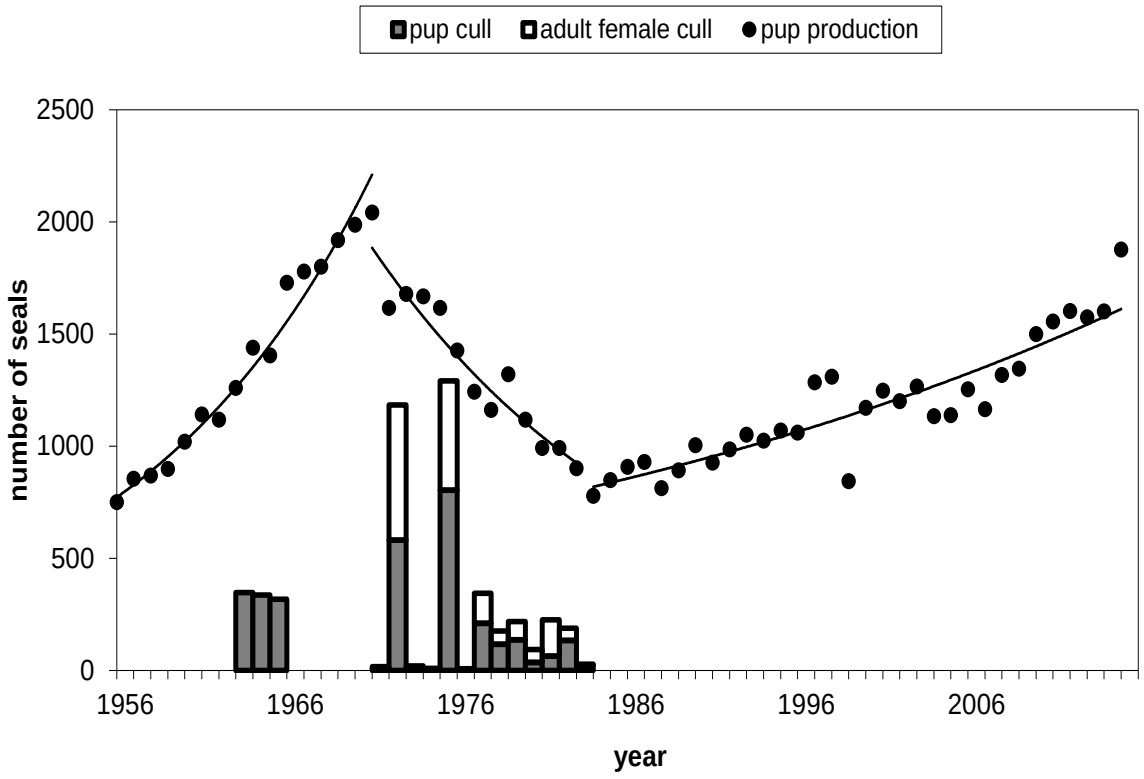

Figure 4 Pup production and number of adult females and pups killed during the population control programme at the Farne Islands. Fitted lines are exponential growth of +7.3% p.a. between 1956 and 1971, a decline of 6.2% p.a. between 1972 and 1984 and an increase of 2.2% p.a. since 1984.

During the 1960s and 1970s the pup and adult culls in the Farne Islands were aimed at population reduction. They apparently achieved their goal of reducing pup production to 1950s levels and

reduced overall grey seal population size at the Farne Islands , but the overall effect on the North Sea grey seal population may have been less than expected (see below).

Table 1 Numbers of adult female and pups killed during the intensive population control programme in the 1970s and early 1980s.

Year	No. pups killed	No. adult females killed
1962	347	0
1963	336	0
1964	318	0
1971	5	12
1972	581	748
1973	3	17
1974	4	5
1975	804	663
1976	4	4
1977	209	134
1978	117	58
1979	137	80
1980	35	58
1981	64	162
1982	134	54
1983	24	4

4.2.2 Fast Castle breeding colony

The rapidly expanding breeding colony at Fast Castle is now the largest in the North Sea. The most recent available estimate of pup production was 2940 in 2014. An new round of surveys was carried out in November and December 2016. Results of these surveys will be available through the NERC Special Committee on Seals in 2018.

Small numbers of grey seals have been known to breed on beaches at the base of cliffs at Fast Castle, Berwickshire since the late 1980s. Reports of increased breeding activity in the mid 1990's prompted the first comprehensive pup production surveys in 1997, at which time pup production was estimated at 236. It is therefore likely that significant numbers of pups were being born there from the late 1980s onwards. In 1997 the pups were restricted to the beaches either side of Downlaw Dean. The colony has since spread dramatically, mainly to the west. Substantial numbers of pups are born on most of the accessible beaches between 55°54.3'N; 2°9'W and 55°55.6'N; 2°16.8'W (figure 5).

Pups are spread along the coast and are found at high densities on almost all sections that have any form of beach (Figure 6).

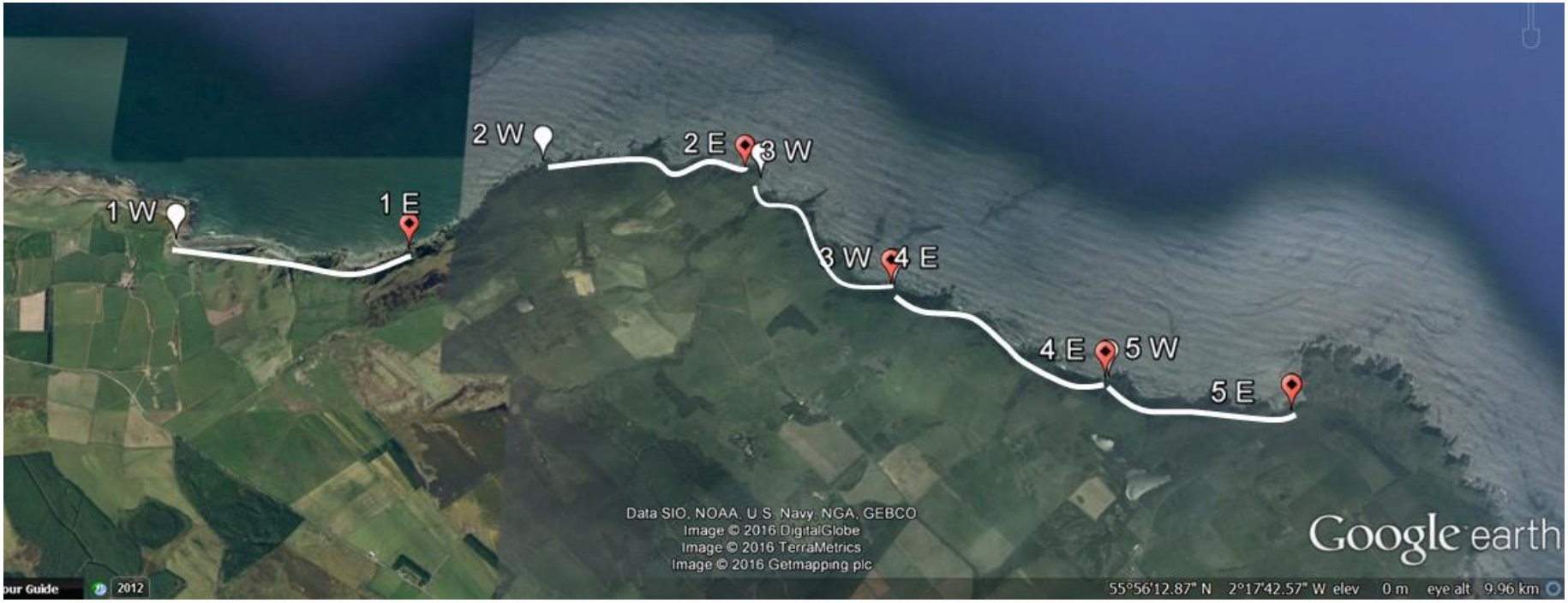

Figure 5 Satellite image of the pupping sites at Fast Castle. Distributions of pups on different sectors of the breeding site are presented for sectors 1 (western most) to sector 5 (eastern most) in Figure 6 below. The colony continues to expand as pup production continues to increase.

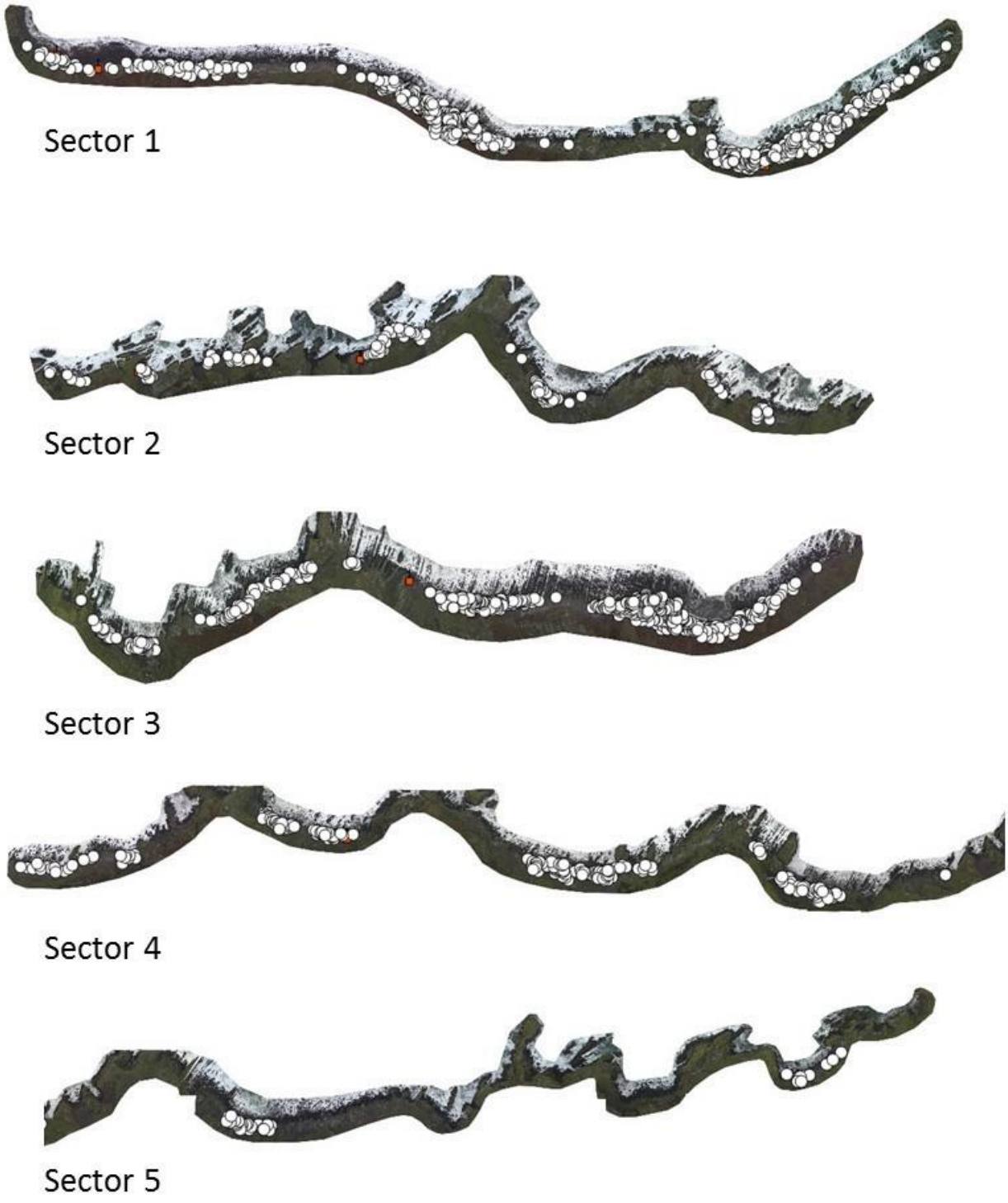

Figure 6 Distribution of pups throughout the Fast Castle breeding colony at the peak of the breeding season in 2014. Each white circle represents one pup.

Unlike at the Farne Islands, the surveys of Fast Castle are carried out by aerial survey using vertical aerial photography using the standard SMRU grey seal survey methodology (SCOS 2015). Up to six

surveys are carried out each breeding season. Pups are counted and classified into pre and post moult categories. Pup production is estimated from this series of counts using a statistical model to fit parameters of the birth curve, mean and variance of the age at moulting and length of time ashore (SCOS 2015).

Pup production at Fast Castle continues to grow exponentially at an average rate of approximately 15.8% p.a. (Figure 7). It is generally assumed that a closed population of grey seals with the highest plausible fecundity and adult and pup survival levels can grow at around 12% per annum in the absence of density dependent effects (Härkönen et al. 2002). The sustained growth of 15.8% p.a. at Fast Castle probably indicates some additional recruitment from other breeding colonies. In this case it seems likely that the nearby Isle of May and Farne Islands populations are major sources of recruits, however, the much larger but more slowly increasing population in Orkney is another potential source of additional recruits. The most notable feature of the Fast Castle colony is that it exhibited very rapid growth throughout a period when the adjacent colonies at the Farne Islands and the Isle of May have shown little growth.

