An Bord Achomharc Um Cheadúnais Dobharshaothraithe
Aquaculture Licences Appeals Board

Report 13 Feb 2018

assessing potential impact on

Wild Birds

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Appeal Ref No.s AP1-4/1/2017, AP1-4/2/2017, AP3/3/2017, AP6/1/2017, AP6/2/2017

Bird Expert's Report: Briefing Note

Bird impact assessment

13 February, 2018

Dr. Tom Gittings

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Introduction

Ten applications (four site renewals, one variation and five new site licence applications) for a total of 20 discrete intertidal areas on Braade Strand, located within the Inner Gweedore Bay and approaches, Co. Donegal, have been submitted and duly granted by the Minister for Agriculture, Food and the Marine. Subsequently, eleven appeals from two separate appeal tranches were lodged under the provisions of Section 40(1) of the Fisheries (Amendment) Act 1997. These appeals were confined to the new licence applications only, constituting five applications incorporating ten discrete areas. The appellants raised a wide range of issues as grounds for their appeal, which have been considered by the Aquaculture Licences Appeals Board and its appointed Technical Advisor. One of the issues raised was the impact on nearby SPAs in general and the threat to some bird species in particular.

The purpose of this briefing note is to determine whether the Appellants' concerns are scientifically justified on the basis of currently available information and whether the screening in respect of the surrounding SPAs was adequate and appropriate.

Brief

The brief for this report was as follows:

The expert will undertake a desktop review of the potential for adverse impact(s) from the proposed and existing oyster farms on the nearby SPAs and their respective bird qualifying interests and provide expert advice on possible requirement for an Appropriate Assessment under the terms of the Habitats Directive. This should include:

- *A review of the designated SPAs adjacent to, or within close proximity to, the current and proposed oyster farm licence areas in Gweedore Bay, with due regard for bird mobility in respect of the distance to the proposed oyster farm sites;*
- *An assessment of the vulnerability of the species of interest, for which each identified site is designated, to the proposed and current oyster farming activity in Gweedore Bay, with specific comments on the species identified as being of concern by the Appellants;*
- *An evaluation of the potential cumulative or combined impacts of the wider maritime activity in Gweedore Bay, with an assessment of the contribution to direct and indirect adverse impacts (if any) that the additional activities is likely to make on the bird resource;*
- *An evaluation of the existing EIA screening and Appropriate Assessment and their robustness consistent with Article 6(3) and 6(4) of the Habitats Directive (92/43/EEC), providing an opinion on whether further or supplementary screening is appropriate.*

This document is structured to address the specific requirements of this brief.

Methodology and data sources

The assessment contained in this briefing note is based on a desk review of relevant information, supplemented by a site visit in January 2018.

Site definition

For the purposes of this assessment, Gweedore Bay has been divided into three sections: Inner Gweedore Bay, Outer Gweedore Bay and Maghera Strand (Figure 1).

Inner Gweedore Bay was defined as the tidal habitat in the Gweedore River Estuary, with the outer limits being the tidal flats at Dunmore Strand and Tramore. Inner Gweedore Bay was divided into three sub-divisions: the lower section, north of the narrows at An Machaire Loiscthe; the upper section, south of the narrows; and the Gweedore River section, east of Illanmurrish. Bing aerial imagery was used to map the extent of intertidal habitat in each of these sections (Figure 1).

Outer Gweedore Bay refers to the inshore marine habitat between Carnboy and Glashagh Lower. Maghera Strand refers to the estuary of the Catheen and Corveen Rivers.

