

Scottish Natural Heritage

Habitats Regulations Appraisal (HRA) on the Moray Firth

A Guide for developers and regulators



Photo: Donald M Fisher



Contents

Section 1 Introduction	4
Introduction	4
Section 2 Potential Pathways of Impact	6
Construction	6
Operation	6
<i>Table 1 Generic impact pathways and mitigation to consider</i>	7
Section 3 Ecological Principles	9
Habitats and physical processes	9
Management of the environment	10
Land claim and physical management of the intertidal	10
Dredging and Disposal	11
Disturbance – its ecological consequences	12
Types of disturbance	12
Disturbance whilst feeding	13
Disturbance at resting sites	14
Habituation and prevention	14
Section 4 Habitats Regulations Appraisal (HRA)	15
Natura 2000	15
The HRA procedure	16
HRA in the Moray Firth area	17
<i>Figure 1 The HRA process up to and including appropriate assessment</i>	18
The information required	19
Determining that there are no adverse effects on site integrity	19
<i>Figure 2 The HRA process where a Competent Authority wishes to consent to a plan or project, but cannot conclude that there is no adverse effect on site integrity</i>	20

Section 5 Accounts for Qualifying Interests	21
Habitats	21
Atlantic salt meadows	21
Coastal dune heathland	22
Lime deficient dune heathland with crowberry	23
Embryonic shifting dunes	24
Shifting dunes with marram	25
Dune grassland	26
Dunes with juniper	27
Humid dune slacks	28
Coastal shingle vegetation outside the reach of waves	29
Estuaries	30
Glasswort and other annuals colonising mud and sand	31
Intertidal mudflats and sandflats	32
Reefs	33
Subtidal sandbanks	34
Species - Birds	35
Whooper Swan	37
Greylag Goose	38
Wigeon	39
Teal	40
Pintail	41
Scaup	42
Common Eider	43
Long-tailed duck	44
Common scoter	45
Velvet scoter	46
Goldeneye	47
Red-breasted merganser	48
Goosander	49

Red-throated diver	50
Great Northern Diver	51
Great cormorant	52
European Shag	53
Slavonian grebe	54
Osprey	55
Oystercatcher	56
Curlew	57
Bar-tailed godwit	58
Knot	59
Dunlin	60
Redshank	61
Common tern	62
Species – Mammals, fish and aquatic invertebrates	63
Otter	64
Bottlenose dolphin	65
Harbour seal	66
Atlantic salmon	67
Freshwater Pearl Mussel	69
Further Reading	70

Introduction

The purpose of this guide is to help developers and regulators meet the requirements of the Habitats Regulations in the Moray Firth when first considering proposals. It does this by drawing together and presenting information on qualifying interests, explaining basic principles of ecology and the most important impact pathways. It considers the aspects involved in carrying out projects in the Moray Firth that could affect the qualifying interests of associated Natura sites, such as the Inner Moray Firth Special Protection Area (SPA) or the Moray Firth Special Area of Conservation (SAC). We hope it will help in making decisions about projects, including how to avoid or mitigate impacts on Natura sites before proposals become so defined that problem solving is more expensive or difficult. It is not however, an exhaustive “how to” guide to carrying out Habitats Regulations Appraisal (HRA) or associated Appropriate Assessments (AA). It simply introduces broad principles to consider. Links to formal guidance are provided throughout this document and these should be used when carrying out HRA.

The wider Moray Firth (stretching from Duncansby Head in the north to Fraserburgh in the east) is the largest of Scotland’s Firths, occupying a large proportion of the coast of north-east Scotland. With such a large site, many types of possible human-related activities and disturbance can occur, including leisure (onshore and offshore), industry (harbours, offshore energy, oil rig repair and decommissioning sites, etc.), dredging and disposal, exploitation of natural resources and reclamation for industrial uses. In addition to the marine waters the area also includes a mosaic of coastal habitats and settlements that accommodate a wide range of species. The Moray Firth is a complex area with a number of management challenges. It is surrounded by towns and villages and heavy industry alongside areas of countryside and farmland. It provides a range of services including provision of food, flood management, coastal protection, recreation opportunities, energy and trade opportunities. These sometimes competing demands all need to be balanced against each other.

Under the Habitats Regulations, decision makers (known as Competent and Relevant authorities in the legislation) can only agree to development proposals which are unconnected with the nature conservation management of the site after having confirmed that they will not affect the integrity of the Natura sites. The process of coming to this judgement is commonly referred to as Habitats Regulations Appraisal (HRA). If this is not the case and there are no alternative solutions, the proposal can only be allowed to proceed if there are imperative reasons of over-riding public interest (IROPI) - (see pages 15-16 for more detailed explanation).

Development in and around the Moray Firth often has potential to affect Natura qualifying interests and therefore requires HRA. The size and diversity of the Natura sites which could be affected by development on or around the Firth means that assessment of potential impacts can seem complex and daunting. This guide will make HRA simpler by presenting common themes and issues which can help to focus thinking when considering impacts.

Recent EC guidance^{1 2} has highlighted that many of the delays and problems encountered in HRA’s and AA’s are caused by incomplete or deficient information

¹ Wind Energy Developments and Natura 2000; (EC, Luxembourg; 2011, page 74).
http://ec.europa.eu/environment/nature/natura2000/management/docs/Wind_farms.pdf

² <http://ec.europa.eu/environment/nature/natura2000/management/docs/Estuaries-EN.pdf>

gathering and provision, meaning Competent Authorities cannot confirm that there are no adverse effects on site integrity.

This guidance document is intended to help with the collating of information to support HRAs in the area of the Moray Firth.

There are some key things to consider at the earliest opportunity.

- What is the development in its entirety?
- Could works involve impact pathways to the qualifying interests of Natura sites?
- If so, can they be modified in location, scale, nature or timing to avoid the impact pathway entirely?

To consider these issues, it is helpful to have a basic understanding of the qualifying species' ecological requirements and how they might be affected by development. Some aspects of ecology are obvious – for instance bottlenose dolphin don't roost in trees! However, many of the qualifying interest bird species of the SPA's are also unlikely to be found in trees, being birds of open water, intertidal habitats or grassland. This may also seem obvious to an ecologist but will perhaps be less so for developers, regulators or specialists in other fields. We hope that the species accounts in this document will help provide simple information on the ecology of the interests.



Photo: Donald M Fisher

Potential Pathways of Impact

Examples of common ways in which a proposal can have an effect on the qualifying interests in the Moray Firth.

Construction

- Permanent or temporary habitat loss/deterioration.
- Disturbance (noise and visual) and displacement from people or machinery;
- Underwater noise and vibration impacts from piling and construction, and traffic movements (including shipping) during construction.
- Reduced water quality (including increased suspended solids, reduced dissolved oxygen and release of contaminants) from deposition of polluting materials and dredging.
- Changes to coastal processes, e.g. hydrology and sedimentation.

Operation

- Disturbance and displacement (noise and visual) from people, machinery and increased ship traffic.
- Lighting.
- Changes to coastal processes, e.g. hydrology and sedimentation.

In many cases these effects do not work independently and the way they interact needs to be considered. For example land-claim and dredging may lead to changes in coastal processes, sediment deposition and water flows. Some may be temporary. Other pathways may present a risk to Natura interests throughout the life of a development from construction onward, such as the risk of introducing invasive non-native species (INNS).

The table below identifies generic impacts and mitigation measures for some of the commonly occurring potential activities in the Moray Firth. The mitigation suggested may not be applicable in all cases, but will provide a starting point for consideration.

Thinking about the ecological principles that result in these impact pathways may also be useful when considering solutions. A discussion is provided in the next section – we have not tried to discuss every issue but rather we aim to deal with some of the most common principles. The discussion largely focuses on birds but the principles discussed also apply to other qualifying interests.

Table 1 Generic impact pathways and mitigation to consider

Generic Impact	Potential Generic Mitigation
Damage to intertidal habitat through run-off or pollution.	<ul style="list-style-type: none"> • SNH advice, Scottish Government & SEPA guidance such as SEPA pollution prevention guidance
Direct loss of intertidal habitat within the Natura site and supporting qualifying interests.	<ul style="list-style-type: none"> • No generic mitigation. Avoid if at all possible or accept that it is difficult to mitigate without creating alternative compensatory habitat and failing the initial Natura tests. (see <i>figure 2</i>)
Indirect loss of intertidal habitat within the Natura site and supporting qualifying interests (for example as a consequence of changed coastal processes).	<ul style="list-style-type: none"> • Where a proposal would affect coastal processes modelling of the coastal processes should be used to design solution which avoid the impact, such as modifying structure locations or dredge proposals.
Temporary (construction) disturbance.	<ul style="list-style-type: none"> • Time construction to avoid peak times that qualifying interests are present - most suitable for smaller projects. • Provide screening between construction site and coastal area. • Use “soft start” techniques to avoid sudden unexpected disturbance.
Permanent disturbance e.g. from lighting, noise, human activity, etc. on development sites adjacent to areas of use by qualifying species.	<ul style="list-style-type: none"> • Developments can be designed to minimise these impacts – depends on the type of development, e.g. birds may habituate more to background industrial noise and vehicles than they will to people walking about, particularly with the unpredictable activity of dogs. Also depends on the sensitivity of the site.

Permanent disturbance from recreational activity in the intertidal area, i.e. people walking on the beach.

- Where planned development is close to the coast developers should plan alternative recreational provision to take pressure off the coastal site, e.g. links into core path networks away from the coast, good greenspace provision within the development. Specific access management may be required for some sites (though in general it is not possible to prevent people accessing the beach). Large scale development at particularly sensitive sites may not be suitable for this reason.
- Developers and regulators may have to consider mitigating effects from an increase in disturbance facilitated by house building more widely in the Firth's hinterland. Consider strategic mitigation such as ensuring increased provision of alternative recreational facilities, e.g. core path networks, country parks, ranger-managed coastal honey pot sites, good greenspace provision in developments, etc.

Temporary (construction) disturbance/damage to intertidal habitat.

- Time construction to avoid peak times that qualifying interests are present - most suitable for smaller projects.
- Carefully-defined working corridors to minimise damage.
- Habitat restoration may be required.

Collision risk / barriers to flight lines (from wind turbines or tall buildings on or very close to the intertidal area) or migratory passage through water for fish and marine mammals.
Loss of feeding or roosting sites for birds on greenfield sites outwith the SPA, e.g. agricultural land, parks, sports fields, etc.

- No generic mitigation - siting and design of buildings would need to be assessed.
- Displacement of birds by small scale development can sometimes be mitigated by careful siting and design.

Ecological Principles

Habitat and physical processes

Animals require energy to survive and to breed which they obtain from their food. Different species are adapted to feed on different resources and therefore favour different habitats. For example: wigeon graze mainly on grass and similar plants and can be found on saltmarsh or coastal fields; lapwing and golden plover feed on invertebrates in arable farmland and grassland; many other waders feed on invertebrates on mudflats; gannet dive for fish in surface waters and velvet scoter dive for molluscs on the seabed in inshore waters.

Even within the same habitat, different species may exploit different food resources. For example, through variation in bill length and shape, birds are adapted to feed on different prey species. Many waders and other long-billed birds have touch-sensitive bill tips and typically forage by touch or a combination of sight and touch, whereas the short-billed plovers forage mainly by sight.

There are a number of dimensions of estuarine habitat that are critical for birds; the following are especially important either for their own survival or for their preferred food source:

- Water depth and the extent of the intertidal area
- Sediment particle size and the substrate character of the intertidal area
- Nutrient levels
- Salinity
- Disturbance – area around them clearly visible and the ability to detect trouble coming
- Light

Estuarine habitats are strongly influenced by sediment transport processes. Sediment particle size varies throughout an estuary, determined by topography, currents, tides and weather and these aspects create different substrates from coarse sand through to fine muds. Whether a substrate is rocky, shingle, sand or mud is a key determinant of which animals and food-plants are abundant in which parts of an estuary, and hence the food available to the various species of estuarine bird. This variability of habitat in and around the Firth is key and also influences the abundance of prey items in the water column for seabirds and marine mammals.

In the estuarine environment, the tidal cycle influences habitat availability and has a strong effect on bird behaviour. This is compounded by limited daylight hours in winter. Estuarine birds may therefore need to feed at night. Tactile feeders are adapted better for this than visual feeders (e.g. plovers) though the latter often have large eyes which enable them to feed in low light conditions, at least on moonlit nights. Movement of fish species and their associated marine mammal predators are also influenced by the tidal cycle in terms of daily movements and migration.

Intertidal habitats are important for purposes other than foraging. At high tide when coastal areas and their associated food resources are unavailable to waders and wildfowl, these species often move to a safe place where they roost and wait for the tide to turn. Some birds may seek alternative feeding sites such as coastal fields or lagoons adjacent to the estuary. Birds, especially when migrating or over-wintering, must conserve their resources and minimise unnecessary and wasteful energy expenditure.

Consequently, roosting sites need to be undisturbed, by predators and human activity. Roost sites may comprise natural habitats, for example a saltmarsh or an island or mudflat, or man-made sites such as concrete islands and jetties.

Many species use different habitats in different seasons or at different stages of their life. This is particularly pronounced for fish species such as lamprey and salmon where different stages of the life cycle move between the sea and freshwater. It is also true of many bird species that migrate between breeding and non-breeding areas. For some species, including oystercatcher, curlew and redshank a proportion of birds remain within Britain but many of them move inland to breed and only small numbers breed within the Moray Firth and its immediate vicinity.

Minor changes to processes such as sediment deposition, water flows, habitats, availability of food resources and predator/prey relationships constantly occur. Their impact can be extremely complicated and, in some cases, small incremental changes may lead to a substantial overall effect. Minor changes to the environment therefore need to be assessed carefully when considering factors that could cause declines in bird numbers.

Management of the environment

Land-claim and physical management of the intertidal

Land-claim (also referred to as “reclamation”) involves converting marine or intertidal habitat to dry land, often by constructing a barrier such as a seawall to prevent the tide from reaching that area. Historically, parts of the Moray Firth have been claimed and converted for use as industrial sites (e.g. the Longman Industrial site, Inverness and the former oil rig fabrication yards at Nigg and Ardersier). In addition there have been longer term and progressive loss of habitats for agriculture, harbours and other industrial development. The most obvious impact of land-claim on birds is the loss of natural marine and intertidal habitats. However, change is not always entirely negative. In time, some of the areas claimed from the estuary develop into different habitats, some of which become valued as wildlife habitats and local nature reserves in their own right (e.g. the [Nigg Bay managed re-alignment scheme](#) and the Musselburgh lagoons are an example in the Firth of Forth). Even where development has minimal or no physical impact on intertidal habitat, birds may still be affected. Some developments adjacent to the estuary may not directly affect estuarine habitats but result in loss of inland habitat used by estuarine birds that can be particularly important at certain times e.g. feeding areas for pink-footed geese, wigeon, lapwing, golden plover, curlew and roost sites for a variety of species.

Birds and mammals that previously used claimed areas must find new habitat. Their ability to do so will depend on whether alternative areas have capacity to support a greater population. A study of birds displaced by the construction of Cardiff Bay barrage highlighted that displaced birds will not necessarily be able to find suitable alternative long-term habitat elsewhere. The barrage caused the displacement of almost all of the shelduck, oystercatcher, curlew and redshank that had previously used the area. Some displaced shelduck, oystercatcher and curlew moved initially to nearby sites. However, the increases at these sites were not sustained in subsequent winters. Earlier studies had demonstrated that redshank were largely faithful to the bay. Continued studies confirmed that the displaced birds moved to nearby sites where they joined other redshank already present. The study demonstrated that the displaced birds were significantly lighter than

those which had previously been using the site, and suffered significantly higher winter mortality.

Land-claim may also have indirect effects. Altered topography may cause changes to currents and tidal flows, affecting sediment deposition and erosion and potentially affecting the extent and type of intertidal habitat available. Such effects may extend well beyond the immediate vicinity of the development. For example, the creation of jetties may cause additional accretion to occur one side of the jetty and reduced accretion or scour on the other. Land-claim also has the potential to create narrower estuaries and 'coastal squeeze', making habitats more vulnerable to future sea-level rise.