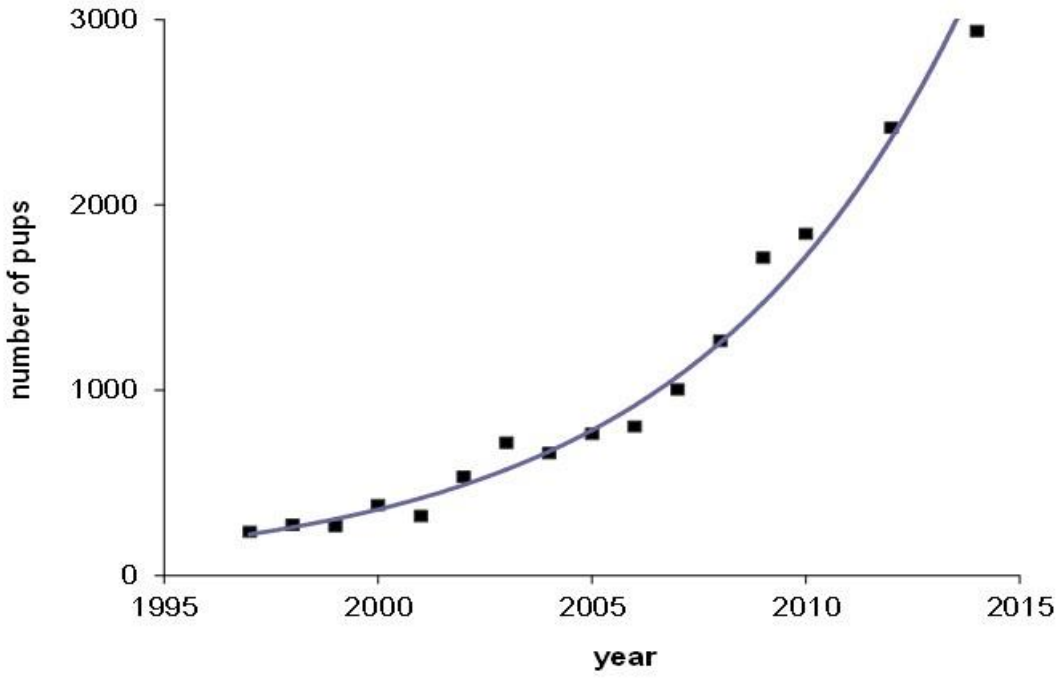

Figure 7 Grey seal pup production at Fast Castle, Berwickshire. The fitted exponential curve indicates an average annual rate of increase of 15.8% (R2=0.98)

By 2008 the colony at Fast Castle was producing as many pups as the Farne Islands. Although pup production has increased at the Farne Islands, the rate of increase at Fast Castle has been much

greater, with a sustained and continuing 15.8% p.a. growth rate. As previously predicted, the Fast Castle colony is now substantially larger than the colony at the Farne Islands, producing 80% more pups in 2014 than the Farnes.

Pups may occasionally be born on other sections of the coast, with recent reports of small numbers of grey seal pups within the Lindisfarne NNR. The recent history of extremely rapid increases at Fast Castle and at new colonies on the East Anglian coast means that any reported new breeding groups should be investigated and monitored.

4.3 The Isle of May breeding colony

The most important breeding site in the vicinity of the BNNC SAC is the Isle of May which lies in the mouth of the Firth of Forth approximately 35 km north-west of Fast Castle and 85 km north west of the Farne Islands. This colony is thought to be closely related to the Farne Islands and Fast Castle breeding colonies because of their proximity and the relationships between their growth patterns (see below).

Grey seals have bred on the Isle of May in small numbers since at least the 1960s (Prime 1981,1982). Until the mid-1970s pupping was restricted to a small shingle beach at Pilgrims Haven on the west side of the island and production remained relatively constant at approximately 40 pups p.a. However, in the late 1970s the pup production suddenly increased, with a report of 300 pups being born there in 1979. Systematic ground counting surveys in 1980 and 1981 produced estimates of approximately 500 pups per annum. As a consequence the Isle of May was included in the annual grey seal monitoring programme in the early 1980s and annual, aerial survey based pup production estimates have been obtained since then. The trajectory of the pup production is shown in Figure 8. Pup production increased at an average rate of 8% pa, reaching a peak of over 2100 in 2000. Since 2000 the pup production has varied substantially, but overall has remained around 2000 pups p.a..

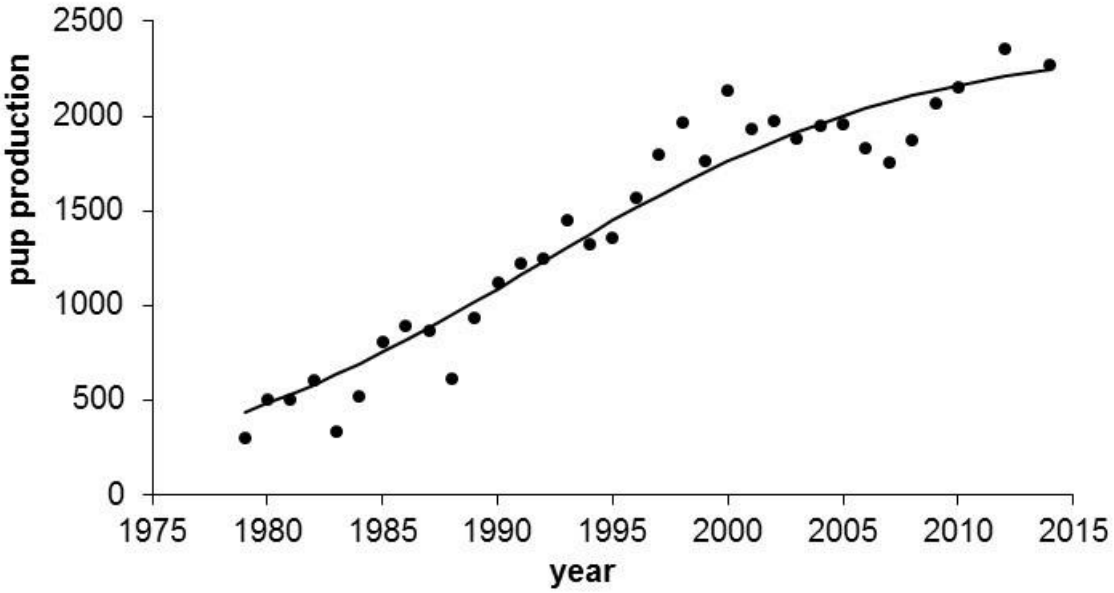

Figure 8 Grey seal pup production estimates for the Isle of May from 1979 to 2014. A logistic curve is fitted to highlight the reduction in growth rate over the past decade.

Compared to the Farne Islands and Fast Castle, the Isle of May is a large and apparently open breeding site. The area of the island used by seals for breeding has increased as the population increased. Between 1988 and 1994 an index of the proportion of the island's northern area occupied by seals increased from 0.48 to 0.65, while the average population density in these occupied areas decreased over the same period. Although seals have begun to breed in southern parts of the island that were unused previously, other apparently suitable breeding areas on the island remain vacant.

Breeding females marked at the Isle of May since 1987 returned there to breed with few exceptions, and most females that returned were faithful to their previous pupping sites (median distance between sites used in consecutive breeding seasons = 25 m). Site fidelity persisted even when a previous pupping was unsuccessful and most individuals' pupping locations did not change with time (Pomeroy *et al.* 2000a,b).

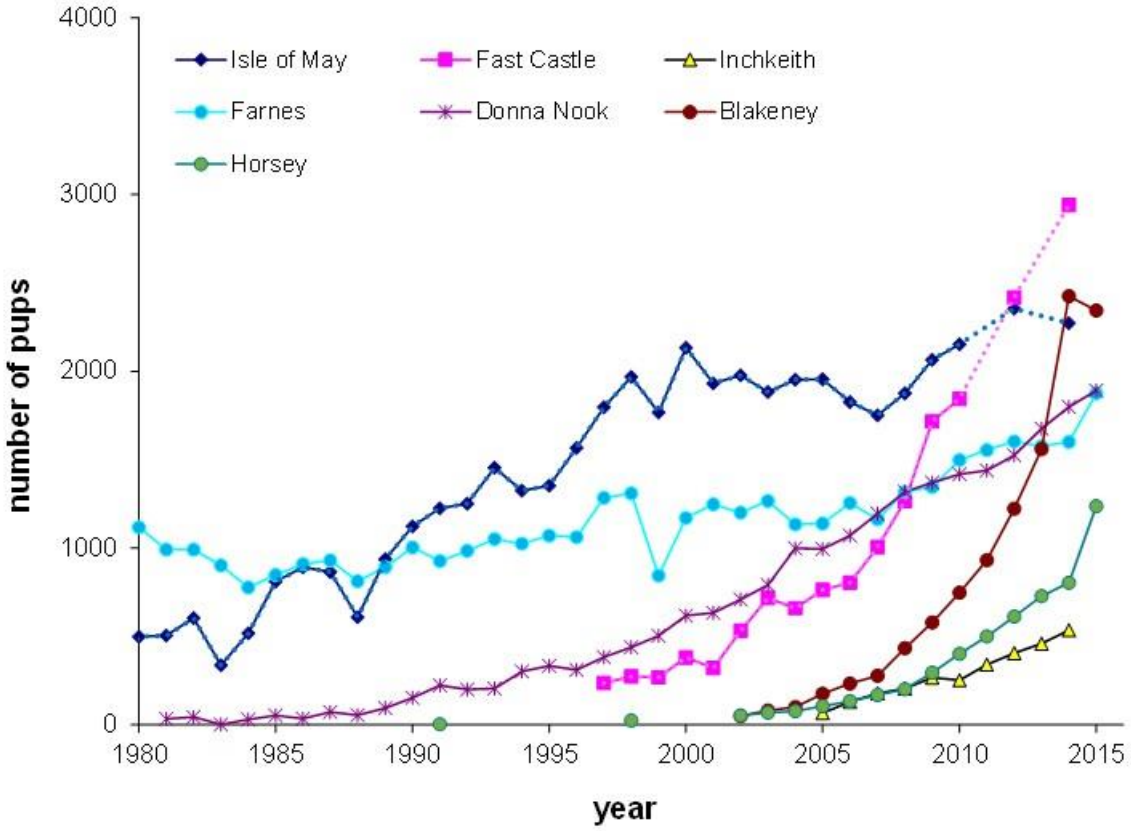

Figure 9 Grey seal pup production from 1980 to 2015 at the six main breeding colonies in the North Sea: Farne Islands, Fast Castle, Isle of May, Inchkeith, Donna Nook, Blakeney and Horsey.

To the south of the BNNC SAC the nearest breeding colony is in the mouth of the Humber estuary at Donna Nook approximately 200km south of the Farne Islands. Again the colony at Donna Nook has shown a rapid and continual increase since the early 1980s (Fig. 9). Pup production has increased at an average rate of 15% p.a. As with the Fast Castle growth, it is unlikely that this is entirely intrinsic growth and probably indicates continued immigration/recruitment of females from one or more of the Farnes and Isle of May or more distant colonies in Scotland Newer colonies have been established since 2000 at Blakeney and Horsey on the Norfolk coast. These are again growing rapidly and Blakeney is now producing more pups than the Isle of May (Fig. 9).

4.4 Overall North Sea population trajectories

The BNNC SAC contains two important breeding groups at the Farnes and Fast Castle. However, these breeding groups are clearly subsets of a much larger and more widespread North Sea population. This overall North Sea population is continuing to increase and expand (Fig. 10). New and rapidly increasing colonies have been established in the extreme south of the region in East Anglia and in the extreme North West of the region in the Firth of Forth at Inch Keith . A simple exponential growth curve fits well to the combined population (R^2= 0.95) between 1980 and 2007, indicating continued growth at an average rate of 5.7% p.a. Since 2007 the North Sea population growth rate appears to have increased and fits well to an exponential growth rate of 10.7% p.a. (R^2=0.99).

The most dramatic/important event in the history of the grey seal population in the North Sea was the large scale culling program in the 1960s and 1970s. This had the obvious effect of removing a large proportion of the breeding females and the removal of over 3000 pups would have had an effect on subsequent recruitment. The overall effect was a short term decrease in pup production at the Farne Islands following the culls. Pup production then stabilised around the mid-1980s. In the medium term, the overall North Sea population recovered from these reductions and by the early 1980s was exhibiting growth rates similar to those seen in the Farne Islands prior to the culling programme. In terms of overall effects on the North Sea population size it appears that the growth of the population was delayed by around 10 to 15 years (Figure 10). We cannot say what the population would have done in the absence of the culling, but it is reasonable to assume that it could have grown to at least its current level. In that case, the level of seal foraging effort in the central and southern North Sea will have been substantially lower for the entire period since the mid-1970s, than it would have been in the absence of the culling programme.

However, it is also clear that the disturbance caused by the culling program had other effects. In 1972, the first year of the targeted adult cull, the pup production in the Farne Islands declined, and was approximately 500 lower than would have been expected. This presumably represents a large number of pregnant females moving away from the Farne Islands to avoid the disturbance. It is likely that some or all of these females will have pupped somewhere and it is likely that a proportion of them moved to the Isle of May and successfully reared pups there. It is plausible that the initial increase in the Isle of May pup production was a result of the continued, deliberate disturbance of breeding females at the Farne Islands throughout the 1970s and 1980s. It is also possible that the same process was responsible for establishing the breeding group at Donna Nook.

The situation in the North Sea with a continual exponential increase is in contrast with the patterns in the other major UK grey seal populations (Fig. 11). Pup production in the Inner and Outer Hebrides grew rapidly during the 1980s and early 1990s. As in the North Sea, the growth in the Outer Hebrides was not universal, in that almost all of the increase in pup production was due to rapid growth at the Monach Isles. Pup production at older colonies, including North Rona in fact declined slowly during this period. Pup production in both the Inner and Outer Hebrides stabilised in the mid-1990s and has remained relatively constant since. A similar pattern is emerging in Orkney where rapid growth continued until around 2000 and has since slowed considerably.