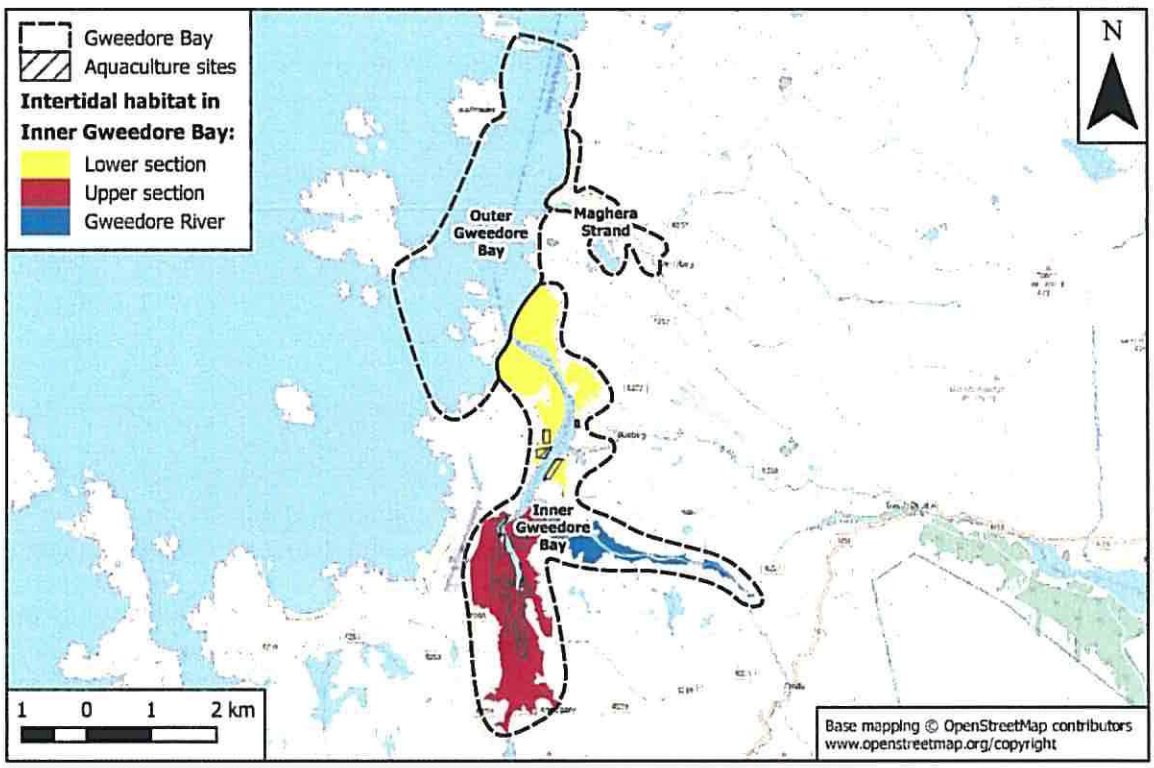

Figure 1. Gweedore Bay.

Site visit

A site visit was carried out on 20th January 2018. The purpose of the site visit was to assess the potential value of the habitats in and around Inner Gweedore Bay for the species that are the focus of this assessment. The main aquaculture sites in Inner Gweedore Bay were examined in detail at low tide, while a driveover survey of the entire bay was also carried out, and Maghera Strand was also visited. In addition, the outlying section of the Derryveagh and Glendowan Mountains SPA adjacent to Inner Gweedore Bay was also examined using viewpoints from surrounding public roads.

During the visit, an estimated count of waterbirds in Inner Gweedore Bay was compiled, and an accurate count of waterbirds in Maghera Strand was also taken.

Data sources

In addition to the documentation associated with the licence applications, a key source used was the results of the trestle study carried out by Gittings and O'Donoghue (2012, 2016b). This study examined the patterns of association between intertidal oyster cultivation and waterbird distribution. It included an extensive study across six sites (four or five counts per site) and an intensive study at one site (18 counts). The results of the extensive study were analysed at two spatial scales, so, overall, the trestle study provided three spatial scales of analysis. The patterns of association between intertidal oyster cultivation and waterbird distribution were initially examined using ordination analyses and graphical comparison of observed versus expected numbers in trestle blocks, with the expected numbers being calculated using the null hypothesis that intertidal oyster cultivation does not affect waterbird distribution (Gittings and O'Donoghue, 2012). Subsequently, an adapted version of Jacobs' Index (D; Jacobs, 1974) was used to quantify the degree of positive or negative association with trestle blocks (Gittings and O'Donoghue, 2016b). D can vary from -1 (indicating complete avoidance) to +1 (strong preference). This allowed calculation of mean D values and confidence intervals (for species with sufficient data). Where the confidence intervals do not include zero, the species was considered to show a significant positive, or negative, pattern of association with trestle blocks. Variation between sites in the extensive study was examined by calculating a single index value for each site using the sums of the observed and expected numbers across all counts. In addition, the results of the intensive study were also used to analyse species densities, in bands parallel to the tideline, within and outside trestle blocks. The results of these analyses were used to categorise the nature of species responses to trestle blocks as negative, neutral/positive, or variable.

