

Scottish Natural Heritage

Habitats Regulations Appraisal (HRA) on the Firth of Forth

A Guide for developers and regulators



Contents

Section 1 Introduction	1
Introduction	1
Section 2 Potential Pathways of Impact	3
Construction	3
Operation	3
<i>Table 1 Generic impact pathways and mitigation to consider</i>	4
Section 3 Ecological Principles	6
Habitats and physical processes	6
Management of the environment	7
Land claim and physical management of the intertidal	7
Dredging	8
Disturbance – its ecological consequences	9
Types of disturbance	9
Disturbance whilst foraging	10
Disturbance at roosting sites	10
Habituation and prevention	11
Section 4 Habitats Regulations Appraisal (HRA)	12
Natura 2000	12
The HRA procedure	12
HRA in the Firth of Forth area	12
<i>Figure 1 The HRA process up to and including appropriate assessment</i>	14
The information required	15
Determining that there are no adverse effects on site integrity	15
<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>	16
Section 5 Species Accounts for Qualifying Interests	17
Birds – an explanation of the account sections	17
Conservation Status	17

Origin	18
Behaviour	18
Diet	18
Habitat	18
Distribution	18
Seasonality	18
Pressures	18
Population trends	19
Marine Mammals and Fish	19
Pink footed goose	20
Shelduck	21
Wigeon	22
Mallard	23
Scaup	24
Eider	25
Long-tailed duck	26
Common scoter	27
Velvet scoter	28
Goldeneye	29
Red-breasted merganser	30
Red-throated diver	31
Fulmar	32
Manx shearwater	33
Gannet	34
Great cormorant	35
Shag	36
Great crested grebe	37
Slavonian grebe	38
Oystercatcher	39
Golden plover	40
Grey plover	41

Lapwing	42
Ringed plover	43
Curlew	44
Bar-tailed godwit	45
Turnstone	46
Knot	47
Dunlin	48
Redshank	49
Puffin	50
Razorbill	51
Guillemot	52
Sandwich tern	53
Common tern	54
Roseate tern	55
Arctic tern	56
Kittiwake	57
Black-headed gull	58
Little gull	59
Common gull	60
Lesser black-backed gull	61
Herring gull	62
Bottlenose dolphin	63
Harbour seal	64
Grey seal	65
Atlantic salmon	66
Sea lamprey	67
River lamprey	68

Introduction

The purpose of this guide is to help developers and regulators meet the requirements of the Habitats Regulations on the Forth 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 issues involved in carrying out projects on the Firth of Forth that affect qualifying interests of associated Natura sites, such as the Firth of Forth Special Protection Area (SPA) or the River Teith 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 solving problems is more expensive and 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 Forth is the most substantial estuary on the east coast of Scotland. It stretches around 55 miles between the flood plain around Stirling and Kincardine to the open sea and cliffs characteristic of the mouth of the Firth. Between these is a mosaic of coastal habitats and settlements that accommodates a wide range of species. It is a complex area with a number of management challenges. It is surrounded by areas of high population and heavy industrial development alongside areas of countryside and farmland. It provides a range of services including provision of resources such as food, flood management, recreation opportunities, energy and trade opportunities. These sometimes competing demands need to be balanced against each other.

Under the Habitats Regulations, decision makers (known as competent 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 site. 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 around the 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 Forth 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 AAs are caused by incomplete or deficient information gathering and provision, meaning competent authorities cannot confirm that there are no adverse effects on site integrity.

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>

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

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 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 be less so for developers, regulators and specialist in other fields. We hope that the species accounts in this document will help provide simple information on the ecology of the interests.



Potential Pathways of Impact

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

Construction

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

Operation

- Disturbance (noise and visual) from people, machinery and increased ship traffic and displacement.
- 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 be a risk throughout the life of a development from construction onward, such as the risk of introducing damaging invasive non-native species (INNS).

The table below identifies generic actions that have the potential to mitigate or avoid some of the commonly occurring potential impacts on the Firth of Forth. This generic mitigation may not be applicable in all cases but will provide a starting point for consideration.

Thinking about the ecological principles that cause these pathways to have impacts may also be useful in arriving at solutions. A basic discussion is provided in the next section – we have not tried to discuss every issue but aim to deal with some of the more fundamental ones. The discussion largely focuses on birds but the principles discussed apply to other qualifying interests. More detailed consideration may be needed in practice than set out in the summary table; the specifics of the proposal are important considerations and mitigation needs to be specifically tailored to focus on the relevant impacts.

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 or Scottish Government "Scotland's environment" estuaries page.
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.

<p>Permanent disturbance from recreational activity in the intertidal area, i.e. people walking on the beach.</p>	<ul style="list-style-type: none"> • 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 also 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.
<p>Temporary (construction) disturbance/damage to intertidal habitat.</p>	<ul style="list-style-type: none"> • 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.
<p>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.</p>	<ul style="list-style-type: none"> • No generic mitigation - siting and design of buildings would need to be assessed.
<p>Loss of feeding or roosting sites for birds on greenfield sites outwith the SPA, e.g. agricultural land, parks, sports fields, etc.</p>	<ul style="list-style-type: none"> • 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. For birds the following are especially important either for their own survival or that of 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 habitat is strongly influenced by sediment transport processes. Sediment particle size varies throughout an estuary, determined by topography, currents, tides and weather and creates different substrates from coarse sand 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 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 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 at night, at least on moonlit nights. Movement of fish species and their associated marine mammal predators can be influenced by the tidal cycle allowing free migration up river.

Habitats are important for purposes other than foraging. At high tide or when intertidal habitats and their associated food resources are unavailable waders and wildfowl often move to a safe place where they roost and wait for the tide to turn. Some may seek alternative feeding sites such as coastal fields or lagoons adjacent to the estuary. Birds, especially when migrating or over-wintering, must conserve energy and minimise unnecessary and wasteful energy expenditure. Consequently, roosting sites need to be undisturbed, by predators and human activity. Birds may use 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 different stages of their life. This is particularly pronounced in 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 sites 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 Firth of Forth 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. Apparently minor changes to the environment therefore need to be assessed carefully when considering factors that could cause declines in bird numbers, whether these changes occur as a result of natural processes or human activities.

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. Parts of the Forth estuary have been claimed and converted for use as industrial sites (e.g. the Grangemouth industrial complex, Rosyth port complex). Other areas have been used for dumping mining waste, ash from coal-fired power stations and general waste (e.g. at Bo’ness, Longannet and Kinneil) with most such losses occurring in the 20th century. In addition there has been longer term and progressive loss for agriculture. As much as 50% of the historic intertidal of the Firth of Forth has been lost for a variety of reasons including agriculture, harbours and 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 old bing at Bo’ness and Kinneil lagoon. Musselburgh lagoons are another example and are an important area of the Firth of Forth SPA for birds). 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 that previously used claimed areas must find new habitat. Their ability to do so will depend on whether these sites have any capacity to support extra birds. 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 to birds. 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

The act of dredging has consequences beyond the area dredged and the immediately adjacent seabed. It alters the sediment equilibrium leading to redistribution over a much wider area. Many living organisms are removed and habitats for others are destroyed or redistributed.

Maintenance dredging is an ongoing process and there may be insufficient time for 'recovery'. Therefore changes in sediment structure and invertebrate communities may be more permanent and the bird assemblages associated with such continuously dredged areas could potentially achieve a new stable equilibrium. Capital dredging is likely to have a greater impact on established use of an area by birds.

Dredging may also increase the levels of metals and organic pollutants in the estuary, by releasing contaminants that have been trapped within the sediments. In some cases, it has also been suggested that nutrients have also been released during dredging operations.

Dredging can also change the level of mudflats and sandflats so that less area is exposed at certain states of the tide, reducing areas available for foraging birds.

The impact of dredging can differ markedly between sites and therefore potential changes to the water and sediment flows of an estuary should be carefully assessed and tested through models specific to that site. Modelling is most often carried out at the project stage. Strategic planning should therefore consider whether dredging associated with proposals is possible in principle, and should ensure adequate policy safeguards are in place in addition to ensure no adverse effect on site integrity.



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 roosting birds may be disturbed by a wide variety of human activities. In the environment of an open estuary, views are very long and sound carries well, especially over water. Thus disturbance on estuaries can have exceptionally long reach.

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.
- **Water-based recreation**
Water-based recreational activities include sailing, water-skiing, jet-skis, motorboats, kayaking and windsurfing. Water-based activities may affect species that normally forage at sea and are less used to disturbance than birds using other habitats.

- 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 from some intertidal areas, during the construction phase (and sometimes after construction)
- Noise
Birds often respond to loud noise by flying away but few studies have looked at the effect of noise on foraging and roosting birds. Most studies have found that irregular and/or louder noises cause more disturbance than quiet and/or regular noises. Noise impacts through the water can be particularly disturbing to some marine mammals and fish and can even cause physical damage. Sound propagation in marine environments is affected by four main factors: the frequency of the sound, water depth, and density differences within the water column, which vary with temperature and pressure.
- Artificial lighting
Artificial lighting can make it easier for visual feeders to find and capture prey but also make birds more vulnerable to predators.

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 foraging

The actual 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
- 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 areas will be variable in their foraging quality. This limiting factor 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 so are more susceptible to the effects of disturbance during cold weather. Sustained or repeated disturbance may result in an area becoming unusable and effectively the long-term loss of an area of feeding habitat. Such disturbance may therefore cause a

reduction in the number of birds that a site can support, known as the 'carrying capacity' of a site.

Disturbance at roosting sites

Most recreational activity usually takes place at or close to the high-tide mark. Hence roosting birds are often more vulnerable to disturbance, as they are usually gathered in large flocks close to the high water mark, whereas foraging birds are often 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 does lead to increased energy expenditure. Therefore, regular disturbance at secure roost sites may cause population declines even if sufficient food resources remain available in an area.

Habituation and prevention

The impact of disturbance may be lower if it occurs regularly and is predictable (e.g. walkers staying on footpaths), especially if the intensity of the disturbing feature is not severe. 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.

Measures to prevent disturbance in late winter may be particularly important as this will be 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.



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.

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. Note that the test for *significant effect* acts as a simple but very precautionary filter to exclude any plans or projects which are not capable of having a significant effect from further assessment, 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

³ <http://www.snh.gov.uk/protecting-scotlands-nature/protected-areas/international-designations/natura-sites/hra-help-and-advice/>

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

⁵ <http://www.snh.gov.uk/protecting-scotlands-nature/protected-areas/international-designations/natura-sites/hra-appropriate-assessment/>

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

⁷ <http://www.snh.gov.uk/protecting-scotlands-nature/protected-areas/international-designations/natura-sites/hra-likely-significant-effect/>

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)

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 Firth of Forth area

The Firth of Forth area contains several Natura sites, including the Firth of Forth SPA, the Forth Islands SPA, Imperial Dock Lock Leith SPA, Isle of May SAC and the Firth of Forth and Tay Bay Complex draft SPA. Between them they contain 43 named qualifying bird species. Some other nearby Natura sites that may also lead to a requirement for HRA of proposals in the Firth of Forth include: the River Teith SAC, the Firth of Tay & Eden Estuary SAC, the Moray Firth SAC, Berwickshire and North Northumberland Coast SAC, and St. Abb's Head to Fast Castle SPA. Although these sites are all outwith the Firth of Forth they are designated for mobile species such as fish, dolphins, seals and birds which may be found within the Forth.

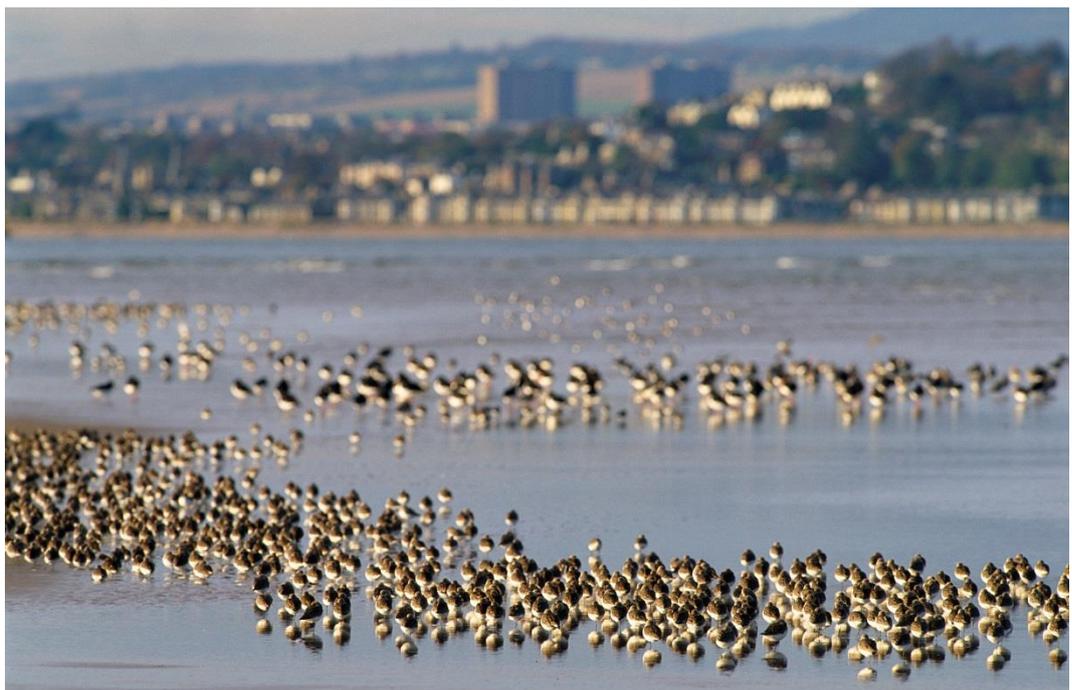
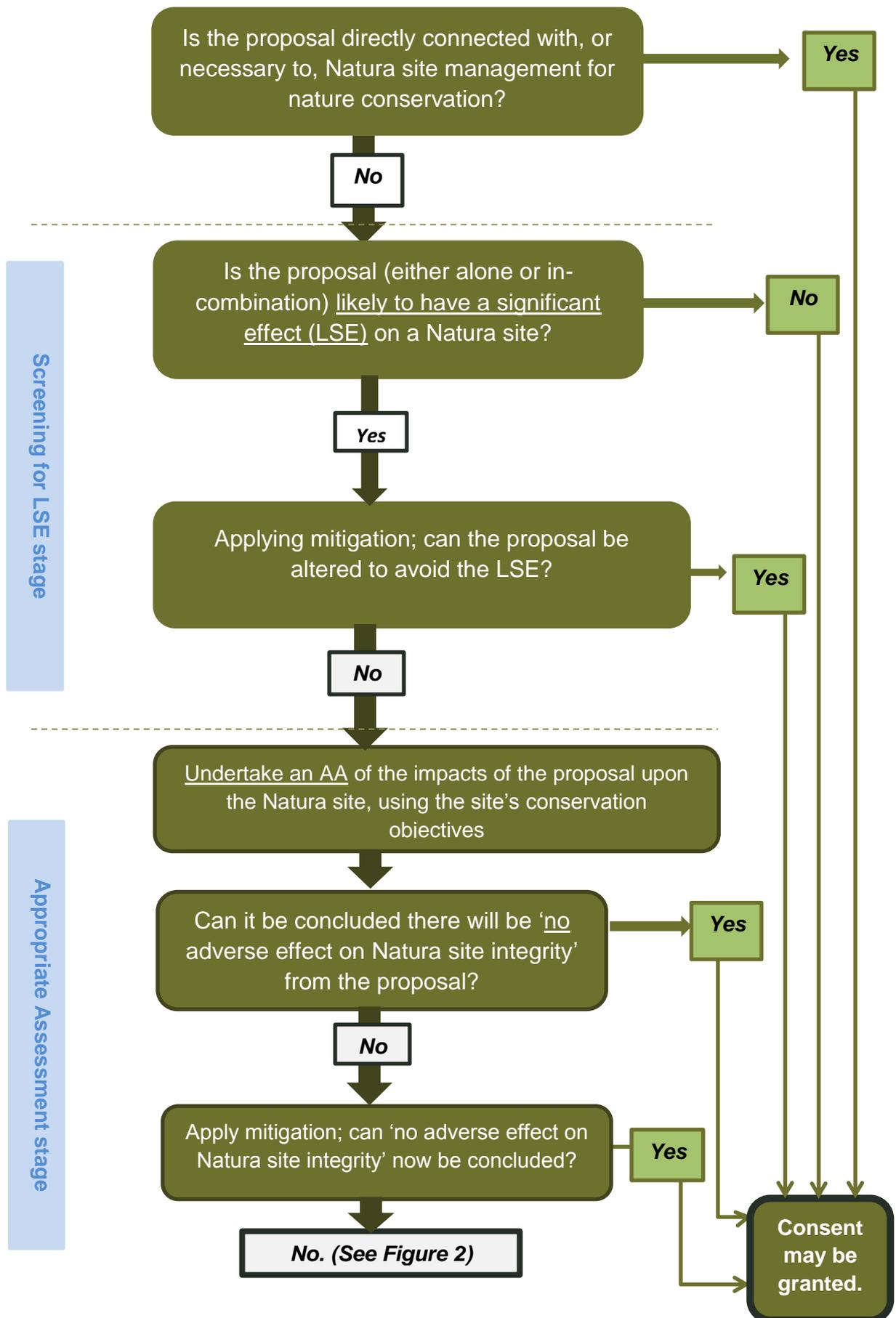


Figure 1: The HRA process, up to and including appropriate assessment.



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. An HRA need not therefore be difficult or lengthy where 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.