Land-claim and development projects may often be small but the cumulative effect of many small-scale developments causing minor loss of habitat may be significant.

Dredging and disposal

Dredging and disposal may have a number of effects on Natura interests arising from suspension of sediments in the water column, remobilisation of contaminants, underwater noise, impacts on seabed habitats or coastal processes and injury or disturbance to animals using the water column.

These effects will be less pronounced for maintenance dredging where plants and animals are likely to have adapted to regular dredging/disposal activities. Capital dredging is likely to have more significant impacts as any areas affected may not have experienced levels of disturbance previously and are therefore more likely to support stable and established habitats and wildlife populations.



Photo: SNH image library

Disturbance – its ecological consequences

Types of disturbance

Disturbance is defined as any event that disrupts behaviour of species communities or individuals. Disturbance can occur naturally, for example when predators approach potential prey. However, this section focuses on anthropogenic disturbance. Feeding and resting activity of birds and mammals may be disturbed by a wide variety of human activities arising from both the presence of people or noise associated with particular activities. Sound may travel long distances in air and underwater depending on the local topography and hydrography.

Causes of disturbance include

- **Walking and dog-walking**
Walking (including bird-watching) and dog-walking are among the most common and widespread activities carried out on British estuaries. Individual instances of disturbance from these activities may be relatively minor, but cumulatively the effects may be considerable. For example a stretch of shore used by many people for recreation may become unusable for birds or otters.
- **Water-based recreation**
Water-based recreational activities include sailing, fishing, water-skiing, jet-skis, motorboats, kayaking and windsurfing.
- **Aircraft**
Aircraft may have particularly strong effects on waterfowl, but as with other influences this depends on volume, height, frequency of flights and other factors.
- **Construction work**
Construction work on or adjacent to an estuary may cause noise and visual disturbance. Major construction work can reduce densities, or exclude birds and marine mammals from favoured areas, during the construction phase (and sometimes after construction). Otters can be susceptible to vehicle accidents. Most occur within 100m of watercourses, especially when river levels are high and otters are reluctant or unable to swim under bridges or through culverts due to strong currents or blockages.
- **Noise**
Birds and mammals often respond to loud noise by flying or moving away but few studies have looked at the effect of noise on feeding and resting. Most studies have found that irregular and/or louder noises cause more disturbance than more predictable and/or quieter noises. Depending on level and frequency, underwater noise can disturb marine mammals or mask their ability to communicate or find prey.
- **Artificial lighting**
Artificial lighting has been found to affect the movements of migratory birds by attracting them, sometimes causing mortality. However, artificial lighting can make it easier for visual feeders to find and capture prey but it can also make birds more vulnerable to predation.

The effects of disturbance depend on magnitude, frequency, predictability, extent and duration. Whilst it is clear and obvious that species may be disturbed to some extent by human activity, it is more difficult to assess the actual impact that disturbance may have on individuals or at a site or population level.

Disturbance whilst feeding

The impact of disturbance to feeding animals depends on the effects of disturbance on energy intake and expenditure. This will be determined by:

- how much foraging time is lost;
- how much extra energy expenditure occurs because of disturbance, and
- whether individuals can compensate for energy spent

Animals may be able to compensate by a variety of means:

- using alternative habitat, if available;
- increasing food intake rates when they resume feeding and/or
- extending the length of time that they feed

Minor levels of disturbance may therefore have little long-term effect. However, the ability to compensate may be limited. Wading birds can feed on mudflats only during low tide when they are uncovered, and different areas will vary in their foraging quality. Disturbance becomes more important in cold weather when birds need to feed for longer to meet their energy requirements. Some species need to feed for longer than others and will therefore be more susceptible to disturbance during cold weather. Sustained or repeated disturbance may result in an area becoming unusable and effectively the long-term loss of an area for feeding. Such disturbance could lead to a reduction in the number of birds that a site can support, known as the 'carrying capacity' of a site.

Disturbance at resting sites

Many disturbing activities can occur at or close to the high-tide mark. Roosting birds are therefore often more vulnerable to disturbance, as they are usually gathered in large flocks close to the high water mark, whereas foraging birds are generally spread out over a wide area of mudflat, and further away from most human activities. Disturbance at a high-tide roost site does not cause birds to stop feeding, but it may lead to increased energy expenditure. Therefore, regular disturbance at important roost sites may cause population declines even if sufficient food resources remain available in an area.

Seals (grey and common) are vulnerable to disturbance at their haul out sites. People getting too close, especially with dogs are a particular problem. Seals are especially vulnerable to disturbance during the breeding season and, to a lesser extent, during their moult. Mothers recognise their pups from their calls and smell. The bond formation between mother and pup can be interrupted by excessive or persistent disturbance, particularly during the first few days after birth. If a mother fails to recognise her pup and abandons it, the pup is likely to starve and die. Females pupping for their first time are often more susceptible to disturbance. During their moult, seals prefer to spend longer out of the water than at other times of the year. This is because they are growing new hair. At this time their peripheral blood supply is open, providing the cells that make the new hair with the necessary nutrients. If they are forced to enter the water the blood

system closes down and they have to restart this system when they next haul out. This is a drain on their energy reserves.

Otters are vulnerable to disturbance at their breeding or resting sites. Otter have been recorded breeding in every month of the year and it is therefore difficult to avoid potential impacts through careful timing of work, as is the case with breeding birds. Consequently other mitigation measures such as exclusion zones during critical periods may be required.

It is difficult to determine specific resting or breeding sites for dolphin, but we do know that certain areas are particularly important for them. In the Moray Firth this includes the Sutors, Chanonry Point, the Kessock Channel and Spey Bay in particular, although they do occur across the entire Firth, usually with 10km of the shore. Disturbance to key behaviors in these important areas is likely to be more of an issue than in areas that they use for transit.

Habituation and prevention

The impact of disturbance may be lower if it occurs regularly and is predictable e.g. walkers staying on footpaths or marine vessels maintaining constant speed and direction. In such cases, birds may show habituation to disturbance and allow a closer approach than birds which are not habituated. This does not mean that it is safe to assume that birds will habituate to any disturbance; the level of habituation varies from one activity to another and certain species are more able to habituate than others. Similarly, marine mammals may habituate to low and predictable levels of disturbance in areas that are not crucial for important life stages such as resting, feeding, breeding etc.

Measures to prevent disturbance to birds in late winter may be particularly important as this is when many species are likely to be most at risk and less able to compensate for the effects of disturbance; declining temperatures and food quality combine to make survival more difficult in late winter. This is especially true during periods of severe weather, when birds may be at risk of starvation even without the added impact of disturbance. A formal statutory process and set of criteria already exists in the UK to suspend shooting in severe weather.



Photo: SNH image library

Habitats Regulations Appraisal (HRA)

Natura 2000

Natura 2000 is the title for the network of areas (Special Protection Areas and Special Areas of Conservation) set up to conserve key natural habitats and species which are rare, endangered, or vulnerable in the European Community. Due to their international importance, Natura sites receive protection from development and other regulated activities (including general permitted development rights) in Scotland through both [legislation](#) and [policy](#). The Natura network is not, however, a series of strict nature reserves where all human activities are excluded; instead the emphasis is on ensuring that the management of Natura sites is sustainable.

The HRA procedure

[Habitats Regulations Appraisal](#)³ is a precautionary and rigorous procedure required by [the 'Habitats Regulations'](#)⁴ when consenting a plan or project: e.g. under the Planning Acts. The HRA procedure must be applied to any plan or project that might affect the qualifying interests of any Natura site; this includes plans and projects outside a Natura site. HRA comprises a series of steps, summarised in Figure 1 below.

³ <https://www.nature.scot/professional-advice/safeguarding-protected-areas-and-species/protected-species/legal-framework/habitats-directive-and-habitats-regulations>

⁴ <http://www.legislation.gov.uk/ukxi/1994/2716/contents/made>

Competent Authorities (i.e. the body responsible for consenting the proposal in question) need to carry out an [appropriate assessment \(AA\)](#)⁵ of a plan or project⁶, if it is [likely to have a significant effect \(LSE\)](#)⁷ on a Natura site, either alone or in-combination with other plans and projects. European guidance⁸ states that Competent Authorities must judge proposals on a case-by-case basis because it should be recognised that what may be significant in relation to one site may not be in relation to another. The test for *likely significant effect* acts as a simple but very precautionary filter to exclude from further assessment, any plans or projects which are not capable of having a significant effect. To help clarify this the [Waddenzee Judgement](#) (para 45) says there is a Likely Significant Effect, “...if it cannot be excluded, on the basis of objective information, that it will have a significant effect on that site”, and as such there is a high likelihood that many projects are likely to have significant effects which require further consideration.

At the end of the HRA the Competent Authority must come to a conclusion as to whether there are no adverse effects on Natura site integrity. This conclusion is legally binding in nature and must be reached in view of the site’s conservation objectives. The conservation objectives can be thought of as ecological yardsticks to assess the effects of proposals against, and apply to each qualifying species or habitat of a Natura site. They can be found on [Sitelink](#). The developer is usually expected to supply the information required for the Competent Authority to complete its HRA. The Competent Authority must consult SNH over their appropriate assessment and have regards to our comments. Further [help and advice on HRA](#); including links to useful guidance, court cases, legislation, and other websites can be found on the SNH website.

HRA in the Moray Firth area

The Moray Firth area contains a number of Natura sites, including:

- Moray Firth SAC
- Dornoch Firth and Morrich More SAC
- River Moriston SAC
- Culbin Bar SAC
- Inner Moray Firth SPA
- Cromarty Firth SPA
- Dornoch Firth and Loch Fleet SPA
- Moray and Nairn Coast SPA
- Moray Firth pSPA

These sites all occur within the inner part of the Moray Firth (or have connectivity to it) and are within the wider area delineated by the Moray Firth SAC (i.e. waters and intertidal west of a line drawn from Helmsdale to Lossiemouth). There are a number of European

5 <https://www.nature.scot/professional-advice/planning-and-development/environmental-assessment/habitats-regulations-appraisal/habitats-regulations-appraisal-hra-appropriate>

6 Within the flow diagrams the phrase ‘plans and projects’ has been changed to ‘proposal’, although the intended meaning remains the same.

7 <https://www.nature.scot/professional-advice/planning-and-development/environmental-assessment/habitats-regulations-appraisal-hra/habitats-regulations-appraisal-hra-likely>

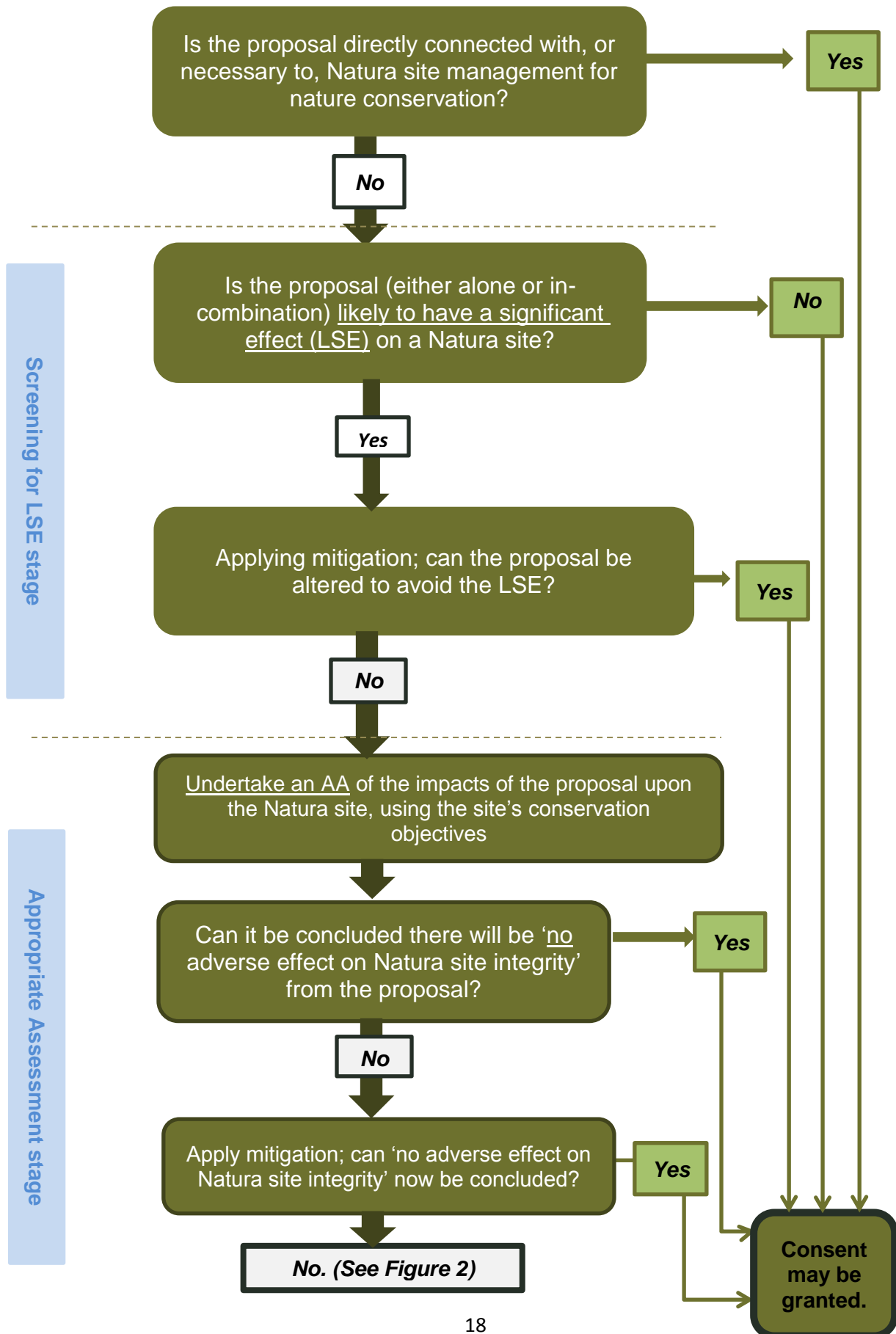
8 [European Commission \(2000\). Managing Natura 2000 Sites: The provisions of Article 6 of the Habitats Directive 92/43/EEC. Office for Official Publications of the European Communities, Luxembourg](#) (paragraph 4.4.1)

sites out with this area which are not included within the scope of this report. This includes sites designated for mobile species such as fish and birds which may be found within or transit through the Firth. Whilst some sites are excluded we hope that the principles and information provided in this report will be useful for considering development in the Moray Firth as a whole.



Photo: SNH image library

Figure 1: The HRA process, up to and including appropriate assessment.



The information required

There can be a perception that the HRA process is complicated; however the level of detail should reflect the complexity of the case and be sufficient to allow the Competent Authority to determine beyond reasonable scientific doubt that there are no adverse effects on site integrity. A HRA need not therefore be a difficult or lengthy process when the issues involved are straightforward. The breadth, content, and level of information required for an HRA depends upon the individual circumstances of each case. It is usually the proposer of the plan or project who must supply the relevant information to the Competent Authority to carry out the HRA.

Determining that there are no adverse effects on site integrity

There are no hard and fast rules about what constitutes a possible adverse effect on site integrity. Each case should be judged on its own merits, although case-law can provide some help in interpreting the legislation. Ultimately Competent Authorities must not authorise a plan or project unless they can ascertain, by means of an HRA, including if required an Appropriate Assessment, that the plan or project concerned will not adversely affect the integrity of a Natura site, except in certain limited circumstances.