Other data sources used include:

- Details of aquaculture licences in other areas in Donegal contained in *Ireland's Marine Atlas* (https://atlas.marine.ie). This data was last updated on the 15th December 2017
- JNCC seabird colony dataset comprising a full dataset of all colonies surveyed since 1986 (last updated 22 October 2010; http://jncc.defra.gov.uk/page-4460). This includes the results of the Seabird 2000 survey, which is the most recent complete survey of seabird colonies in Britain and Ireland.[1]
- A review of seabird foraging ranges carried out by Thaxter *et al.* (2012). This review assessed mean, mean maximum and maximum foraging ranges for most of the seabird species that breed in Ireland. These provide information on likely typical distances that seabirds will travel from their breeding colonies to forage. This review also contributed to the Seabird Wikispace, which was an online resource developed by BirdLife International, although this resource is no longer available. The explanatory document for the Seabird Wikispace (Lascelles, 2008) says "it may be useful to think of areas within the average foraging range as a core zone of activity being exploited by the majority of the birds the majority of the time, and those between the average and the maximum foraging range as a buffer zone, exploited by fewer birds for less of the time" (although it also acknowledges that this is not always the case). Therefore, the mean foraging range distance (rather than the mean maximum or maximum) will generally provide the best indication of the likely core foraging range distance.
- Guidance on "connectivity distances" with SPAs for various upland breeding species and wintering swans and geese (SNH, 2016). This guidance, which is based on a review by Pendlebury *et al.* (2011), was prepared to help assess potential connectivity between proposed wind farm sites and SPAs. It identifies core, and maximum, foraging range

[1] These data were extracted from the Seabird Monitoring Programme Database [at www.jncc.gov.uk/smp and/or www.jncc.gov.uk/page-4460]. Data have been provided to the SMP by the generous contributions of nature conservation and research organisations, and of many volunteers throughout the British Isles.

distances from nest sites (breeding species) and from roosts (wintering swans and geese). The guidance notes that:

"in most cases the core range should be used when determining whether there is connectivity between the proposal and the qualifying interests. Maximum ranges are also provided to indicate that birds will, at times, travel further. In exceptional cases distances up to the maximum foraging range may be considered; for example, whilst osprey core foraging range is 10km an osprey foraging at a loch well beyond this distance from its SPA may still be connected if there is a lack of other closer foraging sites."

SPA review

Introduction

This section addresses the following part of the brief:

A review of the designated SPAs adjacent to, or within close proximity to, the current and proposed oyster farm licence areas in Gweedore Bay, with due regard for bird mobility in respect of the distance to the proposed oyster farm sites .

For each SPA, the listed Special Conservation Interests (SCIs) are reviewed to assess whether they are likely to use intertidal or subtidal habitats (habitat screening), and whether the aquaculture sites in Inner Gweedore Bay are likely to be within the core foraging ranges of the SPA populations (mobility screening). Following this screening exercise, the distribution and status is reviewed for the SCI populations that have not been screened out.

SPAs

The Technical Advisor's Report identified ten SPAs close to Gweedore Bay: Derryveagh and Glendowan Mountains SPA, Falcarragh to Meenlaragh SPA, Horn Head to Fanad Head SPA, Illancrone and Inishkeeragh SPA, Inishbofin, Inishdooey and Inishbeg SPA, Inishkeel SPA, Roaninish SPA, Tory Island SPA, West Donegal Coast SPA, and West Donegal Islands SPA. These SPAs mainly occur along the coastline between Gwebarra Bay and Horn Head, with one large inland SPA (Figure 2). However the West Donegal Coast SPA also includes a section of coastline around 30 km to the south, which comprises a much larger area than the sections in the vicinity of Gweedore Bay.

The SPAs close to Gweedore Bay include six SPAs designated for Barnacle Goose, six SPAs designated for various breeding seabird species (Fulmar, Cormorant, Shag, Puffin, Razorbill, Guillemot, Little Tern, Common Tern, Arctic Tern, Kittiwake, Common Gull, Lesser Black-backed Gull and Herring Gull,), four SPAs designated for Corncrake, two SPAs designated for Peregrine, two SPAs designated for Chough, one SPA designated for Greenland White-fronted Goose, and one SPA designated for upland breeding species (Red-throated Diver, Golden Plover, Dunlin and Merlin) (Table 1).