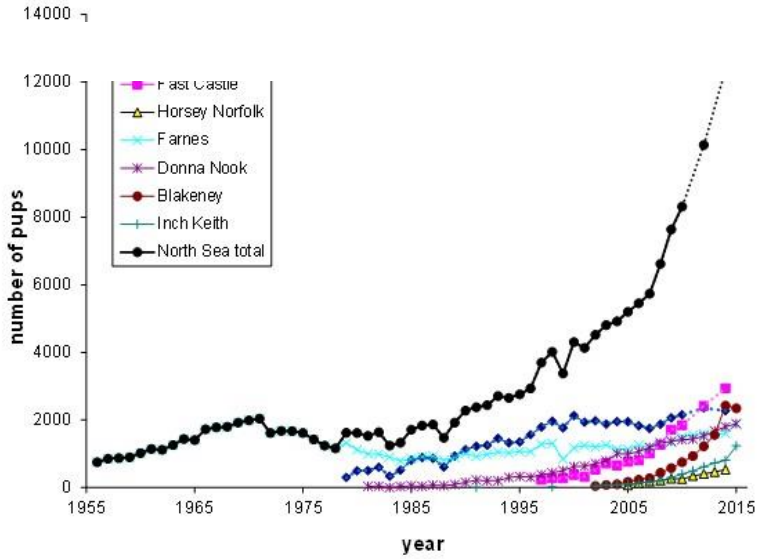

Figure 10 Grey seal pup production at all the UK breeding colonies in the North Sea: Farne Islands, Fast Castle, Isle of May and Donna Nook and recently expanding colonies at Blakeney and Horsey in East Anglia and Inch Keith in the Firth of Forth. Over the period 1980 to 2008 the pup production increased at an average rate of 5.7% p.a..

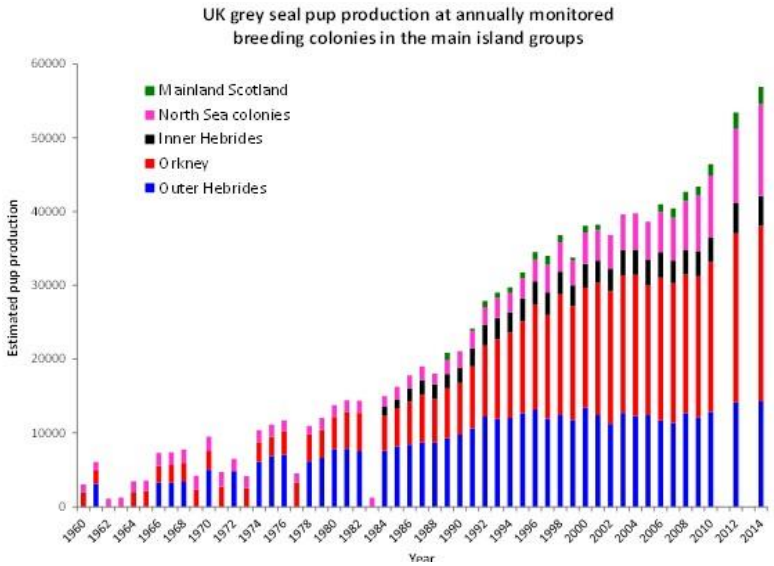

Figure 11 Grey seal pup production in the four sub-populations of the UK grey seal population.

4.5 Importance of BNNC-SAC breeding sites.

The BNNC-SAC breeding colonies at the Farne Islands and Fast Castle produced approximately 4800 pups in 2014 the most recent year for which UK wide pup production figures are available. This represents approximately 37% of the grey seal pup production at the UK North Sea colonies, 8% of the UK pup production and approximately 2.8% of the World's grey seal pup production.

4.6 UK grey seal population in a World context

The UK grey seal population represents approximately 45% of the world population on the basis of pup production. The other major populations in the Baltic and Canada are also increasing, but at a faster rate than in the UK (Table 2).

Table 2 *Relative sizes of grey seal populations. Pup production estimates are used because of the uncertainty in overall population estimates (from: SCOS 2015)*

Region	Pup Production	Year	Possible population trend
UK	**60,500**	2014	Increasing
Ireland	2,100	2012[1]	Increasing
Wadden Sea	1,100	2015[2]	Increasing
Norway	1,300	2008[3]	Increasing
Russia	800	1994	Unknown
Iceland	1,200	2002	Declining
Baltic	6,400	2013[4,5]	Increasing
Europe excluding UK	**12,900**		Increasing
Canada - Scotian shelf	88,200	2016[6]	Increasing
Canada - Gulf St Lawrence	10,500	2016[6]	Increasing
USA	3,600	2014[7]	Increasing
WORLD TOTAL	**169,400**		Increasing

[1]Ó Cadhla, O., Keena, T., Strong, D., Duck, C. and Hiby, L. 2013. Monitoring of the breeding population of grey seals in Ireland, 2009 - 2012. Irish Wildlife Manuals, No. 74. National Parks and Wildlife Service, Department of the Arts, Heritage and the Gaeltacht, Dublin, Ireland.

[2] http://www.waddensea-secretariat.org/sites/default/files/downloads/tmap/MarineMammals/GreySeals/grey_seal_report_2016.pdf.

[3]Øigård, T.A., Frie, A.K., Nilssen, K.T., Hammill, M.O., 2012. Modelling the abundance of grey seals (*Halichoerus grypus*) along the Norwegian coast. ICES Journal of Marine Science: Journal du Conseil, 69(8) 1436-1447.

[4]Data summarised in*: Grey seals of the North Atlantic and the Baltic*. 2007. Eds: T. Haug, M. Hammill & D. Olafsdottir. NAMMCO Scientific Publications, Vol. 6.

[5]Baltic pup production estimate based on mark recapture estimate of total population size and an assumed multiplier of 4.7 HELCOM fact sheets (www.HELCOM.fi) & http://www.rktl.fi/english/news/baltic_grey_seal.html

[6] M.O. Hammill, den Heyer, C.E., Bowen, W.D., and Lang, S.L.C. 2017. Grey Seal Population Trends in Canadian Waters, 1960-2016 and harvest advice. DFO Can. Sci. Advis. Sec. Res. Doc. 2017/xxx.

[7]NOAA (2009) http://www.nefsc.noaa.gov/publications/tm/tm238/247_f2015_grayseal.pdf

5. Non Breeding Distribution within the BNNC SAC

Outside the breeding season grey seals come ashore regularly to rest and during late winter to moult. Recent telemetry studies indicate that grey seals spend approximately 20% of their time ashore throughout the year. At present there is little information on why seals haulout and on what effects reducing their ability/options for hauling out would have on their individual fitness. A haulout deprivation study on harbour seals indicated that they respond to being prevented from hauling out by increasing the length of subsequent haulout periods. This has been interpreted as indicating a physiological requirement for hauling out (Brasseur *et al.* 1996).

There has been relatively little effort to monitor the distribution and haulout numbers of grey seals outside the breeding season. Surveys targeted on harbour seals during their annual moult in August provide an opportunity to census the grey seal population outside their breeding season. Over the past 20 years these have been expanded to include all the grey seal haulout sites along the UK's North Sea coast. These surveys occur at irregular intervals but on average the area is surveyed every four or five years. In addition to the August surveys, a series of aerial surveys of the east coast between Coquet Island and Fraserburgh were carried out between April and September 2008. Locations of haulout sites and counts of seals are presented in Table A1 and figures 12,13 & 14.

Grey seal haulout sites are widely distributed on the east coast. Figure 12 shows the distribution from Fraserburgh to Coquet island throughout the spring and summer months in 2008. The area around the Farne Islands and Lindisfarne holds the largest concentration of hauled out seals along this section of coast line in all months. It is approximately 80 km south of the nearest large haulout sites in the Firth of Forth. To the south there is a major haulout site at Coquet Island (an SPA on the southern boundary of the BNNC SAC) but then no major haulout sites between Coquet Island and the Humber estuary, although small numbers of grey seal regularly haulout at St Mary's Island at Whitley Bay, Tyneside.

The counts of seals in the BNNC SAC during the summer varies dramatically (Table 3) but in recent years the count has been apparently increasing. The peak count of 4600 at Lindisfarne in 2015 is the second largest single haulout group ever recorded in the UK and the total count for the BNNC SAC of 6993 represents approximately 20% of seals estimated to have been hauled out in the UK at that time (Russell *et al*. 2016). The BNNC SAC must therefore be regarded as an important haulout area for grey seals during the summer.

Table 3 Counts of grey seals hauled out at sites within the BNNC SAC during August.

year	1994	1997	2000	2005	2007	2008	2011	2015
Count of grey seals	100	603	568	1,092	1,907	2,338	4,249	6,926

Figure 13 shows the distribution of haulout sites within the BNNC SAC and the numbers of seals counted each month during the spring and summer months in 2008. The haulout sites are concentrated around the Farne Islands and Lindisfarne with one minor haulout site in Newton Bay and the major site at Coquet Island. North of Lindisfarne there were no records of seals hauling out except for three small groups in Berwickshire during the August surveys.

There was little obvious seasonal pattern in the haulout distribution. Coquet Island showed a gradual decline in importance during the year. The large haulout group in early spring included a disproportionate number of juveniles, but this proportion declined to zero in the September survey.

The complete absence of seal haulout sites along the coast at the Fast Castle breeding site was unexpected as there are haulout sites close to most grey seal breeding sites in the UK. This almost complete absence of haulouts along the Berwickshire coast has been confirmed during subsequent helicopter based surveys using thermal imagery to detect seals during surveys targeted on moulting harbour seals. In the case of Fast Castle the most likely explanation is that the local topography does not provide suitable haulout habitat. Whereas access to sheltered and undisturbed beaches is the primary consideration for breeding grey seals haulout site are usually at sites with easy access to open water. The stratigraphy at Fast Castle, with erosion of cliffs with steep incline planes means that there are few suitable haulout rocks. The sheltered beaches have restricted access routes which may reduce their attractiveness to seals. The proximity (50km represents less than half day's swim for a grey seal) of the large and presumably attractive haulout sites at the Farnes, Isle of May and Firth of Tay and the wide ranging foraging movements of grey seals means that this absence of haulout sites does not indicate a problem for grey seals, (but see discussion of telemetry tracking data below).

Figure 14 shows the fine scale haulout distribution within the Farnes (including Lindisfarne), each month during the spring and summer months in 2008.

The proximity of the Lindisfarne haulout sites to those in the Farne Islands and the large scale re-distributions within it suggest that they should be regarded as one haulout site. It is likely that the relative numbers at Lindisfarne and the main Farne Islands is a function of the weather and to a smaller extent may be the result of increased boat activity and occasional disturbance events at the Farnes during the summer months. It was noteworthy that on the one occasion when few seals were found at Lindisfarne, large numbers were found on the small haulout rocks at Knivestone on the outer fringe of the Farnes.

The number of seals hauling out on the sand banks inside Lindisfarne varied through the survey programme, during June and July over 50% of seals counted were at Lindisfarne.

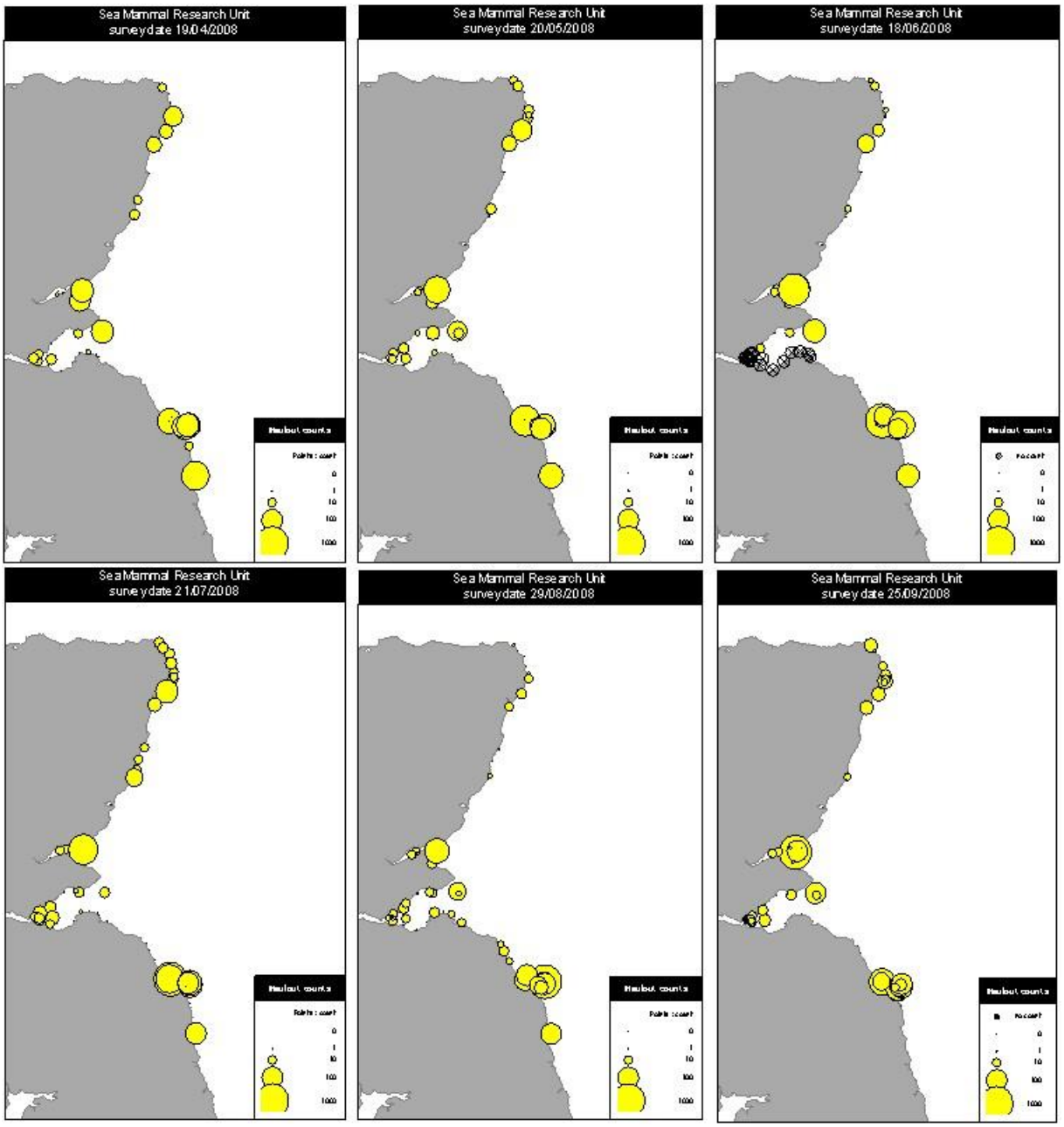

Figure 12 Distribution of grey seal at haulout sites along the east coast from Fraserburgh to Coquet Island in 2008 spring and summer months.