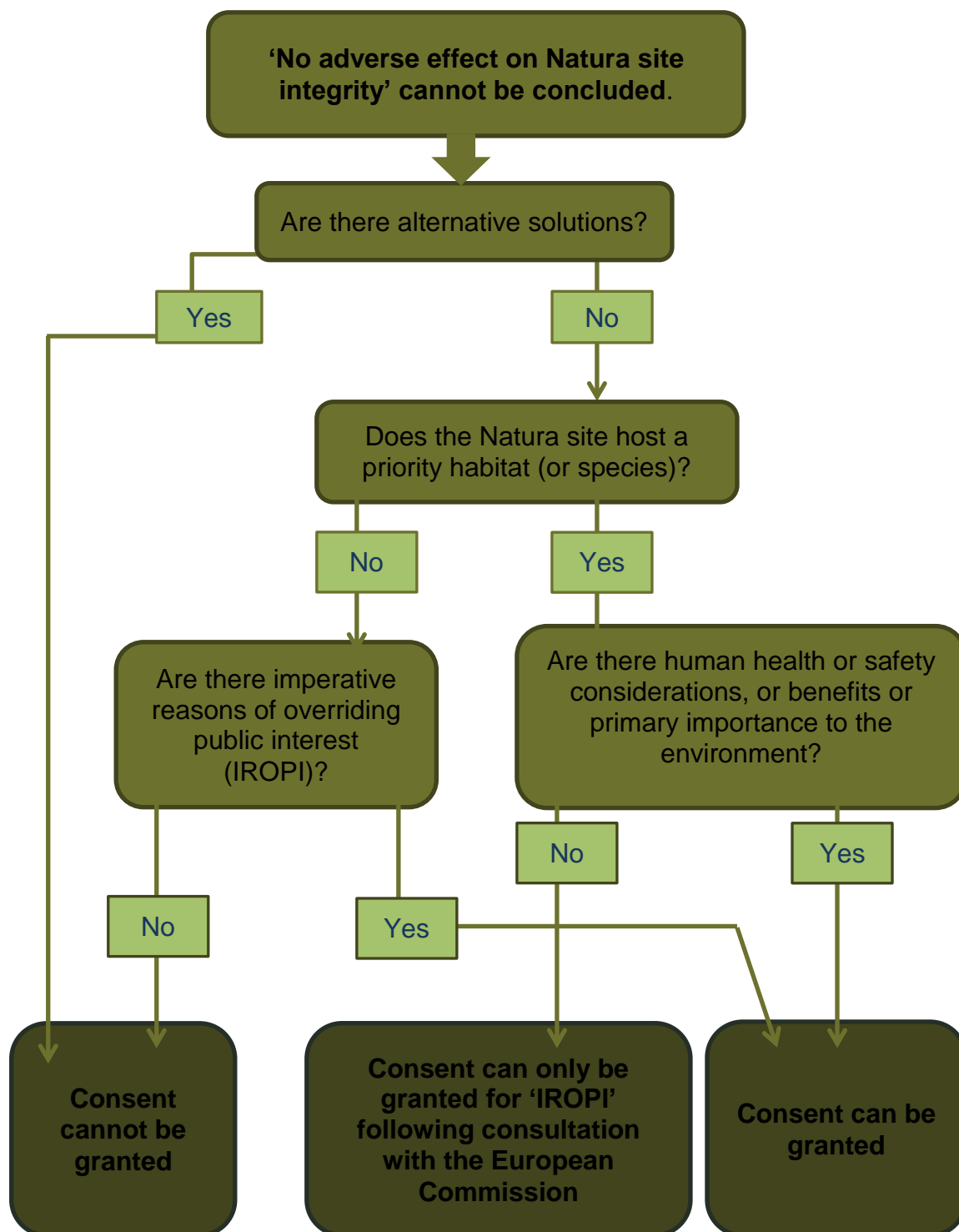
These exceptions are set out in regulation 49 of [the Habitats Regulations](#). The regulation provides some scope for derogation to approve a plan or project even when it cannot be ascertained that there is no adverse effect on Natura site integrity. For a proposal to meet the derogation tests there must first be no alternative solutions, and imperative reasons of overriding public interest (IROPI), for the proposal to go ahead (see Figure 2 below). This decision requires notification to Scottish Ministers. Like the other steps in an HRA, judging IROPI should also be done on a case by case basis, but guidance⁹ suggests that the following guiding principles can help in deciding whether imperative reasons of overriding public interest are demonstrated:

- a need to address a serious risk to human health and public safety;
- the interests of national security and defence; the provision of a clear and demonstrable direct national or international environmental benefit;
- a vital contribution to strategic economic development or regeneration;
- or where a failure to proceed would have unacceptable social and/or economic consequences.

The Scottish Government expects that such derogation will only be required in exceptional circumstances.

⁹ Scottish Office Circular 6/95 (Updated 2000)

Figure 2: The HRA process where a Competent Authority cannot conclude that there is no adverse effect on Natura site integrity, and yet wishes to consent to a plan or project¹⁰.



¹⁰ N.B “priority” habitats and species are a subset of the protected habitats and species. They are habitats and species which are classed as being in danger of disappearance. Scotland has NO priority species as a qualifying interest of an SAC, but there is a [list of priority habitats which occur in Scotland](#).

Accounts for Qualifying Interests

Habitats

Habitats

Atlantic salt meadows

Relevant SAC(s) and Area Extent of Feature:

- Dornoch Firth and Morrich More (530.77ha)

General Feature Description

Atlantic salt meadows develop when salt-tolerant vegetation colonises soft intertidal mud and sand in areas protected from strong wave action. This vegetation forms the middle and upper reaches of saltmarshes, where tidal inundation still occurs but with decreasing frequency and duration. Saltmarshes can cover large areas and the communities it supports vary with climate and the frequency and duration of tidal inundation.

Grazing by domestic livestock is particularly significant in determining the habitat's structure and species composition which can influence its relative value for plants, invertebrates and wintering or breeding waterfowl. For instance, grazing can affect sward height which in turn can affect the saltmarshes ability to intercept and retain sediment.

Feature Description in the Context of Relevant SACs

Dornoch Firth and Morrich More is the most northerly site selected for Atlantic salt meadows and represents this habitat type in the northern part of its UK range. The site supports a wide variety of community types, with the characteristic zonation of saltmarsh vegetation. At Morrich More the saltmarshes lie adjacent to sand dunes and there are important transitions between these habitats.



Photo: SNH image library

Condition Status and Date of Last Assessment:

- Dornoch Firth and Morrich More - Favourable Maintained (2014).

Pressures:

- Dornoch Firth and Morrich More – grazing, agricultural activities (including vehicular access).

Coastal dune heathland

Relevant SAC(s) and Area Extent of Feature:

- Dornoch Firth and Morrich More (356.75ha)

General Feature Description

Coastal dune heathland occurs on mature, stable dunes towards the landward end of the dune system and represents the latter stages in the succession of sand dune habitats.

Though similar in composition to *Lime-deficient dune heathland with crowberry* (see below) this habitat is more widespread, tolerating drier and warmer conditions. The main species present vary considerably throughout the UK but the most characteristic community is dune heath in which ling heather (*Calluna vulgaris*) is found in combination with sand sedge (*Carex arenaria*).

Feature Description in the Context of Relevant SACs

Dornoch Firth and Morrich More represents the only site in north-east Scotland to be selected for its coastal dune heathland. At this site, dune vegetation has developed on a coastline that has been generally rising relative to sea level in the 7,000 years since the last glaciation. A combination of leaching, stabilisation and the decreased influence of saltwater has produced a sequence of dry, stable dune ridges, interspersed with wet dune hollows. The coastal dune heathland vegetation covers a large area on this site and forms part of a complex mosaic of fixed dune vegetation types, including other types of heathland together with saltmarsh and transitional communities. This is the most important acidic dune site in Scotland, owing to its size and the exceptional diversity of habitats within it. Despite some localised industrial development, structure and function are well-conserved at this site and accretion is continuing.



Photo: Stewart Angus

Condition Status and Date of Last Assessment:

- Dornoch Firth and Morrich More - Unfavourable-recovering (2001).

Pressures:

- Dornoch Firth and Morrich More – Agricultural activities, statutory undertaker development.

Lime-deficient dune heathland with crowberry (*Empetrum nigrum*)

Relevant SAC(s) and Area Extent of Feature:

- Dornoch Firth and Morrich More (60.91ha)

General Feature Description

Like Coastal dune heathland (above) lime-deficient dune heathland with crowberry also occurs on mature, stable dunes and represents the latter stages in the succession of sand dune habitats. This habitat develops in areas with increased soil acidity; conditions which are favoured by ling heather and crowberry.

This type of heathland habitat tends to occur in mosaics with other dune habitats, depending on local physical and soil conditions (e.g. dune heath, dune slacks and acidic grasslands).

Grazing helps to maintain the open nature of the vegetation, this would otherwise develop into scrub and woodland through the process of succession. However, it is vulnerable to overgrazing, and planting of trees can lower the water table, which in turn will suppress open dune heath vegetation.

Similar in composition to *Coastal dune heathland* this habitat has a more restricted distribution in Scotland in relatively wetter and more base-poor conditions. At some sites it is very difficult to allocate stands of different dune heath habitat as the vegetation forms a continuous spectrum of variation within complex habitat mosaics. The two types may also succeed one another in the same location over time.

Feature Description in the Context of Relevant SACs

Dornoch Firth and Morrich More SAC represents one of just two sites which are designated for this habitat type in the UK. Here, the dune vegetation has developed on a coastline that has been generally rising relative to sea level in the 7,000 years since the last glaciation. A combination of leaching, stabilisation and the decreased influence of salt water has produced a sequence of dry, stable dune ridges, interspersed with wet dune hollows.

A large area of this habitat type occurs on site as a mosaic with other fixed dune vegetation types, principally coastal dune heathland (see above). Within this complex of habitats there are examples of dune,

saltmarsh and transitional communities that include large populations of several northern dune species, such as Baltic rush (*Juncus balticus*).

This is the most important acidic dune site in Scotland because of its size and the exceptional diversity of habitats within it. Despite some localised industrial development, structure and function are well-conserved at this site and accretion is continuing.



Photo: Stewart Angus

Condition Status and Date of Last Assessment:

- Dornoch Firth and Morrich More – Unfavourable-recovering (2001).

Pressures:

- Dornoch Firth and Morrich More – Agricultural activities, statutory undertaker development.

Embryonic shifting dunes

Relevant SAC(s) and Area Extent of Feature:

- Dornoch Firth and Morrich More (52.21ha)

General Feature Description

Embryonic shifting dunes represent the newest part of sand dune systems and form closest to the sea at the dune/beach interface. They develop where windblown sand settles and accumulates to form sand mounds and ultimately, over time sand dunes. However, they are highly dynamic and unstable and can be modified by high winds or wave action particularly during storm conditions.

Embryonic dunes represent the first zone where vegetation can colonise, above the sea although the typical plant community is species-poor being limited to salt-tolerant species such as sea rocket (*Cakile maritima*) and the sand-binding grasses lyme-grass (*Leymus arenarius*) and sand couch (*Elytrigia juncea*).

This pioneer habitat type rarely occurs in isolation because of its position in the succession of dune systems and is typically succeeded by marram further up the dune system which distinguishes embryonic shifting dunes from the shifting dunes with marram habitat (see below).

Feature Description in the Context of Relevant SACs

Dornoch Firth and Morrich More is one of three sites representing embryonic shifting dunes on the east coast of Scotland and is the most northerly example of the habitat type with well-marked lyme-grass (*Leymus arenarius*) dominated areas. The process of continued progradation is central to the conservation of this habitat type at this site, which has the largest, most complete area of sand dune in the UK, in part owing to the exceptionally high rate of progradation.

This habitat type rarely occurs in isolation because it's position in the success of dune systems and is typically found in association with other dune habitats.

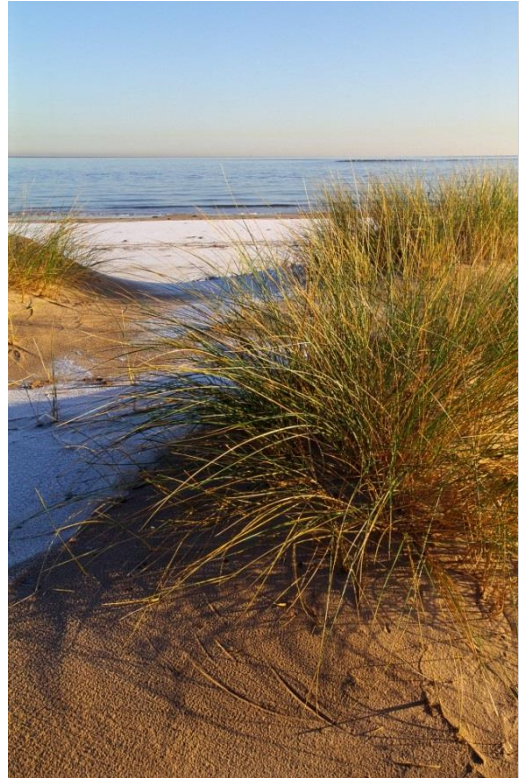


Photo: SNH image library

Condition Status and Date of Last Assessment:

- Dornoch Firth and Morrich More – Favourable-maintained (2010).

Pressures:

- Dornoch Firth and Morrich More – None.

Shifting dunes with marram

Relevant SAC(s) and Area Extent of Feature:

- Dornoch Firth and Morrich More (26.1ha)

General Feature Description

Shifting dunes with marram is a transitional habitat which occurs between embryonic shifting dunes (above) and older, more stable fixed dune habitats and is represented by the predominance of sand-binding marram.

Like embryonic shifting dunes, this habitat type also rarely occurs in isolation because of its position in the succession of dune systems and is typically succeeded by marram further up the dune system and is typically succeeded inland by other dune habitats (e.g. dune grassland (above)).

There is also geographical variation in the floristic composition of the habitat type.

Feature Description in the Context of Relevant SACs

The large dune system of Dornoch Firth and Morrich More is physically diverse, with areas of active accretion, marine erosion and internal instability as well as well-formed parabolic dunes. All of these formations provide opportunities for shifting dunes with marram to develop. As a result this habitat type is relatively extensive within the site. The vegetation is representative of northern mobile dune vegetation, with lyme-grass prominent in some stands. The site is largely undisturbed, resulting in a natural habitat structure.



Photo: Stewart Angus

Condition Status and Date of Last Assessment:

- Dornoch Firth and Morrich More – Favourable-maintained (2010).

Pressures:

- Dornoch Firth and Morrich More – None

Dune grassland

Relevant SAC(s) and Area Extent of Feature:

- Dornoch Firth and Morrich More (287.14ha)

General Feature Description

Dune grassland occurs on mature, stable areas inland of the dune zone which is dominated by marram grass (*Ammophila arenaria*). It is formed as the sand is stabilized and the organic content increases.

It is a complex habitat type and the herbaceous vegetation it supports exhibits considerable variation across the UK.

Feature Description in the Context of Relevant SACs

The extensive dune grassland system of Dornoch Firth and Morrich More consists of a low dune plain which is still active. The dune system consists of a series of ridges with heath and juniper scrub on the older ridges which grade into the fixed dune vegetation of maritime grassland in the mid and outer parts.



Photo: SNH image library

Condition Status and Date of Last Assessment:

- Dornoch Firth and Morrich More – Unfavourable (2001).

Pressures:

- Dornoch Firth and Morrich More - Agricultural activities, recreation/disturbance.

Dunes with juniper (*Juniperus communis*) thicket

Relevant SAC(s) and Area Extent of Feature:

- Dornoch Firth and Morrich More (17.4ha)

General Feature Description

This habitat type comprises common juniper scrub on coastal sand dunes and occurs within the inland zone of dune systems, away from the shore. Stands are usually very small and are intimately mixed with other Annex I habitat types, including dune grassland and heath. In the UK, dunes with juniper only occur in Scotland.

Feature Description in the Context of Relevant SACs

Morrich More is the most important site in the UK for juniper stands on dunes. Stands of juniper cover approximately 10 ha, with scattered individuals over a larger area. The juniper is extremely well-developed on the dry ridges and transitions to dune slacks. The best stands occur in grasslands in the southern sector, but prostrate individuals also extend into wet heath and slack habitats within the site.