Table 1. SPAs close to the current and proposed oyster farm licence areas in Gweedore Bay.

SPA	Distance (km)	Special Conservation Interests (SCIs)
West Donegal Coast SPA	0.2	Fulmar, Cormorant, Shag, Razorbill, Kittiwake, Herring Gull, Peregrine and Chough
Derryveagh and Glendowan Mountains SPA	2	Red-throated Diver, Golden Plover, Dunlin, Merlin and Peregrine
West Donegal Islands SPA	3	Barnacle Goose, Shag, Corncrake, Common Gull and Herring Gull
Illancrone and Inishkeeragh SPA	12	Barnacle Goose, Little Tern, Common Tern, Arctic Tern
Falcarragh to Meenlaragh SPA	14	Corncrake
Inishbofin, Inishdooey and Inishbeg SPA	16	Barnacle Goose, Corncrake, Arctic Tern, Common Gull and Lesser Black-backed Gull
Horn Head to Fanad Head SPA	21	Greenland White-fronted Goose, Barnacle Goose, Fulmar, Cormorant, Shag, Razorbill, Guillemot, Kittiwake, Peregrine
Inishkeel SPA	21	Barnacle Goose
Roaninish SPA	21	Barnacle Goose
Tory Island SPA	24	Fulmar, Corncrake, Puffin and Razorbill

Distances are straight line distances between the nearest points of the aquaculture sites and the SPAs.

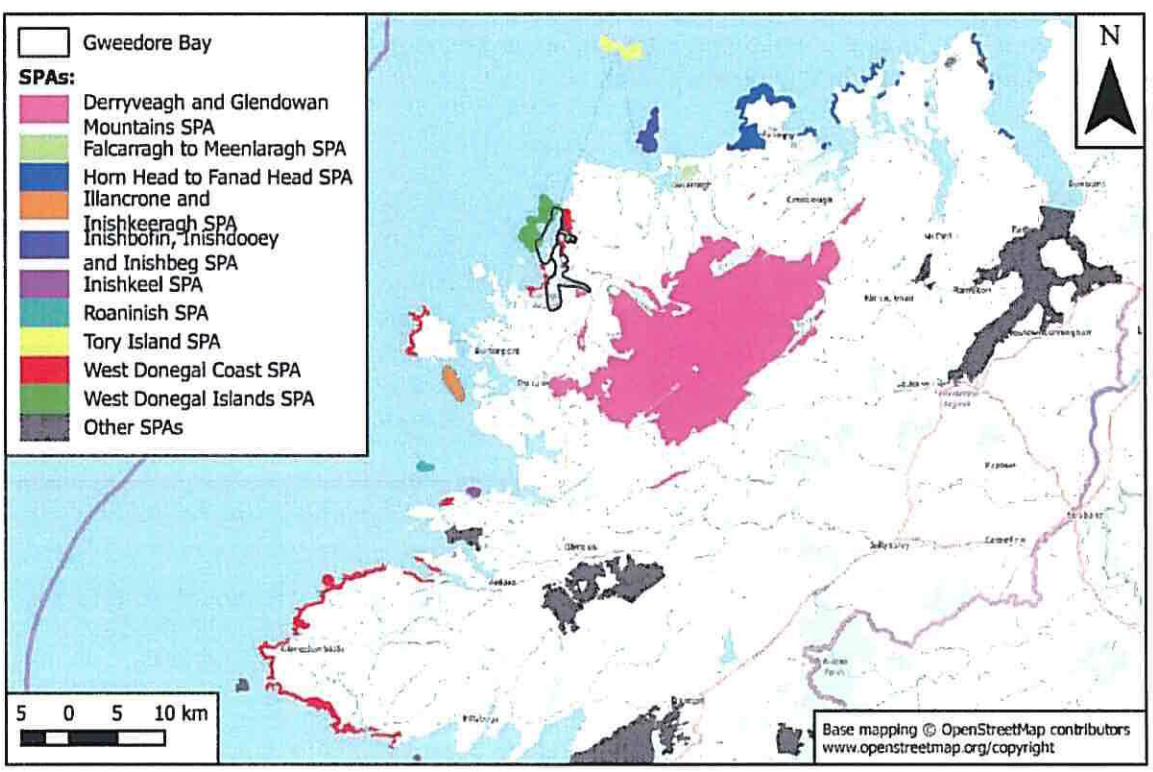

Figure 2. SPAs.