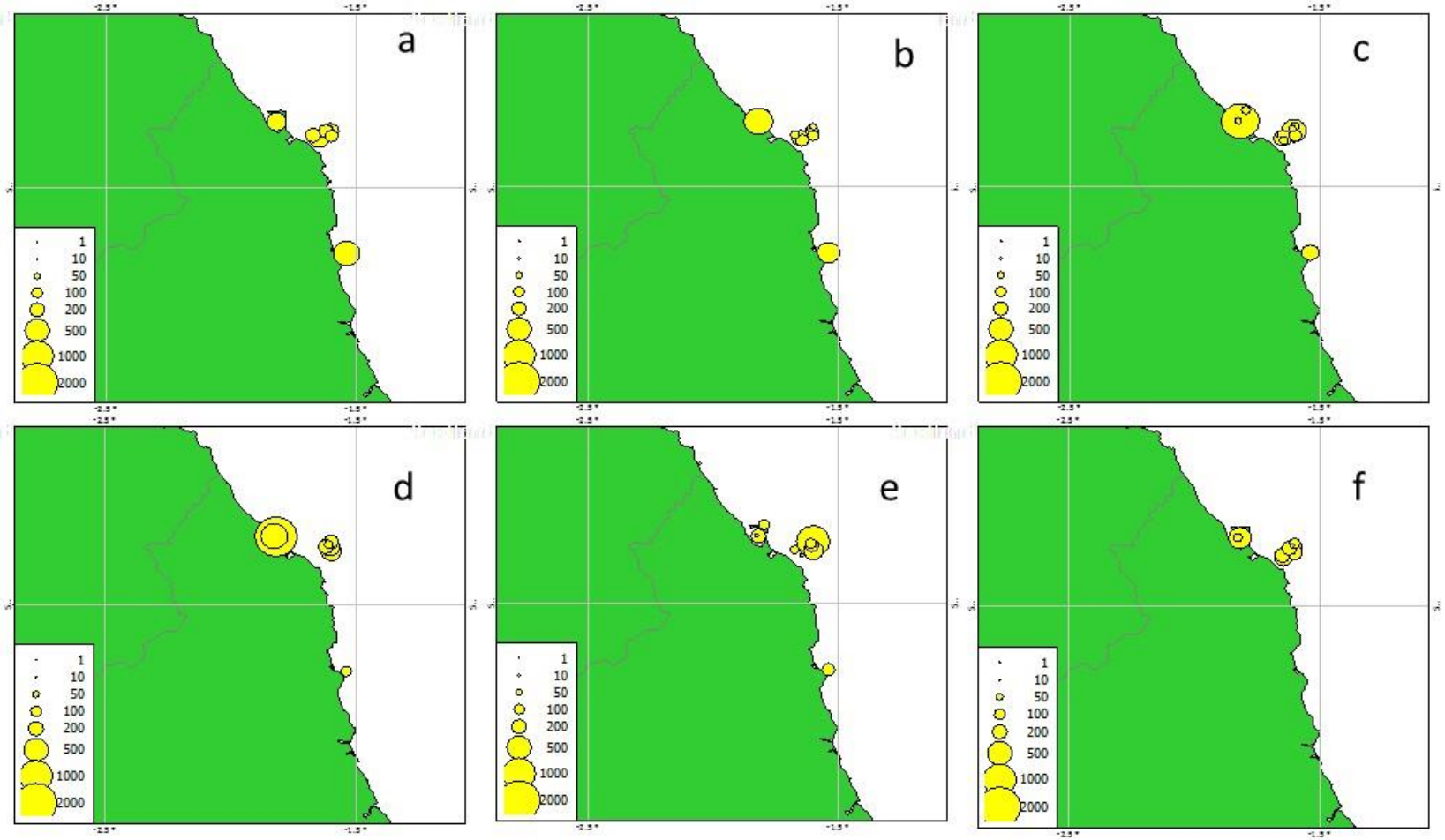

Figure 13 Distribution of grey seals at haulout sites within the BNNC SAC and at Coquet Island on the southern edge of the BNNC SAC outside the breeding season in 2008. a) April, b) May, c)June, d)July, e)August, f) September

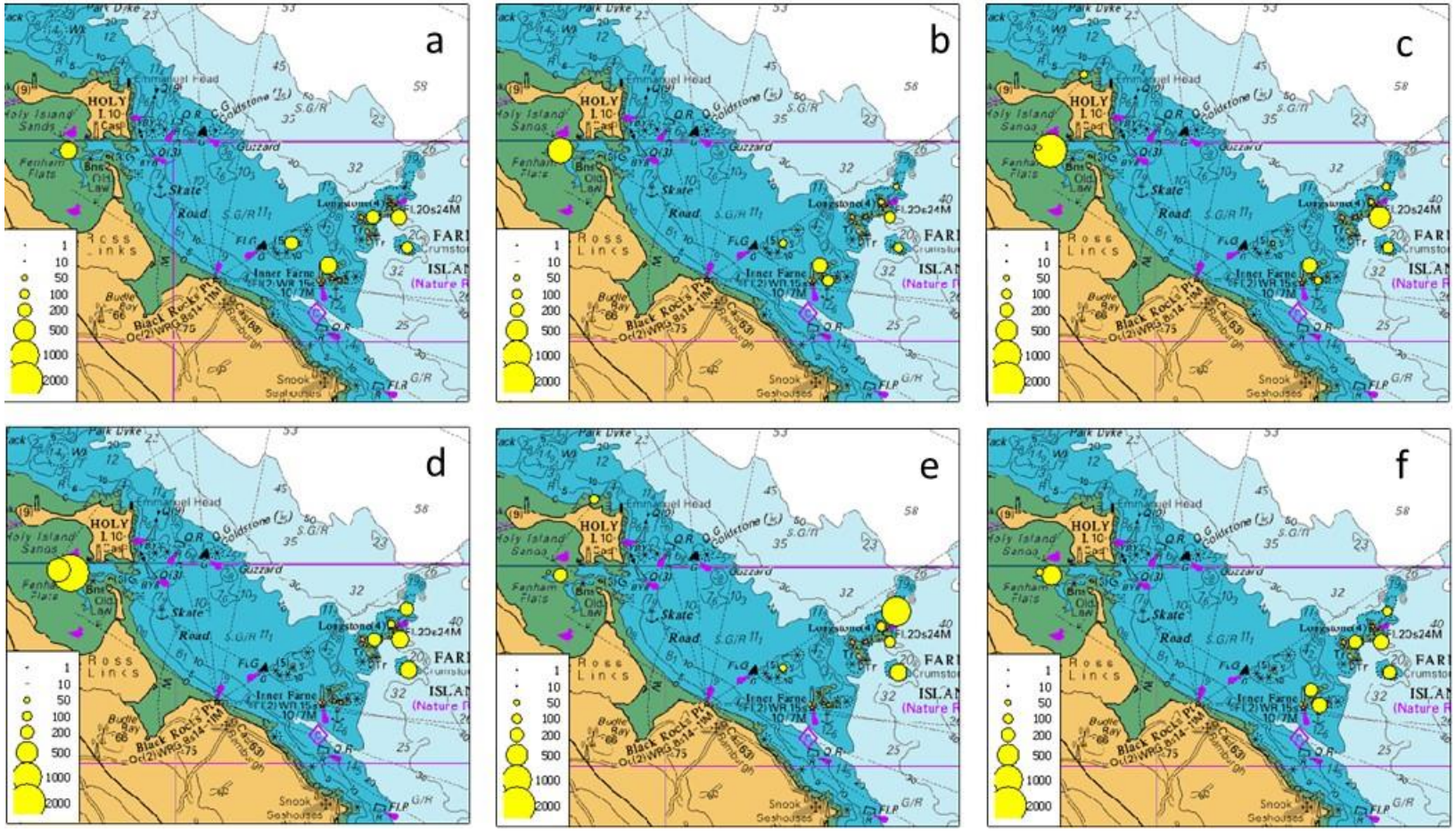

Figure 14 Distribution of haulout groups of grey seals within the Farne Islands and Lindisfarne outside the breeding season in 2008. a) April, b) May, c) June, d) July, e) August, f) September

In summary, eight years ago, the BNNC SAC was an important haulout area for grey seals. Given the numbers of seals throughout the SAC, the area likely continues to be an important haulout area in 2016 onwards.

6. Foraging Distribution

Information on the movements and spatial distribution of grey seals in the North Sea has been collected during a series of telemetry tracking studies (Russell et al 2013). Two types of tracking devices have been used to study grey seal movements: early deployments (pre-2000) used ARGOS Satellite transmitters which produce approximately 5 to 10 position fixes per day, but with significant location error in those position fixes, while more recent deployments have used GPS logging UHF transmitters that use the GSM mobile phone network to download data and produce a higher frequency of more accurate (mean error < 50m) position fixes. Figure 15 shows the swimming tracks of grey seals tagged at: the Farne Islands; Abertay (a large haulout site in the Tay estuary, approximately 50km north of the BNNC SAC); Donna Nook (a large haulout site in the Humber estuary, approximately 150km south of the BNNC SAC) and in Orkney (Russell, 2016a).

In Figure 15 the swimming tracks of the sample of tagged seals are superimposed on a 5km x 5km grid, coloured to represent the estimated instantaneous density of seals in each grid cell (Jones *et al*. 2016; Jones & Russell 2016). The density estimates are the product of a model combining telemetry data from all grey seals tagged in the UK and the most recent counts of grey seals at each haulout site (Jones *et al*. 2016; Jones & Russell 2016). The maps can be interpreted as showing the average number of seals expected to be in that cell at any point in time.

The track data clearly demonstrate that grey seals range widely throughout the western North Sea. There is frequent movement between the major haulout sites. Seals tagged at Donna Nook, the Isle of May and Abertay made frequent visits to the haulout sites in the BNNC SAC and foraged in the waters offshore from the BNNC SAC.

Historically, grey seals tagged at the Farne Islands and Abertay Sands (McConnell *et al.* 1999) have been recorded making long distance movements to Orkney, Shetland, the Faroes, and far offshore into the Eastern Atlantic and the North Sea. Similarly, grey seals tagged in northern France and the Netherlands have travelled to and through the BNNC SAC (Brasseur *et al.* 2015; C. Vincent, pers. com). Most long distance trips were directed to known haulout sites. The large distances travelled indicate that grey seals that haulout at in the BNNC SAC are not ecologically isolated from those at sites along the English and Scottish east coasts, Orkney, Shetland and mainland Europe. The grey seals that forage in the North Sea can thus be considered as coming from a single ecological population.

All the seals were tagged outside the breeding season, at times when they were assumed to have dispersed to their foraging areas. A subset of the tagged seals were tracked long enough to follow them through the subsequent breeding season, allow an estimate of migration/movement probabilities between regions (Russell *et al.* 2013). The data show significant movement between breeding locations in one management region and foraging locations in adjacent management regions. These management regions (SCOS, 2015) are large areas, e.g. the East coast sites between

the Isle of May and Donna Nook fall within a single management region. Taken together, the raw track data (Figure 15), the significant movements between breeding and foraging sites in different management regions and the clear evidence of recruitment into the southern North Sea during the breeding season combine to produce a picture of significant and frequent interchange between sites in the North Sea.

The implication of this widespread interchange is that any management decisions affecting foraging success in any part of the North Sea could be having an effect on the BNNC SAC. Conversely, any management actions targeted on the seals in the BNNC SAC will need to take into account the extent of the foraging distribution.

The habitat usage map (Figure 16) suggests that there is a concentration of seal activity, including both transit swimming and foraging activity in an area directly offshore from the Farne Islands. This high density area spreads out in a broad NE/SW strip approximately 20km wide and 40-50 km long. Conversely there appears to be little grey seal activity in the waters directly offshore from the breeding site at Fast Castle.