Photo: Stewart Angus

Condition Status and Date of Last Assessment:

- Dornoch Firth and Morrich More – Unfavourable-recovering (2014).

Pressures:

- Dornoch Firth and Morrich More - None.

Humid dune slacks

Relevant SAC(s) and Area Extent of Feature:

- Dornoch Firth and Morrich More (174.02ha)

General Feature Description

Dune slacks are low-lying areas within dune systems that are seasonally flooded and where nutrient levels are low.

True dune slacks are fed mainly by rain water and are characterised by a pattern of pronounced annual fluctuation of the water table. Variations in the extent and duration of flooding of the dune surface as well as the physical, environmental and chemical conditions associated with the dune system are very important in determining the vegetation communities which exist there.

Feature Description in the Context of Relevant SACs

Morrich More is one of the largest acidic dune sites in the UK. The sequence of development has resulted in the formation of extensive humid slack communities of an acidic character which lie as parallel hollows between the dune ridges and form part of a complex mosaic of dune habitats, several of which have been proposed as Annex I habitat types in their own right. This is the most important acidic dune system in Scotland, owing to its size and the exceptional diversity of the habitats within it.



Photo: Stewart Angus

Condition Status and Date of Last Assessment:

- Dornoch Firth and Morrich More – Favourable-maintained (2001).

Pressures:

- Dornoch Firth and Morrich More – Forestry operations, development.

Coastal Shingle Vegetation outside the reach of waves

Relevant SACs and Area Extent of Feature:

- Culbin Bar SAC (116.2ha)

General Feature Description

Shingle structures develop when a sequence of foreshore beaches is deposited at the limit of high tide. More permanent ridges are formed as storm waves throw pebbles high up on the beach, from where the backwash cannot remove them. Several beaches may be piled against each other and extensive structures can form. The ecological variation in this habitat type depends on stability, the amount of fine material accumulating between pebbles, climatic conditions, width of the foreshore, and past management of the site. The ridges and lows formed also influence the vegetation patterns, resulting in characteristic zonations of vegetated and bare shingle.

Feature Description in the Context of Relevant SACs

Historically, Culbin Bar formed part of the same shingle aggregation as Lower River Spey – Spey Bay to the east. Although sea-level rise has separated the sites, they are still linked, being maintained by the same coastal processes. Culbin Bar and the Lower River Spey – Spey Bay are, individually, the two largest shingle sites in Scotland and together form a shingle complex unique in Scotland. They represent Perennial vegetation of stony banks in the northern part of its UK range. Culbin Bar is considered to be one of the best areas in the UK.

Culbin Bar is 7 km long. It has a series of shingle ridges running parallel to the coast that support the best and richest examples of northern heath on shingle. Dominant species are heather *Calluna vulgaris*, crowberry *Empetrum nigrum* and juniper *Juniperus communis*. The natural westward movement of the bar deposits new ridges for colonisation. Being virtually unaffected by damaging human activities, Culbin Bar is an example of a system with natural structure and function.

Narrow, less-stable structures (spits and bars or the fringing beach associated with older, fossil beaches) are more exposed to waves or salt spray. Where wave energy causes movement of the shingle, the plant communities have affinities with the vegetation of drift lines. The presence of the yellow

horned-poppy *Glaucium flavum* and the rare sea-kale *Crambe maritima* both species that can tolerate periodic movement, is significant. In more stable areas above this zone, where sea spray is blown over the shingle, plant communities with a high frequency of salt-tolerant species such as thrift *Armeria maritima* and sea campion *Silene uniflora* occur. These may exist in a matrix with abundant lichens.

On the largest and most stable structures the sequence of vegetation includes scrub, notably broom *Cytisus scoparius* and blackthorn *Prunus spinosa*. Heath vegetation with heather *Calluna vulgaris* and/or crowberry *Empetrum nigrum* occurs on the more stable shingle structures, particularly in the north. This sequence of plant communities is also influenced by natural cycles of degeneration and regeneration of the shrub vegetation that occurs on some of the oldest ridges.



Photo: SNH image library

Condition Status and Date of Last Assessment:

- Culbin Bar – Favourable Maintained (2011)

Pressures:

- Culbin Bar - None

Estuaries

Relevant SAC(s) and Area Extent of Feature:

- Dornoch Firth and Morrich More (6813.06ha)

General Feature Description

Estuaries are habitat complexes consisting of subtidal and intertidal habitats, which are closely associated with the surrounding terrestrial habitats. They form the transition between rivers and the sea which results in a gradient of salinity from freshwater to increasingly marine conditions towards the open sea. Estuarine habitats are also subject to the tide as well as other physical and environmental influences.

The parts of estuaries furthest away from the open sea are usually characterised by soft sediments and the salinity is more strongly influenced by riverine freshwater input. Here the animal communities are typically dominated by sediment-living worms, with few other invertebrates.

Closer towards the mouth of the estuary and the sea, the substrate become coarser and more sand-dominated while the water gradually becomes more saline. Here the animal communities of the sediments are dominated by invertebrates such as marine worms, bivalve molluscs and small crustaceans.

In addition to the sedentary communities of the subtidal and intertidal muds and sands, the water column of estuaries supports free-living species such as fish and juvenile stages of benthic plants and animals. In

particular, they are important pathways for fish species such as Atlantic salmon (*Salmo salar*) which migrate between the marine and freshwater environments.



Photo: SNH image library

Feature Description in the Context of Relevant SACs

Dornoch Firth is the most northerly large, complex estuary in the UK. The estuary is fed by the Kyle of Sutherland and is virtually unaffected by industrial development. There is a complete transition from riverine to fully marine conditions and associated communities. Inland, and in sheltered bays, sediments are generally muddy. Gravelly patches occur in the central section of the Firth. Wide sandy beaches dominate the large bays at the mouth of the Firth and areas of saltmarsh occur around the shores. Sublittoral sediments are predominantly medium sands with a low organic content.

Condition Status and Date of Last Assessment:

- Dornoch Firth and Morrich More – Not assessed.

Pressures:

- Dornoch Firth and Morrich More – None.

Glasswort (*Salicornia* spp.) and other annuals colonising mud and sand

Relevant SAC(s) and Area Extent of Feature:

- Dornoch Firth and Morrich More (8.7ha)

General Feature Description

This pioneer saltmarsh vegetation community colonises intertidal mud and sandflats in areas protected from strong wave action and is an important precursor to the development of more stable saltmarsh vegetation (see Atlantic salt meadows above). It typically develops at the lower reaches of saltmarshes where the vegetation is frequently flooded by the tide.

It is dominated by glassworts (*Sarcocornia* spp) or annual seablite (*Suaeda maritima*) along with other saltmarsh species such as common saltmarsh-grass (*Puccinellia maritima*), common cord-grass (*Spartina anglica*) and sea aster (*Aster tripolium*).

A less common form of the habitat consists of ephemeral vegetation colonising open pans in upper saltmarshes.

Feature Description in the Context of Relevant SACs

Dornoch Firth and Morrich More has the most extensive area of pioneer glasswort *Salicornia* spp. saltmarsh in Scotland. It is the most northerly site selected for this Annex I habitat type and represents the habitat in the northern part of its range in the UK. It forms part of a complete transition from pioneer to upper salt meadow and important sand dune habitats.



Photo: SNH image library

Condition Status and Date of Last Assessment:

- Dornoch Firth and Morrich More – Favourable-maintained (2010).

Pressures:

- Dornoch Firth and Morrich More – None.

Intertidal mudflats and sandflats

Relevant SAC(s) and Area Extent of Feature:

- Dornoch Firth and Morrich More (3854.64ha)

General Feature Description

Intertidal mudflats and sandflats are submerged at high tide and exposed at low tide. They form a major component of the over-arching estuaries and large shallow inlets and bays habitat types in the UK but also occur along the open coast and in lagoonal inlets. The physical structure of the intertidal flats ranges from mobile, coarse-sand beaches on wave-exposed coasts to stable, fine-sediment mudflats in estuaries.

This habitat type can be divided into three broad categories (clean sands, muddy sands and muds), although in practice there is a continuous gradation between them. Within this range the plant and animal communities which occur vary according to the type of sediment, its stability and the salinity of the water.

Feature Description in the Context of Relevant SACs

The Dornoch Firth is the most northerly complex estuary in the UK and contains extensive areas of mudflats and sandflats. The flats extend in a wide belt along the northern and southern shores and are characteristic of a range of environmental conditions. There is a continuous gradient in the physical structure of the flats, from medium-sand beaches on the open coast to stable, fine-sediment mudflats and muddy sands further inland. This results in a high diversity of animal and plant communities supporting marine worms, molluscs and amphipod crustaceans. The sheltered bays provide a habitat for communities of algae, eelgrass (*Zostera* spp.) and the pioneer saltmarsh plant glasswort (*Salicornia* spp.).



Photo: SNH image library

Condition Status and Date of Last Assessment:

- Dornoch Firth and Morrich More – Favourable-maintained (1996).

Pressures:

- Dornoch Firth and Morrich More – Forestry operations.

Reefs

Relevant SAC(s) and Area Extent of Feature:

- Dornoch Firth and Morrich More (78.31ha)

General Feature Description

Reefs are rocky marine habitats or biological concretions that rise from the seabed. They are generally subtidal but may extend into the intertidal zone, where they are exposed to the air at low tide. Reefs are very variable in form and in the communities that they support with two main types being recognised: those where animal and plant communities develop on rock or stable boulders and cobbles (rocky reefs), and those where structure is created by the animals themselves (biogenic reefs).

Rocky reefs are extremely variable and include a wide range of topographical forms ranging from vertical rock walls to horizontal ledges, sloping or flat bed rock, broken rock, boulder fields, and aggregations of cobbles. They are characterised by communities of attached algae and invertebrates, usually associated with a range of mobile animals, including invertebrates and fish, the compositions of which vary according to a variety of physical and environmental factors.

Biogenic reefs are less variable but the associated communities can vary according to local conditions of water movement, salinity, depth and turbidity.

Feature Description in the Context of Relevant SACs

Both rocky and biogenic reefs occur within the Dornoch Firth. Rocky reefs exist as small outcrops of predominantly intertidal bedrock along the shores of the upper estuary. These typically support lichens on the upper shore with brown algae in the mid to lower shore and dense kelp forests (*Laminaria* spp.) inhabited by marine invertebrates below the low water mark.

The biogenic reefs are represented by well-developed common mussel (*Mytilus edulis*) beds which predominate in shallow sites between the middle of the estuary and the estuary mouth. These reefs are characterised by an abundant and species-rich flora and fauna that is more diverse than the adjacent sediment-based habitats. This includes various algae, crustaceans, molluscs and starfish.

Towards the mouth of the estuary the reefs are also colonised by an abundance of the soft coral, dead men's fingers (*Alcyonium digitatum*).



Photo: SNH image library

Condition Status and Date of Last Assessment:

- Dornoch Firth and Morrich More – Favourable-maintained (1996).

Pressures:

- Dornoch Firth and Morrich More – None.

Subtidal sandbanks

Relevant SACs and Area Extent of Feature:

- Dornoch Firth and Morrich More (2958.41ha)
- Moray Firth (45382.2ha)

General Feature Description

Subtidal sandbanks are permanently covered by shallow sea water. The diversity and types of faunal community associated with this habitat are determined particularly by sediment type as well as other physical, chemical and environmental factors such as exposure to wave action, water depth, turbidity and salinity.

The shallow sandy sediments are typically colonised by a burrowing worms, crustaceans and bivalve molluscs while mobile fauna such as shrimps, gastropod molluscs, crabs and fish, with sand-eels (*Ammodytes* spp.) in particular representing an important food source for birds living on the surface of the sandbank. Where coarser, more stable material is present species of seaweeds and specialist marine invertebrates may form distinctive communities. Shallow sandy sediments are often important nursery areas for fish, and feeding grounds for seabirds.

Feature Description in the Context of Relevant SACs

This feature represents an important supporting habitat within the wider estuarine/marine ecosystems of these sites.

In the Dornoch Firth there is a continuous gradient in the physical structure of sublittoral sediments from sandy muds and muddy sands in the upper estuary to medium and coarse sands at the entrance and adjacent to the open coast. Fine sands and muds in the upper estuary are colonised by assemblages of invertebrates typical of upper estuarine communities that are tolerant of low and fluctuating salinities. The species diversity increases towards the middle reaches of the estuary. The sublittoral

sandbanks in the outer estuary are characterised by animals that are adapted to coarse or sandy substrates.

In the Moray Firth SAC sublittoral sediments range from muddy sands and sandy sediments in the more sheltered parts of the site with coarser sand and gravel-based sediments in the outer, more coastal reaches of the Firth. These contrasting habitat conditions support a variety of distinctive algal and invertebrate species.

These sandbank habitats may be spawning grounds and nursery areas for juvenile fish species and may support large populations of sandeels. This productivity in turn becomes an important food source for marine mammals and seabirds.



Photo: SNH image library

Condition Status and Date of Last Assessment:

- Dornoch Firth and Morrich More - Favourable-maintained (1996);
- Moray Firth - Favourable-maintained (2004).

Pressures:

- Dornoch Firth and Morrich More – Flood/coastal defence works, recreation/disturbance;
- Moray Firth – None.

Birds

The bird species accounts apply to the Natura sites to which they relate, and identify their populations at classification, UK and global conservation status, origin, behaviour, habitat, diet, seasonality, pressures, latest site condition status and population trends. The following also identifies the reference sources from which the information required to complete the various aspects of each species' account was obtained.

Species are presented in accordance with the British Ornithologists' Union list, rather than order of SPA qualification criterion.

Conservation Status

For most sites, the baseline qualifying populations were either taken from the relevant SPA citations or the JNCC's 2001 SPA Review (Stroud et al, 2001). For the proposed Moray Firth SPA, populations were taken from the site's SPA selection document (SNH, 2016).

Each species' conservation status in the UK was taken from the latest review of birds of conservation concern (Eaton, M.A. *et al.*, 2015). From this review, each species has been placed on one of three lists reflecting their conservation status: **Red**, **Amber** or **Green**.

- **Red list** species have undergone severe breeding or wintering population declines in the UK of more than 50% over 25 years or have undergone a severe breeding range decline of more than 50% in the past 25 years or else are listed by BirdLife International as being Globally Threatened using IUCN criteria.
- **Amber list** species have undergone moderate breeding or wintering population declines in the UK of between 25% and 50% over 25 years or at least 50% of the UK breeding or non-breeding population found in 10 or fewer sites or the UK breeding population is estimated at less than 300 pairs, or non-breeding population less than 900 individuals or have undergone a breeding range decline of between 25% and 50% in the past 25 years.
- **Green list** species do not qualify under any of the red or amber criteria. In some cases this might be a result of insufficient data.

Each species' global conservation status was taken from the International Union for Conservation of Nature and Natural Resources' (IUCN) Red List for Birds (see <http://www.birdlife.org/globally-threatened-bird-forums/2015/10/global-iucn-red-list-for-birds-2015-changes/>). The primary categories, with an indication of the qualifying criteria, are:

- *Critically Endangered* species have either undergone a rapid population decline in the last 10 years, an extremely restricted range or very low population size and so faces an extremely high risk of extinction in the wild.
- *Endangered* species have undergone population decline of >50%, have a restricted range or low population size and so faces a very high risk of extinction in the wild.
- *Vulnerable* species have undergone a population decline of >30%, have a limited range or small population size, so the population faces a high risk of extinction in the wild.
- *Near Threatened* species do not qualify for the above three categories, but are considered as close to doing so, or to do so in the near future.
- Species which do not fulfil these criteria are considered of *Least Concern*, though some for which information is relatively limited and could be included as *Data Deficient*.

Origin

Describes whether each species is a resident within each of the relevant designated sites or whether they are migratory. For non-resident species, it identifies where they spend the rest of the year.

Behaviour

Provides key information on each species' feeding, roosting and breeding behaviour.

Diet

Provides key information on the diet of each species when they are present within each of the relevant designated sites.

Habitat

Summarises information on the principle habitats that each species uses both within the relevant designated sites and more generally. Where relevant, habitat use is described for both high and low tides as some species' presence in a particular habitat can be dependent on the state of the tide.