Habitat screening

Corncrake and Chough are purely terrestrial species. Therefore, the Corncrake SCIs of the Falcarragh to Meenlaragh SPA, Inishbofin, Inishdooey and Inishbeg SPA, Tory Island SPA, and West Donegal Islands SPA, and the Chough SCIs of the West Donegal Coast SPA, will not have any spatial overlap with the aquaculture sites in Inner Gweedore Bay and can be screened out from further assessment.

Several of the seabird species are largely pelagic species that rarely, or never, come into enclosed bays and estuaries. Therefore, the Fulmar SCIs of the Horn Head to Fanad Head SPA, Tory Island SPA and West Donegal Coast SPA, the Puffin SCI of the Tory Island SPA, the Razorbill SCI of the Horn Head to Fanad Head SPA, Tory Island SPA, and West Donegal Coast SPA, the Guillemot SCI of the Horn Head to Fanad Head SPA and the Kittiwake SCI of the Horn Head to Fanad Head SPA, and West Donegal Coast SPA, can all be screened out from further assessment.

The other SCIs listed in Table 1 are species that can regularly occur in intertidal, or subtidal, habitat in enclosed bays and estuaries.

Mobility screening

The likely mobility of the SCIs listed in Table 1, excluding those screened out above, is summarised in Table 2, using data on core foraging ranges for Barnacle Goose and the upland species from SNH (2016) and data on mean foraging ranges for the seabird species from Thaxter *et al.* (2016).

The aquaculture sites are within the likely core foraging range distances of the all the SCIs of the West Donegal Coast SPA and the West Donegal Islands SPA, the Red-throated Diver, Golden Plover, Merlin and Peregrine SCIs of the Derryveagh and Glendowan Mountains SPA, and the Barnacle Goose SCI of the Illancrone and Inishkeeragh SPA. Therefore, these SCIs are all screened in for further assessment.

The aquaculture sites are outside the likely core foraging range distance of the Dunlin SCI of the Derryveagh and Glendowan Mountains SPA, the Little Tern, Common Tern and Arctic Tern SCIs of the Illancrone and Inishkeeragh SPA, the Barnacle Goose and Arctic Tern SCIs of the Inishbofin, Inishdooey and Inishbeg SPA, and all the SCIs of the Horn Head to Fanad Head SPA, Inishkeel SPA and Roaninish SPA. However, as the aquaculture sites are only just beyond the core foraging range distance, or within the mean maximum, or maximum, foraging range distances of several of these SCIs, it is necessary to consider whether there are special features that might result in the SCIs having larger than expected core foraging range distances.

In the case of the Dunlin SCI of the Derryveagh and Glendowan Mountains SPA, it is unlikely that any breeding Dunlin occur in the outlying section of the SPA that is close to Gweedore Bay. The habitat in this section (degraded cutover bog/heath) is unlikely to be very suitable as breeding Dunlin in upland habitats are strongly associated with the density of pool systems (Lavers and Haine-Young, 1986). Dunlin appear to be very scarce within the SPA with only 5 pairs recorded in 2002 (NPWS site synopsis) and intact peat bog at Lough Barra is highlighted as being a key area for the species within Glenveagh National Park (Dempsey and O'Clery, 2014). There were no breeding records in hectads overlapping the SPA during the 2002 upland bird survey (NPWS, unpublished data), or the 2007-11 Bird Atlas survey (Balmer *et al.*, 2013)[2]. Therefore, it seems likely that any breeding Dunlin within the SPA are confined to areas of extensive bog habitat in the main block of the SPA and occur at

[2] There was a probable breeding record from tetrad B72, but this hectad does not overlap the Derryveagh and Glendowan Mountains SPA, and this breeding record was presumably from coastal machair habitat.

distances from Gweedore Bay well beyond the maximum foraging range distance of 3 km. Therefore, this SCI can be screened out from further assessment.