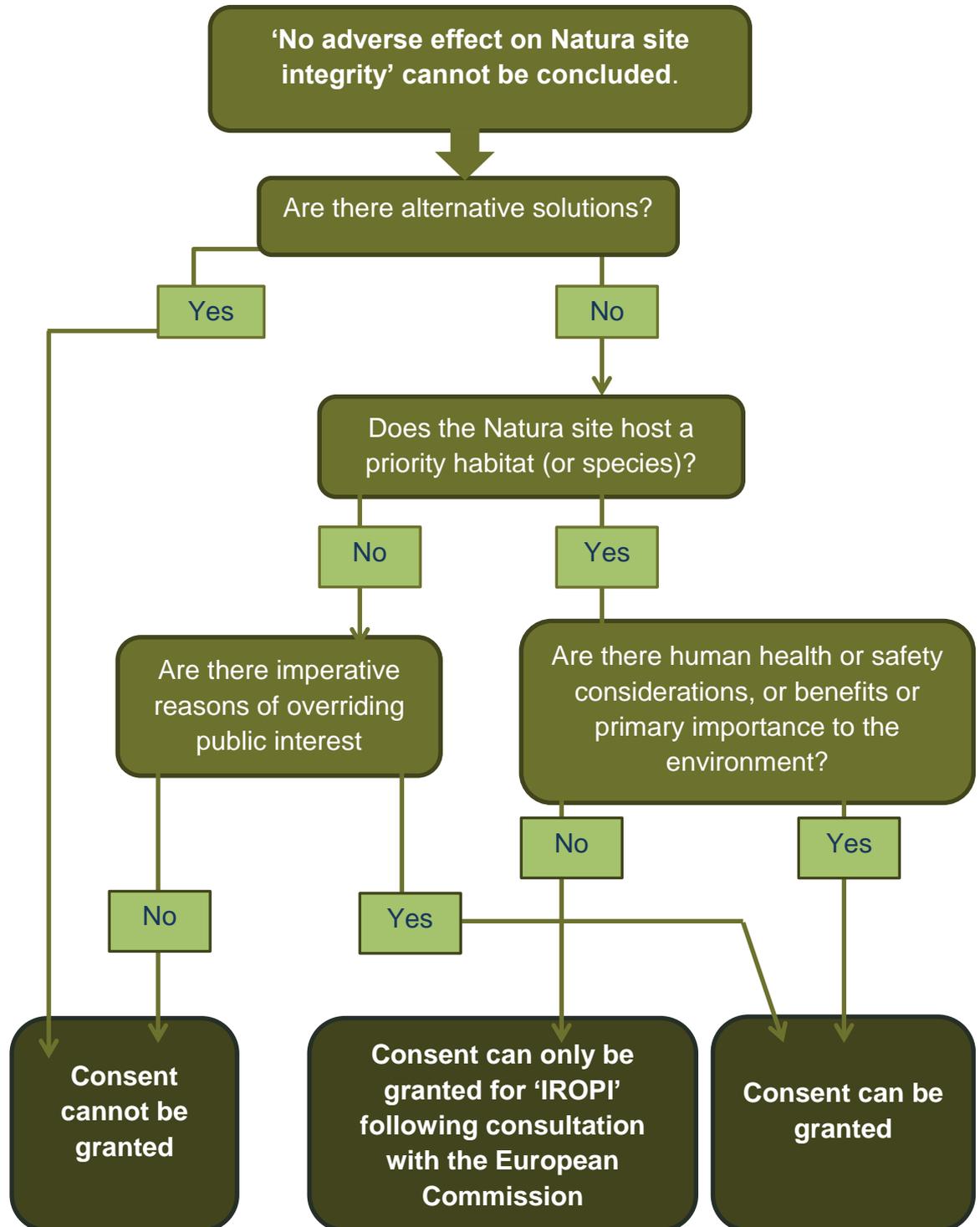
These exceptions are set out in regulation 49 of [the Habitats Regulations](#). The regulation provides some scope for derogation to approve a plan or project even when it cannot be ascertained that there is no adverse effect on Natura site integrity. For a proposal to meet the derogation tests there 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](#).

Species Accounts for Qualifying Interests

This section contains brief species descriptions for all the qualifying interests of Natura sites which are likely to require consideration for projects occurring on the Firth of Forth. Not all developments will have the potential to affect all interests. The accounts are not arranged by Natura site. The species can be clearly referenced to the relevant Natura site by checking the citation. Information on all Natura sites and their qualifying interests is [available on SNH Sitelink page](#). This includes interactive maps of the sites.

Birds - an explanation of the account sections

This work is based on SNH Commissioned Report 804, but accounts have been modified where UK conservation status has been updated since the original publication. At the head of each account is the common name, scientific name and a photograph. The remaining sections summarise the basic ecology of the species, its status and distribution within the Firth of Forth area under the following headings:

Conservation Status

This includes:

- The baseline population cited in SPA citations. For most sites (the Firth of Forth and Forth Islands SPAs) classification as SPA was in October 2001 and the cited population baselines vary in origin between 1986 and 1998 dependent on the species involved;
- UK conservation status - The conservation status of 244 regularly occurring birds in the UK has been reviewed by the leading governmental and non-governmental conservation organisations (Eaton, M.A. *et al.*, 2015). This resulted in each species being placed on one of three lists: **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.
- Global - Species of global conservation concern are assessed by the International Union for Conservation of Nature and Natural Resources (IUCN) and placed in a series of categories based on their global status (IUCN 2001). Details here reflect the 2015 changes to the Global 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

This section describes whether the species is a resident within the Firth of Forth area covered by this review, or migratory. For non-resident species, it describes briefly where they spend the rest of the year.

Behaviour

Key information on each species' feeding, roosting and breeding behaviour when they are present within the Firth of Forth area.

Diet

Key information on the diet of each species when they are present within the Firth of Forth area.

Habitat

This section summarises information on the principle habitats that species use within the Firth of Forth area. 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

This section summarises the occurrence and abundance of the species within: (a) the 'Inner Forth', defined as the largely estuarine area up river from the Queensferry Bridges; and (b) the 'Outer Forth' that includes the Firth of Forth below the Queensferry Bridges, the Forth Islands and outer Tay areas. Within each area, the distribution and abundance of species are described using the terms:

- Widespread – species found in most areas of suitable habitat within the site;
- Local – species found in a few (often specific) areas of the site;
- Absent, rare, scarce, uncommon, common, numerous – six subjective categories are used to indicate relative in increasing order of magnitude. These categories are based on data from the Wetland Bird Survey (WeBS), the Seabird Monitoring Programme, local bird reports and BTO expertise. Numerical data for each species are presented in the population trends section.

Seasonality

Periods of presence and relative abundance are presented graphically using data from the WeBS where applicable or are otherwise summarised by brief text. Where presented, the figures show mean monthly counts for five recent years.

Pressures

This section, provides a short summary of some pressures and issues most relevant to each species, both within the SPAs and elsewhere in the Firth of Forth. Some pressures

apply to all species (for example pollution or recreational disturbance) and to prevent repetition, these are largely excluded from the species accounts but are noted in the discussion on impacts earlier in this document. A more detailed discussion is available at

[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](#) upon which this guidance is based.

In some instances, there is a lack of published evidence that specific pressures identified for one species may also influence other species, even though this seems likely. An example that is especially relevant to the Firth of Forth is the interaction between scaup, molluscs and water quality - reduced sewage outputs leading to reduced mollusc abundance which supported fewer scaup. Although it is likely that other seaduck will have similar interactions, their accounts may not include this pressure because a link has not been investigated or the details remain unpublished. Therefore the list of pressures should not be considered comprehensive but rather an indication of current knowledge about them, and new issues may arise in future which plans and projects need to consider.

Population Trends

Where data are available, this section details whether the Firth of Forth area population for each species has increased, declined or remained stable, and makes comparisons with the wider Scottish trend. The comparisons are made to illustrate that a decline or increase within the Forth area does not always indicate a change in the conditions of that area. In some cases, a change in the Forth may simply reflect wider scale changes occurring in Scotland and further afield. The accounts use data from the Wetland Bird Survey (WeBS), and the Seabird Monitoring Programme.

Note that population trends are determined from data that are not necessarily restricted to the SPA. This will lead to some apparent discrepancy from baseline population estimates given under the 'Conservation Status' heading; however the trends should be representative of patterns of change within the SPAs.

Figures derived from WeBS show relative changes in peak counts over the period covered (generally over three decades) with the baseline year (index = 100) taken as the 2010/11 winter. The figures illustrate both the raw maximum indices (joined by a dotted line) and also the smoothed trend (shown by a solid line) derived from those counts.

Population changes for pink-footed goose are based on winter roost counts. Population changes for breeding seabirds are based on counts of apparently occupied nest sites. Breeding seabird trends are shown for years when most (and a constant sample of) island colonies have been counted. Longer runs of seabird data than presented are available from single colonies, notably for the Isle of May.

Marine Mammals and Fish

Species accounts use similar layout to the bird accounts but use a number of different sources of information

Pink-footed goose
Anser brachyrhynchus

Conservation status

SPA Population at Classification: 10,852

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

Global: Least Concern.

Origin – Winter visitors to Scotland, breed in Iceland and eastern Greenland. Many birds that winter in England stage in Scotland in the spring and autumn.

Behaviour – Highly gregarious, roosting and feeding in large flocks. Persistent use of favoured feeding sites within and between winters, especially when little disturbed.

Diet – Herbivorous. Outside the breeding season feeds on improved grasslands, cereal stubbles and vegetables (e.g. potatoes, sugar beet, carrots).

Habitat – Feeds on farmland and usually roosts on estuaries at night. Foraging areas are normally within 20 km of roost sites.

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

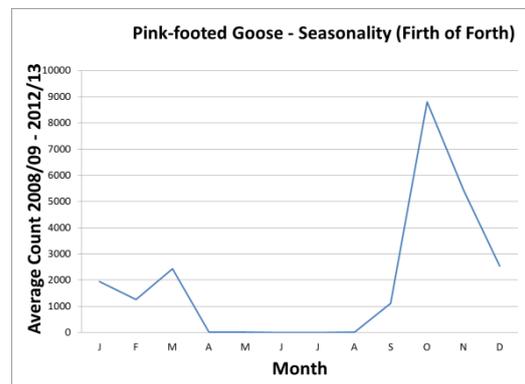
Distribution

Inner Forth	Locally numerous
Outer areas	Locally numerous



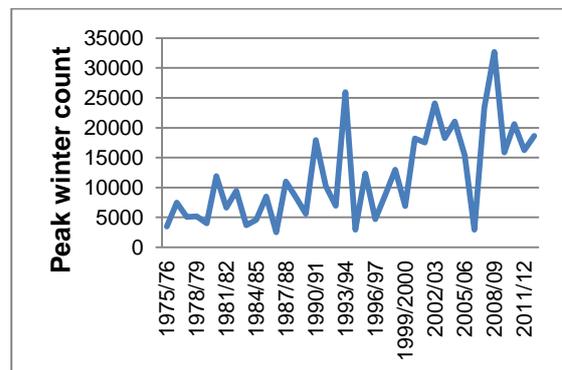
Anne Cotton

Seasonality – Mainly a passage migrant with more modest numbers through the winter.



Pressures – Conflict with farmers may grow especially if numbers continue to increase. Changes in agricultural practice could affect food availability. Disturbance to roosts and feeding areas. A major quarry species for hunters.

Population trends – Winter numbers in (and around) the Firth of Forth have increased in line with national trends.



Shelduck

Tadorna tadorna

Conservation status

SPA Population at Classification: 4,509

UK: **AMBER** (localised and important non-breeding population; moderate breeding population decline over 25 years).

Global: Least Concern.

Origin – Undertakes short migrations to moulting sites in late summer when most adults leave the UK for a month or two. Small number of birds moult in British estuaries, notably including the Forth.

Behaviour – Feeds by digging and dabbling in intertidal areas, feeding during both day and night according to the tide. The late summer moulting flock around Grangemouth is one of the three largest in Britain.

Diet – Various tiny invertebrates, with small molluscs predominant in northern and western Europe, especially *Hydrobia* snails.

Habitat – Prefers saline habitats including muddy and sandy estuaries.

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

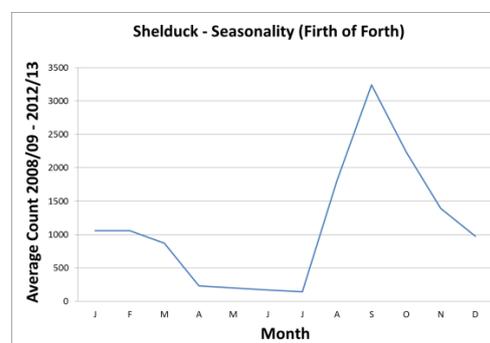
Distribution

Inner Forth	Widespread, numerous
Outer areas	Locally common



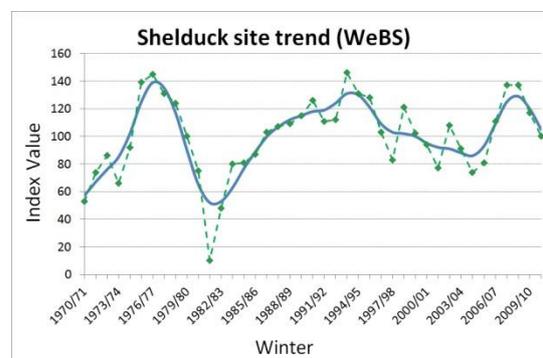
Anne Cotton

Seasonality – Mainly an autumn/winter visitor, with peak numbers occurring during the autumn moult in August/September. The breeding population on low ground around the estuary is important in a Scottish context.



Pressures – Disturbance to potentially flightless moulting birds. Across UK estuary sites counts were significantly lower in areas close to footpaths. The abundance of *Hydrobia* water snails (a major food source for the species) is influenced by water quality and may affect the numbers of shelduck and their duration of stay.

Population trends – Numbers reasonably stable in recent years.



Wigeon

Anas penelope

Conservation status

SPA Population at Classification: 2,139

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

Global: Least Concern.

Origin – Birds wintering in UK breed mainly in northern Russia, though some Icelandic-bred birds also occur in Scotland.

Behaviour – Gregarious, forming large flocks, often grazing in grassy fields. Can feed at night, especially in marine habitats.

Diet – Plant material from both above and below surface level

Habitat – Salt marshes, lagoons, estuaries, intertidal mudflats, sheltered marine habitats and nearby grassy fields.

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

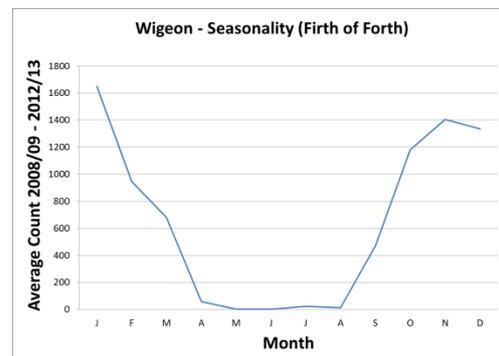
Distribution

Inner Forth	Widespread, common
Outer areas	Locally common



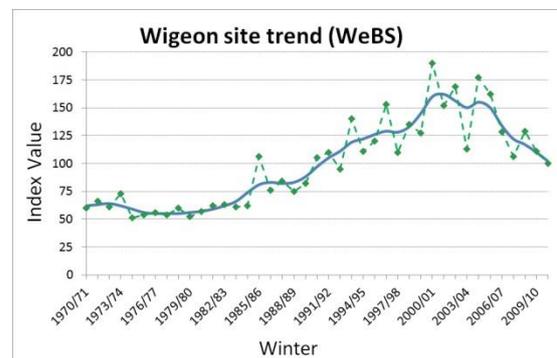
Edmund Fellowes

Seasonality – Winter visitor, from September to March.



Pressures – Wigeon flocks feed close to the water's edge. When disturbed, flocks fly to the safety of open water and take a while to come back to feed affecting their ability to forage if ongoing disturbance occurs.

Population trends – The Forth trend is tracking the Scottish trend, and the proportion of Scottish wintering birds using the site is stable. This suggests the site remains relatively favourable to this species.



Mallard

Anas platyrhynchos

Conservation Status

SPA Population at Classification: 2,564

UK: **AMBER** (moderate recent breeding population decline).

Global: Least Concern.

Origin – Many are local but up to three-quarters of the birds wintering in the UK may be winter visitors from north west Europe.

Behaviour – Feeds predominantly by dabbling in shallows, or upending in slightly deeper water. Birds may occasionally graze ashore. May feed at night. Often tolerant of humans, especially in urban areas.

Diet – Will eat both plant and animal matter.

Habitat – All wetland types, though prefers sites with shallow water and cover. Will feed and roost on the sea and in brackish waters.

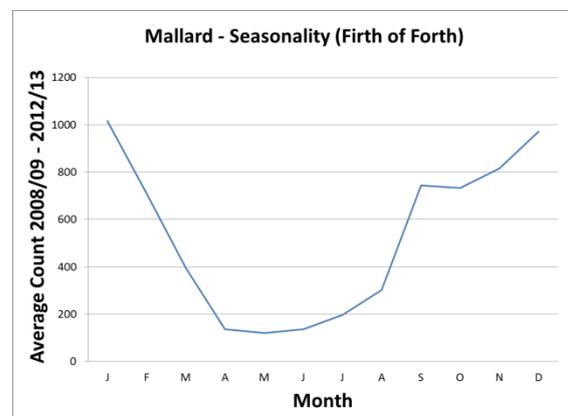
	Low tide	High tide
Open water	✓	✓
Intertidal mud	✓	-
Saltmarsh	✓	✓
Rocky shore	-	-
Coastal fields	✓	✓
Inland fields	✓	✓

Distribution

Inner Forth	Widespread, common
Outer areas	Widespread, common

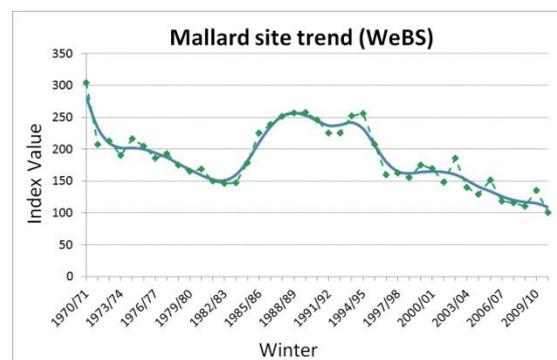


Seasonality – Mainly a winter visitor but with substantial numbers resident and breeding.



Pressures – Localised disturbance.

Population trends – The decline in the wintering population in the UK is thought to be caused by a reduction in long-distance movement by European mallards, perhaps because of milder winters in mainland Europe. The Forth trend is tracking the Scottish trend and the proportion of Scottish wintering birds using the site is stable. This suggests conditions on the site remain favourable for this particular species.