Distribution

Identifies the spatial occurrence and abundance of each species within the relevant designated sites as well as more generally.

Seasonality

Identifies the periods of the year when each species typically occurs in greatest abundance within the relevant designated sites and more generally.

Pressures

Identifies the key pressures which are recognised to potentially threaten the presence, abundance and distribution of each species' both within the relevant designated sites and more generally.

Population Trends

Summarises, where data are available, the population trends of each species in relation to the relevant designated sites as well as at the national (Scottish) and UK level. For most waterfowl and wading birds, site specific data was obtained from Cook et al. (2013) via the British Trust for Ornithology's (BTO) [Wetland Bird Survey \(WeBS\) Alerts website](#). For other species information was obtained from Robinson et al., (2004) for whooper swan, Challis et al, 2015 for osprey, Mitchell (2016) for greylag goose, and more generally from Forrester et al., (2007).

Birds

Whooper swan

Cygnus cygnus

Conservation status

SPA Population(s) at Classification:

- Cromarty Firth: 64

UK: AMBER (rare breeder and localised non-breeding population).

Global: Least concern.

Origin – Birds wintering in UK originate almost exclusively from the Icelandic breeding population.

Behaviour – Typically occurs in small groups/ family parties with strong fidelity to key wintering grounds.

Diet – Terrestrial and aquatic plant material.

Habitat – Freshwater lochs/ponds, estuarine/coastal fringe habitats (salt marshes, lagoons, intertidal mudflats) and nearby grass and arable stubble fields.

	Low tide	High tide
Open water	✓	✓
Intertidal mud	✓	-
Saltmarsh	✓	✓
Rocky shore	-	-
Coastal fields	✓	✓
Inland fields	✓	✓

Distribution

Loch Eye and nearby surrounding coastal fringe habitats and inland fields associated with Cromarty Firth. Small numbers also associated with Dornoch Firth at Loch Evelix and the Beaully Firth.



Photo: SNH image library

Seasonality – Winter visitor, predominantly from October to March.

Pressures – Collision with powerlines, lead poisoning, habitat loss.

SPA Site Condition status:

- Cromarty Firth: Unfavourable, no change (2010).

Population trends – The number of whooper swan over-wintering on Cromarty Firth SPA have fluctuated markedly over the past few decades making interpretation of the underlying trend impossible. However, numbers over-wintering in Scotland have been stable in the short-term, and have been increasing in the long term in the wider UK.

Greylag goose

Anser anser

Conservation status

SPA Population(s) at Classification:

- Cromarty Firth: 1,782
- Dornoch Firth & Loch Fleet: 1,146
- Inner Moray Firth: 2,651

UK: AMBER (localised non-breeding population).

Global: Least concern.

Origin – The vast majority of the birds which overwinter in Scotland breed in Iceland.

Behaviour – Highly gregarious, roosting and feeding in small to medium-sized flocks.

Diet – Herbivorous with wintering birds feeding on low-lying agricultural areas including improved grassland and stubble fields.

Habitat – Foraging on low-lying agricultural areas surrounding nearby roosting lochs and coastal areas.

	Low tide	High tide
Open water	-	-
Intertidal mud	✓	-
Saltmarsh	✓	✓
Rocky shore	-	-
Coastal fields	✓	✓
Inland fields	✓	✓

Distribution

Coastal fringe habitats and inland fields associated with Inner Moray Firth, Cromarty Firth and Dornoch Firth/Loch Fleet.

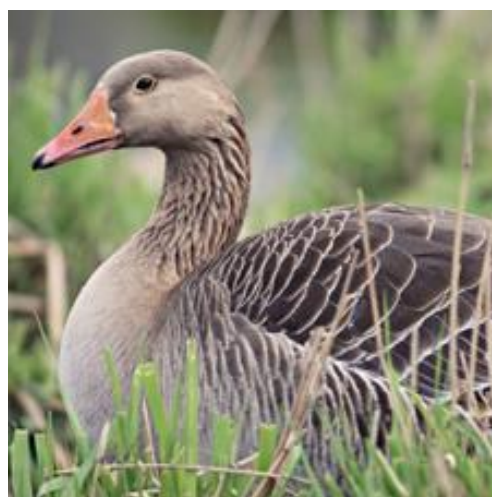


Photo: SNH image library

Seasonality – Winter visitor, predominantly from late September to March.

Pressures – Shooting (particularly in Iceland), changes in agricultural practice and recreational disturbance at roost sites and feeding areas.

SPA Site Condition status:

- Cromarty Firth: Favourable, maintained (2001),
- Dornoch Firth & Loch Fleet: Favourable, maintained (2015),
- Inner Moray Firth: Favourable, maintained (2001).

Population trends – Population trends for this species at the site level have not been evaluated. At the UK level however, the species' Icelandic breeding population has undergone a recent decline suspected to have been influenced by shooting in Iceland and in Orkney. Nonetheless the species' population remains high and as such conservation status remains favourable.

Wigeon

Anas penelope

Conservation status

SPA Population(s) at Classification:

- Cromarty Firth: 9,204
- Dornoch Firth & Loch Fleet: 15,304
- Inner Moray Firth: 7,310

UK: AMBER (localised and important non-breeding population).

Global: Least concern.

Origin – Birds wintering in UK breed mainly in Iceland, Scandinavia and Russia.

Behaviour – Gregarious, forming large flocks, often grazing on coastal fringe habitats and grassy fields.

Diet – Terrestrial and aquatic plant material.

Habitat – Freshwater lochs/ponds, estuarine/coastal fringe habitats (salt marshes, lagoons, intertidal mudflats) and nearby grass and arable stubble fields.

	Low tide	High tide
Open water	✓	✓
Intertidal mud	✓	-
Saltmarsh	✓	✓
Rocky shore	-	-
Coastal fields	✓	✓
Inland fields	✓	✓

Distribution

Estuarine and coastal fringe habitats and inland fields associated with Inner Moray Firth, Cromarty Firth and Dornoch Firth/Loch Fleet.



Photo: Ian Sargent

Seasonality – Winter visitor, from September to March.

Pressures – Damage/destruction of eel grass (*Zostera marina*) beds and human disturbance.

SPA Site Condition status:

- Cromarty Firth: Favourable, maintained (2000),
- Dornoch Firth & Loch Fleet: Favourable, maintained (2015),
- Inner Moray Firth: Favourable, maintained (2001).

Population trends – The number of wigeon over-wintering on the Cromarty Firth, Dornoch Firth and Loch Fleet and Inner Moray Firth SPAs have been decreasing in the short to medium-term having previously peaked. Numbers of this species over-wintering in Scotland have also been decreasing in the short-term, although at the UK level the over-wintering population has been stable.

Teal

Anas crecca

Conservation status

SPA Population(s) at Classification:

- Dornoch Firth & Loch Fleet: 1,462,
- Inner Moray Firth: 2,066

UK: **AMBER** (important non-breeding population).

Global: Least concern.

Origin – Birds wintering in UK breed mainly in Iceland, Fennoscandia and Russia.

Behaviour – Gregarious, forming large flocks, typically in coastal fringe habitats.

Diet – Terrestrial and aquatic plant material.

Habitat – Predominantly estuarine/coastal fringe habitats (salt marshes, lagoons, intertidal mudflats) and occasionally nearby arable land.

	Low tide	High tide
Open water	✓	✓
Intertidal mud	✓	-
Saltmarsh	✓	✓
Rocky shore	-	-
Coastal fields	-	-
Inland fields	-	-

Distribution

Estuarine and coastal fringe habitats particularly associated with Inner Moray Firth and Dornoch Firth/Loch Fleet, but also Cromarty Firth.



Photo: SNH image library

Seasonality – Winter visitor, predominantly from September to March.

Pressures – Localised loss/deterioration of wetland habitat.

SPA Site Condition status:

- Dornoch Firth & Loch Fleet: Favourable, maintained (2015),
- Inner Moray Firth: Favourable, maintained (2001).

Population trends – Numbers of teal over-wintering on Dornoch Firth and Loch Fleet and Inner Moray Firth SPAs have been decreasing in the short-and medium term respectively, having previously peaked. Numbers over-wintering in Scotland have also been decreasing in the short-term while at the UK level numbers have been stable in the medium term.

Pintail

Anas acuta

Conservation status

SPA Population(s) at Classification:

- Cromarty Firth: 319

UK: AMBER (recent non-breeding population decline, recent and longer term range decline, localised and important non-breeding population, rare breeder).

Global: Least concern.

Origin – Birds wintering in UK breed mainly in Fennoscandia and Russia.

Behaviour – Occurs in small localised flocks.

Diet – Aquatic plant material and invertebrates.

Habitat – Estuarine/coastal fringe habitats (salt marshes, lagoons, intertidal mudflats) and freshwater lochs.

	Low tide	High tide
Open water	✓	✓
Intertidal mud	✓	✓
Saltmarsh	-	-
Rocky shore	-	-
Coastal fields	-	-
Inland fields	-	-

Distribution

Estuarine and coastal fringe habitats particularly associated with Cromarty Firth, but also occurring in the Inner Moray Firth.



Photo: RSPB

Seasonality – Winter visitor, from September to March.

Pressures – Localised loss/deterioration of wetland habitat and human disturbance.

SPA Site Condition status:

- Cromarty Firth: Favourable, maintained (2000).

Population trends – The number of pintail over-wintering on Cromarty Firth SPA have been increasing in the short-term following a previous decline. Numbers of this species over-wintering in Scotland have also been increasing in the longer term while at the UK level numbers have been decreasing in the short-term.

Scaup

Aythya marila

Conservation status

SPA Population(s) at Classification:

- Cromarty Firth: 995
- Inner Moray Firth: 119
- Moray Firth (proposed): 930

UK: **RED** (severe non-breeding population decline over longer term).

Global: Least concern.

Origin – Birds wintering in the UK come from Iceland, the Baltic, Scandinavia and Russia.

Behaviour – Occurs in large, localised flocks in shallow coastal waters, diving to feed.

Diet – Omnivorous, but mostly molluscs in winter.

Habitat – Winters in sheltered coastal waters and estuaries.

	Low tide	High tide
Open water	✓	✓
Intertidal mud	-	✓
Saltmarsh	-	-
Rocky shore	-	-
Coastal fields	-	-
Inland fields	-	-

Distribution

Widely distributed within coastal waters of the wider Moray Firth, with particular concentrations in the Inner Moray Firth.



Photo: [Susan Young](#) / [CC BY](#)

Seasonality – Winter visitor, predominantly from October to March.

Pressures – Human disturbance, sewage treatment/improved water quality and associated negative effects on food abundance, marine pollution.

SPA Site Condition status:

- Cromarty Firth: Unfavourable, no change (2000),
- Inner Moray Firth: Favourable, maintained (2001),
- Moray Firth (proposed): undefined.

Population trends – Numbers of scaup overwintering on Cromarty Firth SPA have been increasing over the long term, while in the Inner Moray Firth numbers have fluctuated over the past few decades making interpretation of the underlying trend difficult. Population trend data for the wider Moray Firth (relevant to the proposed Moray Firth SPA) were not available. Numbers overwintering in Scotland and the wider UK have been decreasing in the short-term having previously been relatively stable.

Common eider

Somateria mollissima

Conservation status

SPA Population(s) at Classification:

- Moray Firth (proposed): 1,733

UK: AMBER (vulnerable in Europe).

Global: Near threatened.

Origin – In Scotland mainly a resident species with only a few birds making short-distance movements.

Behaviour – Typically occurs in small flocks in inshore as well as further offshore, diving to feed.

Diet – Predominantly molluscs and small crustaceans.

Habitat – Almost entirely coastal occurring in sheltered inshore waters, including estuaries.

	Low tide	High tide
Open water	✓	✓
Intertidal mud	-	✓
Saltmarsh	-	-
Rocky shore	-	-
Coastal fields	-	-
Inland fields	-	-
Offshore islands	-	-

Distribution

Widely distributed within coastal waters of the wider Moray Firth, particularly along the Nairn Coast.



Photo: SNH image library

Seasonality – Present year round.

Pressures – Human disturbance, ground predators, marine pollution.

SPA Site Condition status:

- Moray Firth (proposed): undefined.

Population trends – Population trend data for the wider Moray Firth (relevant to the proposed Moray Firth SPA) were not available. Within Scotland the population generally remains stable although there have been some localised increases and declines.

Long-tailed duck

Clangula hyemalis

Conservation status

SPA Population(s) at Classification:

- Moray Firth (proposed): 5,001

UK: RED (globally vulnerable)

Global: Vulnerable (recent non-breeding decline).

Origin – Breeds around the Arctic Circle. Those wintering in Britain may originate from Iceland, Fennoscandinavia and north west Russia.

Behaviour – Occurs in small to large flocks of foraging and roosting birds, in both inshore and offshore waters, diving to feed.

Diet – Predominantly molluscs and small crustaceans.

Habitat – Almost entirely coastal, occurring in sheltered inshore waters, including estuaries as well as further offshore.

	Low tide	High tide
Open water	✓	✓
Intertidal mud	-	✓
Saltmarsh	-	-
Rocky shore	-	-
Coastal fields	-	-
Inland fields	-	-

Distribution

Widely distributed within coastal waters of the wider Moray Firth, particularly within the Inner Moray Firth and along the Nairn Coast.



Photo: Ian Sargent

Seasonality – Winter visitor, mainly November to April.

Pressures – Human disturbance, marine pollution and negative changes in food supply.

SPA Site Condition status:

- Moray Firth (proposed): undefined.

Population trends – Population trend data for the wider Moray Firth (relevant to the proposed Moray Firth SPA) were not available. The number of birds overwintering in Scotland is estimated to be approximately 15,000 to 30,000, though this is likely to be an underestimate due to the species coastal and offshore habits and the difficulty associated with obtaining accurate counts from land-based surveys.

Common scoter

Melanitta nigra

Conservation status

SPA Population(s) at Classification:

- Moray Firth (proposed): 5,479

UK: RED (recent & longer term breeding population & range decline, localised non-breeding population, rare breeder).

Global: Least Concern.

Origin – Mostly a winter visitor from Iceland and Fennoscandinavia, although small numbers of non-breeding birds may be present year round.

Behaviour – Occurs in small to large flocks of foraging and roosting birds, in both inshore and offshore waters, diving to feed.

Diet – Predominantly molluscs and small crustaceans.

Habitat – Almost exclusively marine in the non-breeding season, occurring in shallow near-shore and coastal waters.

	Low tide	High tide
Open water	✓	✓
Intertidal mud	-	✓
Saltmarsh	-	-
Rocky shore	-	-
Coastal fields	-	-
Inland fields	-	-

Distribution

Widely distributed within coastal waters of the wider Moray Firth, particularly along the Nairn coast.

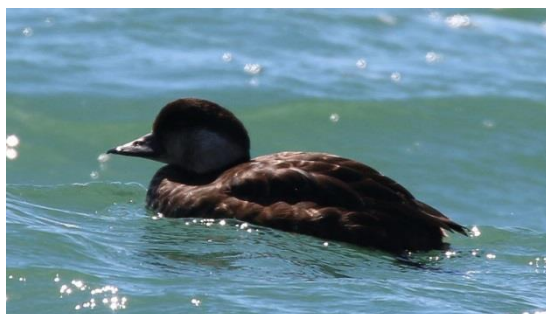


Photo: [Nick Goodrum](#) / [CC BY](#)

Seasonality – Present year round with numbers peaking in mid-winter.

Pressures – Human disturbance and marine pollution.

SPA Site Condition status:

- Moray Firth (proposed): undefined.

Population trends – Population trend data for the wider Moray Firth (relevant to the proposed Moray Firth SPA) were not available. The number of birds overwintering in Scotland is estimated to be approximately 25,000 to 30,000, though this is likely to be an underestimate due to the species coastal and offshore habits and the difficulty associated with obtaining accurate counts from land-based surveys.