In the case of the Little Tern, Common Tern and Arctic Tern SCIs of the Illancrone and Inishkeeragh SPA, and the Arctic Tern SCIs of the Inishbofin, Inishdooey and Inishbeg SPA, there are coastal bays and estuaries that are much closer to the respective SPAs, compared to Gweedore Bay. Therefore, there is no particular reason to suspect that these tern colonies have larger than expected core foraging range distances. Therefore, these SCIs can be screened out from further assessment.

The case of the Barnacle Goose SCIs of the Inishbofin, Inishdooey and Inishbeg SPA, the Horn Head to Fanad Head SPA, the Inishkeel SPA and the Roaninish SPA is more complex. The Inishbofin, Inishdooey and Inishbeg SPA is only just outside the likely core foraging range distance. More generally, it is quite likely that the Barnacle Goose populations of the various SPAs along this coastline are interconnected and that there is significant interchange between the Barnacle Goose populations of the above SPAs and the SPAs within the core foraging range distance, and evidence of such interchange is noted later in this briefing note.

For the other SCIs of the Horn Head to Fanad Head SPA and the Roaninish SPA (Cormorant, Shag and Herring Gull) there are no particular reasons to suspect that these SCIs have larger than expected core foraging range distances, although it is notable that the mean maximum foraging range distance for Herring Gull is much larger than the mean foraging range distance. However, all these species have already been screened in for further assessment as SCIs of closer SPAs.

Distribution and status of the SCI populations

Barnacle Goose

Barnacle Goose is a SCI of six of the SPAs listed in Table 2 and, as these populations are likely to be interconnected, it makes sense to consider these populations together. The five-yearly spring census counts show a rather even distribution of birds between these SPAs, with typical counts of around 200-300 geese per SPA, apart from an exceptional count of 1,215 in the Horn Head to Fanad Head SPA in 2013 (Table 3). The Barnacle Goose population in the latter SPA has also been monitored by I-WeBS counts in recent winters with peak counts of 750 in 2013/14 and 650 in 2014/15 (online Site Summary Table for 0A099 Dunfanaghy New Lake; accessed *via* www.birdwatchireland.ie/?tabid=111, 06/02/2018). The site synopses for the SPAs indicate the inter-connected nature of these populations with references to geese commuting between the Inishkeel SPA and the Roaninish SPA, the Illancrone and Inishkeeragh SPA and the West Donegal Islands SPA, the West Donegal Islands SPA and the Inishbofin, Inishdooey and Inishbeg SPA, and the Inishbofin, Inishdooey and Inishbeg SPA and Horn Head to Fanad Head SPA. In addition, the NPWS Conservation Ranger in the Illancrone and Inishkeeragh SPA area notes that the Barnacle Geese from the SPA travel to Aranmore and Maghery (Emer Magee, NPWS, pers. comm.). The site synopses for the West Donegal Islands SPA and the Inishbofin, Inishdooey and Inishbeg SPA notes that the geese use the islands for both feeding and roosting. The site synopsis for the Horn Head to Fanad Head SPA notes that the geese occur at New Lake/Rinclevan and the dunes to the west, and feed in dune grassland and intensive grassland.

The distribution of Barnacle Goose flocks recorded in the five-yearly spring census counts is shown in Figure 3.

Table 2. Foraging range distances of SCIs of the SPAs close to Gweedore Bay, excluding purely terrestrial species.