Scaup

Aythya marila

Conservation status

SPA Population at Classification: 437

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

Global: Least Concern.

Origin – Birds wintering in Britain & Ireland come from Iceland, the Baltic, Scandinavia and Russia.

Behaviour – Gregarious outside breeding season, feeding by diving in shallow waters.

Diet – Omnivorous, but mostly molluscs in winter, especially mussels *Mytilus* species. Also cockles *Cardium* species and clams *Macoma* species in estuaries and *Hydrobia* species in brackish waters.

Habitat – Winters in sheltered coastal waters e.g. estuaries.

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

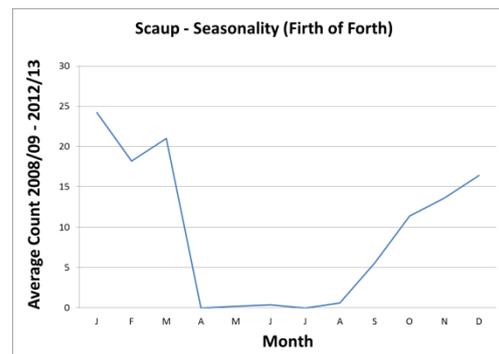
Distribution

Inner Forth	Scarce
Outer areas	Scarce



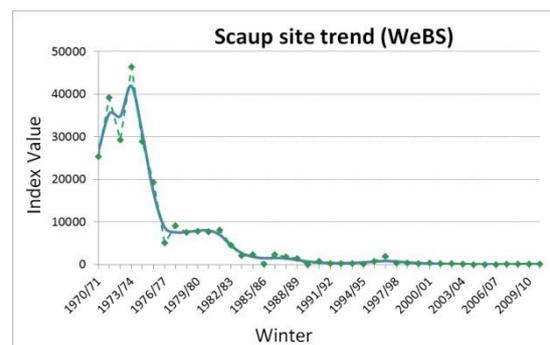
Graham Gately

Seasonality – Winter visitor, mainly October to March.



Pressures – Improving water quality may have a negative effect on abundance of some food sources, such as molluscs.

Population trends – Numbers using the site declined sharply, from >60% of Scottish wintering birds in the late 1970s to less than 5% in recent years. Declines linked to reduction in sewage inputs.



Eider

Somateria mollissima

Conservation status

SPA Population at Classification: 2,400 pairs

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 – Eider feed either by diving in deeper water or upending in shallow water. Frequent flights are made between roost and feeding sites. Eider form large flocks during July and August when birds moult and are flightless for several weeks. After hatching, young will join together to form large creches which can disperse several km (e.g. from islands to mainland coast).

Diet – Molluscs and crustaceans, blue mussels *Mytilus edulis* are the main prey species .

Habitat – Eiders are a marine species concentrated in sheltered waters. Eider nest on the ground mainly on mammal-free offshore islands and on quieter areas of mainland coast.

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

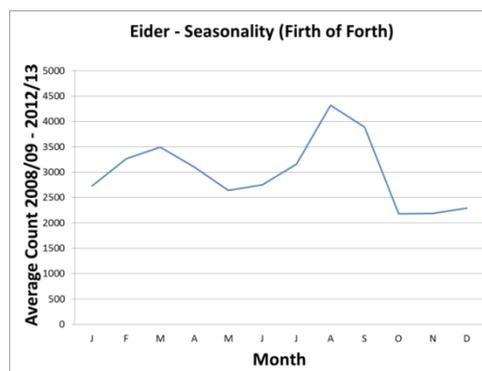
Distribution

Inner Forth	Uncommon
Outer areas	Common



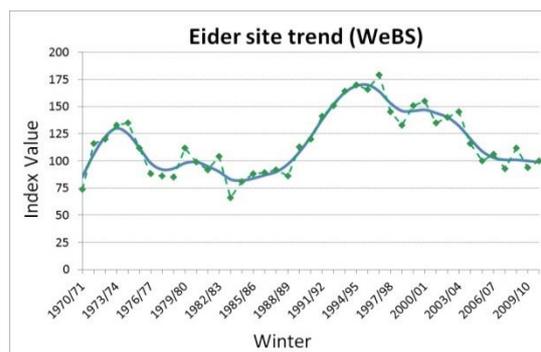
Anne Cotton

Seasonality – Present year-round in the Firth of Forth with a peak in late summer /early autumn as numbers are supplemented by young birds.



Pressures – Nest predation, especially by mammals. Recreational disturbance by walkers and dogs.

Population trends – Winter counts of eider have declined in recent years at a more rapid rate than for Scotland as a whole; the proportion of the Scottish population supported by the area is therefore declining.



Long-tailed duck

Clangula hyemalis

Conservation status

SPA Population at Classification: 1,045

UK: RED (globally vulnerable)

Global: Vulnerable (recent non-breeding decline).

Origin – Breeds around Arctic Circle. Those wintering in Britain may originate from Fennoscandia and north west Russia.

Behaviour – Highly gregarious outside the breeding season, roosting and feeding in inshore and offshore waters. Feed during day by diving, regularly to depths of 3–10m, but to maximum depth of 50–60m.

Diet – Predominantly animal matter, including crustaceans, molluscs, other marine invertebrates and fish.

Habitat – At sea, often far offshore, but also in estuarine waters.

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

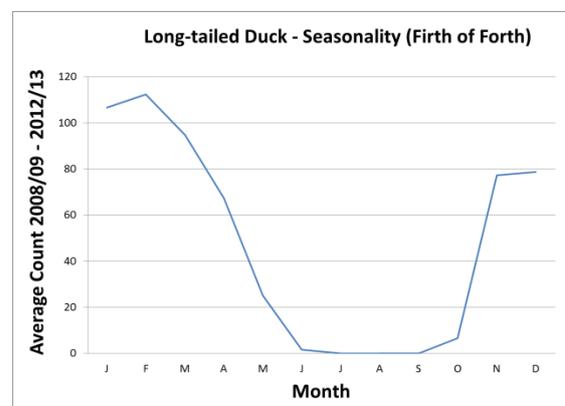
Distribution

Inner Forth	Rare
Outer areas	Locally uncommon



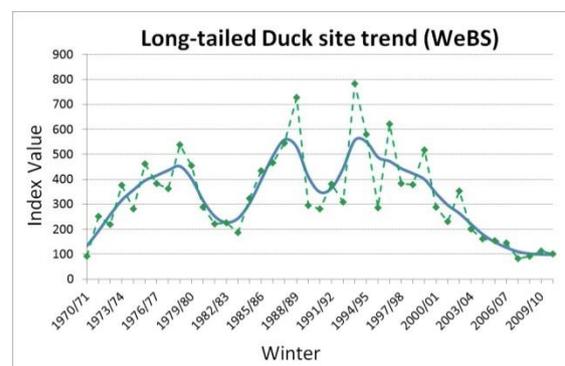
Dave King

Seasonality – Winter visitor, mainly November to April, peaking in February.



Pressures – Reduced breeding success (away from Scotland) in recent years.

Population trends – The Forth trend is lower than the Scottish trend. A declining proportion of Scottish wintering birds have been supported by this site since the turn of the century.



Common scoter

Melanitta nigra

Conservation status

SPA Population at Classification: 2,125 individuals

UK: RED (recent & longer term breeding population & range decline).

Global: Least Concern.

Origin – Mostly a winter visitor from Iceland and Fennoscandinavia, although small numbers of non-breeding birds are present in the Firth of Forth throughout the year.

Behaviour – Feeds and roosts in flocks sometimes quite far offshore. Frequently fly between favoured feeding areas.

Diet – A range of mollusc species caught by diving and foraging mostly over sandy substrates.

Habitat – Away from their breeding grounds common scoter spend most of their time on the sea. They forage for food by diving in inshore waters that are up to 20 m deep.

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

Distribution

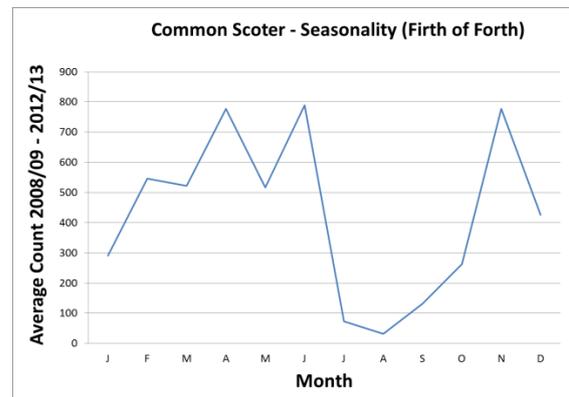
Inner Forth	Rare
Outer areas	Locally common

Large flocks found between Musselburgh and North Berwick on the south side of the Forth, in Largo Bay and St Andrews Bay in Fife.



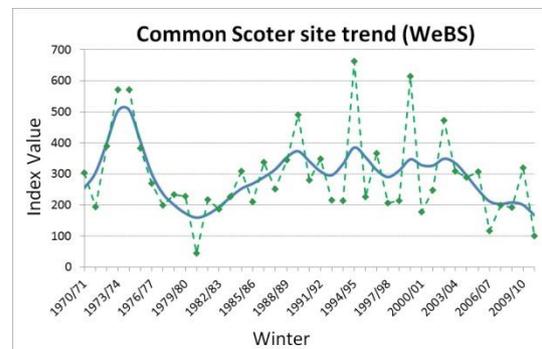
Graham Catley

Seasonality – Numbers are highest in November and during April to June.



Pressures – None specifically recognised but in common with other seaduck likely to include disturbance from recreational water use and impacts on water quality through pollution or sediment movement.

Population trends – Declining but tracking the Scottish trend. The proportion of the Scottish population supported by this site is stable. This suggests that despite the on-going decline in numbers, the conditions on the site remain relatively favourable for this particular species.



Velvet scoter

Melanitta fusca

Conservation status

SPA Population at Classification: 612

UK: **RED** (vulnerable globally).

Global: Endangered.

Origin – A winter visitor from Fennoscandia and Russia, although small numbers of non-breeding birds are present in the Forth through the year.

Behaviour – Feeds and roosts in flocks, often mixed with common scoter, although velvet scoter often forage closer to shore. Frequently fly between favoured feeding areas.

Diet – A high proportion of velvet scoter diet consists of molluscs, caught by diving underwater and foraging in mostly sandy substrates.

Habitat – Away from their breeding grounds, velvet scoter spend most of their time on the sea. They forage for food by diving in inshore waters that are up to 20 m deep.

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

DISTRIBUTION

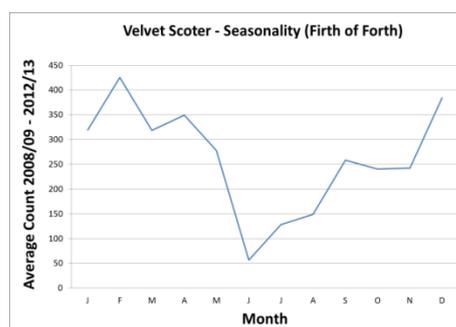
Inner Forth	Rare
Outer areas	Locally common

Large flocks found between Musselburgh and Gullane on the south side of the Forth, and in Largo Bay and St Andrews Bay in Fife.



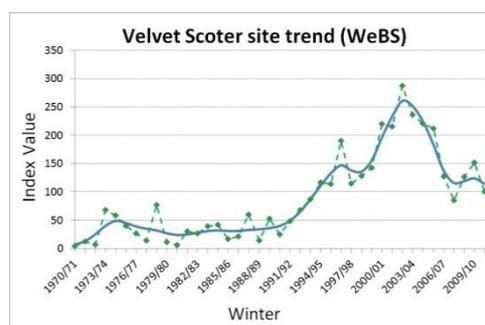
Peter Walkden

Seasonality – Numbers increase from late summer with a peak in late winter.



Pressures – None specifically recognised but in common with other seaduck likely to include recreational water use and interactions with water quality and sediments.

Population trends – Although numbers fluctuate over time, approximately two-thirds of the UK's velvet scoters were in the Firth of Forth during the winter of 2012/13. A greater rate of decline elsewhere leads to the Firth of Forth supporting an increasing proportion of the UK's population of velvet scoter.



Goldeneye

Bucephala clangula

Conservation status

SPA Population at Classification: 2,465

UK: AMBER (small breeding population).

Global: Least Concern.

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

Behaviour – Principally a daytime feeder. Feeds by diving.

Diet – Mostly aquatic insects, molluscs and crustaceans and occasionally fish. Plant material generally less than 25% of diet.

Habitat – Mainly shallow estuaries, bays and harbours; also larger lakes and rivers and in the vicinity of sewage outfalls.

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

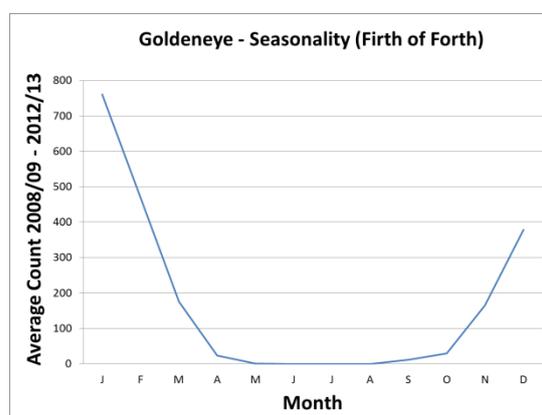
Distribution

INNER FORTH	Widespread, uncommon
OUTER AREAS	Widespread, uncommon



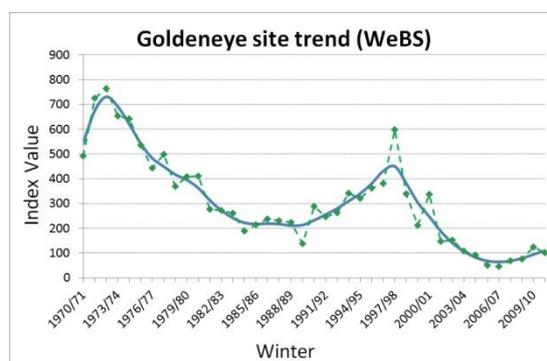
Anne Cotton

Seasonality – Winter visitor (mainly November to March).



Pressures – None specifically recognised but in common with other seaduck likely to include recreational water use and interactions with water quality and sediments. Note declining status in Forth.

Population trends – A declining proportion of Scottish wintering birds are being supported by the Forth. This suggests that conditions on the site are deteriorating for this particular species.



Red-breasted merganser

Mergus serrator

Conservation status

SPA Population at Classification: 670

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 – Gregarious during winter. Feeds by diving.

Diet – Mainly fish and crustaceans; also worms, insects and amphibians.

Habitat – Winters mainly at sea on secluded bays or estuaries. Shows a preference for clear, shallow waters not affected by heavy wave action.

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

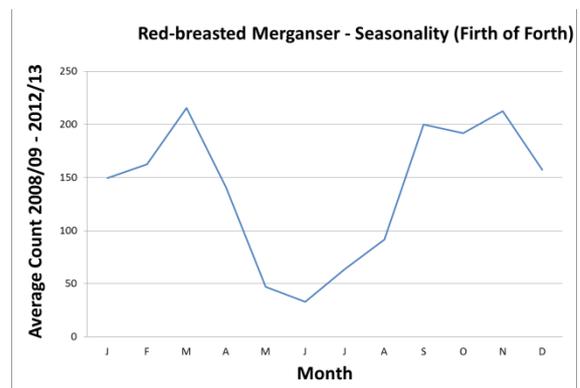
Distribution

INNER FORTH	Widespread, uncommon
OUTER AREAS	Widespread, uncommon



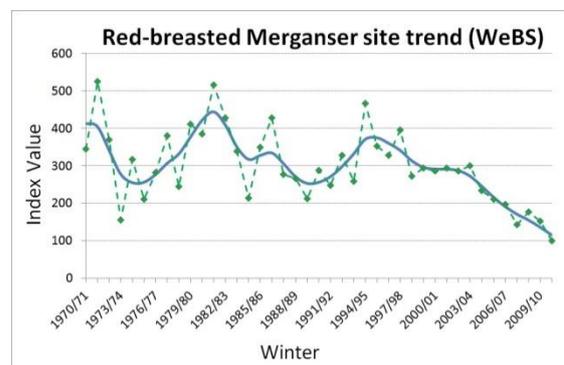
Anne Cotton

Seasonality – Mainly a winter visitor, but birds start returning in late summer to moult in the Firth of Forth.



Pressures – This species is shot under licence at fisheries throughout Scotland. Otherwise, none specific, but note declining status in Forth.

Population trends – The Firth of Forth supports a declining proportion of Scottish wintering birds. This suggests conditions for this particular species on the site are deteriorating relative to other sites.



Red-throated diver

Gavia stellata

Conservation status

SPA Population at Classification: 104 individuals

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. Occasionally in large flocks further offshore. Often flies between feeding grounds on wintering areas.

Diet – Primarily fish.

Habitat – Principally a marine species in winter, occurring on sheltered inshore waters above soft substrates and sometimes also in large numbers further offshore. Offshore occurrence maybe more frequent than is recorded but difficult to monitor.

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

Distribution

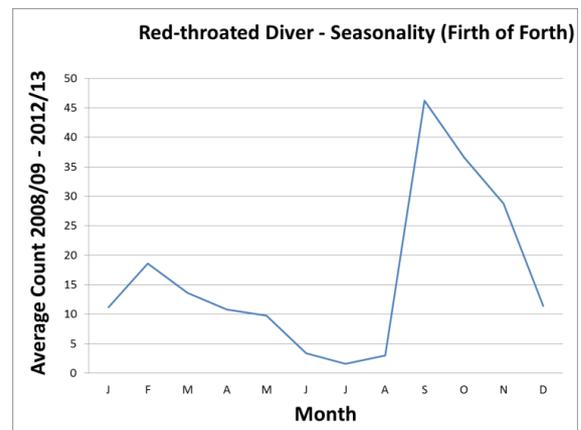
Inner Forth	Scarce
Outer areas	Widespread, scarce

The largest numbers are in the outer Firth of Forth and St Andrews Bay.