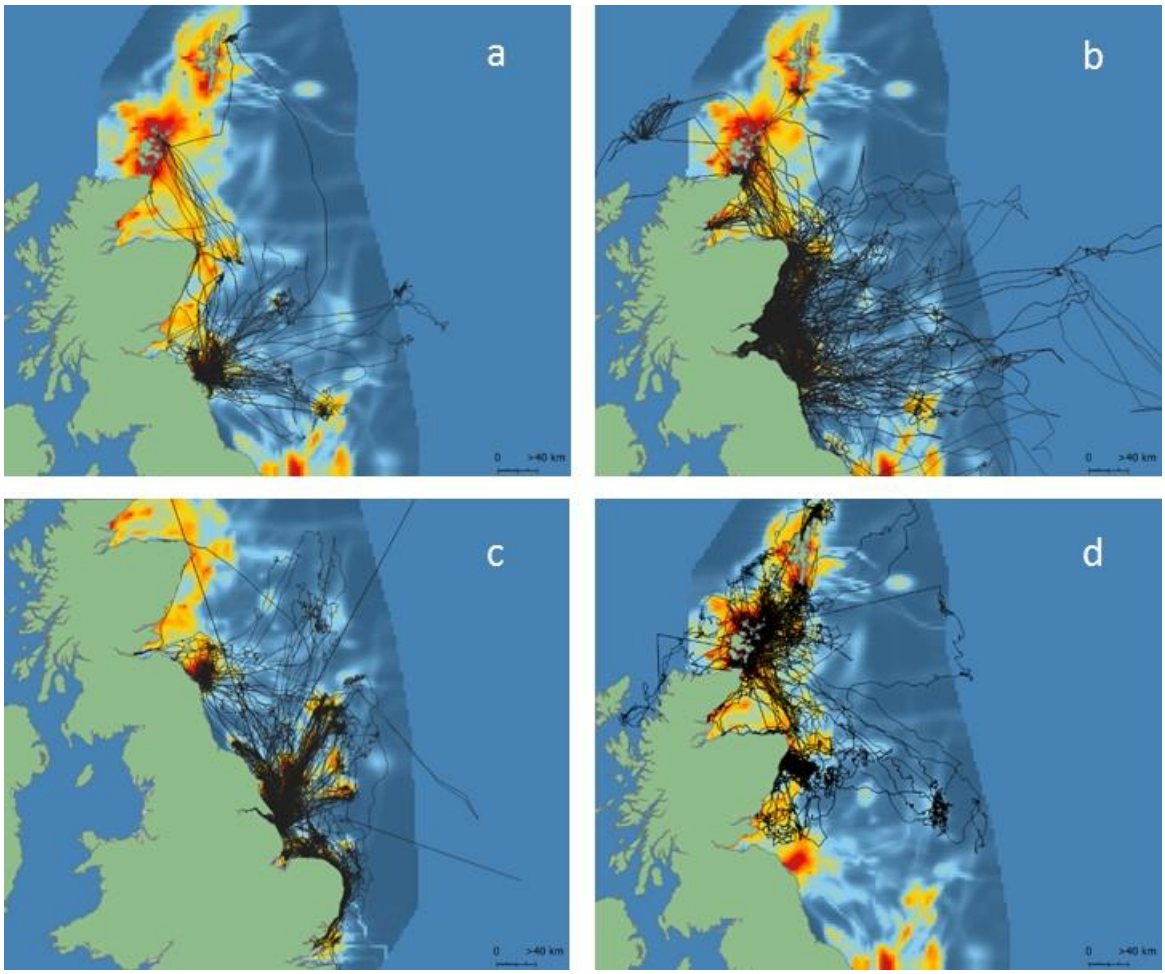

Figure 15 Swimming tracks of grey seals overlaid on at sea, seal density maps; seals tagged at a) the Farne Islands, b) Abertay Sands, c) Donna Nook and d) Orkney.

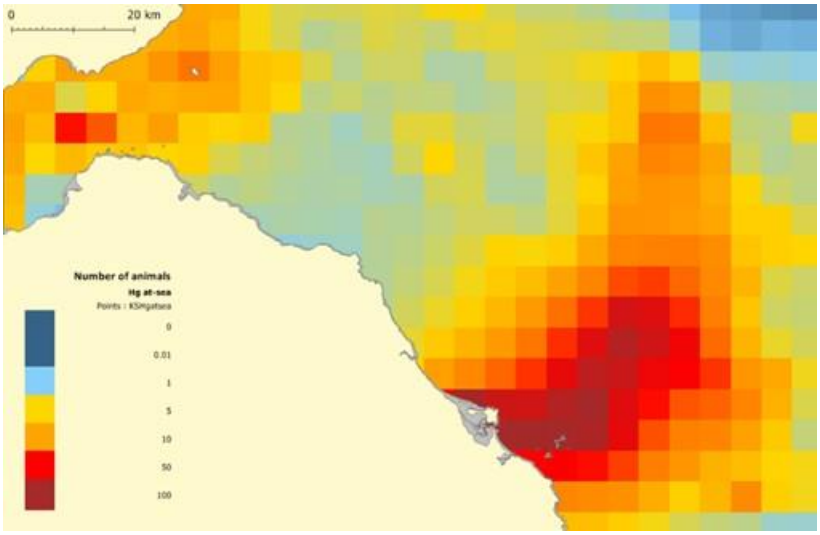

Figure 16 Contour map of predicted relative density of grey seals in 25 km^2 grid cells from north east Scotland, Abertay and Farnes haulout regions in 1991-2008.

7. Food & Feeding

The diet of grey seals has been studied extensively in the North Sea. Information is available for seals that haul out around the Humber Estuary, the Farne Islands, the Firths of Forth and Tay, and Orkney for three years, 1985, 2002, 2011.

In the 1985 study the diet in the central North Sea was dominated by sandeels and cod, with whiting also a significant component (Hammond and Prime 1990; Hall and Walton 1999). In the south-western North Sea, three species accounted for the majority of the diet: sandeels, cod and sole. Other significant prey were dab, flounder and plaice. There were clear seasonal changes with the diet dominated by flatfish in spring and sandeels in summer. Overall, a clear picture emerges of grey seal diet comprising primarily sandeels, gadoids and flatfish, in that order of importance, but varying seasonally and from region to region.

A reassessment of grey seal diet was carried out in 2002. Marked changes were found in grey seal diet composition between 1985 and 2002. The core species (sandeels, cod and other gadoids) were similar in both time periods, but the proportions they contributed were different both regionally and seasonally. In the East Coast region, the general changes were less pronounced; the percentage of gadoids in the diet was lower and the percentage of sandeels was higher in 2002 compared with 1983-88. Within the gadoids, however, the percentage of cod in the diet overall declined almost 5-fold, and the percentage of haddock increased by an order of magnitude.

Table 4 Estimated diet composition for prey groups, expressed as % of the diet by weight, for 1985, 2002 and 2010/11. (from Hammond & Wilson 2016)

	Central North Sea			Southern North Sea		
Prey group	**1985**	**2002**	**2010/11**	**1985**	**2002**	**2010/11**
Gadid	29.5	22.3	8.4	14.6	17.5	9.0
Trisopterus	1.2	0.3	0.2	0.8	1.0	0.3
Sandeel	63.9	62.2	78.5	46.3	17.9	58.6
Flatfish	3.3	6.1	8.8	18.3	10.9	16.2
Sandy benthic	0.6	3.1	0.9	7.8	21.9	6.3
Scorpion fish	1.3	4.7	2.0	11.0	29.4	7.7
Pelagic	0.1	0.1	0.8	1.3	0.8	0.9
Salmonid	0.0	0.0	0.0	0.0	0.0	0.0
Cephalopod	0.0	0.9	0.3	0.0	0.5	0.8
Other	0.0	0.2	0.2	0.0	0.1	0.2

In the North Sea, grey seal diet was dominated by sandeels, particularly in the central North Sea, where the only other prey species contributing more than a very small amount to the diet were plaice and cod. In the southern North Sea, the diet was more varied and included whiting, cod, plaice, Dover sole, dragonet and sea scorpion but in relatively small amounts. Flatfish were more prevalent in the diet in the southern North Sea than in other areas

In Orkney and the northern North Sea, sandeels made up around half of the diet. Bullrout was also important in the diet, particularly in Shetland. Flatfish contributed less to the diet in the Northern Isles than in other regions. Shetland was the only region where there were any salmonids in the diet (half of one percent).

In the central North Sea, the prevalence of gadids declined markedly from 30% to 22% to 8% in 1985, 2002 and 2010/11, respectively. Sandeels increased from 64% and 62% in 1985 and 2002, respectively, to 79% in 2010/11 (Table 3).

In the southern North Sea, estimated diet composition in 2010/11 was closer to the composition in 1985 than that in 2002 when the prevalence of sandeels declined and benthic species including scorpionfish and increased. In the 2010/11 samples sandeels were the dominant prey, representing 50% of the diet with sandy benthic species and scorpion fish representing approximately 15% (Table 4).

Prey consumption by grey seals in the North Sea compared to the estimated size of fish stocks assessed by ICES in Subarea IV (North Sea, including Shetland and Orkney) in 1985, 2002 and 2010 are presented in Table 6. In Subarea IV, annual consumption by grey seals as a percentage of stock size is estimated to be small; the highest figures are for cod (3.5% in 2002, 5.1% in 2010). To date there are no indications that food is limiting grey seal populations as pup production continues to increase at close to the maximum theoretical rate both within the BNNC SAC and at breeding sites to the north and south.

Table 5 Estimated grey seal annual prey consumption (in tonnes) in 1985, 2002 and 2010 and estimates of annual consumption by seals as a percentage of estimated stock size for fish stocks assessed by ICES in Subarea IV (North Sea) (from Hammond & Wilson 2016).

	Grey seal consumption (t)			Total Stock Biomass (TSB) (t)			Consumption as a % of estimated stock size		
	1985	2002	2010	1985	2002	2010	1985	2002	2010
North Sea (Subarea IV)									
Grey seal population	*27,681*	*64,938*	*74,600*						
Cod	3,161	8,337	9,580	554,599	234,920	189,662	0.57%	3.5%	5.1%
Whiting	598	2,646	1,626	968,423	780,089	563,120	0.06%	0.34%	0.29%
Norway pout	44	810	2,373	479,543	362,388	821,416	0.01%	0.22%	0.29%
Plaice (SSB)	582	4,967	3,816	338,997	197,124	465,482	0.17%	2.5%	0.82%
Dover sole (SSB)	51	222	187	40,476	30,546	30,201	0.13%	0.73%	2.1%
Herring	26	180	1,680	4,110,273	5,728,705	4,077,522	0.001%	0.003%	0.05%
Sandeel (Central & South)	4,870	14,233	25,995	1,448,813	1,824,909	2,639,942	0.34%	0.78%	1.0%
Grey seal population (Central & South)	*4,475*	*15,028*	*22,176*						

8. Pressures faced by seals in the UK Regional Seas

The pressures and activities listed here are considered to be likely to impact on UK seal populations. However, the extent and magnitude of most impact(s) has not been quantified at either national or local levels.

8.1 Climate change

The ultimate effect of a changing climate on seals is difficult to determine and will depend of the nature of the change.

Rising sea levels are likely to remove certain breeding and haul out locations but are also likely to make others sites available. Projections of sea level rise by the year 2100 in SE Scotland, under a high emissions scenario, are approximately 40cm with an upper confidence limit of approximately 55cm (Jenkins *et al*. 2009). Within the BNNC SAC these predicted rises would reduce the available breeding habitat slightly and increase the amount of that habitat subject to waves. This could potentially increase the risk of pups being washed off breeding sites. It is not clear that this would have a significant impact on the breeding performance of the grey seal population in the BNNC SAC. Rises of that magnitude would change the topography of the sand/mud banks at Lindisfarne and would therefore potentially alter the haulout patterns at those sites. Again it is not clear how this would impact the population.

Boehme *et al*. 2012 used telemetry data from grey seals to identify suitable habitat based on the depths of dives and the local sea surface temperature data and used this method to estimate the historical extent of suitable habitat for grey seals. Similar methods are being employed to predict future useable habitat extent under the lowest and highest scenarios of warming as determined for the Intergovernmental Panel on Climate Change (2014). This work is ongoing (L. Boehme pers. com.) and preliminary results suggest a range of effects at both the northern and southern extremes of the

species' range. However, in all scenarios tested to date, the waters in the central and northern North Sea remain suitable habitat for grey seals.

Changing sea temperature is likely to affect the distribution of prey species and this, in turn, may have the greatest impact on seal populations and their distribution. Both UK seal species have a varied diet and they may be able to buffer prey distributional changes by altering their diet composition. Fish species ranges have been recorded moving northwards in the North Sea (e.g. Perry *et al*. 2005)). This is in direct contrast to the apparent movement of grey seals into the southern North Sea. It is therefore clear that the relationship between prey distribution and seal distribution is not simple.

Rising sea temperature may increase the occurrence of toxic algal blooms that have caused mortality in seal populations in the USA and in North Africa (Hernandez *et al*., 1998; Scholin *et al*., 2000). No similar mortality has been recorded in the UK although algal blooms are recorded and there are indications that algal toxin levels may have been elevated in stranded harbour seal carcasses in 2007 in eastern Scotland (SCOS 2008). Higher levels of domoic acid and saxitoxins were recorded in harbour seals in areas experiencing population declines around Scotland, suggesting a possible link between biotoxin exposure and population decline (Jensen *et al*. 2015). To date there are no indications of a similar effect in grey seals. In south east Scotland DA levels recorded in grey seals were significantly lower than those recorded in harbour seals (SMRU, 2011).

8.2 Contamination by pathogens and hazardous substances

Seals accumulate organochlorine (OC) and other persistent organic pollutant residues in their blubber and these have been demonstrated to affect immune competence, hormone regulation and may affect fertility rate. OCs such as polychlorinated biphenyls (PCBs), DDT and polybrominated diphenyl ethers (PBDEs) are highly lipophyllic compounds (i.e. they have a very high affinity for fat molecules) and are passed from mothers to offspring during lactation (Ross *et al*., 2000).

Seals may be vulnerable to oil spillage (e.g. Braer, Sea Empress, Exxon Valdez), especially the youngest age classes that may not be physically able to move through or away from contaminated areas.

Seals may be susceptible to pathogens introduced into the marine environment from sewage outfalls either directly or through consuming contaminated prey species.

Toxic algal blooms are also a major global concern for seals. See above.

Phocine distemper virus may recur at 15 to 17 year intervals (Grenfell *et al*., 1992). In both 1988 and 2002 outbreaks, over 17,000 harbour seals died in the southern North Sea but grey seal mortality appeared to be negligible.

8.3 Habitat loss or damage

Industrial development on or close to haulout sites can have significant effects. E.g. to the south of the BNNC SAC a historical population of harbour seals in the Tees estuary was reduced to zero in the late 1800s, following industrial development around the mouth of the river. A small population has returned to this location and appears to be very slowly increasing (Woods, 2008). A number of fishing practices (e.g. trawling, scallop dredging) around the UK coast result in damage to the sea bed and therefore reduce the habitat availability of various prey species. However, it is not clear how this affects foraging success in grey seals and as stated earlier, to date there is no indication that reduced prey availability is affecting the BNNC SAC population.