SPA name	Distance (km)	Species	Foraging range (km)			Confidence
			core/ mean	mean max	max	
West Donegal Coast SPA	0.2	Cormorant	5.2	25	35	moderate
		Shag	5.9	14.5	17	moderate
		Herring Gull	10.5	61.1	92	moderate
		Peregrine	2	-	18	-
Derryveagh and Glendowan Mountains SPA	2	Red-throated Diver	4.5	9	9	low
		Golden Plover	3	-	11	-
		Dunlin	0.5	-	3	-
		Merlin	5	-	-	-
		Peregrine	2	-	18	-
West Donegal Islands SPA	3	Barnacle Goose	15	-	25	-
		Shag	5.9	14.5	17	moderate
		Common Gull	25	25	50	poor
		Herring Gull	10.5	61.1	92	moderate
Illancrone and Inishkeeragh SPA	12	Barnacle Goose	15	-	25	-
		Little Tern	2.1	6.3	11	low
		Common Tern	4.5	15.2	30	moderate
		Arctic Tern	7.1	24.2	30	moderate
Inishbofin, Inishdooey and Inishbeg SPA	16	Barnacle Goose	15	-	25	-
		Arctic Tern	7.1	24.2	30	moderate
		Common Gull	25	50	50	poor
		Lesser Black-backed Gull	71.9	141	181	moderate
Horn Head to Fanad Head SPA	21	Greenland White-fronted Goose	5-8	-	-	-
		Barnacle Goose	15	-	25	-
		Cormorant	5.2	25	35	moderate
		Shag	5.9	14.5	17	moderate
		Peregrine	2	-	18	-
Inishkeel SPA	21	Barnacle Goose	15	-	25	-
Roaninish SPA	21	Barnacle Goose	15	-	25	-
		Herring Gull	10.5	61.1	92	moderate

Foraging ranges for Red-throated Diver, Cormorant, Shag, Little Tern, Common Tern, Arctic Tern, Common Gull, Lesser Black-backed Gull and Herring Gull are mean foraging ranges and these and the confidence levels are from Thaxter *et al.* (2012). Foraging ranges for Greenland White-fronted Goose, Barnacle Goose, Golden Plover, Dunlin, Merlin and Peregrine are core foraging ranges from SNH (2016). Note that SNH (2016) also gives the following information on foraging ranges for Red-throated Diver: "Generally less than 8km, but regular flights of 11-13.5km recorded on Western Isles".

Table 3. Barnacle Goose counts in SPAs.

SPA	2003	2008	2013
Inishkeel SPA	210	210	0
Roaninish SPA	255	207	100
Illancrone and Inishkeeragh SPA	235	164	191
West Donegal Islands SPA	320	228	318
Inishbofin, Inishdooey and Inishbeg SPA	290	190	232
Horn Head to Fanad Head SPA	0	320	1215

Sources: Worden *et al.* (2004), Mitchell *et al.* (2008), Mitchell and Hall (2013).