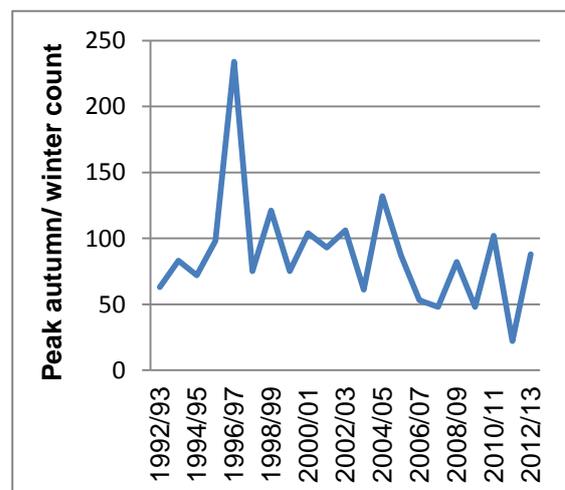
Dave King

Seasonality – Numbers peak in autumn with low numbers present all year.



Pressures – None specific.

Population trends – Appears relatively stable but data should be treated with caution as this species is difficult to survey comprehensively from the shore. Birds spend much of their time too far from land to count accurately.



Fulmar

Fulmarus glacialis

Conservation status

SPA Population at Classification: 798 Pairs

UK: **AMBER** (endangered in Europe, localised breeding).

Global: Least Concern.

Origin – Adult birds spend the winter offshore in Scottish waters, with immatures wandering more widely around the North Atlantic.

Behaviour – Can forage very long distances from breeding sites. Surface feeder, frequently following fishing vessels, also feeds on bioluminescent prey at night.

Diet – Fish, squid, crustaceans, other marine invertebrates, and material discarded from fishing vessels.

Habitat – Fulmars are a marine species feeding out at sea during both day and night. In the Forth, most breed on cliffs and stacks on offshore islands. Small numbers also breed on the mainland coast on cliffs and occasionally man-made structures.

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

Distribution

Inner Forth	Rare
Outer areas	Widespread, common

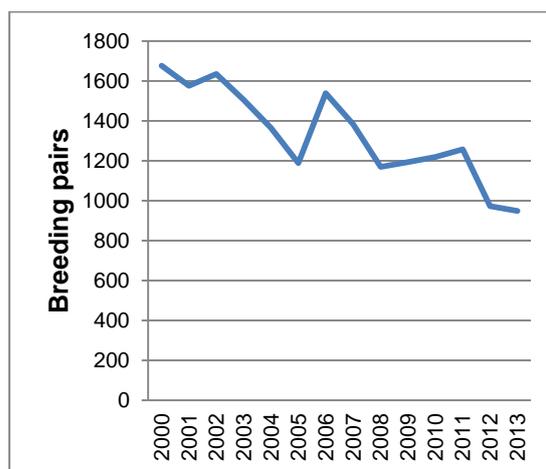


Anne Cotton

Seasonality – Most breeding birds are back at their nests in January. All birds have left breeding cliffs by September. Scarce at sea outside nest occupation period.

Pressures – Discards from fishing supported an expansion of the population during the 20th century. Changes in treatment of fishing discards might have significant population effects on this species.

Population trends – Breeding numbers have declined on the Forth islands in recent years.



Manx shearwater

Puffinus puffinus

Conservation status

SPA Population at Classification: N/A (dSPA)

UK: **AMBER** (moderate breeding range decline over longer term, important localised breeder).

Global: Least Concern.

Origin – A North Atlantic species of which 80% nest on islands off the west coast of Britain and Ireland. Manx shearwaters are predominantly spring and autumn migrants off the east coast of Scotland. They winter in the south Atlantic off South America.

Behaviour – Manx shearwaters are a long-distance migrant, able to cover very large distances over the sea. This species feeds on the surface as well as underwater, where it actively pursues prey using its wings.

Diet – Manx shearwater diet consists mainly of fish and squid.

Habitat – Oceanic but mainly over the continental shelf, only coming ashore to breed on predator-free offshore islands.

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

Distribution

Inner Forth	Rare
Outer areas	Uncommon

Small or moderate numbers are intermittently recorded offshore from the Outer Forth areas during summer and early autumn. Some are driven into the Inner Forth during particularly strong winds.



Seasonality – A rare breeder on the Isle of May where small numbers of birds return from their wintering grounds in April. Peak numbers in the Forth are movements of birds not breeding in the Forth – particularly between July and September

Pressures – Breeding range is constrained by the presence of rats and other ground predators on otherwise suitable offshore islands.

Population trends – There are currently no national population trends available for this species. Manx shearwaters breed in burrows in the ground and only return to their colonies at night, so their populations are very difficult to monitor. Within the Forth the presence of single pair(s) breeding on the Isle of May has been proven in recent years but further birds may be present where ground predators are absent.

Alex Barclay

Gannet

Morus bassanus

Conservation status

SPA Population at Classification: 21,600 pairs

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

Global: Least Concern.

Origin – Breeds throughout the North Atlantic with Scotland holding half the world population in 14 colonies. The Bass Rock in the Firth of Forth is the world's largest single colony. Winter out at sea as far south as West Africa. As birds grow older they winter closer to the breeding grounds.

Behaviour – Breeding birds fly between their colony and foraging areas up to 500 km away. Large feeding flocks occur in the Forth. Gannets can catch prey at a wide range of depths. Prey is caught by plunge-diving from height or occasionally by diving from the surface.

Diet – A diverse range of fish and squid, including fisheries discards.

Habitat – Gannets are a marine species that rarely come to land except to breed. They breed on sheer cliffs and stacks, but where conditions are right, as on Bass Rock, also on flat surfaces.

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

Distribution

Inner Forth	Scarce
Outer areas	Locally numerous

In the Forth only breeds on Bass Rock.

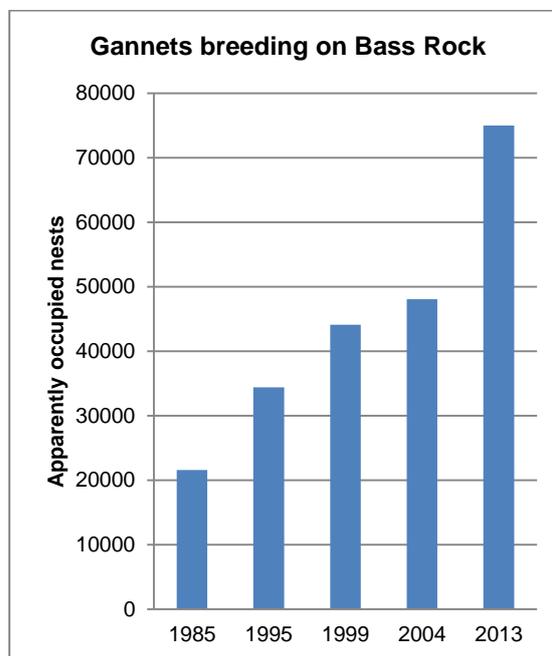


Jill Pakenham

Seasonality – Gannets are present all year but more numerous during the breeding season. They return to their nesting sites in January. Most egg laying takes place in April and fledging peaks in early to mid-September.

Pressures – Plastic debris floating in the sea can be ingested or cause entanglement, both potentially fatal. Flight heights of gannets could make them vulnerable to collision at wind farms. Changes to fisheries discard regulations may affect gannets.

Population trends – Bass Rock is now the largest gannetry in the North Atlantic, following steady increases in recent decades. A similar increase has been reported at other Scottish colonies.



Great cormorant

Phalacrocorax carbo

Conservation status

SPA Population at Classification: 200 Pairs

UK: **GREEN**

Global: Least Concern.

Origin – Resident breeders supplemented by migrants in winter. Most Scottish Cormorants are of the sub-species *P.c. carbo*.

Behaviour – In the Forth breeds on cliffs and stacks on islands. Feeds by diving underwater from the surface.

Diet – A wide range of small fish (generally smaller than 20 cm in length) such as butterfish, sandeels, flatfish and eels.

Habitat – Feeds in shallow water, generally less than 20 m deep. Foraging range up to 50 km. Roosts on man-made structures (e.g. buoys, jetties, harbour walls) as well as natural rocky headlands, islands, beaches and on estuaries at low tide.

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

DISTRIBUTION

Inner Forth	Widespread, common
Outer areas	Widespread, common



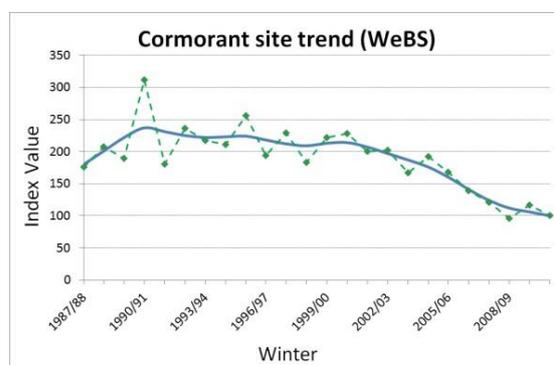
Edmund Fellowes

Seasonality – Numbers peak in autumn, bolstered by young birds.

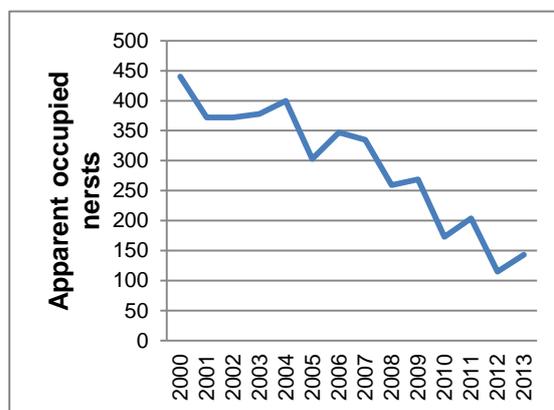


Pressures – Cormorant are shot under licence at inland fisheries in Scotland.

Population trends – The winter population in the Firth of Forth is declining but tracking the Scottish trend.



The breeding population on the Forth islands is declining.



Shag

Phalacrocorax aristotelis

Conservation status

SPA Population at Classification: 2,400

Pairs

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

Global: Least Concern.

Origin – A resident and dispersive species with interchanges of birds between the Forth and elsewhere in Scotland, England and Norway.

Behaviour – Shags dive from water surface pursuing fish underwater. Can form large flocks, both at roosting and feeding sites.

Diet – Small fish, most commonly sandeels, even in winter months. Young are fed almost exclusively on lesser sandeels *Ammodytes tobianus*.

Habitat – Almost exclusively marine, breeding on most of the islands in the Forth. Shags are seldom seen far from shore and do not forage far from breeding colonies. Roosts on man-made structures (e.g. buoys, jetties, harbour walls) as well as natural features such as rocky headlands and islands.

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

Distribution

Inner Forth	Rare
Outer areas	Widespread, common



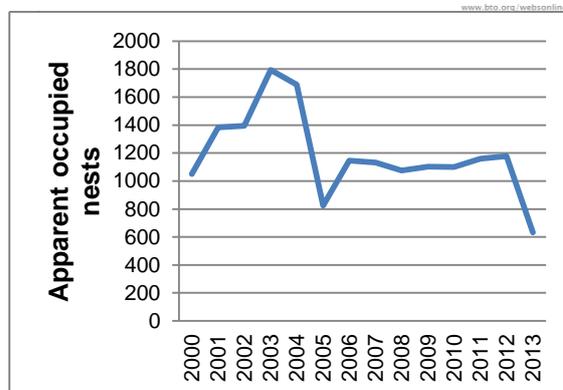
Hugh Insley

Seasonality – Numbers peak in autumn, bolstered by young birds.



Pressures – Sandeel shortages cause breeding failure; winter storms.

Population trends – Winter and breeding numbers fluctuate with some evidence of recent decline (in common with elsewhere in Scotland).



Great crested grebe

Podiceps cristatus

Conservation status

SPA Population at Classification: 646

UK: **GREEN**

Global: Least Concern.

Origin – Most wintering birds probably breed locally but there are few ring recoveries. Little is known about the amount of interchange between Britain and continental Europe.

Behaviour – Largely solitary during winter, though temporary aggregations may form.

Diet – Includes large fish, insects, crustaceans (e.g. crayfish and shrimps) and molluscs.

Habitat – Overwinters on large lakes and reservoirs, and in inshore coastal waters especially when inland waters are frozen.

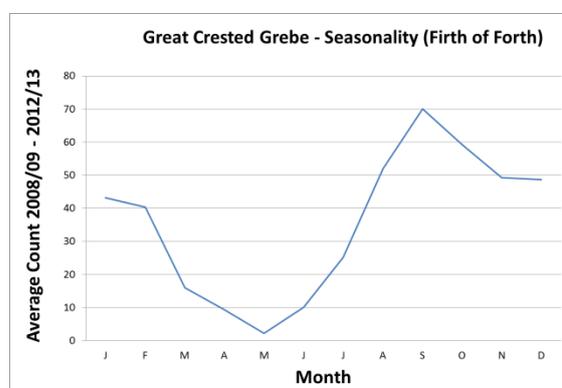
	Low tide	High tide
Open water	✓	✓
Intertidal mud	-	✓
Saltmarsh	-	-
Rocky shore	-	-
Coastal fields	-	-
Inland fields	-	-

Distribution

Inner Forth	Widespread, uncommon
Outer areas	Widespread, uncommon

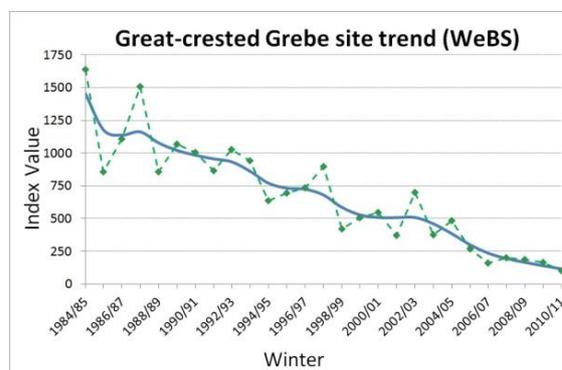


Seasonality – Mainly a winter visitor and passage migrant with peak in September. Many pairs breed on nearby lakes and reservoirs, especially in Fife.



Pressures – None specified but note the severe declining trend for this species.

Population trends – Severe and steady decline. The trend for the Forth is broadly tracking the Scottish trend, although a declining proportion of Scottish wintering birds are being supported by the site. This suggests that conditions for this particular species are deteriorating on the site.



Slavonian grebe

Podiceps auritus

Conservation status

SPA Population at Classification: 84

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

Global: Least Concern.

Origin – Birds wintering in the Firth of Forth probably breed in Iceland and Norway.

Behaviour – Slavonian grebe dive underwater from the surface to catch prey.

Diet – Mainly small fish and crustaceans.

Habitat – In winter predominantly a marine species, preferring sheltered sites.

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

Distribution

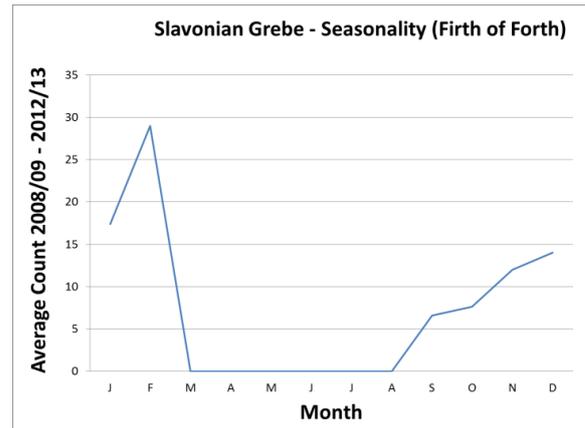
Inner Forth	Rare
Outer areas	Local and uncommon

Most regular between Musselburgh and Gullane on the south side of the Forth and in Largo Bay in Fife.



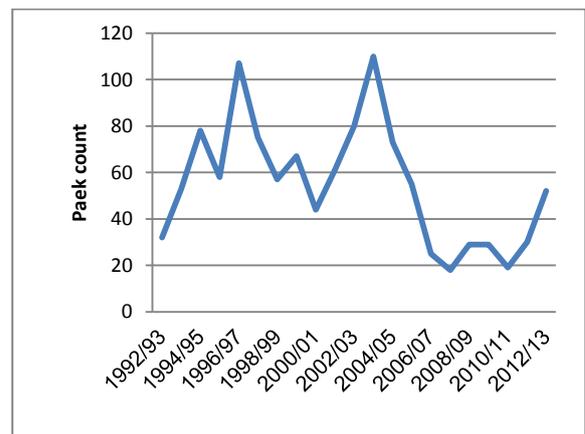
Adrian Dancy

Seasonality – Numbers increase from August onwards, peaking in late winter. Absent in summer.



Pressures – None specified.

Population trends – Peak counts are lower than they were in the 1990s which contrasts with the wider Scottish trend. Overall numbers are small and variable, and therefore difficult to interpret.



Oystercatcher

Haematopus ostralegus

Conservation status

SPA Population at Classification: 7,846

UK: **AMBER** (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 – Prey is detected by both sight and touch and birds feed by day and night. Many oystercatchers are site faithful, returning to the same shellfish beds, though others roam over a wider area. Less sensitive to disturbance than other waders.

Diet – Predominantly shellfish, especially large cockles *Cerastoderma edule* and mussels *Mytilus edulis*. Also include ragworms *Nereis* species and lugworms *Arenicola* species on mudflats and earthworms.

Habitat – Mostly on shellfish beds on intertidal mudflats, using nearby mixed wader roost sites when feeding areas are covered by tides. Some also feed on adjacent greenfield areas.