Velvet scoter

Melanitta fusca

Conservation status

SPA Population(s) at Classification:

- Moray Firth (proposed): 1,488

UK: **RED** (vulnerable globally, localised non-breeding population).

Global: Vulnerable.

Origin – A winter visitor from Fennoscandinavia and Russia, although small numbers of non-breeding birds may be present year round.

Behaviour – Occurs in small to large flocks of foraging and roosting birds, in both inshore and offshore waters, diving to feed.

Diet – Predominantly molluscs and small crustaceans.

Habitat – Almost exclusively marine in the non-breeding season, occurring in shallow near-shore and coastal waters.

	Low tide	High tide
Open water	✓	✓
Intertidal mud	-	✓
Saltmarsh	-	-
Rocky shore	-	-
Coastal fields	-	-
Inland fields	-	-

DISTRIBUTION

Widely distributed within coastal waters of the wider Moray Firth, particularly along the Nairn coast.



Photo: [Åsa Berndtsson](#) / [CC BY](#)

Seasonality – Passage and winter migrant occurring between September and April.

Pressures – Human disturbance and marine pollution.

SPA Site Condition status:

- Moray Firth (proposed): undefined.

Population trends – Population trend data for the wider Moray Firth (relevant to the proposed Moray Firth SPA) were not available. The number of birds overwintering in Scotland is estimated to be approximately 2,500 to 3,500, though this is likely to be an underestimate due to the species coastal and offshore habits and the difficulty associated with obtaining accurate counts from land-based surveys.

Goldeneye

Bucephala clangula

Conservation status

SPA Population(s) at Classification:

- Inner Moray Firth: 218
- Moray Firth (proposed): 907

UK: AMBER (rare breeder).

Global: Least concern.

Origin – A small number of birds breed in the north of the UK but most wintering birds in Scotland are thought to be from Norway and northern Sweden.

Behaviour – Occurs in small to large flocks, diving to feed.

Diet – Mostly aquatic insects, molluscs and crustaceans and occasionally fish and aquatic plant material.

Habitat – Sheltered, shallow coastal waters, estuaries, rivers and freshwater lochs.

	Low tide	High tide
Open water	✓	✓
Intertidal mud	-	✓
Saltmarsh	-	-
Rocky shore	-	-
Coastal fields	-	-
Inland fields	-	-

Distribution

Widely distributed within coastal waters of the wider Moray Firth, but with particular concentrations in the Inner Moray Firth.



Photo: Ian Sargent

Seasonality – Winter visitor, predominantly occurring between November and March.

Pressures – Human disturbance (recreational).

SPA Site Condition status:

- Inner Moray Firth: Favourable, maintained (2001)
- Moray Firth (proposed): undefined.

Population trends – The number of goldeneye over-wintering on Inner Moray Firth SPA have been decreasing in the medium-term having previously peaked. Population trend data for the wider Moray Firth (relevant to the proposed Moray Firth SPA) were not available. Numbers of this species over-wintering in Scotland and the wider UK have also been decreasing in the medium-term which are considered to be partly due to a shift in wintering range in response to climate change Lehtikoinen et al., (2013).

Red-breasted merganser

Mergus serrator

Conservation status

SPA Population(s) at Classification:

- Cromarty Firth: 204
- Inner Moray Firth: 1,184
- Moray Firth (proposed): 151

UK: GREEN

Global: Least concern.

Origin – Wintering birds include some local breeders and probably some from central Europe, but most are from Iceland and possibly eastern Greenland.

Behaviour – Typically occurs in small groups, diving to feed.

Diet – Predominantly fish, crustaceans and other invertebrates.

Habitat – Winters mainly at sea, in sheltered, shallow coastal waters and estuaries.

	Low tide	High tide
Open water	✓	✓
Intertidal mud	-	✓
Saltmarsh	-	-
Rocky shore	-	-
Coastal fields	-	-
Inland fields	-	-

Distribution

Widely distributed within coastal waters of the wider Moray Firth.



Photo: [zenbikescience](#) / [CC BY](#)

Seasonality – Mainly a winter visitor largely occurring between September and March.

Pressures – Human disturbance, culling at game fisheries, pollution.

SPA Site Condition status:

- Cromarty Firth: Favourable, maintained (2000),
- Inner Moray Firth: Unfavourable, no change (2001)
- Moray Firth (proposed): undefined.

Population trends – The number of red-breasted mergansers over-wintering on Cromarty Firth SPA have been stable in the medium-term having previously declined while on Inner Moray Firth SPA numbers have decreased in the medium-term having previously peaked. Numbers of this species over-wintering in Scotland and the wider UK have also been decreasing in the medium-term.

Goosander

Mergus merganser

Conservation status

SPA Population(s) at Classification:

- Inner Moray Firth: 325

UK: GREEN

Global: Least concern.

Origin – Birds wintering in the UK breed in northern Europe and western Russia.

Behaviour – Typically occurs in small groups, diving to feed.

Diet – Predominantly fish.

Habitat – Winters on the lower reaches of rivers including tidal stretches and estuaries, as well as in shallow coastal waters.

	Low tide	High tide
Open water	✓	✓
Intertidal mud	-	✓
Saltmarsh	-	-
Rocky shore	-	-
Coastal fields	-	-
Inland fields	-	-

Distribution

Sheltered near-shore coastal waters of the Inner Moray Firth, particularly around the mouths of river systems.



Photo: SNH image library

Seasonality – Occurs at coastal sites in winter mainly between September and February, particularly during the autumn moulting period.

Pressures – Human disturbance and culling at game fisheries.

SPA Site Condition status:

- Inner Moray Firth: Unfavourable, no change (2001).

Population trends – The number of goosanders over-wintering on Inner Moray Firth SPA have been decreasing in the long term. Similarly, numbers of this species over-wintering in Scotland and the wider UK have been decreasing in the medium-term having previously peaked.

Red-throated diver

Gavia stellata

Conservation status

SPA Population(s) at Classification:

- Moray Firth (proposed): 324

UK: GREEN

Global: Least concern.

Origin – Circumpolar species with Scotland at the southern edge of the breeding range. Wintering birds can originate from Scotland, Fennoscandinavia, Iceland and Greenland.

Behaviour – Feeds by diving, usually solitary or in small groups.

Diet – Primarily fish.

Habitat – Principally a marine species in winter, occurring in sheltered nearshore and coastal waters.

	Low tide	High tide
Open water	✓	✓
Intertidal mud	-	✓
Saltmarsh	-	-
Rocky shore	-	-
Coastal fields	-	-
Inland fields	-	-

Distribution

Widespread throughout the Moray Firth with particular concentrations in the coastal waters of the Dornoch, Cromarty and Outer Moray Firth (Spey Bay).



Photo: SNH image library

Seasonality – Occurs in coastal waters in winter predominantly between October and March.

Pressures – Disturbance on breeding grounds, marine pollution.

SPA Site Condition status:

- Moray Firth (proposed): undefined.

Population trends – Population trend data for the wider Moray Firth (relevant to the proposed Moray Firth SPA) were not available. The number of birds overwintering in Scotland is estimated to be at least 2,270, though this is likely to be an underestimate due to the species coastal and offshore habits and the difficulty associated with obtaining accurate counts from land-based surveys.

•

Great northern diver

Gavia immer

Conservation status

SPA Population(s) at Classification:

- Moray Firth (proposed): 144

UK: AMBER (vulnerable in Europe, important non-breeding population).

Global: Least concern.

Origin – Breeds in Iceland, Greenland and North America with birds wintering in Scotland predominantly originating from Iceland and Greenland.

Behaviour – Feeds by diving, usually solitary or in small groups.

Diet – Primarily fish, but also crustaceans opportunistically.

Habitat – Principally a marine species in winter, occurring in sheltered nearshore and coastal waters.

	Low tide	High tide
Open water	✓	✓
Intertidal mud	-	✓
Saltmarsh	-	-
Rocky shore	-	-
Coastal fields	-	-
Inland fields	-	-

Distribution

Widespread throughout the Moray Firth with particular concentrations in the coastal waters of the Dornoch Firth and Outer Moray Firth (Spey Bay).



Photo: SNH image library

Seasonality – Winter visitor predominantly occurring in coastal waters between October and April.

Pressures – Disturbance on breeding grounds, marine pollution.

SPA Site Condition status:

- Moray Firth (proposed): undefined.

Population trends – Population trend data for the wider Moray Firth (relevant to the proposed Moray Firth SPA) were not available. The number of birds overwintering in Scotland is estimated to be up to 3,000 individuals, though this is likely to be an underestimate due to the species coastal and offshore habits and the difficulty associated with obtaining accurate counts from land-based surveys.

Great cormorant
Phalacrocorax carbo

Conservation status

SPA Population(s) at Classification:

- Inner Moray Firth: 409

UK: GREEN.

Global: Least concern.

Origin – Birds wintering in the Moray Firth probably comprise a mixture of Scottish breeders (of the *carbo* sub-species) and, to a lesser extent, breeders from continental Europe (of the *sinesis* sub-species).

Behaviour – Dives underwater from the surface to catch prey.

Diet – Predominantly small fish.

Habitat – Largely marine, particularly sheltered coastal waters, but also inland freshwater habitats to forage.

	Low tide	High tide
Open water	✓	✓
Intertidal mud	-	✓
Saltmarsh	-	-
Rocky shore	-	-
Coastal fields	-	-
Inland fields	-	-

Distribution

Widely distributed throughout the Moray Firth, with particular concentrations in the Inner Moray Firth.



Photo: SNH image library

Seasonality – Occurs year round but with numbers increasing over winter between August and February.

Pressures – Marine pollution and persecution at Game fisheries.

SPA Site Condition status:

- Inner Moray Firth: Unfavourable, no change (2001).

Population trends – The number of cormorants over-wintering on Inner Moray Firth SPA have fluctuated over the past few decades making interpretation of the underlying trend difficult. Numbers of this species over-wintering in Scotland have been decreasing in the short-term having previously been relatively stable while in the UK numbers have remained relatively stable over the long term.

European shag

Phalacrocorax aristotelis

Conservation status

SPA Population(s) at Classification:

- Moray Firth (proposed): 6,462 (non-breeding) / 5,494 (breeding).

UK: RED (severe breeding population decline recently, important breeding population).

Global: Least concern.

Origin – The species is largely sedentary with birds tending to remain close to breeding site year round.

Diet – Small fish, predominantly sand eel.

Habitat – Entirely marine, preferring sheltered coastal waters.

	Low tide	High tide
Open water	✓	✓
Intertidal mud	-	-
Saltmarsh	-	-
Rocky shore	✓	✓
Coastal fields	-	-
Inland fields	-	-

Distribution

Breeding grounds concentrated along the northern Moray Firth coast between Brora and Helmsdale.

Wintering distribution concentrated in two areas along northern (Helmsdale to Berriedale) and southern (Portsoy) Moray Firth coast.

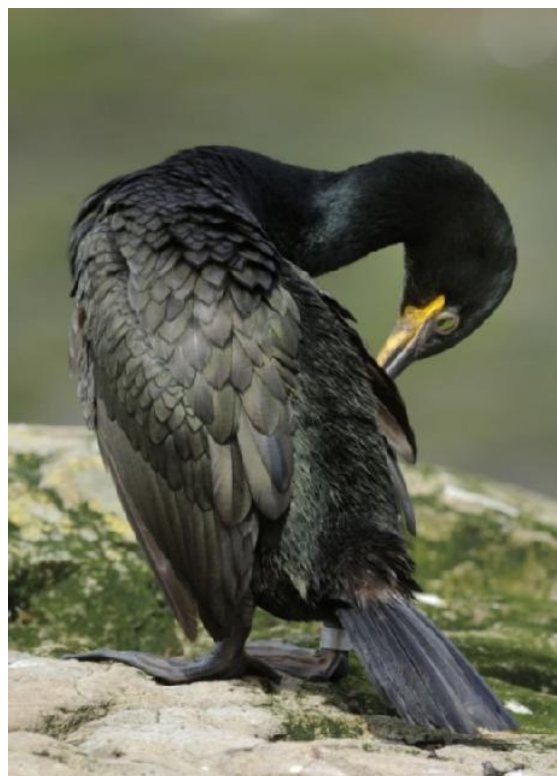


Photo: SNH image library

Seasonality – Birds tend to remain close to breeding site year round.

Pressures – Marine pollution and overfishing.

SPA Site Condition status:

- Moray Firth (proposed): undefined.

Population trends – While population data for the number of shags overwintering in the wider Moray Firth (relevant to the proposed Moray Firth SPA) were not available, data on the number of breeding birds indicates that the population has increased over the past few decades. The number of birds overwintering in Scotland is estimated to be up to 80,000 individuals, while the breeding population is estimated to be up to 30,000 pairs.

Slavonian grebe

Podiceps auritus

Conservation status

SPA Population(s) at Classification:

- Moray Firth (proposed): 43

UK: RED (vulnerable globally, severe breeding population decline recently & over longer term, rare breeder).

Global: Vulnerable.

Origin – Birds wintering in the Moray Firth probably breed in Iceland and Norway but may be accompanied by individuals from the small Scottish breeding population.

Behaviour – Feeds by diving, usually solitary or in small groups.

Diet – Mainly small fish and crustaceans.

Habitat – In winter predominantly a marine species, preferring sheltered, shallow coastal waters.

	Low tide	High tide
Open water	✓	✓
Intertidal mud	-	-
Saltmarsh	-	-
Rocky shore	-	-
Coastal fields	-	-
Inland fields	-	-

Distribution

Widespread in coastal waters of the Outer Dornoch, Cromarty and Moray Firths and Inner Moray Firth.



Photo: Ian Sargent

Seasonality – A winter visitor to coastal waters occurring between October and March.

Pressures – Disturbance and predation on breeding grounds, marine pollution.

SPA Site Condition status:

- Moray Firth (proposed): undefined.

Population trends – Population trend data for the wider Moray Firth (relevant to the proposed Moray Firth SPA) were not available. The number of birds overwintering in Scotland is estimated to be up to 500 individuals, though this is likely to be an underestimate due to the species coastal habits and the difficulty associated with obtaining accurate counts from land-based surveys.

Osprey

Pandion haliaetus

Conservation status

SPA Population(s) at Classification:

- Cromarty Firth: 2
- Dornoch Firth & Loch Fleet: 20
- Inner Moray Firth: 2

UK: AMBER (historical population decline, rare breeder).

Global: Least concern.

Origin – Birds breeding in Scotland migrate from west Africa and south western Europe.

Behaviour – Ospreys are long-distance migrants returning to the UK each year from their wintering grounds (see above). Osprey pairs are typically monogamous and return to the same nesting site each year throughout their lives.

Diet – Exclusively fish, predominantly comprising brown trout and pike as well as sea trout and flounder where near the sea.

Habitat – Nests in trees, predominantly conifers, as well as on pylons, within range of freshwater and coastal fishing/foraging grounds.

	Low tide	High tide
Open water	✓	✓
Intertidal mud	-	✓
Saltmarsh	-	-
Rocky shore	-	-
Coastal fields	-	-
Inland fields	-	-

Distribution

Birds associated with the Cromarty Firth, Dornoch Firth and Loch Fleet and Inner Moray Firth SPAs predominantly nest in trees located within 10km of these sites. As well as these coastal waters however, they will also use rivers and inland waterbodies in search of fish.



Photo: SNH image library

Seasonality – Ospreys arrive from their wintering grounds in late march/early April and remain until late August/early September.

Pressures – None specified.

SPA Site Condition status:

- Cromarty Firth: Favourable, maintained (2004),
- Dornoch Firth & Loch Fleet: Favourable, maintained (2011),
- Inner Moray Firth: Favourable, maintained (2003).

Population trends – Although site specific population trend data for ospreys were not available, at the Scotland-wide level the species' successful and well documented recovery continues following its historic persecution. Indeed it is in the Highland region (the most relevant region to the three SPAs for which this species is designated) where Scotland's largest breeding population occurs. This indicates that at the associated regional level, the population trend is at least stable if not continuing to increase, as reflected in the species' continued favourable site condition status at all three SPAs.