8.4 Marine energy production

The impact of tidal turbines on seals is not known at present. Areas of strong tidal flow, where tidal turbines are likely to be sited, are generally areas of high productivity due to the increased mixing of water layers. Seals and other marine mammals are likely to use these areas for foraging. It is unlikely that large scale tidal energy extraction will be a feature of the waters around the BNNC SAC.

Large scale wind farm developments have, to date, been concentrated in the southern North Sea but there are proposed large windfarm sites within 30km of the northern end of the BNNC SAC and smaller sites 40km to the south. To date there is no published information on responses of grey seals to construction activity or operation of wind farms. Harbour seals in the Wash have been shown to avoid pile driving, with reduced activity within 25km of active pile driving operations (Russell *et al.* 2016). Despite this avoidance behaviour, up to 45% of seals studied were estimated to have been exposed to sound levels likely to cause hearing damage (Hastie *et al.* 2016). Avoidance behaviour was restricted to periods of pile driving with no avoidance of the sites during the rest of the construction phase. Seals did not appear to avoid operational wind farms and individual harbour seals were shown to use turbine foundations as foraging sites (Russell *et al.* 2014). Grey seals have been shown to use pipelines and other anthropogenic structures as foraging sites (Russell *et al.* 2014).

The lack of information on grey seal responses mean that it is not possible to confidently predict the effects of any future developments. However, the rapid increases in pup production and the equally rapid increases in numbers of grey seals at summer haulout sites on the English coast south of the Humber suggests that the construction of wind farms has not had a measurable negative effect on grey seals so far.

8.5 Shipping

There is little direct information on the effects of routine operations on seals, but the presence of large seal haulout groups in areas such as the mouth of the Humber and Thames suggest that seals are at least tolerant of shipping traffic. Unusual events, such as vessels sinking and cargo release (e.g. hydrocarbons and chemicals) have the potential to impact local seal populations.

In 2010 examples of a particular type of seal mortality knowns as corkscrew seals were recorded on the east coast of England and Scotland (Thompson *et al*. 2010, 2012). These were initially identified as resulting from interactions with ships propellers (Thompson *et al*. 2010, 2012; *et al*. Bexton *et al*. 2012) but were later shown to be the result of predation and cannibalism by adult male grey seals (Van Neer *et al.* 2015; Brownlow *et al.* 2016).

In order for seals to physically interact with vessels they would need to come into close proximity. An analysis comparing the spatial distribution patterns of grey seals (based on telemetry tracking data from 200 individuals) with the spatial distribution of shipping traffic (based on AIS data) around the UK was used to identify areas of high levels of overlap in order to highlight areas of potential problems. The analysis was carried out at a spatial resolution of 5km (i.e. seal and ship densities were plotted on a 5km x 5km grid) (Jones *et al.* in press; Onoufriou *et al.* 2016). This analysis identified an area of high co-occurrence off shore from the Farne Islands. It is not clear that such co-occurrence indicates a direct threat to seals; although there are anecdotal reports of seals being injured or killed in collisions with vessels we are not aware of any confirmed cases in or near the BNNC SAC.

A secondary concern is the potential for acoustic disturbance or even damage due to shipping noise. At present there are no published data to suggest that this would be a major issue for grey seals in the BNNC SAC.

8.6 Removal (particularly over-exploitation) of target and non-target species

Over-fishing has the potential to impact seals populations and their distribution, both through reduction of prey species and through damage to habitat essential to prey species. Seals are considered by many fishermen to be at least partly responsible for declines in stocks of certain commercially important fish species and this may lead to some killing of seals (see Legitimate and illegitimate killing, below).

Effects of over fishing are not necessarily simple or unidirectional. It is possible that the widespread increase of seals in the late 20th century was to some extent stimulated by the removal of most of the large piscivorous fish from the North Sea. While usually regarded as prey items, in fact large gadoids were certainly a major competitor for forage fish. The removal of a vast biomass of competitors may have significantly increased grey seal populations.

8.7 Bycatch

Seals are regularly by-caught by the fishing industry. Seals are caught and drowned in bottom set tangle nets and trammel nets. For example, large numbers of grey seals were killed during experimental fishing for crayfish around the Outer Hebrides in 1980 (DAFS working paper No 80/23). The numbers of seals killed in the crayfish fishery apparently declined through the 1990s probably as a result of changes in netting locations to avoid entangling seals. During the 1990s observers on crayfish vessels did not report any seal bycatch.

Experimental bottom set gill/tangle nets were also tried in 1980 for whitefish off Shetland and the Hebrides and on wrecks between Northern Island and Skye (DAFS 80/23) but there was no reported seal bycatch during these experimental fishing activities in 1980. The scale of tangle netting in the waters off the BNNC SAC is relatively low and there is no documented by catch.

Northridge *et al*. (2015) estimated a total bycatch of seals in UK waters of 417 (95% c.i. 255-1312) during 2014. This was similar to estimates for previous years. All seals recorded in their bycatch monitoring survey were identified as grey seals. The BNNC SAC lies within ICES Statistical Area IVb, which stretches from Fraserburgh to Donna Nook and across the full width of the North Sea. Based on observations from a small sample of fishing trips with dedicated observers and scaled up appropriately for total fishing effort by net type, the estimated by catch of grey seals, for Area IVb was eight animals.

This rate is low compared with other estimates of bycatch rates: e.g. Johnston et al. (2015) estimated a bycatch of approximately 300 grey seals in the Sink Gillnet fishery off the NE USA; in 2010., compared e.g. with The Farne Islands and Fast Castle colonies produce around 50% of the pups born in Area IVb. This bycatch represents less than 1% of an estimated Potential Biological Removals (PBR) for the population associated with the Farne Islands and Fast Castle. PBR is the method currently used for assessing the number of seals that can be removed from a population without affecting its chances of reaching its Optimum Sustainable Population size. At less than 1% of this "acceptable" level, bycatch can be discounted as a significant threat to the status of grey seals in the BNNC SAC.

Seals can also be drowned in ghost nets (nets that are lost while fishing). However, the catching efficiency of ghost nets in terms of catches of commercial and noncommercial species declines rapidly due to collapse, entanglement and roll-up of nets and algal growth (Revill & Dunlin 2003, FANTARED 1 & FANTARED 2- relevant results presented in: Brown *et al.* 2007). These studies suggest that lost/abandoned gillnets in UK coastal waters are an insignificant source of unaccounted fishing mortality and do not present a major ecological hazard whether deployed over wrecks or on open fishing ground.

Throughout their range grey seals are frequently observed with netting or other plastic debris caught around their necks. The rate of this form of entanglement is not known for the BNNC SAC population, but in other areas such as Cornwall, relatively high levels of entanglement, up to 5% have been recorded (Allen *et al*. 2012). It is not clear how such entanglements will impact on the survival of individuals, but some increased mortality could be expected.

8.8 Legitimate and illegitimate killing

In Scotland seals may only be killed under licence, and as far as we are aware there have been no seals killed under licence within the Scottish parts of the BNNC SAC or in the immediate vicinity of the site. In England seals may be killed legally to protect fishing activities. There is no record of the numbers of seals killed legally or illegally in England outside the close seasons when there is no requirement to report numbers killed.

Others may be killed illegally and not reported, either by prohibited methods or in areas and at times when they are protected. There is no information to indicate the numbers of either species that are removed from the UK population. Due to the proximity of most haulout sites in the BNNC SAC to areas of public and often conservation oriented activity it is unlikely that large scale killing is going unnoticed and it is unlikely to be a major factor for grey seal populations in the BNNC SAC.

8.9 Disturbance at haulout and/or breeding sites

Seals are susceptible to disturbance, particularly during their breeding season when new-born pups may be separated from their mothers. If mothers have not had sufficient time to bond with their pups, the pups can be abandoned, leading to increased pup mortality. Although disturbance events such as this are probably infrequent, they may occur and persistent disturbance could ultimately lead to seals abandoning haulout sites or breeding colonies.

8.9.1 Breeding season

Breeding grey seals are capable of adapting to apparently heavily disturbed conditions. For some time now the main growth in the UK grey seal population has been due to increases at colonies on the mainland coast, specifically at Fast Castle, Donna Nook in Lincolnshire and Blakeney and Horsey in Norfolk.

The Marine (Scotland) Act 2010 – Part 6 Conservation of Seals makes it an offence to kill or take any seal at any time except under specific licence or to alleviate suffering. It also introduces in section 117 a new offence of intentional or reckless harassment of seals at haul-out sites designated as such by Order by Scottish Ministers (Marine Scotland 2010). Fast Castle is a designated haulout site under the Marine (Scotland) Act 2010 and is therefore afforded legal protection from intentional or reckless harassment. In addition, some sections of the Fast Castle colony are at the base of high cliffs and therefore afforded some protection from disturbance. The Fast Castle colony is continuing to grow rapidly. We do not know of any records of human disturbance at the site, and its susceptibility to human disturbance is limited because of the terrain. The rapid increase suggests that at present human disturbance, if present, is not a problem.

The other mainland sites along the English east coast are on open sandy beaches with direct easy access from land. Seals at Donna Nook are exposed to large crowds of tourists in very close proximity throughout the breeding season and both Blakeney and Horsey are easily accessible. Visitors are controlled to some extent at each site and whatever disturbance does occur has clearly had little or no effect on the seals as evidenced by the fact that the colonies have been growing at close to the theoretical maximal intrinsic rate.

The Farne Islands are afforded protection during the breeding season by the relative remoteness of the islands and by the presence of National Trust wardens on the islands, throughout the breeding season. Visitor access is therefore tightly controlled.

Experience at Donna Nook suggests that, if managed properly, human disturbance in the form of wildlife watching/tourist activity is not necessarily a significant issue even for accessible mainland colonies. The continued increases, albeit at slower rates, at both the Isle of May and the Farne Islands are occurring in spite of research and population monitoring activities that involve repeated bouts of human presence within the breeding groups. This again indicates that carefully controlled human disturbance can occur without dramatic negative effects on the integrity or productivity of the site.

8.9.2 Non breeding

Outside the breeding season there are few seals hauled out along the coast north-west of St Abbs Head. This is based mainly on results from aerial surveys during August, although surveys in each month from April to September 2008 detected no seals along that section of the BNNC SAC coastline (Figure 7 & 8).

Conversely, the sand banks between Lindisfarne and the mainland hold large haulouts of grey seals throughout the year. The remoteness of the sandbanks affords protection and disturbance activities appear to be low. Anecdotally, the grey seals at Lindisfarne appear to be less tolerant of aircraft disturbance than other groups of grey seals on the east coast (SMRU pers com), and have on occasion been flushed into the water at relatively long range by approaching light aircraft.

The Farne Islands are famous for their seals and the haulout sites within the main islands are regularly and frequently visited by commercial tour vessels operating from Sea houses. Seals hauled out at these sites do not appear to be adversely affected by the tourist vessels and will allow relatively close approaches. These vessels are usually operating within the core of the reserve and if they do cause any disturbance it will be restricted to the specific groups that they visit.

Unregulated visits by privately owned vessels and dive boats are likely to be more widespread within the islands and may reach the large haulout groups on the outlying skerries of Megstone, Crumstone and Knivestone. We are not aware of any information on numbers of visits to these sites or any evidence of disturbance to the seals hauled out there.

The consequences of disturbance at/from haulout sites is unknown for grey seals. However, recent studies of the behavioural effects on harbour seals of controlled disturbance trials (Patterson *et al*. 2016) and incidental human disturbance (Andersen et al. 2012) at haulout sites showed that individual seals either hauled out again soon after disturbance or left the site to perform what appeared to be a normal foraging trip. Patterson et al. (2016) showed that disturbed seals were no more likely to relocate to a different haulout site than were undisturbed seals.

Given the low level of disturbance at Lindisfarne and the apparent habituation to the localised tourist vessel activity in the Farne Islands it seems that human disturbance at haulout and breeding sites is not currently a major problem. If the observations of harbour seal reactions to direct disturbance are relevant to grey seals it would seem unlikely that disturbance would be having an adverse effect on the population of grey seals within the BNNC SAC.

9. OSPAR Convention

The Oslo and Paris Commission (OSPAR) has set in place Ecological Quality Objectives (EcoQOs) that are used to assess the state of grey and harbour seal populations in the North Sea (OSPAR 2007). The EcoQOs were devised on the basis of the information collected for monitoring grey and harbour seals in the UK.

The EcoQO for grey seals is: *"Taking into account natural population dynamics and trends, there should be no decline in pup production of grey seals of ≥10% as represented in a five-year running mean or point estimates (separated by up to five years) within any of nine sub-units of the North Sea. These sub-units are: Orkney; Fast Castle/Isle of May; the Farne Islands; Donna Nook; the French North Sea and Channel coasts; the Netherlands coast; the Schleswig-Holstein Wadden Sea; Heligoland; Kjørholmane (Rogaland)."*

(http://www.ospar.org/documents/DBASE/Publications/p00307_EcoQO%20Handbook%202007%201st%20edition.pdf)

In the UK, up to December 2016, grey pup production remains within the above limits. Pup production appears to be beginning to stabilise in Orkney and is increasing at all breeding colonies in the North Sea. If the two colonies recently established in Norfolk (at Blakeney Point and at Horsey) are included with Donna Nook in this EcoQO assessment, that unit has been increasing at around 15% p.a.

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Table A1. Counts of grey seals in each of the 6 monthly surveys at all haul out sites on the East coast between Cairnbulg Point and Coquet Island. Sites not surveyed are marked with *.