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

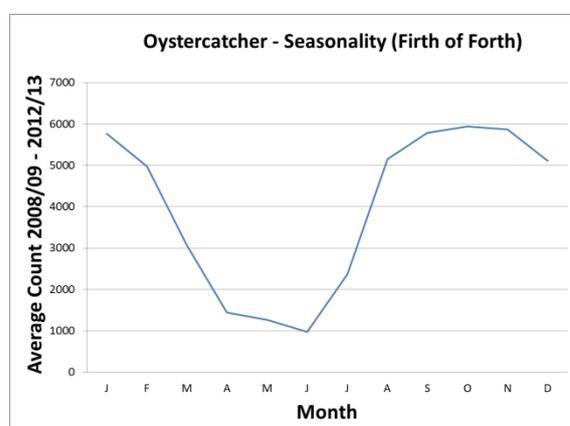
DISTRIBUTION

Inner Forth	Widespread, numerous
Outer areas	Widespread, numerous



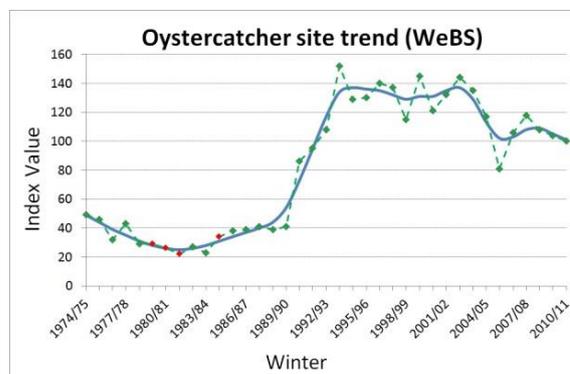
Jill Pakenham

Seasonality – Modest numbers breed along rocky coasts and in fields adjacent to the estuary and coasts. Highest numbers occur during autumn passage through to mid winter, birds begin vacating the site early in the year.



Pressures – Dredging for shellfish, habitat loss (including loss of high tide roost sites).

Population trends – The proportion of Scottish wintering birds using the Forth has remained stable after an increase in the early 1990s. This suggests conditions on the site remain favourable for this particular species.



Golden plover
Pluvialis apricaria

Conservation status
SPA Population at Classification: 2,949
UK: GREEN
Global: Least Concern.

Origin – Wintering birds on the Forth breed in Britain, Fennoscandinavia and Iceland.

Behaviour – Birds forage by day and by night, returning to the same favoured sites each year. Tend to be more tolerant of disturbance than other waders, with flight distances of approximately 50m compared with almost 100m for Redshank and Curlew.

Diet – Mainly insects, especially beetles; also other invertebrates and some plant material.

Habitat – Feeds mainly on pasture and arable farmland in winter with mudflats and saltmarshes mainly used for roosting.

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

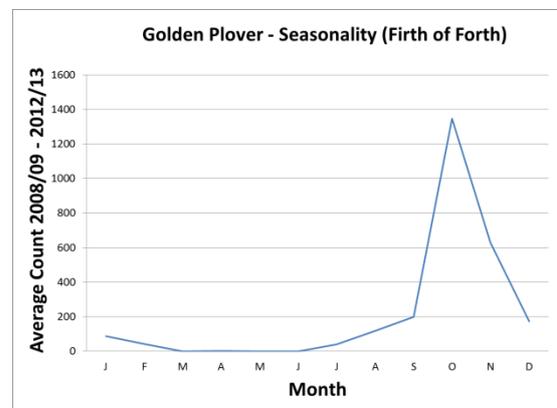
DISTRIBUTION

Inner Forth	Locally common
Outer areas	Locally common



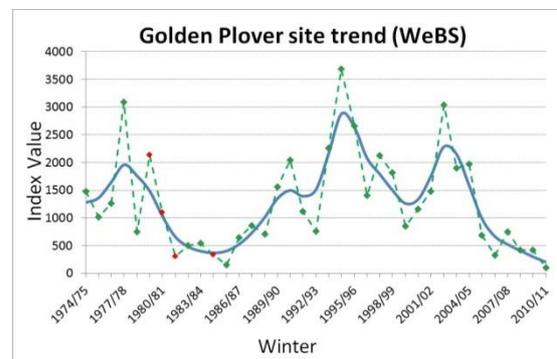
Jill Pakenham

Seasonality – Present during autumn passage and early winter (mainly September to December). Some breed in nearby uplands.



Pressures – Long term declines may be associated with changing conditions in breeding areas.

Population trends – The Forth trend is broadly tracking the Scottish trend, although a declining proportion of Scottish wintering birds are being supported by the site. This suggests that conditions on the site are deteriorating for this species.



Grey plover

Pluvialis squatarola

Conservation status

SPA Population at Classification: 724

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

Global: Least Concern.

Origin – All birds come from the population breeding in western Siberia.

Behaviour – Site faithful, defending individual feeding territories within and between winters. Feeds by sight but can forage by night as well as day.

Diet – Predominantly marine (polychaete) worms, molluscs and crustaceans.

Habitat – Estuaries and lagoons, feeding on mudflats and joining mixed wader roosts. Roost sites may include man-made artefacts or occasionally adjacent fields.

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

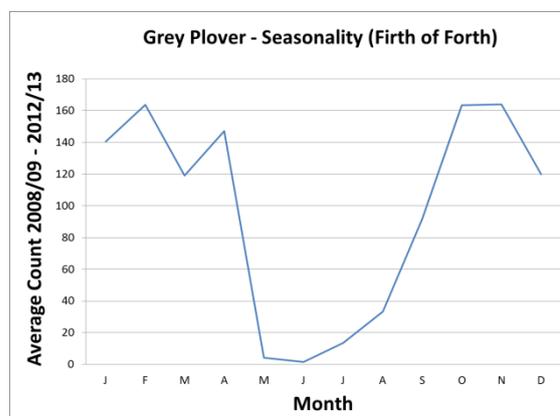
Distribution

Inner Forth	Scarce
Outer areas	Widespread, uncommon



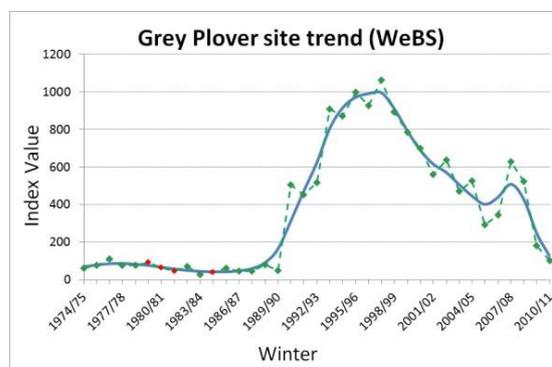
Jill Pakenham

Seasonality – Winter visitor, with first passage or returning birds as early as July.



Pressures – There is some evidence that the distribution of this species is shifting north eastwards in response to climate change. Sensitive to disturbance by walkers and dogs.

Population trends – The trend for the Forth is broadly tracking the Scottish trend, although a declining proportion of Scottish wintering birds are being supported by the site. This suggests that conditions for this species are deteriorating on the site.



Lapwing

Vanellus vanellus

Conservation status

SPA Population at Classification: 4,148

UK: RED (severe recent & longer term breeding population decline).

Global: Near Threatened.

Origin – The majority of wintering birds come to the UK from central Europe and Russia.

Behaviour – Lapwings feed by sight, but have large eyes and so can feed at night, especially during brighter nights.

Diet – Wide range of invertebrates including beetles and earthworms.

Habitat – Feeds mainly on pasture, wet meadows and arable farmland in winter. Roosts in fields or on saltmarsh. Estuarine sites are especially important in cold weather when inland sites freeze.

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

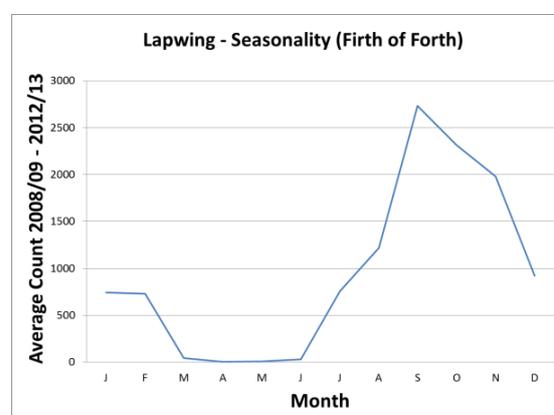
Distribution

Inner Forth	Locally common
Outer areas	Locally common



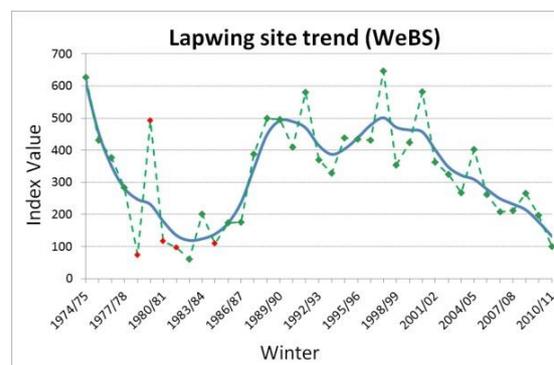
Adrian Dancy

Seasonality – Mainly a passage migrant with some birds wintering. Breeds inland around the estuary and suitable areas of the SPA such as Aberlady Bay. The first continental birds return in July.



Pressures – Steep declines in western Europe have been linked to agricultural intensification. Climate change may further reduce the value of Scottish sites as a winter destination.

Population trends – The trend for the Forth tracks the Scottish trend, although with an increasing proportion of Scottish wintering birds being supported by the site. This suggests that, despite the ongoing decline in numbers, conditions on the site remain relatively favourable for this species.



Ringed plover
Charadrius hiaticula

Conservation status

SPA Population at Classification: 328

UK: RED (severe recent non-breeding population decline; important non-breeding population).

Global: Least Concern.

Origin – Movements are poorly understood. Wintering birds may be local or from further north in Scotland, or elsewhere around the North Sea. Birds from Fennoscandia, Iceland and Greenland probably occur mainly on passage.

Behaviour – Can occur in large flocks in winter. Feeds by sight.

Diet – Mainly marine worms, crustaceans and molluscs.

Habitat – Predominantly sand and shingle shores, sandbanks and mudflats, roosting close to the feeding sites on bare ground and in low vegetation. May also join mixed wader roosts including those on man-made artefacts.

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

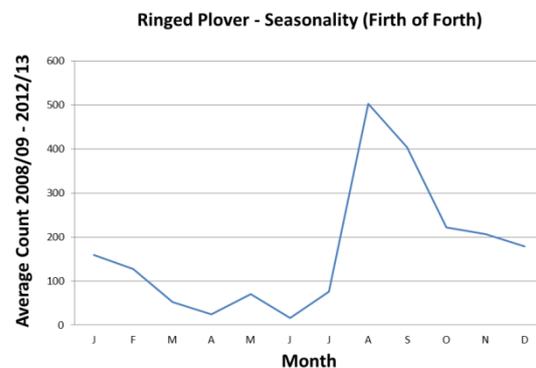
Distribution

INNER FORTH	Widespread in small numbers
OUTER AREAS	Widespread in small numbers



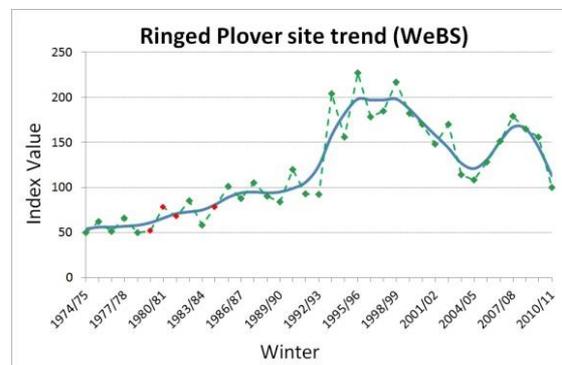
Jill Pakenham

Seasonality – Mainly a passage migrant and winter visitor with peak in autumn (August-September). Small numbers breed on shore and nearby ‘broken’ ground (including man-made surfaces and unvegetated patches in fields).



Pressures – Disturbance to breeding birds is a major threat to this species.

Population trends – Numbers have declined recently. Despite the decrease in numbers on the site an increasing proportion of Scottish wintering birds are supported by the Firth of Forth, suggesting site conditions remain relatively favourable for this species.



Curlew

Numenius arquata

Conservation status

SPA Population at Classification: 1,928

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 Fennoscandinava.

Behaviour – Gregarious during winter, occurring in flocks. Birds tend to be site faithful within and between winters. Curlew feed primarily by touch. Sensitive to disturbance.

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

Habitat – muddy shorelines of estuaries, lagoons, lakes and rivers, with some birds also using inland fields. Roosts at high tide, usually among mixed wader flocks. Roost sites can include man-made artefacts as well as more natural habitats.

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

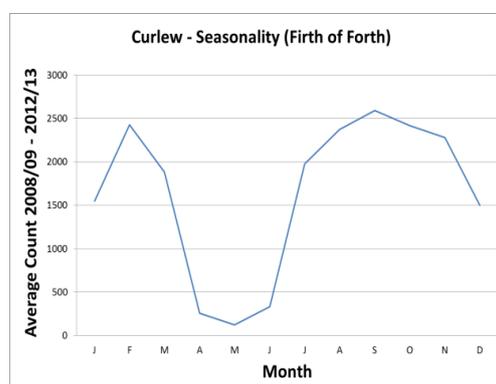
Distribution

INNER FORTH	Widespread, numerous
OUTER AREAS	Widespread, numerous



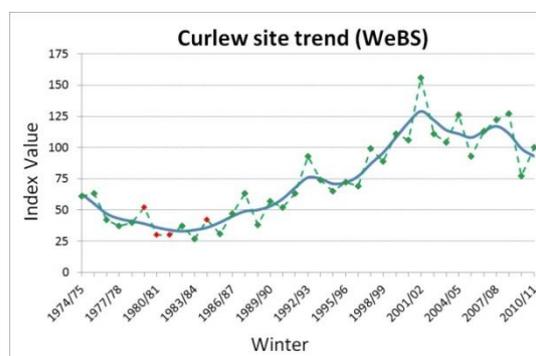
John Harding

Seasonality – Peaks occur in autumn and in late winter. A small (and declining) population breeds in fields adjacent to the estuary and coasts.



Pressures Agricultural intensification, afforestation and predation threatens breeding birds. Disturbance at feeding and especially roost sites by walkers and dogs.

Population trends – Winter numbers are variable but increased to a maximum count of 2,582 in 2008/09 and have decreased slightly since to 1,777 in 2012/13. The Forth trend is similar to the Scottish trend. This suggests that conditions on the site remain relatively favourable for this species.



Bar-tailed godwit

Limosa lapponica

Conservation status

SPA Population at Classification: 1,974

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

Global: Near Threatened.

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

Behaviour – Highly gregarious in winter, forming large flocks. Many birds are site faithful but small numbers do move sites within or between winters. Relatively sensitive to disturbance compared to other waders.

Diet – Mainly marine worms from mudflats.

Habitat – Mudflats in estuaries, preferring the outer parts of estuaries where substrates are generally most sandy. Joins mixed wader roosts at high tide.

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

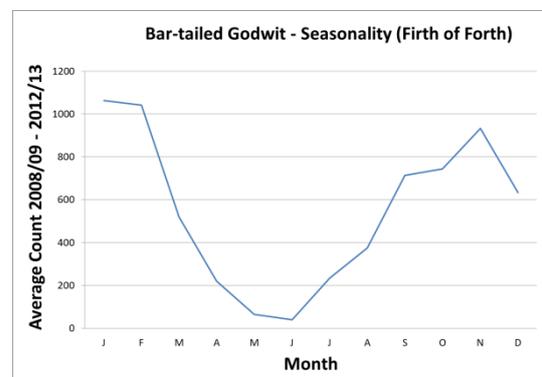
Distribution

INNER FORTH	Local, common
OUTER AREAS	Local, numerous



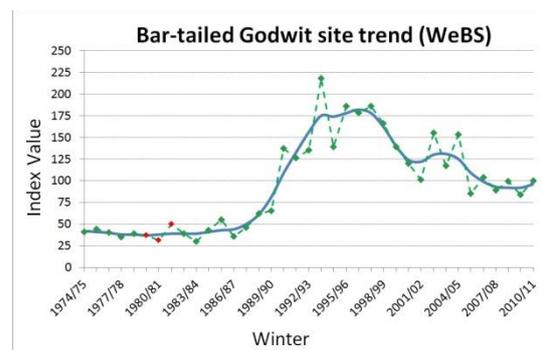
Al Downie

Seasonality – Mainly winter visitor but some spring passage migrants are present in May and return passage may begin in July.



Pressures – Disturbance of feeding flocks and especially roosts by walkers and dogs.

Population trends – The trend for the Forth is broadly tracking the Scottish trend, although an increasing proportion of the Scottish wintering birds are supported by the site. This suggests that despite the ongoing decline in numbers, conditions on the site remain relatively favourable for this species.



Turnstone

Arenaria interpres

Conservation status

SPA Population at Classification: 860

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

Global: Least Concern.

Origin – Wintering turnstone breed in Canada and Greenland. Baltic birds occur in the Forth on migration.

Behaviour – Locates food by sight, often by turning over pebbles or seaweed. Highly site faithful, both within and between winters, often remaining in flocks with the same membership. Not particularly sensitive to disturbance compared to other wader species.

Diet – A very wide range of invertebrates and other material, including carrion.

Habitat – Often along rocky or stony shores, but also on mudflats or sandy shores and especially on tide wrack. May join mixed wader roosts, including on man-made artefacts.

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

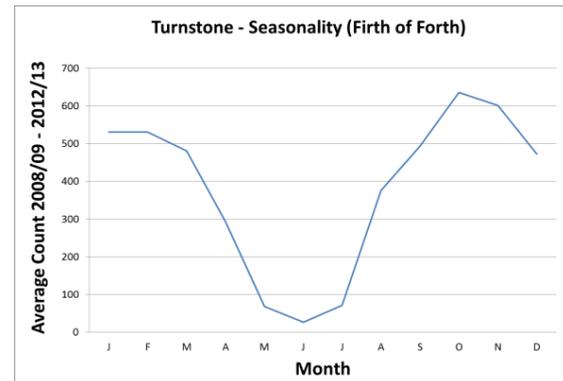
Distribution

Inner Forth	Local, scarce
Outer areas	Locally common



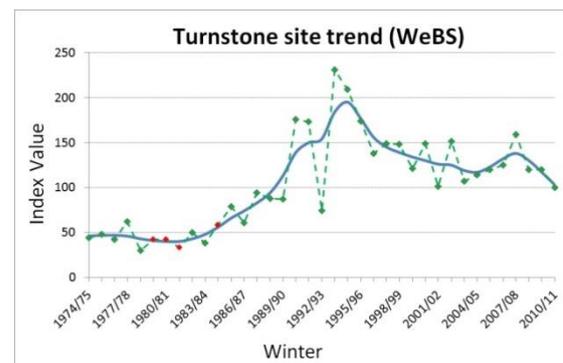
Rob Robinson

Seasonality – Wintering numbers are just exceeded by a passage peak in October. A few non-breeders spend the summer.