Oystercatcher

Haematopus ostralegus

Conservation status

SPA Population(s) at Classification:

- Cromarty Firth: 2,509,
- Dornoch Firth & Loch Fleet: 3,270,
- Inner Moray Firth: 3,063.

UK: **AMBER** (vulnerable in Europe, localised and important non-breeding population, important breeding population).

Global: Near threatened.

Origin – Some wintering birds breed in Scotland. Large numbers also come from Iceland, the Faroes and Norway.

Behaviour – Gregarious during winter, occurring in small to large flocks, congregating at high tide roosts and dispersing across foraging ground at low tide. Prey is caught by both visual capture and sensory probe feeding (touch).

Diet – Predominantly shellfish, but also marine worms and earthworms when foraging inland.

Habitat – Estuarine/coastal fringe habitats including intertidal mud-/sandflats and rocky shores for foraging and salt marshes, lagoons and rocky shores to roost. Inland greenfield areas are also used as supplementary foraging areas.

	Low tide	High tide
Open water	-	-
Intertidal mud	✓	-
Saltmarsh	✓	✓
Rocky shore	✓	✓
Coastal fields	✓	✓
Inland fields	✓	✓

Distribution

Intertidal and coastal fringe habitats of the Inner Moray Firth, Cromarty Firth and Dornoch Firth/Loch Fleet.



Photo: SNH image library

Seasonality – Although small numbers will remain at coastal sites throughout the summer to breed, the highest numbers occur during the winter months between August and February.

Pressures – Human disturbance, dredging for shellfish and habitat loss.

SPA Site Condition status:

- Cromarty Firth: Favourable, maintained (2001),
- Dornoch Firth & Loch Fleet: Favourable, maintained (2015),
- Inner Moray Firth: Favourable, maintained (2001).

Population trends – The number of oystercatchers over-wintering on the Cromarty Firth, Dornoch Firth and Loch Fleet and Inner Moray Firth SPAs has decreased in the medium-term. Similarly, numbers over-wintering in Scotland have also been decreasing in the medium-term in the wider UK numbers have remained relatively stable in the long term.

Curlew

Numenius arquata

Conservation status

SPA Population(s) at Classification:

- Cromarty Firth: 1,313
- Dornoch Firth & Loch Fleet: 1,366
- Inner Moray Firth: 1,262

UK: RED (severe decline of important breeding population over the longer term).

Global: Near threatened.

Origin – The vast majority of curlew in eastern Scotland in winter are from Fennoscandinavia.

Behaviour – Gregarious during winter, occurring in small to large flocks, congregating at high tide roosts and dispersing across foraging ground at low tide. Prey is primarily caught by sensory probe feeding (touch).

Diet – Invertebrates, including intertidal worms, crustaceans, molluscs and earthworms.

Habitat – Estuarine/coastal fringe habitats including intertidal mudflats for foraging and salt marshes, lagoons and rocky shores to roost. Inland fields are also used as supplementary foraging areas.

	Low tide	High tide
Open water	-	-
Intertidal mud	✓	-
Saltmarsh	✓	✓
Rocky shore	✓	✓
Coastal fields	✓	✓
Inland fields	✓	✓

Distribution

Intertidal and coastal fringe habitats of the Inner Moray Firth, Cromarty Firth and Dornoch Firth/Loch Fleet.



Photo: SNH image library

Seasonality – Thought small numbers will remain at coastal sites throughout the summer the highest numbers occur during the winter months between August and March.

Pressures – Human disturbance and agricultural intensification, afforestation and predation on breeding grounds.

SPA Site Condition status:

- Cromarty Firth: Favourable, maintained (2009),
- Dornoch Firth & Loch Fleet: Favourable, maintained (2015),
- Inner Moray Firth: Favourable, maintained (2001).

Population trends – The number of curlew over-wintering on Cromarty Firth and Inner Moray Firth SPAs have been stable in the medium-term having previously increased while on the Dornoch Firth and Loch Fleet SPA have been decreasing in the medium-term having previously peaked. Numbers over-wintering in Scotland and the wider UK have been decreasing in the medium-term having previously peaked.

Bar-tailed godwit

Limosa lapponica

Conservation status

SPA Population(s) at Classification:

- Cromarty Firth: 1,355
- Dornoch Firth & Loch Fleet: 1,184
- Inner Moray Firth: 1,090

UK: **AMBER** (localised and important non-breeding population).

Global: Near threatened.

Origin – Wintering birds breed in northern Europe and western Siberia (*lapponica* race).

Behaviour – Gregarious during winter, occurring in moderate to large flocks. Prey is primarily caught by sensory probe feeding (touch).

Diet – Predominantly marine worms as well as crustaceans.

Habitat – Estuarine/coastal fringe habitats including intertidal mud-/sandflats for foraging and salt marshes, lagoons and rocky shores to roost.

	Low tide	High tide
Open water	-	-
Intertidal mud	✓	-
Saltmarsh	✓	✓
Rocky shore	✓	✓
Coastal fields	✓	✓
Inland fields	-	-

Distribution

Intertidal and coastal fringe habitats of the Inner Moray Firth, Cromarty Firth and Dornoch Firth/Loch Fleet.



Photo: [Arnstein Rønning](#) / [CC BY](#)

Seasonality – A winter visitor predominantly occurring between September and March.

Pressures – Human disturbance and habitat loss (e.g. estuarine land reclamation).

SPA Site Condition status:

- Cromarty Firth: Favourable, maintained (2000),
- Dornoch Firth & Loch Fleet: Favourable, maintained (2015),
- Inner Moray Firth: Favourable, maintained (2001).

Population trends – The numbers of bar-tailed godwits over-wintering on the Cromarty Firth and Inner Moray Firth SPAs have been decreasing in the short and medium-terms respectively having previously peaked. On Dornoch Firth and Loch Fleet SPA number have fluctuated over the past few decades making interpretation of the underlying trend difficult. Numbers over-wintering in Scotland have also been decreasing in the medium-term, which is considered to be partly due to a shift in wintering range in response to climate change (MacLean et al., (2008), while in the wider UK numbers have remained relatively stable in the long term.

Knot

Calidris canutus

Conservation status

SPA Population(s) at Classification:

- Cromarty Firth: 4,312

UK: AMBER (localised and important non-breeding population).

Global: Near threatened.

Origin – The majority of wintering birds are from Greenland.

Behaviour – Occurs in moderate to large flocks and primarily feeds by sensory probe feeding (touch).

Diet – Invertebrates, predominantly molluscs and marine worms.

Habitat – Estuarine/coastal fringe habitats including intertidal mudflats for foraging and salt marshes and lagoons to roost.

	Low tide	High tide
Open water	-	-
Intertidal mud	✓	-
Saltmarsh	✓	✓
Rocky shore	-	-
Coastal fields	-	-
Inland fields	-	-

Distribution

Intertidal and coastal fringe habitats of the Cromarty Firth and to a lesser extent the Inner Moray Firth and Dornoch Firth/Loch Fleet.



Photo: SNH image library

Seasonality – Winter visitor, predominantly between October and March.

Pressures – Human disturbance and habitat loss (e.g. estuarine land reclamation).

SPA Site Condition status:

- Cromarty Firth: Favourable, maintained (2001).

Population trends – The number of knot over-wintering on Cromarty Firth SPA have been decreasing in the medium-term having previously peaked. Numbers over-wintering in Scotland have fluctuated over the past few decades making interpretation of the underlying trend difficult, while in the wider UK numbers have remained relatively stable in the long term.

Dunlin

Calidris alpina

Conservation status

SPA Population(s) at Classification:

- Cromarty Firth: 3,384,
- Dornoch Firth & Loch Fleet: 4,462.

UK: AMBER (moderate non-breeding population decline over the longer term moderate recent breeding range reduction, localised in both seasons).

Global: Least concern.

Origin – The majority of wintering birds are from northern Fennoscandia and European Russia. Dunlin from Iceland and south-eastern Greenland are common on passage.

Behaviour – Occurs in moderate to large flocks and primarily feeds by sensory probe feeding (touch).

Diet – Invertebrates, predominantly small molluscs, crustaceans and marine worms.

Habitat – Estuarine/coastal fringe habitats including intertidal mudflats and occasionally rocky shores for foraging and salt marshes, rocky shores and lagoons to roost.

	Low tide	High tide
Open water	-	-
Intertidal mud	✓	-
Saltmarsh	✓	✓
Rocky shore	✓	✓
Coastal fields	-	✓
Inland fields	-	-

Distribution

Intertidal and coastal fringe habitats of the Cromarty Firth and Dornoch Firth/Loch Fleet as well as the Inner Moray Firth although to a lesser extent.



Photo: SNH image library

Seasonality – Winter visitor, predominantly between October and February

Pressures – Human disturbance and habitat loss (e.g. estuarine land reclamation).

SPA Site Condition status:

- Cromarty Firth: Favourable, maintained (2001),
- Dornoch Firth & Loch Fleet: Favourable, declining (2015).

Population trends – The numbers of dunlin over-wintering on both the Cromarty Firth and Dornoch Firth and Loch Fleet SPAs have been decreasing in the medium-term having previously peaked. Numbers over-wintering in Scotland and the wider UK have also been decreasing in the medium-term, which is considered to be partly due to a shift in wintering range in response to climate change (MacLean et al., (2008).

Redshank

Tringa totanus

Conservation status

SPA Population(s) at Classification:

- Cromarty Firth: 1,149
- Inner Moray Firth: 1,621

UK: **AMBER** (recent breeding and non-breeding population declines, important non-breeding population, recent and longer term breeding range reduction).

Global: Least concern.

Origin – Most wintering birds are Icelandic breeders with some Scottish birds present.

Behaviour – Occurs in small to large flocks and feeds by both visual capture and sensory probe feeding (touch).

Diet – Invertebrates including marine worms molluscs and crustaceans as well as terrestrial and freshwater invertebrates where foraging at inland site.

Habitat – Estuarine/coastal fringe habitats including intertidal mudflats, saltmarshes, lagoons, rocky shores and occasionally inland fields. For both foraging and roosting.

	Low tide	High tide
Open water	-	-
Intertidal mud	✓	-
Saltmarsh	✓	✓
Rocky shore	✓	✓
Coastal fields	✓	✓
Inland fields	✓	✓

Distribution

Intertidal and coastal fringe habitats of the Inner Moray Firth, Cromarty Firth and Dornoch Firth/Loch Fleet.



Photo: SNH image library

Seasonality – Thought small numbers will remain at coastal sites throughout the summer the highest numbers occur during the winter months predominantly between August and March.

Pressures – Human disturbance and habitat loss (including estuarine land reclamation and agricultural intensification on breeding grounds).

SPA Site Condition status:

- Cromarty Firth: Favourable, maintained (2009),
- Inner Moray Firth: Favourable, maintained (2001).

Population trends – The number of redshank over-wintering on Cromarty Firth SPA having remained relatively stable in the long term, while on Inner Moray Firth SPA numbers have been decreasing in the medium-term having previously been relatively stable. Numbers over-wintering in Scotland have also been decreasing in the short-term while in the wider UK numbers have remained relatively stable in the long term.

Common tern

Sterna hirundo

Conservation status

SPA Population(s) at Classification:

- Cromarty Firth: 294 (pairs)
- Inner Moray Firth: 310 (pairs)

UK: **AMBER** (localised breeding population).

Global: Least concern.

Origin – Breeding birds from the UK winter off west Africa. Birds breeding in Iceland, Scandinavia and western Siberia occur on passage.

Behaviour – Nests in colonies and roosts communally often with other tern species. Feeds by diving into surface waters from an aerial dive.

Diet – Small fish, principally sandeels.

Habitat – Predominantly a marine species in Scotland, nesting on flat sand and shingle beaches, undisturbed docksides and jetties and specially provided artificial platforms, and foraging over both inshore and offshore waters.

Distribution

Near-shore and coastal waters of the wider Moray Firth with nesting sites in the Inner Moray Firth and Cromarty Firths.



Photo: Ian Sargent

Seasonality – Common terns begin to arrive back from their wintering grounds in mid-April with the majority back by early to mid-May and remain until September.

Pressures – Human disturbance and predation of eggs and chicks.

SPA Site Condition status:

- Cromarty Firth: Unfavourable, declining (2000),
- Inner Moray Firth: Unfavourable, maintained (2000).

Population trends – Although site specific population trend data for breeding common terns were not available, data for the Ross and Cromarty area shows that the number of breeding pairs has increased markedly over the past few decades. Meanwhile numbers in the Moray and Nairn area have declined over the same period, a trend which is consistent with the population across Scotland.

Mammals, Fish and Aquatic Invertebrates

The species accounts for mammals, fish and aquatic invertebrates include similar information to that provided in the bird accounts as well as summarised details to the designated sites to which they relate.

The majority of the information used to complete these accounts was taken from [SNH Sitelink](#) and the [JNCC website](#). This was supplemented by information provided in the following:

- Habitats Regulations Advice Notes for the Dornoch Firth and Morrich More SAC (SNH, 2006a) for otter and harbour seal and the Moray Firth SAC (SNH, 2006b) for bottlenose dolphin;
- Cheney et al., (2012), Cheney et al., (2014) and Quick et al., (2014) for bottlenose dolphins;
- Duck and Morris (2012), Duck and Morris (2016), Marine Scotland (2016) and annual seal monitoring reports for the Natural Environment Research Council's (NERC) Special Committee on Seal (SCOS, 2015) for harbour seal;
- Chanin (2003) and Findlay et. al, (2015) for otter;
- Hendry and Cragg-Hine (2003), Malcolm et al., (2010), Beatrice Offshore Wind Ltd. (BOWL) (2011) and Rivers and Fisheries Trusts of Scotland (2014) for Atlantic salmon; and,
- Skinner et al., (2003) for freshwater pearl mussel.

Mammals

Otter

Lutra lutra

Relevant SACs and Site Condition Status:

- Dornoch Firth and Morrich More: Favourable, maintained (2011).

Population(s) at designation:

- Dornoch Firth and Morrich More: undefined.

Feature description in the context of relevant SAC: The estuarine habitats of Dornoch Firth and Morrich More SAC and terrestrial and freshwater habitats which surround and feed into it represent good quality habitat for otters. As such, the area supports a good population of otters in what is the only east coast estuarine site selected for the species in Scotland.

Origin – Otters are resident in the UK with Scotland representing a stronghold for the species.

Behaviour – Although otters are typically most active at night and around twilight, coastal-dwelling otters are also often active during the day. Shelters consist of underground holts and above-ground couches, with holts typically considered to be the more important and frequently used resting sites. Males and females live apart for most of the year, but their home-ranges overlap, with those of males overlapping with the ranges of more than one female. While young can be born at any time of the year, there is evidence that in mainland Scotland most young are born between November and January. There are however geographical variations.

Diet – Predominantly fish supplemented by crabs, amphibians, small mammal and birds.

Habitat – Coastal margins and associated freshwater habitats, particularly areas which are well sheltered by woodland and scrub.

Distribution – Shallow coastal waters throughout much of the Moray Firth, particularly the more sheltered areas including the Dornoch Firth and associated rivers and nearby surrounding freshwater bodies.



Photo: SNH image library

Seasonality – Resident year round.

Pressures – Road traffic mortalities, fishing gear, human disturbance and over grazing. Large scale industrial and/or housing developments in flood-plains. Loss of flood-plain area can result in changes to river flow characteristics, more extreme flood events, scouring of the riverbed and associated changes to the invertebrate and fish populations. All of these can have detrimental effects on otters, predominantly by impacts on their food supply. In order to maintain good body condition an otter needs to consume about 1 - 1.5kg of prey every day (predominately fish or frogs, but occasionally birds, mammals or crustaceans).

Population trends – The otter population has been steadily increasing in Scotland since the species' historic decline in the early part of the 20th century. The last national otter survey conducted in 2007 concluded that the species had increased its population and range throughout Scotland and that it could now be considered ubiquitous. That survey included Dornoch Firth and Morrich More SAC where otter presence was confirmed at all monitoring locations with the site considered to be in favourable condition for the species. These findings were repeated during site condition monitoring in 2011 resulting in the site's condition status for otter being maintained as favourable.