Site	Lat	Long	19/04/2008	20/05/2008	18/06/2008	21/07/2008	29/08/2008	25/09/2008
Cairnbulg	57.685	1.939	0	19	6	34	4	57
South Inch	57.651	1.892	18	24	11	30	0	4
Rattray Head	57.617	1.817	0	0	0	24	0	0
Scotstown Head	57.558	1.800	0	0	2	45	0	16
Peter Head Harbour	57.508	1.767	0	31	6	13	4	27
Peter Head Skerry	57.479	1.767	93	8	0	18	22	11
Peter Head Lh	57.469	1.775	0	0	4	34	5	68
Dundonnie	57.461	1.783	0	35	0	24	3	9
Slains Castle	57.417	1.833	0	0	0	2	0	0
Whinnyfold	57.389	1.853	50	114	41	278	27	52
Ythan	57.310	1.990	73	74	84	60	22	52
Aerdeen LH	57.140	2.048	0	1	0	0	0	0
Portlethen	57.054	2.109	0	0	0	11	2	0
Stonehaven	56.980	2.176	10	0	0	11	0	0
Fowelsheugh	56.923	2.199	0	35	9	22	0	0
Catterline	56.892	2.211	34	5	0	10	6	9
Rouen Bay	56.873	2.223	0	0	0	82	0	0
Montrose	56.707	2.489	0	0	0	1	0	0
Barry Buddon	56.465	2.731	9	0	0	0	7	0
Broughty Ferry	56.466	2.856	4	1	0	0	8	5
Abertay	56.447	2.775	47	128	639	375	98	184
Tentsmuir	56.439	2.798	343	495	954	816	385	1046
Bridge Piers	56.441	2.990	0	7	10	18	1	14
Naughton Bank	56.423	3.008	1	8	16	0	4	3
N Shore Lower	56.430	3.058	0	0	0	12	0	11
N Shore Mid	56.414	3.079	5	0	0	0	10	0
N Shore Upper	56.383	3.171	0	0	0	0	0	0
Mid Bank	56.433	3.032	0	0	0	0	11	0
Eden : Out Head	56.379	2.819	123	1	29	0	6	4
Eden : Up River	56.363	2.846	0	46	28	0	27	0
Isle Of May N	56.194	2.567	341	88	335	2	75	153

Isle Of May S	56.182	2.550	0	35	0	33	7	22
Earls Ferry	56.183	2.838	12	56	21	27	19	29
Shell Bay	56.189	2.876	0	0	0	6	19	1
Methil	56.181	3.007	0	7	2	2	5	0
Kirkcaldy	56.119	3.133	0	0	0	0	12	3
East & West Vow s	56.089	3.158	0	28	21	40	26	32
Burntisland	56.058	3.250	0	0	-1	0	0	0
Common Rocks	56.055	3.271	13	27	-1	50	19	18
Car Craig	56.033	3.286	0	0	-1	42	0	10
Inchcolm	56.030	3.303	0	17	-1	18	9	15
Cow & Calf	56.016	3.274	0	0	-1	7	19	15
Oxcars	56.023	3.280	0	18	-1	26	4	8
Inchmickery	56.011	3.274	16	0	-1	32	11	9
Inch Keith	56.027	3.131	29	32	-1	52	20	42
Long Craig	56.031	3.330	28	0	-1	17	7	20
Haystscks	56.028	3.321	0	0	-1	15	0	19
Leith	55.987	3.159	0	0	-1	14	2	0
Musselburgh	55.959	3.016	0	0	-1	0	2	0
Gosford Bay	56.010	2.900	0	0	-1	0	0	0
Eyebroughty	56.066	2.818	2	7	-1	4	24	0
Craigleith	56.073	2.718	6	0	-1	0	3	0
St Baldreds Boat	56.058	2.628	1	0	-1	0	8	0
Beggars Cap	56.043	2.608	0	0	-1	0	3	0
Dunbar	56.008	2.518	0	0	-1	0	15	0
Eyemouth	56.878	2.085	0	0	-1	0	8	0
Cow drait	55.838	2.054	0	0	-1	0	24	0
Berw ick	55.776	1.990	0	0	-1	0	9	0
Lindisfarne Outer	55.691	1.798	0	0	95	0	112	0
Lindisfarne Inner 1	55.663	1.820	396	859	1652	2022	214	490
Lindisfarne Inner 2	55.664	1.828	0	0	54	734	33	86
Megstone	55.629	1.675	210	80	38	0	80	18
Knoxes Reef	55.621	1.651	351	337	320	0	0	256
Wideopens/Scarcar	55.616	1.646	0	191	99	0	49	335
Warmses/Harcar	55.639	1.622	258	0	0	217	0	203
Longstone NW End	55.644	1.611	0	61	69	90	126	48
Longstone SE End	55.639	1.606	324	192	544	374	154	296
Knivestone	55.650	1.601	22	53	75	227	1040	130
Crumstone	55.628	1.600	189	128	188	382	362	217

New ton	55.515	1.605	17	0	0	0	0	0
Coquet Island	55.337	1.540	648	457	312	145	159	0
Total			**3673**	**3705**	**5643**	**6498**	**3331**	**4047**

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02 April 2024

Our ref: CNS / REN / OSWF / NE8 – Buchan – Pre-application

By email only: MD.MarineRenewables@gov.scot

Dear Iain,

BUCHAN OFFSHORE WIND FARM (SCOTWIND NE8)

HABITATS REGULATIONS APPRAISAL STAGE 1 SCREENING REPORT

Thank you for consulting us on the Buchan Offshore Habitats Regulations Appraisal (HRA) Stage 1 Screening Report, received on 28 February 2024.

We have reviewed the HRA Screening Report and provide advice, as outlined below, on those European Sites and their qualifying features for which we consider it reasonable to expect a Likely Significant Effect (LSE) either alone or in-combination with other plans or projects. Our advice is laid out following a similar structure to that in the HRA Screening Report.

NatureScot Advice

Annex 1 Habitats

Identification of European sites, designated for Annex 1 habitats, is considered in Section 4 of the HRA Screening Report. The closest of these is the Moray Firth SAC which is designated for subtidal sandbanks and is located approximately 80 km from the proposed Export Cable Corridor (ECC).

The HRA Screening Report concludes no connectivity to any European sites designated for Annex 1 habitats and therefore no potential for LSE. We agree with this conclusion.

Diadromous fish

Migratory fish are discussed in Section 4.5 and Section 5.4 of the HRA Screening Report. Within Section 7.4, the Screening Report concludes that 12 SACs for Annex II Migratory Fish are to be screened in for further assessment within the Report to Inform Appropriate Assessment (RIAA).

Within our advice provided in response to the Buchan EIA Scoping Report consultation, we advised that diadromous fish should be assessed through EIA only and not through HRA (advice issued on 17 November 2023). This is reflected within the direction provided via the Scoping Opinion issued by MD-LOT on 20 December 2023. In the intervening time, our advice has not changed and remains as follows.

We advise that for diadromous fish species there is limited knowledge of distribution and behaviour of these species in the marine environment. For example, the precise migration routes of adult or juvenile Atlantic salmon or direction taken by migrating adult European eels is not fully known. Published information indicates that European smelt and River lamprey are primarily, though probably not exclusively, associated with estuarine environments. Shad might also prefer estuarine environments.

The recently updated ScotMER evidence map[1] process for diadromous fish confirms these evidence gaps, particularly with respect to spatial and temporal distribution as well as uncertainty around migration routes and connectivity to protected sites. The ScotMER process is an important vehicle for helping to address these evidence gaps and uncertainties. We specifically welcome the ScotMER project *Diadromous Fish in the Context of Offshore Wind – Review of Current Knowledge & Future Research*, due to be published soon.

This research is not expected to significantly change our conclusions on how diadromous fish are treated in both EIA and HRA going forward. However, we advise, based on evidence currently available to us, it is not possible for us to carry out an assessment of diadromous fish to the level required under HRA. We therefore advise that diadromous fish species should be assessed through EIA only and not through HRA.

Marine Mammals

Seals

Marine mammals are discussed in Section 4.3 and 5.2 of the HRA Screening Report. Section 4.3.1 discusses criteria used to screen in seal SACs with a screening distance of 50 km for grey seal and 20 km for harbour seal – this is incorrect and contrary to advice provided within the pre-scoping workshop held on 15 May 2023.

In Scotland, seal SACs provide protection for breeding colonies. While grey seals are known to forage some considerable distance, they tend to stay within 20 km of the breeding colony during the breeding season. Harbour seal however displays greater site fidelity throughout the year staying within approximately 50 km of their preferred haul out sites.

To note, this mix up in screening distances does not change the outcome of our advice. All SACs with seal qualifying features are located beyond these distances and can be scoped out of the RIAA.

[1] https://www.gov.scot/publications/diadromous-fish-specialist-receptor-group/ – published 26 January 2023

Cetaceans

Table 4. 2 (Section 4.3.2) provides a summary of those SACs with cetaceans qualifying features that overlap with the IAMMWG management unit (MU). This includes the Greater North Sea and Coastal East Scotland MU for bottlenose dolphin and the North Sea MU for harbour porpoise. This includes one SAC in Scottish waters (Moray Firth SAC – bottlenose dolphin) and one in English waters (Southern North Sea SAC – harbour porpoise). We do not consider there to be connectivity to the Southern North Sea SAC, but you may wish to seek advice from Natural England for this site.

Potential impact pathways are captured in Table 5.1 (Section 5.2.1) with brief accompanying narrative in Section 5.2.2 and a LSE conclusion summarised within Table 5.2. Those pathways considered are described for generic marine mammals rather than individual species and sites, and no distinction is made between impacts likely to be associated with the array area or the export cable corridor.

Moray Firth SAC

While there is no direct overlap between the export cable corridor and the Moray Firth SAC, designated for its bottlenose dolphin qualifying feature, we know from photo ID studies that bottlenose dolphins from this SAC are regularly sighted along the Moray coastline and down the East coast of Scotland, and can be found some 200 km south in the Tay Estuary and St Andrews Bay area, as well as the Firth of Forth (Hague et al. 2020) and beyond. These sightings are restricted to coastal areas, mainly within the 20m depth contour, which in this region is between ~2-20 km from the coast. There is therefore potential for connectivity and as such we agree that the Moray Firth SAC should be screened into the RIAA.

We have considered the impact pathways presented in Section 5.2.2 with respect to the Moray Firth bottlenose dolphin qualifying feature and advise that there is potential for a LSE from the following activities which could result in injury and or disturbance effects:

- Underwater noise from piling activities
- Underwater noise from UXO clearance activities
- Underwater noise from survey activities

With respect to the potential for underwater noise impacts from the operational WTG and/or moorings (Section 5.2.2.6) which are to be located in offshore waters, as the Moray Firth SAC population is coastal, we do not anticipate these activities to have an impact, similarly for entanglement risk (Sections 5.2.2.9 and 5.2.2.10). We are content that accidental pollution is scoped out as the risk is minimised via other regulatory mechanisms. Any potential for EMF effects from dynamic cabling will be offshore and so can be screened out for this feature.

In summary we are content the following impact pathways are screened out with respect to the bottlenose dolphin qualifying feature for Moray Firth SAC:

- Underwater noise - vessels
- Underwater noise from other construction activities
- Underwater noise – operation (WTGs and mooring)
- Collision risk (vessels)
- Accidental pollution
- Entanglement (primary and secondary)
- Indirect effects on habitat and prey availability

- EMF (dynamic cables)

Please note some of these pathways should be assessed in the EIA Report for the offshore bottlenose dolphin population – these are separate to the SAC population.

In-combination assessment

The Habitats Regulations require consideration of potential effects of a project on European sites both alone and in-combination with other plans or projects. Please note, while it is not explicit in either the Habitats Directive or the Regulations whether consideration of in-combination effects is required at the appropriate assessment stage, the Waddenzee judgement indicates (via paragraph 53) that an appropriate assessment should "…take into account the cumulative effects which result from the combination of that plan or project with other plans or projects in view of the site's conservation objectives". Please be aware there could be a scenario where there is an in-combination adverse effect with no project alone effect.

The approach is set out in the latter part of Section 6.1, whereby a long list of plans and projects will be produced based upon a maximum zone of influence. No information is available yet on impact ranges which would inform the cumulative assessment and so we would welcome further discussion at the appropriate time. We anticipate that iPCoD may be required to assess population level consequences for the Moray Firth SAC – bottlenose dolphin population.

Transboundary SACs

Table 4.2 (Section 4.3.2) screens in 32 harbour porpoise SACs of all which are located within the North Sea MU but outwith UK Waters. Given the lack of evidence to indicate movement of harbour porpoise, in particular no tracking to identify connectivity with SACs, we advise that impacts to this species are assessed under EIA and EPS, and not HRA.

Ornithology

Offshore and intertidal Ornithology are discussed in Section 4.4 and 5.3 of the HRA Screening Report. Overall, the ornithology sections are clearly laid out and logical. It follows NatureScot guidance throughout.

Impact pathways

Section 5 considers the impact pathways which may result in a Likely Significant Effect (LSE) for ornithology interests. Within Table 5.3 impact pathways are considered across construction, operations & maintenance and decommissioning phases. We note that Table 5.3 does not include barrier effects, though this effect is included in Section 5.3.2.2 Disturbance and Displacement. We generally advise that the term Distributional Responses is used to cover all three effects where appropriate.

We welcome the inclusion of the impact pathway 'Disturbance and displacement arising from vessel activity' and advise that vessel movements between ports and the array/ECC areas should be considered as part of this effect.

LSE determination

Table 5.5 contains the determination of LSE for offshore and intertidal ornithology. Please see Appendix 1 for further detailed comments and advice on this table, included at the end of this letter.

Depending on the ports used by the project there could be disturbance/displacement to specific SPAs and qualifying features not covered in Table 5.5. For example, Moray Firth SPA is only considered in terms of LSE for collision, based on the potential for qualifying species to pass through the array area during migration. If ports in the Moray Firth were used, then sensitive diver and sea duck qualifying features could be disturbed/displaced by vessel activity transiting between the ports and Array/ECC areas. This may need to be considered further depending on arrangements for vessel movement and/or 'wet storage'.