Pressures – Climate change may be the cause of a northerly shift in wintering range of turnstone.

Population trends – The proportion of Scottish wintering birds using the Forth has remained stable after increasing in the early 1990s. This suggests the Forth area remains relatively favourable for this species.



Knot

Calidris canutus

Conservation status

SPA Population at Classification: 9,258

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

Global: Near Threatened.

Origin – Most birds wintering in Britain are from Greenland and Arctic Canada.

Behaviour – Knot feed in very large dense flocks on open mudflats, catching food mainly by touch. Flocks will move with the tide and may cover very extensive areas of mudflat. Sometimes fly many kilometres to roost sites. Sensitive to disturbance, especially at roost sites.

Diet – Mainly molluscs, including tellins *Macoma balthica*, mussels *Mytilus edulis*, cockles *Cerastoderma edulis* and mudsnails *Hydrobia ulvae*, the latter especially in early winter.

Habitat – Extensive intertidal mudflats. Knot roost sites may include man-made artefacts and occasionally fields adjacent to the shore.

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

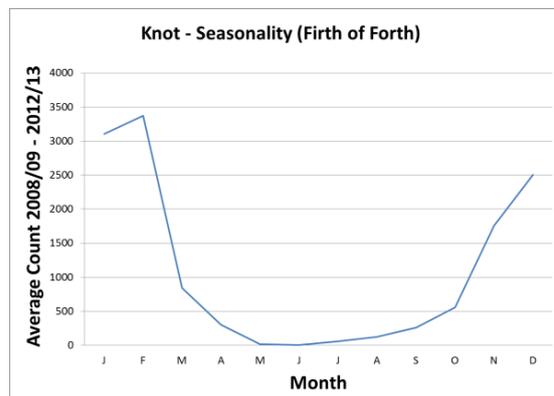
Distribution

Inner Forth	Widespread and numerous
Outer areas	Locally numerous



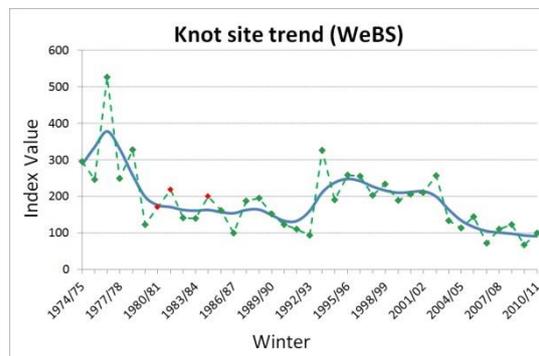
Neil Calbrade

Seasonality – Winter visitor. Mainly October to March, peak in January/February.



Pressures – Climate change may be the cause of an easterly shift in the wintering distribution of this species

Population trends – The trend for the Forth broadly tracks the Scottish trend, although a declining proportion of Scottish wintering birds are being supported by the site. This suggests that conditions on the site are deteriorating for this species.



Dunlin

Calidris alpina

Conservation status

SPA Population at Classification: 9,514

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 Fennoscandinavia and European Russia. Dunlin from Iceland and southeastern Greenland are common on passage.

Behaviour – Feeds by touch and sight by day and night according to tides, remaining in large flocks during winter. Site faithful to winter roost sites both within and between winters.

Diet – Invertebrates, mainly marine worms and small gastropods during winter.

Habitat – Estuarine and non-estuarine intertidal mudflats. Joins wader roosts near feeding areas; will roost on open fields during highest tides.

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

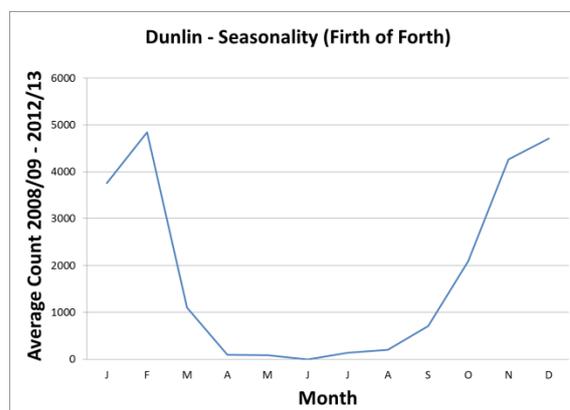
Distribution

Inner Forth	Widespread and numerous
Outer areas	Widespread and numerous



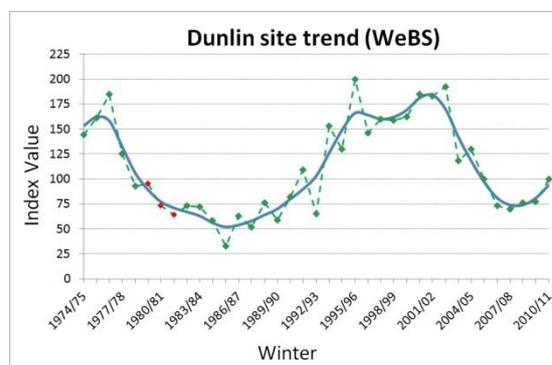
Anne Cotton

Seasonality – Winter visitor (September to March).



Pressures – There is evidence of an easterly shift in the wintering distribution of this species in Europe which may be a result of climate change.

Population trends – The trend for the Forth is broadly tracking the Scottish trend, although with an increasing proportion of Scottish wintering birds being supported by the site. This suggests that despite the recent decline in numbers, conditions on the site remain relatively favourable for this species.



Redshank

Tringa totanus

Conservation status

SPA Population at Classification: 4,341

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

Global: Least Concern.

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

Behaviour – Redshank are usually site faithful in winter, though long-distance movement sometimes occurs, probably in response to cold weather.

Diet – Invertebrates, including insects, spiders, annelid worms, molluscs and crustaceans (especially amphipods).

Habitat – Mainly coastal, including mudflats and tidal estuaries joining mixed wader roosts at high tide. Roost sites may be on man-made artefacts as well as natural sites.

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

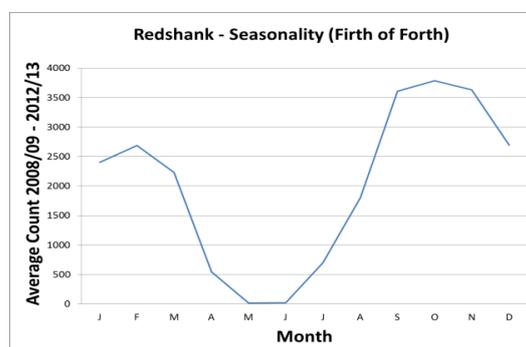
Distribution

Inner Forth	Widespread and numerous
Outer areas	Widespread and numerous



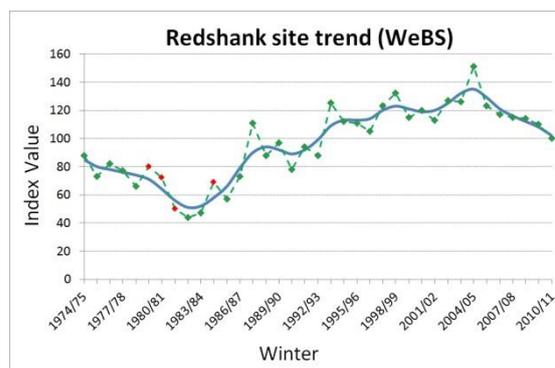
John Harding

Seasonality – Peak numbers occur in autumn, dropping slightly by mid winter. Small numbers breed nearby.



Pressures – Widespread declines in Britain and Europe have been attributed to agricultural intensification on the breeding grounds. Redshank are particularly susceptible to disturbance in severe weather. As they take small prey, they need to feed for longer periods during the tidal cycle than other species and have less scope for extending feeding time when necessary to meet their energy requirements.

Population trends – The trend for the Forth broadly tracks the Scottish trend, although a declining proportion of Scottish wintering birds are being supported by the site. This suggests conditions for this species on the site are deteriorating relative to other sites.



Puffin

Fratercula arctica

Conservation status

SPA Population at Classification: 14,000

UK: RED (globally vulnerable localised breeding population).

Global: Vulnerable.

Origin – Puffin breed on several of the islands in the Firth of Forth. Outside of the breeding season, movements at sea are poorly understood.

Behaviour – Breed in colonies mainly on offshore islands with no mammalian predators. Feed at sea, diving from surface.

Diet – Small fish, with sandeels being the main prey species fed to young during the breeding season.

Habitat – Breed in burrows on offshore islands. Birds on the Isle of May are known to forage up to 64km from the island (most less than 40 km).

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

Distribution

Inner Forth	Rare
Outer areas	Locally numerous

Breeds on islands in Forth Islands SPA.

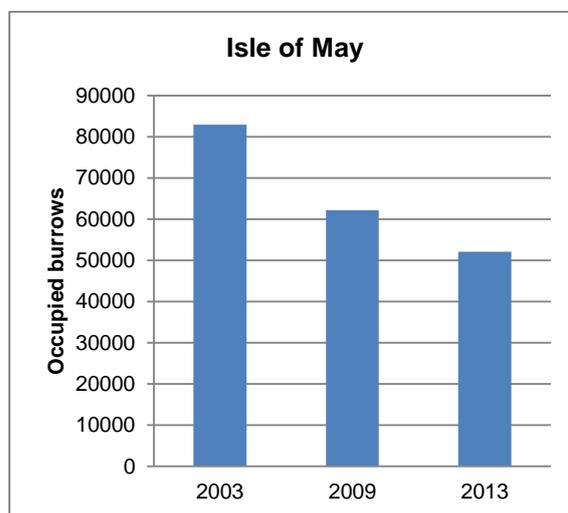


Anne Cotton

Seasonality – Return to their colonies in late March-early April. Most young fledge in July. This species is pelagic in winter and very rarely observed from land.

Pressures – Sensitive to the availability of suitable size (age-class) fish. Also to mammalian predators such as rats in breeding colonies and to some invasive plant species (e.g. tree mallow *Lavatera arborea*) which prevent access to burrows.

Population trends – Monitoring on the Isle of May suggests a recent decline in breeding numbers following a period of increase during the 20th century. This is similar to trends in some, but not all parts of Scotland.



Razorbill

Alca torda

Conservation status

UK: AMBER (localised important breeding population).

Global: Near Threatened.

Origin – Razorbills breed on several of the islands in the Firth of Forth. Local breeders winter in shallow coastal waters, most in the North Sea with some moving south to the Bay of Biscay. Winter birds may include birds from Iceland, the Faroes and Scandinavia.

Behaviour – Breed in colonies of varying sizes mainly on cliffs and offshore islands. Feed at sea, diving from surface.

Diet – Predominantly small fish (sprats *Sprattus sprattus*, herring *Clupea harengus* and sandeels), with prey size being intermediate between those caught by puffin and guillemot.

Habitat – In the Forth, Razorbill breed on cliffs and boulder-scrree slopes on offshore islands.

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

DISTRIBUTION

Inner Forth	Scarce
Outer areas	Locally numerous

Breeds on a number of offshore islands in the outer Forth.

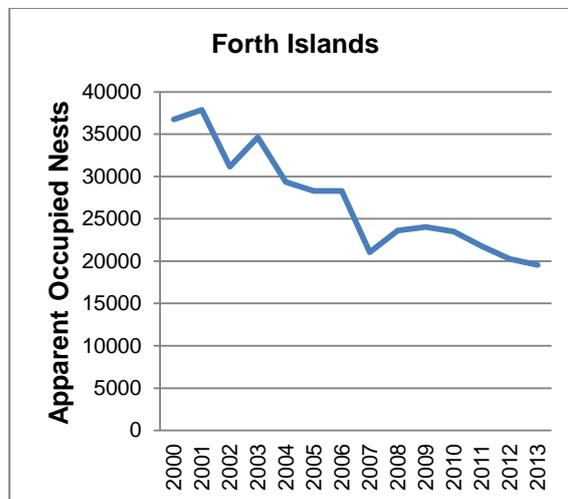


Anne Cotton

Seasonality – Birds are in the Forth all year round (lowest numbers in winter), with most returning to their colonies in late March. Chicks leave their nests during the first week of July when still flightless and are fed by the males for several weeks.

Pressures – Sensitive to the availability of suitable size (age-class) fish.

Population trends – Numbers increased in the Firth of Forth during the 20th century but have declined considerably in the 21st century. This is in contrast to the UK population trend which has increased since 2000.



Guillemot

Uria aalge

Conservation status

SPA Population at Classification: 16,000 pairs

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

Global: Least Concern.

Origin – Guillemot nest on several of the islands in the Firth of Forth. Large numbers of these birds winter off the east coast of Scotland with some moving as far west as Scandinavia, and as far south as the Bay of Biscay. Winter birds may include some from the Faroes and Norway and other British colonies.

Behaviour – Guillemot spend most of their time on the sea, catching their food by diving under the water from the surface. Guillemot, unlike puffins and razorbills only carry one item of prey at a time back to their nest.

Diet – Predominantly small fish such as sandeels, herring and sprats.

Habitat – Outside the breeding season Guillemot are a pelagic species, though a few make short visits to the nesting cliffs in clement weather. In the Forth, Guillemot breed at high densities on sheer cliffs on offshore islands.

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

Distribution

Inner Forth	Uncommon
Outer areas	Locally numerous

Breeds on a number of offshore islands in the outer Forth.

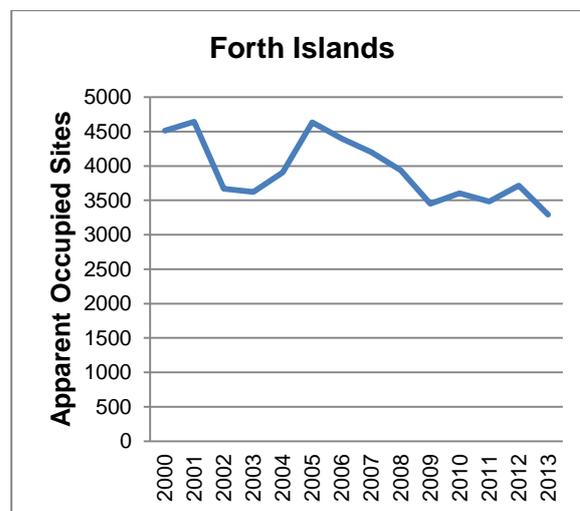


Stuart Newson

Seasonality – Breeding adults return to their colonies by late March. Chicks leave their nests during late June and early July when still flightless and are fed by the males for up to eight weeks.

Pressures – Sensitive to the availability of suitable size (age-class) fish.

Population trends – Numbers increased in the Firth of Forth through the 1980s and 1990s, but have declined since 2003, particularly on the Isle of May, the largest colony in the Forth.



Sandwich tern
Sterna sandvicensis

Conservation status

SPA Population at Classification: 440 Pairs

UK: **AMBER** (recent moderate breeding population decline, localised breeding population).

Global: Least Concern.

Origin – The site is designated as an SPA for the large numbers that congregate in the Forth post-breeding. Ringed birds have originated from breeding sites in Scotland, England, Belgium and The Netherlands. Sandwich terns winter off west Africa, travelling as far as South Africa and the Indian Ocean.

Behaviour – Nests in colonies usually in association with other terns and gulls. Roosts in flocks often with other terns. Dives into the water to catch prey.

Diet – Small fish caught in surface waters.

Habitat – Principally a marine species, but roosts on offshore islands, exposed rocks, estuaries at low tide, and on coastal lagoons. Has nested on offshore islands, undisturbed beaches and sand dunes in the Forth.

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

Distribution

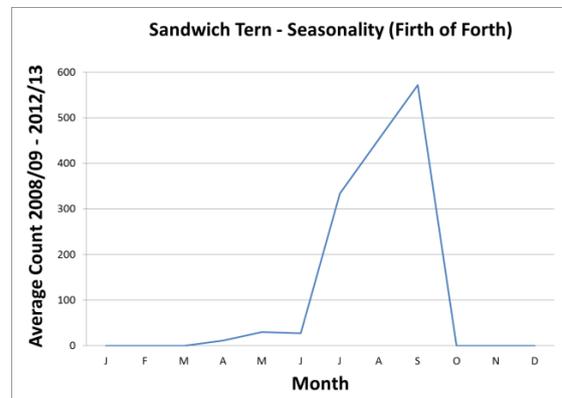
Inner Forth	Uncommon
Outer areas	Common and widespread

Large roosts found between Musselburgh and Aberlady Bay, and also in Tynninghame Bay. Occasionally found in the upper reaches of the estuary when terns follow large shoals of small fish moving upstream.



Jill Pakenham

Seasonality – Large numbers build up in the Forth in July and August (over 2000 in August 2014) with most birds leaving by the end of September.



Pressures – Potentially displaced from colonies by disturbance, predation and increasing gull colonies. Sensitive to the availability of suitable size (age-class) fish.

Population trends – The number of colonies in Scotland has declined dramatically from up to 25 in the past to 7 in 2000, with the subsequent loss of all colonies in the Forth reflecting this.

Common tern

Sterna hirundo

Conservation status

SPA Population at Classification: 558 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. Roosts communally often with other tern species. Feeds by diving into surface waters from an aerial dive.

Diet – Small fish, principally sandeels.

Habitat – Mostly a marine species in Scotland. Nesting on flat ground on offshore islands and formerly on beaches along the Forth coast. Forages over both inshore and offshore waters. Roosts on islands, exposed rocks, estuary shores at low tide.

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

Distribution

Inner Forth	Common
Outer areas	Widespread, common, locally numerous
Important colonies are present at Imperial Dock Lock, Leith SPA, the Isle of May and scattered smaller colonies elsewhere.	