Bottlenose dolphin

Tursiops truncatus

Relevant SACs and Site Condition Status:

- Moray Firth: Favourable, recovered (2016).

Population(s) at designation:

- Moray Firth: 101-250.

Feature description in the context of relevant SAC: The Moray Firth supports the only known resident population of bottlenose dolphin in the North Sea and is one of only two UK sites designated for the species as a primary qualifying feature. The north east of Scotland population is estimated to comprise approximately 195 individuals. Between 1990 and 2013, annual estimates of the number of dolphins using the SAC ranged between 43 and 134.

Origin – The bottlenose dolphins of the Moray Firth are part of the Scottish east coast population. They occur in the Moray Firth all year round.

Behaviour – Sightings are usually of small groups of up to 20 individuals with animals either foraging, commuting or occasionally breaching. Females can produce a calf approximately every 4 to 5 years. In the wild they can live up to 20-50 years. Calves can be born any time of year but typically between March and September.

A wide range of fish species including cod, saithe, whiting, salmon and haddock (Santos et al., 2001) as well as squid, crabs and shrimp.

Habitat – Predominantly inshore coastal waters within 10km of the land but may range further offshore.

Distribution – Although dolphins are found throughout the Moray Firth they seem to prefer certain parts of the Inner Firth, the southern Moray Firth coastline and the mouth of the Cromarty Firth. The population also ranges outwith the Moray Firth with small groups regularly occurring off the Aberdeenshire, Fife and East Lothian coasts and occasionally as far as Northumberland.



Photo: SNH image library

Seasonality – Present within the Moray Firth year round though abundance and distribution varies between summer and winter with animals appearing more dispersed and ranging further down the east coast in winter.

Pressures – Underwater noise from vessels (recreational and commercial) and development activity (e.g. piling, blasting, dredging, seismic survey and general engine noise), recreational disturbance, boat/propeller strikes, marine pollution, capture in fishing nets and potentially tidal turbines.

Population trends –

Despite inter-annual variability, the number of dolphins using the SAC has remained stable. Additional data suggest that the population of dolphins on the east coast of Scotland is increasing, and the SAC is used by greater than 50% of the population annually.

Harbour seal

Phoca vitulina

Relevant SACs and Site Condition Status:

- Dornoch Firth and Morrich More: Unfavourable, declining (2013).

Population(s) at designation:

- Dornoch Firth and Morrich More: 251-500.

Feature description in the context of

relevant SAC: The Dornoch Firth supports a significant proportion of the inner Moray Firth's harbour seal population and represents almost 2% of the UK population.

Origin – Harbour seals are resident in the Dornoch Firth and wider Moray Firth year round.

Behaviour – Harbour seals are typically found hauled out on sand-bars and shores at the mouth of the estuary which are used habitually as favoured locations by the same groups of individuals. Notable haul-out sites include the intertidal sandflats of Dornoch and Whiteness Sands and the intertidal sand bars of the Gizzen Briggs which consistently support around 600 seals. These areas are also used as breeding sites, including locations which are inundated by the tide as pups can swim within an hour after birth with pupping typically occurring in early to mid-June-July. Adult seals undergo an annual moult between August and September during which they spend extended period out of the water.

Diet – Fish, octopus, squid and various shellfish.

Habitat – Sandbanks, sandy and rocky shores and open (marine) water.

Distribution – Harbour seals are found throughout the wider Moray Firth and may range widely in search of prey (up to 50km). However, as they have high fidelity to their favoured haul out sites they tend to remain

close to the sites.



Photo: SNH image library

Seasonality – Harbour seals are present within the Dornoch Firth year round. The harbour seal breeding season is from June, July and August inclusive. The seal moult - for all animals older than pups - follows the pupping season. The moulting season usually lasts about 4–5 weeks, although the time of the moult for individuals may vary according to age, sex and reproductive status.

Pressures – Underwater noise from vessels (recreational and commercial) and development activity (e.g. piling, blasting, dredging, seismic survey and general engine noise), recreational disturbance – particularly at haul out sites, potential persecution from fisheries, marine pollution, capture in fishing nets and potentially tidal turbines.

Trends – There has been a substantial reduction in numbers on the east coast over the past decade or so, including within Dornoch Firth where numbers have declined from around 600 in the mid 1990's to between 111 and 219 since 2010. However, numbers elsewhere in the wider Moray Firth, such as Loch Fleet and Culbin Sands, have increased markedly. At this broader geographic level harbour seal numbers have fluctuated over the medium term showing no discernible trend, although there has been a decline in the short-term. In light of this fluctuation and the more recent declining trend reference should be made to the latest [Special Committee on Seals](#) (SCOS) reports for the most up to date population data.

Fish

Atlantic salmon

Salmo salar

Relevant SACs and Site Condition Status:

- River Moriston: Unfavourable, no change (2011).

Population(s) at designation:

- River Moriston: undefined.

Feature description in the context of

relevant SAC: Although a qualifying species of the River Moriston SAC, Atlantic salmon is not a primary feature of the site's selection. The River Moriston is a tributary of the River Ness and is a regulated river which extends from its outflow at Loch Ness up to the dam below Loch Cluanie.

Origin – Adult Atlantic salmon return to their native rivers to spawn following a period at sea, so the majority of fish within River Moriston originate from this river or its tributaries.

Behaviour - Atlantic salmon have a complex life cycle which begins and ends in freshwater spawning grounds with adults spending a period at sea in between. In Scotland Atlantic salmon can spend up to four years as juveniles ('fry' and 'parr') in freshwater before the immature fish ('smolts') migrate downstream and out to sea. This stage is typically achieved in two years in the River Moriston, although some may take longer. After entering the sea, Atlantic salmon may spend up to four years before coming back to spawn in the same river where they were born. While most fish stay at sea for two or three years and come back as 'salmon', some spend only one year away. These fish (known as 'grilse') are relatively small when compared to multi-sea-winter fish. Atlantic salmon have a strong homing instinct which has led to the establishment of genetically distinct populations both between rivers and within catchments. After spawning the majority of fish die, but a small proportion (known as 'kelts') are able to migrate back to the sea to feed and survive to spawn again.

Diet - Juveniles feed on a wide range of aquatic invertebrates such as caddis flies, stoneflies and mayflies. At sea, adult Atlantic salmon feed on range of prey items, including marine amphipods, shrimps and squid and fish, such as sand eels, capelin and herring. Adults do not feed once they return to freshwater.

Habitat – Juvenile Atlantic salmon require rivers with clean, unpolluted and well-oxygenated water with a habitat mosaic which comprises suitable spawning gravels, cobbles and boulders.

On their return from the sea, it is thought that adult Atlantic salmon use inshore waters of the Moray Firth before migrating up-river to their original/natal spawning grounds.

Distribution – River Moriston and associated tributaries. Fish migrating to the sea disperse via the Moray Firth and North Sea en route to the North Atlantic and return by the same route 1-3 years later.



Photo: SNH image library

Seasonality – Juveniles migrate from river to sea in the spring with the peak in the Moray Firth considered to be between April and May. Adults may migrate back to their natal rivers at any time of year. The core period in the Moray Firth is between May and October with spawning occurring in the River Moriston catchment between November-December. In some localities, such as larger rivers, this may extend from October to late February.

Pressures – Overexploitation, forestry and agricultural operations which impact water quality, invasive species, alteration in water flow regime, physical barriers to migration, pollution, damage to spawning habitat, disease and parasites from fish farming, underwater noise and vibration (e.g. from piling, blasting, dredging), climate change and potentially tidal turbines.

Population trends - Site condition monitoring for Atlantic salmon undertaken in 2011 for the River Moriston SAC found that while densities of parr were reasonably high the density of fry was low. Meanwhile the total number of rod-caught adults within the Ness District, has generally declined since the highest catches in the mid-1960s to typically less than 1500 individuals being caught. Since then, catch figures have fluctuated around 1000 individuals.

Regarding the Southern European Atlantic salmon population of which the Scottish population is part, the trend has been downwards in many Fishery Districts, and, the Spring stock component in particular since the early 1970s. This decline reflects a long-term

and substantial reduction in marine survival rates which has largely been attributed to the indirect effects of climate change, and incidental by-catches of smolts. Marine survival is now considered to be the most critical factor affecting Atlantic salmon populations.

Aquatic Invertebrates

Freshwater pearl mussel

Margaritifera margaritifera

Relevant SACs and Site Condition Status:

- River Moriston: Unfavourable, no change (2011).

Population(s) at designation:

- River Moriston: 10,000-500,000.

Feature description in the context of relevant SAC: The River Moriston flows into the northern side of Loch Ness, and supports a functional freshwater pearl mussel population. Due to illegal pearl-fishing the population is not abundant but survey results show that 40% of the population is composed of juveniles. This is the highest percentage recorded in any Scottish pearl mussel population and indicates that recent successful recruitment has taken place. Iain to check – this is only true below Dundreggan.

Origin – Freshwater pearl mussels are sedentary therefore resident in the River Moriston.

Behaviour – Freshwater pearl mussels can grow to 140mm in length and burrow themselves into sandy substrates, often between boulders and pebbles, in fast-flowing rivers and streams. They feed by filtering fine organic matter syphoned from the water around them. Mussels spend their larval, or glochidial, life stage attached to the gills of salmonid fishes. The larvae attach themselves during mid to late summer and drop off the following spring to settle in the riverbed gravel where they grow to adulthood.

Diet – Suspended organic particles filtered from the water around them.

Habitat – Freshwater pearl mussels require cool, well-oxygenated, clean and relatively nutrient poor, fast-flowing rivers, with coarse sand or fine gravel substrate into which they can bury. In order for the populations to reproduce, they also require the rivers they inhabit to support good numbers of salmonids which they rely on in part of their life cycle (as detailed above).

Distribution – Pearl mussels are present in the River Moriston from downstream of a hydro-electric dam to the confluence with Loch Ness. Small, remnant populations made up of older animals do exist in the upper

reaches above the Dundreggan dam.



Photo: SNH image library

Seasonality – present in the river all year round, Adults are sedentary, larvae are released in mid to late summer and attach to the gills of fish (see 'behaviour')...

Pressures – Development – particularly hydro power schemes, flood protection and fishery improvement measures, statutory undertaker development, deterioration in water quality (pollution and turbidity), alteration in water flow regime and illegal pearl fishing.

Population trends – A comprehensive survey of Scottish rivers from 1996 to 1999 revealed that freshwater pearl mussels are now extinct in most of the lowlands, and scarce everywhere except for a handful of Highland rivers. If the present rates of extinction continue, it has been estimated that surviving Scottish populations may only persist for a further 25 years.

Further Reading

HRA Process

The Conservation (Natural Habitats & c.) Regulations 1994;
<http://www.legislation.gov.uk/ukxi/1994/2716/contents/made>

Habitats Regulations Appraisal; <https://www.nature.scot/professional-advice/planning-and-development/environmental-assessment/habitats-regulations-appraisal-hra/habitats-regulations-appraisal-hra-help-and>

Appropriate assessment (AA); <https://www.nature.scot/professional-advice/planning-and-development/environmental-assessment/habitats-regulations-appraisal/habitats-regulations-appraisal-hra-appropriate>

Likely to have a significant effect (LSE); <https://www.nature.scot/professional-advice/planning-and-development/environmental-assessment/habitats-regulations-appraisal-hra/habitats-regulations-appraisal-hra-likely>

Sitelink; <http://gateway.snh.gov.uk/sitelink/index.jsp>

Help and advice on HRA; <https://www.nature.scot/professional-advice/planning-and-development/environmental-assessment/habitats-regulations-appraisal-hra/habitats-regulations-appraisal-hra-help-and>

Birds

Bird discussion and species accounts in this document are based on [SNH Commissioned Report 804: A review of literature on the qualifying interest species of Special Protection Areas \(SPAs\) in the Firth of Forth and development related influences](#) which contains a comprehensive reference list.

Eaton M, Aebischer N, Brown A, Hearn R, Lock L, Musgrove A, Noble D, Stroud D & Gregory R (2015) Birds of Conservation Concern 4: the population status of birds in the UK, Channel Islands and Isle of Man. *British Birds* **108**: 708–746

Marine Mammals

Cheney, B., Graham, I.M., Barton, T.R., Hammond, P.S. and Thompson, P.M. 2014. Site Condition Monitoring of bottlenose dolphins within the Moray Firth Special Area of Conservation: 2011-2013. *Scottish Natural Heritage Commissioned Report No. 797*.

Quick, N., Arso, N, Cheney, B, Islas, V, Janik, V, Thompson P. M. and Hammond, P
The east coast of Scotland bottlenose dolphin population: Improving understanding of ecology outside the Moray Firth SAC
UK Department of Energy and Climate Change offshore energy Strategic Environmental Assessment (SEA) programme.

Russell, D. J. F., McConnell, B., Thompson, D., Duck, C., Morris, C., and Harwood, P. and Jason Mathiopoulos – Uncovering the links between foraging and breeding regions in a highly mobile mammal *Journal of Applied Ecology* 2013, **50**, 499-509.

Wilson, D. R. B. 1995. The ecology of bottlenose dolphins in the Moray Firth, Scotland : a population at the northern extreme of the species' range – Aberdeen University Thesis.

Fish

Bergstedt, R. A. & Seelye, J. G.1995. Evidence for lack of homing by sea lamprey. *Transactions of the American Fisheries Society* **124**, 235–239.

Gaudron, S. M. & Lucas, M. C. 2006. First evidence of attraction of adult river lamprey in the migratory phase to larval odour. *Journal of Fish Biology*, **68**, 640–644.

Gill, A.B. & Bartlett, M. 2010. Literature review on the potential effects of electromagnetic fields and subsea noise from marine renewable energy developments on Atlantic salmon, sea trout and European eel. *Scottish Natural Heritage Commissioned Report No.401*

Godfrey, J.D., Stewart, D.C., Middlemas, S.J. & Armstrong, J.D. 2014. Depth use and movements of homing Atlantic salmon (*Salmo salar*) in Scottish coastal waters in relation to marine renewable energy development. *Scottish Marine and Freshwater Science Vol 05, No 18*

Hardisty, M.W. 2013. *Biology of the Cyclostomes*. Springer, London.

Maitland, P.S. 2003. *Ecology of the River, Brook and Sea Lamprey*. Conserving Natura 2000 Rivers Ecology Series No. 5. English Nature, Peterborough.

Maitland, P.S., Morris, K.H. East, K., Schoonoord, M. P., van der Wal, B. & Potter, I.C. 1984. The estuarine biology of the River lamprey, *Lampetra fluviatilis*, in the Firth of Forth, Scotland, with particular reference to size composition and feeding. *Journal of the Zoological Society of London*, **203**, 211-225.

Malcolm, I.A., Godfrey, J. & Youngson, A.F. 2010. Review of migratory routes and behaviour of Atlantic salmon, sea trout and European eel in Scotland's coastal environment: implications for the development of marine renewables. *Scottish Marine and Freshwater Science 1: No 14*.

Riley W.D., Bendall B., Ives M.J., Edmonds N.J. & Maxwell D.L. 2012. Street lighting disrupts the diel migratory pattern of wild Atlantic salmon, *Salmo salar* L., smolts leaving their natal stream. *Aquaculture*, **330-333**, 74-81.

Smith, I.P. & Smith, G.W. 1997. Tidal and diel timing of river entry by adult Atlantic salmon returning to the Aberdeenshire Dee, Scotland. *Journal of Fish Biology* **50**, 463–474.

Vrieze, L. A. & Sorensen, P. W. 2001. Laboratory assessment of the role of a larval pheromone and natural stream odor in spawning stream localization by migratory sea lamprey (*Petromyzon marinus*). *Canadian Journal of Fisheries and Aquatic Sciences*, **58**, 2374–2385.

Published: February 2018
Scottish Natural Heritage
Great Glen House
Leachkin Road
Inverness IV3 8NW

www.nature.scot