Appendix A of the Screening Report

A summary of sites and features that have been screened in for further assessment is included in Appendix A of the Screening Report. We note some errors in Appendix A as follows:

- East Caithness Cliffs SPA – guillemot and razorbill – LSE conclusion should include that LSE cannot be ruled out for disturbance, displacement and barrier effects.
- Rousay SPA – guillemot - LSE conclusion should include that LSE cannot be ruled out for disturbance, displacement and barrier effects.

We may not have captured all the potential errors in Appendix A, and advise that Appendix A and Table 5.5 are checked and any inconsistencies are addressed. Please also note that our comments included within Appendix 1, with regard to Table 5.5, will also apply to the table in Appendix A as well.

In-combination

We are content with the approach outlined for ornithology in Section 6.4, noting our advice above with respect to the Waddenzee judgement.

I trust this advice is of assistance. If you have any queries please contact me, using the details below and copying in our marine energy mailbox - marineenergy@nature.scot.

Yours sincerely,

Clare McCarty

Marine Sustainability Adviser – Sustainable Coasts and Seas

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Appendix 1 – Comments and advice on determination of LSE for Offshore and Intertidal Ornithology

The table below includes our advice and comments on Table 5.5 of the HRA Screening Report (pages 45 to 75).

Species	Sites	Comment
Fulmar	All sites where fulmar is a qualifying feature	Conclusion of LSE states that: *LSE cannot be ruled out for impacts to prey on basis of connectivity with the Proposed Development and sensitivity of this species.* It is our view that this impact pathway is unlikely to be important for fulmar because of the particularly large foraging range of this species and therefore the extensive areas of alternative marine habitat available to this species.
Guillemot	Troup, Pennan and Lion's Heads SPA	Assessment of LSE column states: *considered sensitive to collision risk.* This is incorrect, but we note that it is corrected in the conclusion of LSE column.
	West Westray SPA	Accidental pollution has been included as an impact pathway. We understand this will be covered in the MPCP as part as embedded mitigation and therefore doesn't need to be included here.
	Sumburgh Head, Seas off Foula, Marwick Head SPAs	Guillemot should be within foraging range for these sites, using the Northern Isles site specific foraging ranges from our Guidance Note 3[2].
	Fowlsheugh SPA	The array is outwith the foraging range for guillemot from this SPA.
	Noss SPA	The array is outwith the foraging range for guillemot from this SPA site.
Razorbill	Troup, Pennan and Lion's Heads SPA	Assessment of LSE column states: *considered sensitive to collision risk.* This is incorrect, but we note that it is corrected in the conclusion of LSE column.
	Fowlsheugh SPA	The array is outwith the foraging range for razorbill from this SPA.
	West Westray SPA	Accidental pollution has been included as an impact pathway. We understand this will be covered in the MPCP as part as embedded

[2] https://www.nature.scot/doc/guidance-note-3-guidance-support-offshore-wind-applications-marine-birds-identifying-theoretical

		mitigation and therefore doesn't need to be included here.
Shag	Buchan Ness & Collieston Coast SPA	Shag should be considered sensitive to disturbance. This is adjusted in Appendix A of the screening report.
Gannet	All sites where gannet is a qualifying feature	Assessment of LSE column cites gannet as not being sensitive to disturbance/displacement according to Bradbury et al. 2014. SNCB guidance[3] is that this species should be assessed regardless of sensitivity scores, due to more recent empirical studies which demonstrate they are sensitive to displacement and barrier effects (Krijgsveld et al. 2011, Vanermen et al. 2013). The scores for this species have been revised in a recent publication by Wade et al. 2016. A recent study Pavat et al. 2023[4] also highlights sensitivity to both impacts[5]. We note that in the LSE conclusion column that LSE cannot be ruled out for both collision and distributional responses as per our guidance.
Kittiwake	All sites where kittiwake is a qualifying feature	Assessment of LSE column cites kittiwake as not being sensitive to disturbance/displacement according to Bradbury et al. 2014. Currently, our advice is that displacement and collision impacts should be combined for kittiwake. This precautionary approach is recommended due to evidence that supports mixed responses from kittiwake to offshore wind farm developments (i.e. some birds are displaced and others are not and so are therefore at risk of collision (e.g. O'Hanlon et al. 2024[6])). We note that in the LSE conclusion column that LSE cannot be ruled out for both collision and distributional responses as per our guidance.
Great skua	All sites where great skua is a qualifying feature.	Conclusion of LSE states that: *LSE cannot be ruled out for impacts to prey on basis of connectivity with the Proposed Development and sensitivity of this species.*

[3] https://data.jncc.gov.uk/data/9aecb87c-80c5-4cfb-9102-39f0228dcc9a/joint-sncb-interim-displacement-advice-note-2022.pdf

[4] Pavat, D., Harker, A.J., Humphries, G., Keogan, K., Webb, A., and Macleod, K. 2023. Consideration of avoidance behaviour in norther gannet (*Morus bassanus)* in collision risk modelling for offshore wind farm impact assessments. NERCR490. Natural England.

[5] We note there are limitations in applying this to Scottish casework due to seasonality of the study sites.

[6] O'Hanlon, N.J., Thaxter, C.B., Clewley, G.D, Davies, J.G., Humphreys, E.M., Miller, P.I., Pollock, C.J., Shamoun-Baranes, J., Weston, E., & Cook, A.S.C.P. 2024. Challenges in quantifying the responses of Black-legged Kittiwakes *Rissa tridactyla* to habitat variables and local stressors due to individual variation. *Bird Study*: 71(1).

		In our view this impact pathway is unlikely to be important for great skua because of the particularly large foraging range of this species and therefore the extensive areas of alternative marine habitat available to this species.
European storm petrel, Manx shearwater, Leach's storm petrel	All sites where these species are qualifying features.	Assessment of LSE - attraction to/disorientation from lighting on turbines and/or vessels could impact assessment of both displacement and collision risks. We recognise that this can only be assessed qualitatively and will be dependent on species presence and densities within the study area. The following published work and a new project relating to petrels and shearwaters, should be helpful for considering potential impacts on European storm petrel: • Petrel and Shearwater Sensitivities to Offshore Wind farms – Evidence Review https://www.gov.scot/publications/review-inform-assessment-risk-collision-displacement-petrels-shearwaters-offshore-wind-developments-scotland/ • OWSMRF project KG4 - JNCC report 719 Towards better estimates of Manx shearwater and European storm-petrel population abundance and trends, demographic rates and at-sea distribution and behaviour • ProcBe – Procellariiform Behaviours and Demographics https://jncc.gov.uk/about-jncc/jncc-blog/archive/the-procbe-procellariiform-behaviour-and-demographics-project/

RSPB Scotland

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4th April 2024

Dear Iain,

BUCHAN OFFSHORE WIND FARM - LOCATED APPROXIMATELY 75 KILOMETRES OFF THE ABERDEENSHIRE COASTLINE

HABITATS REGULATIONS APPRAISAL ("HRA") SCREENING UNDER THE CONSERVATION (NATURAL HABITATS, &C.) REGULATIONS 1994 (AS AMENDED), THE CONSERVATION OF OFFSHORE MARINE HABITATS AND SPECIES REGULATIONS 2017 AND THE CONSERVATION OF HABITATS AND SPECIES REGULATIONS 2017

Thank you for consulting RSPB Scotland on the above HRA Screening Report, and for allowing RSPB an extension of time to respond.

RSPB Scotland welcomes the Screening Report for its clarity and comprehensiveness.

We understand the proposed development will comprise 70 floating turbines, with a nominal capacity of 960 MW, along with associated infrastructure including transmission cabling. We understand that the extent of the Options Area is approximately 330km^2, but that the final extent of the Options Area required to support the Proposed Development, and the extent of the Array Area within the Options Area, is not yet finalised. We understand that associated onshore infrastructure will be subject to separate regulatory / consenting processes, i.e. that the HRA currently being consulted upon relates to offshore infrastructure only.

Faced with the threats of climate change to the natural world, RSPB considers that a low-carbon energy transition to reach net zero is essential to safeguard biodiversity. Inappropriately designed and/or sited developments can however cause serious and

irreparable harm to biodiversity and must be avoided. We have reviewed the screening report in this context and provide the following comments.

General Comments

The UK is of outstanding international importance for its breeding seabirds and wintering marine birds. As with all Annex I and regularly migratory species, the UK has a particular responsibility under the Birds Directive to secure their conservation. Their survival and productivity rates can be impacted by offshore windfarms directly (i.e. collision) and indirectly (e.g. displacement from foraging areas, additional energy expenditure, potential impacts on forage fish and wider ecosystem impacts such as changes in stratification).

RSPB Scotland encourage the adoption of a precautionary approach to the identification of relevant protected sites for seabirds with clear methodology on the exclusion of sites and species. We generally agree with the collection and analysis methods advised by NatureScot, with some exceptions as set out below. We recommend use of the guidance notes available on their website to inform assessment. If an Applicant chooses to undertake supplementary modelling using alternative parameters to that recommended, we suggest this is clearly labelled.

As set out in Searle et al (2023)[1], assessing impacts of offshore windfarms and other renewables developments is inherently uncertain. This uncertainty is propagated throughout the impact assessments, as there are not only direct impacts, but ecosystem wide impacts that can change, for example, the abundance and availability of prey. Multiple data sources and modelling techniques are used to capture a simplified version of reality. They do not fully capture the complexity of seabird behavioural or demographic processes in a dynamic marine environment.

Not recognising these uncertainties risks poorly informed decisions being made. Furthermore an underestimation of impacts will have repercussions when consenting later offshore wind development. If a precautionary approach is taken from the beginning, the likelihood of irreversible damage occurring is reduced even whilst our knowledge base is incomplete, and modelling improves.

The precautionary principle requires the Applicant to demonstrate with scientific certainty that something would not be harmful. The concept of something being overly precautionary dismisses the inherent uncertainty in modelling and overlooks the simplistic version of reality that the modelling captures.

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[1] Searle, K. R., S. H. O'Brien, E. L. Jones, A. S. C. P. Cook, M. N. Trinder, R. M. McGregor, C. Donovan, A. McCluskie, F. Daunt, and A. Butler. "A framework for improving treatment of uncertainty in offshore wind assessments for protected marine birds." *ICES Journal of Marine Science* (2023): fsad025.

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Foraging Ranges for Common Guillemot and Razorbill

We welcome using foraging ranges as published in Woodward *et al*. (2019)[2] to derive connectivity with SPA colonies. Following Woodward *et al.,* we also recommend that site specific data are examined and where the maximum foraging range from the colony exceeds the generic value, that the site-specific value is used.

The exceptions to this are for common guillemot and razorbill. Tracking on Fair Isle showed foraging for both common guillemot and razorbill distances are greater than those of all other colonies. This may relate to poor prey availability during the study. However, trends for seabirds in the Northern Isles indicate this may be becoming a more frequent occurrence. For all designated sites south of the Pentland Firth (i.e. excluding the Northern Isles), we advise use of mean max (MM) plus one standard deviation (SD) discounting Fair Isle values. For clarity, North Caithness Cliffs SPA is considered to lie south of the Pentland Firth.

	All Northern Isle SPAs	**All sites south of Pentland Firth**
Common guillemot	153.7 MM+SD	95.2 MM+SD
Razorbill	164.6 MM+SD	122.2 MM+SD

In the non-breeding season, seabirds are not constrained by colony location and can, depending on individual species, range widely within UK seas and beyond.

Ecosystem Impacts

RSPB Scotland would welcome inclusion of consideration of the potential wider ecosystem impacts that may arise through the construction and operation of the wind farm[3]. These could occur, for example, through changes in water column stratification arising from the presence of the wind farm ultimately altering the availability of prey to seabirds.

Likely Significant Effects for Manx Shearwater, Leach's Storm Petrel and European Storm Petrel.

RSPB Scotland disagrees with the screening out of Likely Significant Effects arising through collision for Manx Shearwater, Leach's Storm Petrel and European Storm

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[2] Woodward, I., Thaxter, C.B., Owen, E. & Cook, A.S.C.P. 2019. *Desk-based revision of seabird foraging ranges used for HRA screening. BTO research report No. 724*. Thetford: British Trust for Ornithology.

[3] Isaksson, N., Scott, B.E., Hunt, G.L., Benninghaus, E., Declerck, M., Gormley, K., Harris, C., Sjöstrand, S., Trifonova, N.I., Waggitt, J.J. and Wihsgott, J.U., 2023. A paradigm for understanding whole ecosystem effects of offshore wind farms in shelf seas. *ICES Journal of Marine Science*, p.fsad194.

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Petrel. As highlighted in Deakin *et al.,* 2022[4], these species are attracted to light, such as those present on turbine infrastructure, and can become disorientated by them. Such light-induced disorientation may lead to individual birds circling the navigation lights on the nacelle or tower of turbines for protracted periods (as has been reported for birds disorientated by lighthouses or gas flares) and the consequent probability of collision with turbine blades or other surfaces will be vastly increased. Alongside this increased collision risk, the energetic costs of attraction and disorientation may be sufficient to impact on long term survival and the ability to successfully rear young. While we acknowledge that there is insufficient guidance to date on how to quantify these risks, we ask that the Applicant engages with the Marine Directorate, NatureScot and RSPB Scotland to determine the best method to do so until published guidance is available.

Should you wish to discuss of any of the above please do not hesitate to contact me.

Yours sincerely,

Redacted

Peter Hearn
Head of Planning, RSPB Scotland

[4] Deakin, Z., Cook, A., Daunt, F., McCluskie, A., Morley, N., Witcutt, M., Wright, L., Bolton, M., 2022. A review to inform the assessment of the risk of collision and displacement in petrels and shearwaters from offshore wind developments in Scotland. Scottish Government.

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