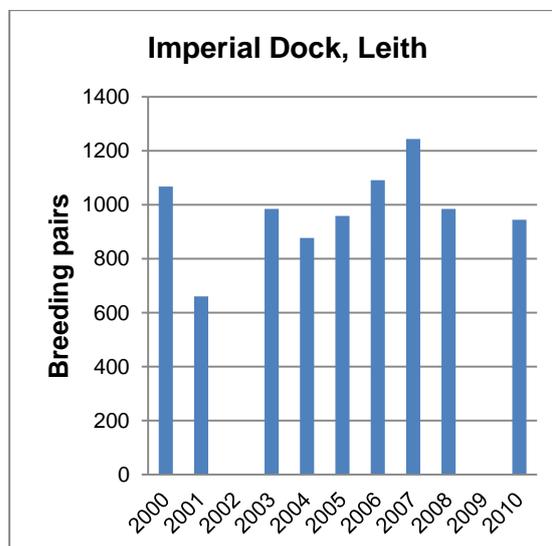


Jill Pakenham

Seasonality – The first common tern arrive in the Forth in mid April with the majority back by early May. Most have left by the first week in September.

Pressures – May be displaced from breeding colonies by human disturbance, predation and increasing gull colonies. Sensitive to the availability of suitable size (age-class) fish, particularly sandeel and sprat.

Population trends – Typically for terns, colony numbers and distributions fluctuate with colonies being formed and deserted over time. Numbers have been generally stable since 2000.



Roseate tern

Sterna dougallii

Conservation status

SPA Population at Classification: 8 Pairs

UK: RED (severe recent & longer term breeding population decline & breeding range reduction over the longer term).

Global: Least Concern.

Origin – Now an irregular breeder, birds visiting the Firth of Forth area are likely to be from colonies in Northumberland. Roseate terns winter off west Africa.

Behaviour – Nests in colonies usually with other terns but often amongst rocks and under artificial cover. Roosts in flocks often with other tern species

Diet – Small fish, principally sandeels in surface waters, which are caught from an aerial dive.

Habitat – Away from their breeding grounds roseate terns are a highly marine species and feed further offshore than most other tern species. Roosts on islands, exposed rocks, estuary shores at low tide.

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

Distribution

Inner Forth	Rare
Outer areas	Rare

Formerly a regular breeder, they are still seen annually, including amongst colonies of other terns.



Graham Catley

Seasonality – Roseate tern arrive in Scottish waters between late April and early June. Post-breeding, occasional birds wander into the Forth in August and early September.

Pressures – Displaced from former colonies by human disturbance, predation and increasing gull colonies. Sensitive to the availability of suitable size (age-class) fish.

Population trends – The UK and Irish population underwent a large decline in the 20th century, with only a few of the large colonies extant. Numbers at these colonies have been increasing since 2000. With an extant colony in Northumberland, and birds recorded annually in the Forth, re establishment of breeding remains possible.

Arctic tern

Sterna paradisaea

Conservation status

SPA Population at Classification: 540 Pairs

UK: **AMBER** (moderate recent breeding population & range decline).

Global: Least Concern.

Origin – A highly migratory species spending northern winters in the southern oceans, with some reaching Antarctic pack ice. Birds breeding elsewhere in northern Britain, Iceland, Scandinavia and western Siberia are likely to pass through.

Behaviour – Nests in colonies. Roosts in flocks often with other tern species.

Diet – Small fish, principally sandeels in surface waters which are caught from an aerial dive.

Habitat – Nests on flat ground. Roosts on offshore islands, exposed rocks, estuaries at low tide, coastal lagoons.. Away from their breeding grounds Arctic tern are a highly marine species. Feeds in inshore and offshore waters.

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

Distribution

Inner Forth	Uncommon
Outer areas	Widespread, common, locally numerous

Nested historically on several of the islands in the Firth of Forth, although only on the Isle of May since 1998.

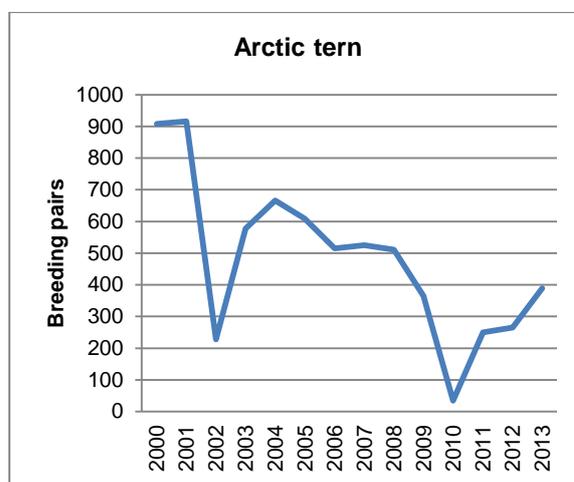


Anne Cotton

Seasonality – The first arctic tern arrive back in the Forth in mid April with the majority back by mid May. Most have left by early September.

Pressures - Displaced from former colonies by human disturbance, predation and increasing gull colonies. Sensitive to the availability of suitable size (age-class) fish, particularly sandeel and sprat.

Population trends – Having been absent from the Isle of May since 1958, arctic tern recolonised the island in 1984 after which numbers increased to 916 pairs in 2001. Numbers have subsequently declined in line with the Scottish trend.



Kittiwake

Rissa tridactyla

Conservation status

SPA Population at Classification: 8,400 Pairs

UK: RED (severe recent & longer term breeding population decline).

Global: Least Concern.

Origin – A marine species breeding in the North Atlantic and North Pacific. Scottish birds winter at sea and may travel as far as North Africa and the east coast of North America. Birds from Norway winter in the North Sea.

Behaviour – Breeds in colonies. Food is caught through shallow plunge-dives or picked from the surface of the sea.

Diet – Sandeels are main prey species for both adults and young in the Forth. In winter, their diet consists mainly of marine invertebrates and small fish.

Habitat – Breeds on cliffs or buildings. Most colonies are on the Forth islands with a few on mainland. Feeds in the open sea. The Banks (area of shallow sea 40 km east) is an especially important feeding ground.

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

DISTRIBUTION

Inner Forth	Locally numerous post breeding
Outer areas	Widespread and locally numerous

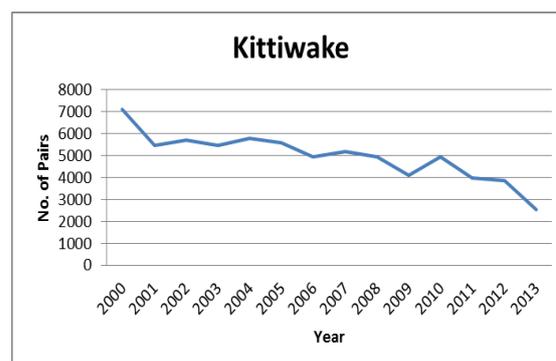


Jill Pakenham

Seasonality – Kittiwake return to their colonies in late February or March. The timing of egg-laying depends on weather and feeding conditions. Nesting colonies are deserted by late August but large feeding concentrations and passage along the east coast occur late into autumn. Some kittiwake winter in the North Sea, but only come close to the coast in inclement weather.

Pressures – Sensitive to the availability of suitable size (age-class) fish.

Population trends – The breeding population of kittiwake in the UK declined by 61% between 2000 and 2013 with a similar decline being recorded in the Firth of Forth.



Black-headed gull
Chroicocephalus ridibundus

Conservation status

SPA Population at Classification: N/A (dSPA)

UK: **AMBER** (moderate recent non-breeding population decline and important non-breeding population).

Global: Least Concern.

Origin – Some winter birds may breed locally; many others breed in northern Europe especially Fennoscandinavia and the Baltic States.

Behaviour – Gregarious throughout the year. Roosts at night in large flocks in winter on the sea, estuary or inland reservoirs, often feeding inland. Often tolerant of humans.

Diet – Mainly aquatic and terrestrial invertebrates. Also artificial food sources provided by humans such as discards or landfill.

Habitat – Most common in winter in coastal habitats though generally avoids rocky coastlines and occurs inland in many different natural and urban habitats.

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

Distribution

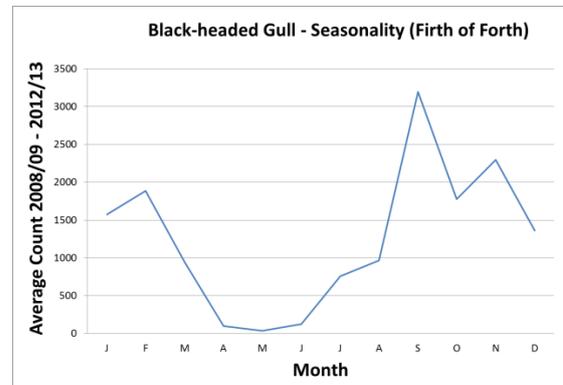
Inner Forth	Widespread and numerous
Outer areas	Widespread and numerous

Small numbers breed close to the SPAs.



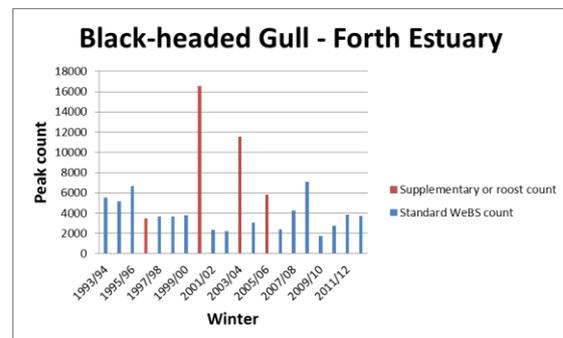
Anne Cotton

Seasonality – Mostly a winter visitor. Failed breeders or post-breeding birds start returning from late June. Peak in September.



Pressures – Breeding numbers have declined in Britain, the reasons for which are unclear.

Population trends – Peak winter counts suggest relative stability.



Little gull

Hydrocoloeus minutus

Conservation status

SPA Population at Classification: N/A
(dSPA)

UK: GREEN

Global: Least Concern.

Origin – A spring and autumn passage bird in eastern Scotland. The main breeding range is in northwest Russia, the Baltic and in Siberia. Several hundred remain in the North Sea for the winter when strong easterly winds can push birds close to shore..

Behaviour – Feeds by picking food items off the surface of water, sometimes in large flocks.

Diet – When in Scottish waters mostly small fish and invertebrates.

Habitat – Roosts on sheltered water, estuaries and beaches, feeding offshore during the day.

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

Distribution

Inner Forth	Rare
Outer areas	Scarce

Largest numbers in eastern Scotland are found in the Tay Bay, but flocks of several hundred have been recorded in the Forth.



Dave King

Seasonality – Two peaks of birds occur in autumn with young birds and adults migrating at different times.

Pressures – Little Gull numbers in the outer Tay have fluctuated, and the sites that they use have been abandoned and others occupied for unknown reasons. Occurrence is probably linked to conditions in breeding areas and weather at the migration times.

Population trends – Increased presence off the east coast of Scotland may be due to a western expansion of their breeding range.

Common gull

Larus canus

Conservation status

SPA Population at Classification: N/A (dSPA)

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

Global: Least Concern.

Origin – Some winter birds breed in Scotland; many others breed in northern Europe especially Fennoscandinavia.

Behaviour – Gregarious in winter and joins mixed gull roosts at night.

Diet – Mainly earthworms, insects, aquatic and terrestrial invertebrates and small fish.

Habitat – Uses both inland and coastal habitats, including farmland and urban habitats. Large night-time roosts form along the coast.

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

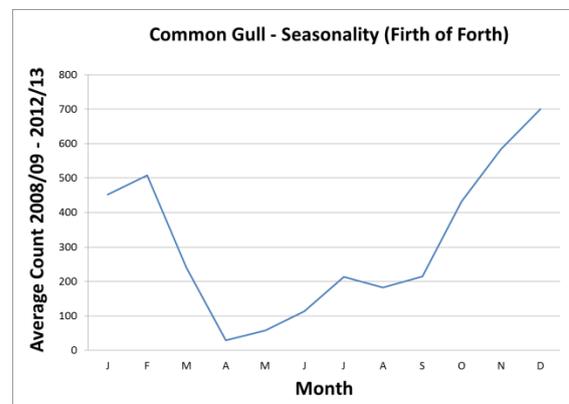
Distribution

Inner Forth	Widespread and numerous
Outer areas	Widespread and numerous



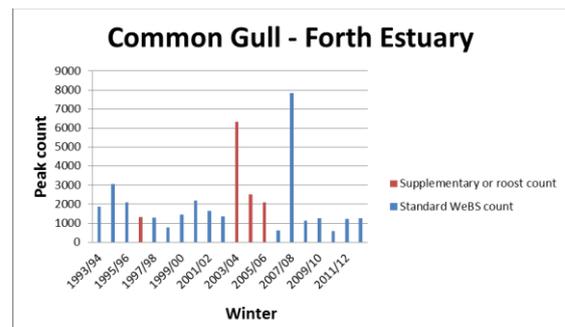
Anne Cotton

Seasonality – Winter visitor mainly present September to March. Small numbers breed close to the Forth (including urban nesting).



Pressures – None specified.

Population trends – Peak winter counts suggest relative stability.



Lesser black-backed gull

Larus fuscus

Conservation status

SPA Population at Classification: 6,600 pairs

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

Global: Least Concern.

Origin – A common and widespread local breeder. Scottish birds can travel in winter to Spain and north Africa although increasing numbers winter in the UK.

Behaviour – Adaptable species, exploiting a range of habitats and food resources. At sea it is a surface feeder, foraging behind fishing boats or catching fish and invertebrates.

Diet – An omnivore that eats a wide range of fish, invertebrates, carrion, live prey and human waste.

Habitat – Tends to forage further out to sea than other large gulls. Also forages in agricultural and urban areas, using rubbish dumps and sewage plants. Away from breeding sites this species forms large roosts with other gulls on sheltered open water, inland or in bays in the Forth.

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

Distribution

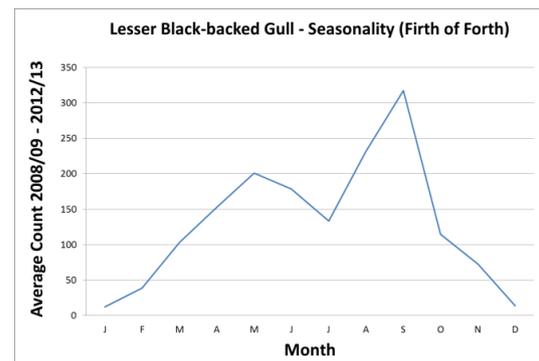
Inner Forth	Widespread and numerous
Outer forth	Widespread and numerous

Breeds in large colonies on Forth islands and also in urban areas (rooftops).



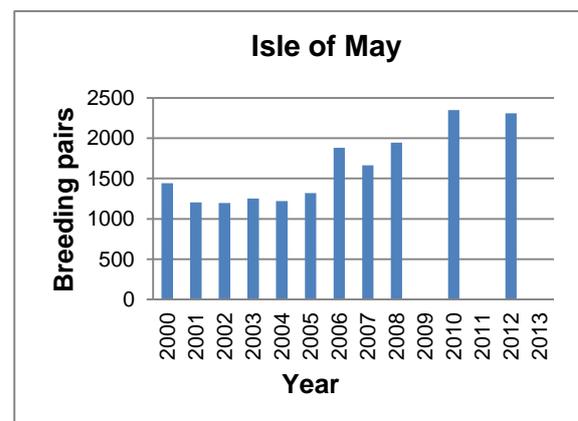
Anne Cotton

Seasonality – Migrants return to the Forth in February and March with birds passing through on their way north at this time as well.



Pressures – Abundance and distribution influenced by availability of human food and fishery discards as well as natural food sources. Urban nesting can cause conflict with humans in some areas.

Population trends – Increased through much of 20th century. Regular counts on the Isle of May suggest a recent increase in population which is counter to the national 48% decline for breeding birds between 2002 and 2012. Increased incidence of urban nesting also contrasts with a wider decline.



Herring gull

Larus argentatus

Conservation status

SPA Population at Classification: 6,600

Pairs

UK: RED (recent severe non-breeding population decline, severe breeding population decline over the longer term).

Global: Least concern.

Origin – Local breeders can remain through the year but some move south in winter including to mainland Europe. Winter population also includes by birds from northern Scotland, Iceland and Scandinavia.

Behaviour – Adaptable species, exploiting a range of habitats and food resources.

Diet – An omnivore that eats a wide range of fish, invertebrates, carrion, live prey and human waste.

Habitat – Breeds on offshore islands, coastal cliffs and buildings. Forages in the intertidal zone, agricultural and urban areas, rubbish dumps and sewage plants.

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

Distribution

Inner Forth	Widespread and numerous
Outer areas	Widespread and numerous

Breeds in large colonies on Forth islands and also in urban areas (rooftops).

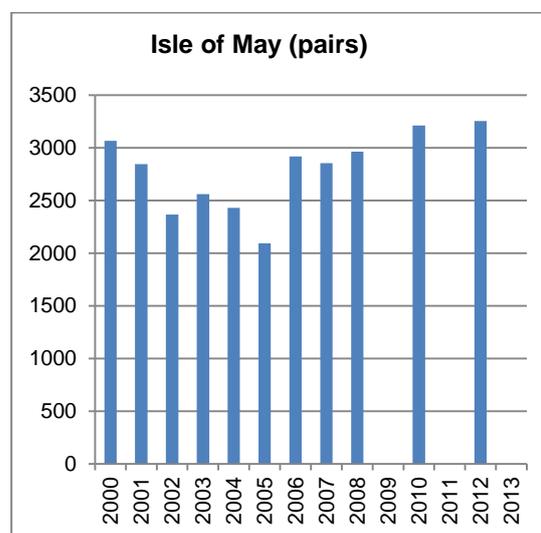


Anne Cotton

Seasonality – Large numbers of birds are present in the Forth year-round. Adult males tend to stay near their breeding colonies year round. Egg-laying takes place from late April and young fledge from early July onwards.

Pressures – Abundance and distribution influenced by availability of human food and fishery discards as well as natural food sources. Urban nesting can cause conflict with humans in some areas.

Population trends – Increased through much of 20th century and subject to control in 70s-80s. Regular counts on the Isle of May suggest a recently stable population which is counter to the national 30% decline for breeding birds between 2002 and 2012.



Bottlenose dolphin

Tursiops truncatus

Conservation status

Moray Firth SAC: Population at designation: 101-250

Origin – Bottlenose dolphins in the Firth of Forth are considered to be part of the Coastal [East Scotland Management Unit](#) population.

The Moray Firth in north-east Scotland supports the only known resident population of bottlenose dolphins in the North Sea. Dolphins are present in the Moray Firth all year round, and, while they range widely they appear to favour particular areas. They may range further afield and occur regularly in the Firths of Tay, Forth and St Andrews Bay. For this reason it is difficult to separate consideration of the SAC population from the Coastal East Scotland population. The most recent estimate for the Coastal East Scotland population was in 2013, which estimated 195 animals (95% CI 162-253).

Behaviour – Sightings are usually of small groups of between 2 and 29 individuals within the Firth of Forth, primarily around the south east coast of Fife. They are most often observed foraging or travelling through an area; occasionally seen breaching. Females can produce a calf approximately every two years, though a three year interval between calves is most common in the Coastal East Scotland population. In the wild they can live up to 20-50 years. Calves can be born any time of year but there is a slight peak between May – October. Calves have been recorded in the Firth of Forth in recent years

Diet – A wide range of fish species, squid, crabs and shrimp.

Habitat – Usually seen close inshore rather than far offshore. Limited data means there is little understanding of the relative importance of the Firth of Forth in terms of habitat.

	Low tide	High tide
Open water	✓	✓
Inshore water	✓	✓

Distribution

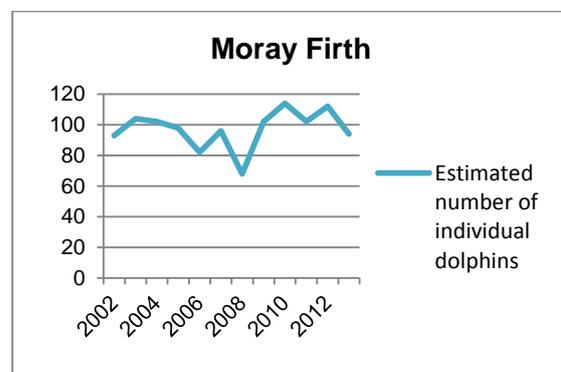
Inner Forth	Absent
Outer areas	Locally regular or occasional



Seasonality – Most records in the Forth have been between May-September, but the limited nature of the data means it is not currently possible to make firm conclusions on how animals may be distributed.

Pressures – Underwater noise from development activity and vessels. Examples include piling, blasting, dredging and seismic survey. Noise propagates more effectively in water and dolphins are dependent on their hearing for social behaviours and for feeding. Different degrees of noise can cause disturbance, displacement, damage to animals hearing and in extreme circumstances death. Because the species is long lived and reproduces slowly, long term chronic pressures (pollution, disturbance) that reduce breeding success can be a significant issue. Collision (boat strike or propellor strike) – from commercial and/or recreational boat traffic is another little-understood pressure.

Population trends – Numbers appear stable. Modelling has been focused on the Moray Firth population with confidence Intervals of (95% CI)



Harbour seal

Phoca vitulina

Conservation status

SAC (Firth of Tay and Eden Estuary)

Population at Classification: 600

Origin – Resident

Behaviour – Harbour seals are found on sandflats and estuaries, and on rocky shores in Scotland. As pups swim almost immediately after birth, seals can breed on sheltered tidal areas where banks allow access to deep water. Seals may range widely in search of prey, but individuals often return to favoured haul-out sites. Harbour seals have limited daily foraging ranges of around 20km. They will often remain relatively close to their main haul-out and pupping sites. Over the longer term there is interchange between animals on different haul-outs and there is movement between the Tay and the Forth, but unlike grey seals they generally do not travel very long distances, either for foraging or seasonally. Notable haul-out sites in the Forth include the rocky coastline south of Kirkcaldy and around Inchmickery and nearby smaller islands.

Diet – Fish, marine invertebrates

Habitat – Rocky shore, sandbanks, open water.

	Low tide	High tide
Open Water	✓	✓
Sandbanks	✓	-
Rocky shore	✓	✓

Distribution

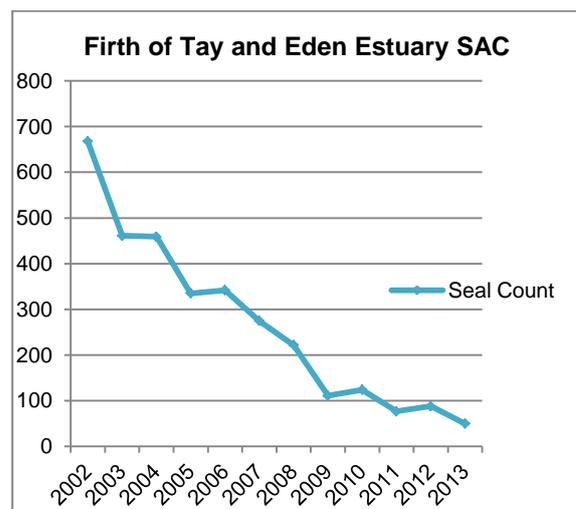
Inner Forth	Uncommon
Outer areas	Locally common



Seasonality – Pupping is during June-July followed by an adult moulting period August-September.

Pressures – Underwater noise, disturbance of haul-out sites. Possible contributory factors to the population drop noted below include a general increase in disturbance, changes in prey species abundance or disease. In some areas of the UK predation and unregulated shooting have also be put forward as potential factors in population declines. Harbour seals' faithfulness to a fairly small home range means that colonies that crash or become extinct may be slow to recover as immigration is uncommon.

Population trends – There has been a substantial reduction in numbers on the east coast. The Firth of Tay and Eden Estuary breeding population dropped by over 90% from over 600 to 40-50 by 2014 but it is not clear what has caused this.



Grey seal

Halichoerus grypus

Conservation status

SAC (Isle of May) Population at
Classification: 5900

SAC (Berwickshire and North
Northumberland Coast) Population at
Classification: 501-1000

Origin – Resident

Behaviour – Grey seals forage in the open sea and return regularly to haul out on land where they rest, moult and breed. They may range widely to forage and frequently travel over 100 km between haul-out sites. Foraging trips last anywhere between 1 and 30 days. These can involve long distance movements, with some individuals crossing the North Sea from Britain to the European mainland as far afield as Norway.

Diet – Fish and marine invertebrates.

Habitat

	Low tide	High tide
Open water	✓	✓
Intertidal mud	✓	-
Rocky shore	✓	-

Distribution

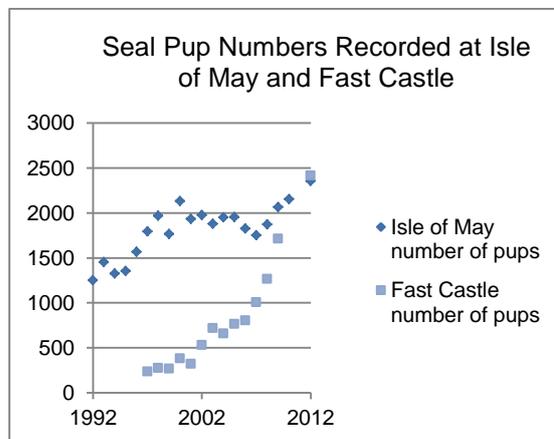
Inner Forth	Widespread,
Outer areas	Widespread, common



Seasonality – In September to late November females congregate on secluded beaches to pup, and are joined by smaller numbers of dominant males who mate with them post-pupping. In some places large numbers of seals at high density are found, such as on the Isle of May. For the remainder of the year, they disperse widely around Scotland and further afield. Numbers are resident within the Forth throughout the year, with main pupping sites at Isle of May, Fast Castle coast, Craigleith and Inchkeith.

Pressures – Underwater noise, disturbance of haul-out sites, fisheries interactions and shooting. Underwater noise impacts similar to those discussed for bottlenose dolphin also apply for both seal species.

Population trends – The Isle of May is the largest east coast breeding colony of grey seals in Scotland and the fourth-largest breeding colony in the UK, contributing approximately 4.5% of annual UK pup production, though Fast Castle coastline has increasingly become an important large breeding colony. Inchkeith and Craigleith islands are also notable grey seal breeding colonies.



Atlantic salmon

Salmo salar

Conservation status

River Teith SAC: 0.7% of the Scottish population (1998)

Origin – The Rivers Forth, Teith, Allan and tributaries.

Behaviour - Atlantic salmon using the Forth have a complex life cycle which begins and ends in freshwater spawning grounds in the catchments of the rivers Forth, Teith, Allan and tributaries. In Scotland Atlantic salmon typically spend around four years as juveniles in freshwater. They progress through several life stages before becoming smolts, migrating downstream and out to sea. Adult salmon spend up to four years growing at sea, then migrate back to the spawning grounds where they came from. This strong homing connection leads to genetically distinct populations.

Fish which spend only one year at sea are called grilse and are relatively small. A proportion of the Atlantic salmon stock may stay at sea for two or three years, in feeding grounds as far away as West Greenland, before returning. The timing of return is important from both a fisheries and conservation perspective. If these fish return to Scottish rivers between the months of January-June, they are referred to as 'spring salmon', and this stock component has shown a long-term decline since records began in 1952.

Diet - Juveniles feed on a wide range of aquatic invertebrates species such as caddisflies, stoneflies and mayflies. Adult Atlantic salmon feed on range of prey items, including marine amphipods, shrimps and squid and include sandeels, capelin and herring.

Habitat – It is thought that Atlantic salmon use inshore waters when migrating through the Firth of Forth rather than the mid-channel. Post-smolt Atlantic salmon typically occupy the upper layers of the water column as they pass out to sea, though this can be variable. Tagged Atlantic salmon typically occupied near-surface habitats during a study on the north coast of Scotland

Distribution

Inner Forth	Seasonally common
Outer areas	Seasonally common



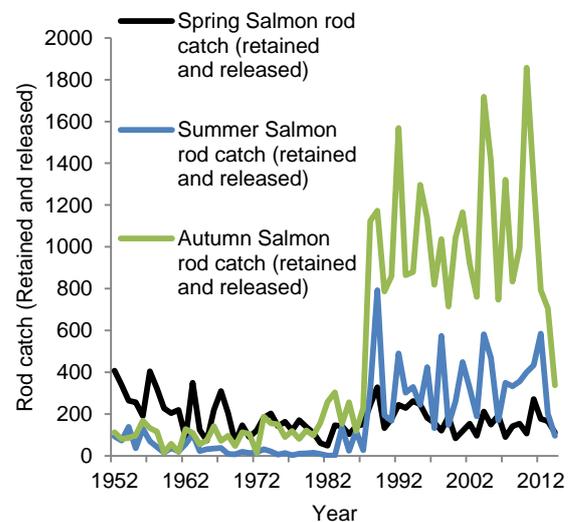
Seasonality - Salmon may enter Scotland's rivers throughout the year. Juvenile smolts migrate from river to sea during the months of March to May. Fish that stay at sea for two or three years are known as multi sea winter salmon (MSW). Adults may migrate to their natal rivers at any time of year. Peak spawning occurs between November-December but in some localities such as larger rivers may extend from October - late February.

Pressures - Underwater noise and vibration such as piling, blasting dredging or seismic survey. Noise effects upon fish range from disturbance and displacement, damage to hearing, organs and even immediate death.

Population trends

Data, available from 1952 to present, shows considerable variation in annual abundance. Overall number of recorded Atlantic salmon returning to Scottish rivers increased over recent years but dropped each year since 2010.

The number of salmon retained and released by anglers in the Forth District during the period 1952-2013. (Data MSS, Crown copyright)



Sea lamprey

Petromyzon marinus

Conservation status: River Teith SAC feature

Origin - Sea lamprey live in freshwater as juveniles but migrate to sea to grow into adults. There is no evidence that adult sea lamprey return to their river of origin but may be attracted to suitable rivers by chemical cues from juveniles (ammocoetes). Adults return to the River Teith SAC and freshwater reaches of the River Forth in every year.

Behaviour - Sea lamprey return to British rivers to spawn in gravel or cobbles when the water temperature reaches at least 15°C. Adults die after spawning is completed. Juvenile sea lamprey (ammocoetes) settle in silt beds within the River Teith SAC for up to five years. They may use deeper habitats in rivers than those of brook or river lamprey, and their abundance in surveys may be under-reported. Sea lamprey typically migrate downstream and to sea in autumn to mid-winter. Most movement occurs during darkness and may be connected to periods of increased water discharge. They spend 18 to 24 months at sea feeding, before migrating back to the River Teith SAC.

Diet - Juveniles are filter feeders. Diet mainly consists of diatoms (algae) and river detritus. Adults are parasitic, using their teeth to attach to cetaceans and large fish to feed on their blood and flesh.

Habitat - As transformers these fish may utilise currents to assist movement, but there is no evidence that adults or transformers are predominantly, or exclusively, found in either inshore or offshore areas. Lamprey ammocoetes can be found wherever suitable habitat is located downstream of spawning sites, including the lower reaches of rivers towards their tidal limits

Distribution

Inner Forth	Seasonally common
Outer areas	Seasonally common



Brian Morland/Bellflask Ecological Surveys

Seasonality - Metamorphosis from juvenile to adult takes place between July and September. Pre-adult sea lamprey migrate from river, through the Firth of Forth to the open sea between October - December. Mature sea lamprey return through the Firth to freshwater to spawn in the rivers Forth and Teith. This can occur as early as April and these fish typically spawn in late May or June.

Pressures – Noise: underwater noise and vibration, though less sensitive than salmon. The most obvious source of these effects are piling and blasting, although the noise associated with other operations may also be significant. Electromagnetic Fields (EMF): Sea lamprey are likely to encounter EMF from subsea cables but it is unclear what impact EMF may have on the movement of emigrating or returning sea lamprey. Water quality: Significant pollution can eliminate whole populations of sea lamprey from rivers and prevent migration. Lighting: Anadromous lampreys avoid the light during the daytime, hiding under rocks or river banks and resuming their upstream movement only during the hours of darkness. Lamprey may be sensitive to non-natural lighting, although this may also be influenced by the availability of cover. Exploitation: no fisheries exist for this species within the UK.

Population trends Sea lamprey were found to be in favourable condition within the River Teith SAC during the last monitoring cycle in 2011.

River lamprey

Lampetra fluviatilis

Conservation status: River Teith SAC feature

Origin - River lamprey live in freshwater as juveniles but migrate to sea to grow into mature adults. There is no evidence that adult river lamprey return to the same river in which they themselves were spawned but evidence suggests that they are attracted back to rivers through their ability to detect chemical cues from juvenile lamprey. River lamprey adults return to the River Teith SAC in every year. They have also been recorded in freshwater reaches of a number of other rivers which flow into the Firth of Forth, including the rivers Allan, Devon, Forth and the Water of Leith.

Behaviour - Spawn in nests excavated in clean gravel or cobble substrates in freshwater reaches at water temperature 10-11°C. Juvenile river lamprey (ammocoetes) disperse into silt beds within the River Teith SAC for three to five years. During this time, river lamprey are indistinguishable from brook lamprey. Transformers migrate downstream in darkness to estuaries. River lamprey may spend a significant part of their adult life within the Firth of Forth and other coastal areas. They may spend 18 to 24 months in coastal waters, before migrating back to the SAC.

Diet - Juvenile river lamprey are filter feeders. Diet mainly consists of microorganisms and river detritus. Adult river lamprey are parasitic, and feed on blood and flesh of other fish. River lamprey can feed for many months in estuarine environments and that the size of lamprey and its host are related, with Clupeids an important prey in the Forth.

Habitat There is evidence that river lamprey may use inshore waters when present in Firth of Forth and be present throughout the Firth.

Distribution

Inner Forth	Seasonally common
Outer areas	Seasonally common



Tiff Hunt / CC-BY-SA-3.0

Seasonality – River lamprey return to the rivers from coastal and estuarine areas from October to December and typically spawn in late March to May. Metamorphosis from the juvenile to adult form takes place between July and September.

Pressures - Noise: underwater noise and vibration, though less sensitive than salmon. The most obvious source of these effects are piling and blasting, although the noise associated with other operations may also be significant. Electromagnetic Fields (EMF): River lamprey are likely to encounter EMF from subsea cables but it is unclear what impact EMF may have on the movement of emigrating or returning lamprey. Water quality: Significant pollution can eliminate whole populations of lamprey from rivers and prevent migration. Lighting: Anadromous lampreys avoid the light during the daytime, hiding under rocks or river banks and resuming their upstream movement only during the hours of darkness. Lamprey may be sensitive to non-natural lighting, although this may also be influenced by the availability of cover. Exploitation: not exploited in Scotland, but are exploited elsewhere in a limited number of locations within the UK. River lamprey fisheries in the Humber and Yorkshire Ouse catchments are used to supply the angling market. No fish are sold for human consumption.

Population trends River lamprey were found to be in favourable condition within the River Teith SAC during the last monitoring cycle in 2011.

Further Reading

HRA Process

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

Habitats Regulations Appraisal; <http://www.snh.gov.uk/protecting-scotlands-nature/protected-areas/international-designations/natura-sites/hra-help-and-advice/>

Appropriate assessment (AA); <http://www.snh.gov.uk/protecting-scotlands-nature/protected-areas/international-designations/natura-sites/hra-appropriate-assessment/>

Likely to have a significant effect (LSE); <http://www.snh.gov.uk/protecting-scotlands-nature/protected-areas/international-designations/natura-sites/hra-likely-significant-effect/>

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

Help and advice on HRA; <http://www.snh.gov.uk/protecting-scotlands-nature/protected-areas/international-designations/natura-sites/hra-help-and-advice/>

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: May 2016
Scottish Natural Heritage
Great Glen House
Leachkin Road
Inverness IV3 8NW

www.snh.gov.uk



Scottish Natural Heritage
Dualchas Nàdair na h-Alba
All of nature for all of Scotland
Nàdar air fad airson Alba air fad