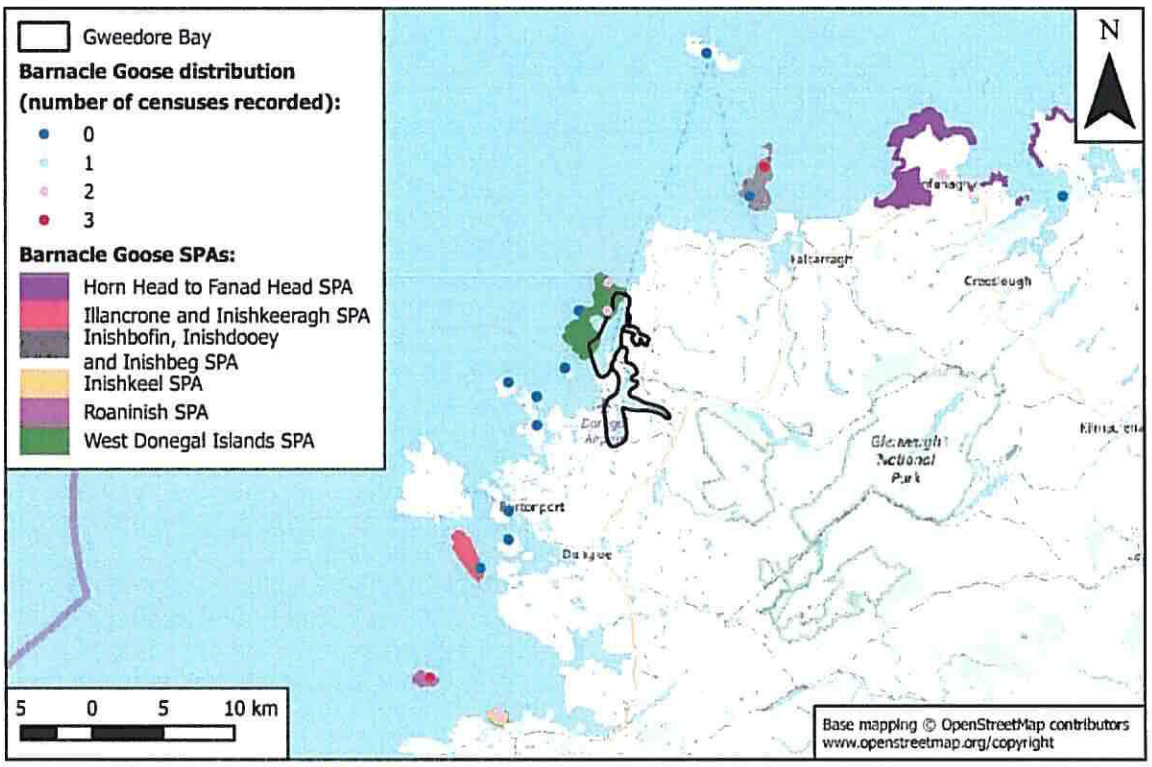

Figure 3. Distribution of Barnacle Goose flocks recorded in the five-yearly spring census counts.

West Donegal Coast SPA

The NPWS site synopsis states that the West Donegal Coast SPA holds nationally important populations of Cormorant, Shag, Peregrine and Herring Gull, with population estimates of 71 pairs of Cormorant in 1999 and 2006, 86 pairs of Shag, 6 pairs of Peregrine in 2002 and 229 pairs of Herring Gull. These population estimates apply to the entire SPA, most of which is over 30 km from Gweedore Bay.

The distribution of Cormorant, Shag and Herring Gull colonies in the sections of the West Donegal Coast SPA close to Gweedore Bay, as recorded in the JNCC seabird colony dataset, is shown in Figure 4. These colonies are all located in the section of SPA on the western side of Aranmore (around 15 km from the aquaculture sites), where there is one Cormorant colony (10 AON[3]), three Shag colonies (13 AON), and two Herring Gull colonies (22 AON).

[3] AON = apparently occupied nests.

Derryveagh and Glendowan Mountains SPA

The NPWS site synopsis states that:

This site is one of only a few locations where Red-throated Diver breed in Ireland and the birds also use a number of lakes within the site for feeding. A survey in 2010 recorded 6 pairs at the site. The extensive bog and heath habitats provide excellent foraging habitat for both Peregrine (5-6 pairs in 2002) and Merlin (estimated 6-11 pairs). Peregrine nest on the crags and cliffs, whilst Merlin nest in the heather or in old crows' nests in trees. The site is very important for breeding Golden Plover and Dunlin (subsp. schinzii) with 18 and 5 pairs respectively recorded in 2002.

The distribution of Golden Plover in hectads overlapping the Derryveagh and Glendowan Mountains SPA, as recorded in the 2002 upland bird survey, is shown in Table 4. The total number of pairs (22) is higher than given in the NPWS site synopsis, but some of the pairs may have been recorded outside the SPA.

Table 4. Distribution of Golden Plover in hectads overlapping the Derryveagh and Glendowan Mountains SPA in 2002.

Hectad	Number of tetrads surveyed	Golden Plover pairs
B80	1	1
B81	2	2
B82	1	2
B90	5	10
B91	1	2
B91/B92	1	4
B92	1	1
C02	1	0

Source: Upland Bird Survey (NPWS, unpublished data).

West Donegal Islands SPA

The NPWS site synopsis states that:

"The West Donegal Islands SPA also supports nationally important breeding populations of Shag (40 pairs on Gola Island in 1999 and 30 pairs on Inishsirrer in 2000), Common Gull (20 pairs on Gola Island in 1999 and 55 pairs on Inishsirrer and Inishmeane in 2000) and Herring Gull (65 pairs on Gola Island in 1999 and 25 pairs on Inishsirrer in 2000)."

The locations of these colonies are shown in Figure 4. They are 4-7 km from the aquaculture sites.

Inishbofin, Inishdooey and Inishbeg SPA

The NPWS site synopsis states that:

"Inishbofin, Inishdooey and Inishbeg SPA ... supports nationally important breeding populations of Common Gull (25 pairs on Inishdooey in 2002), Lesser Black-backed Gull (81 pairs on Inishdooey in 2002)."

The locations of these colonies are shown in Figure 4. They are around 17 km from the aquaculture sites.

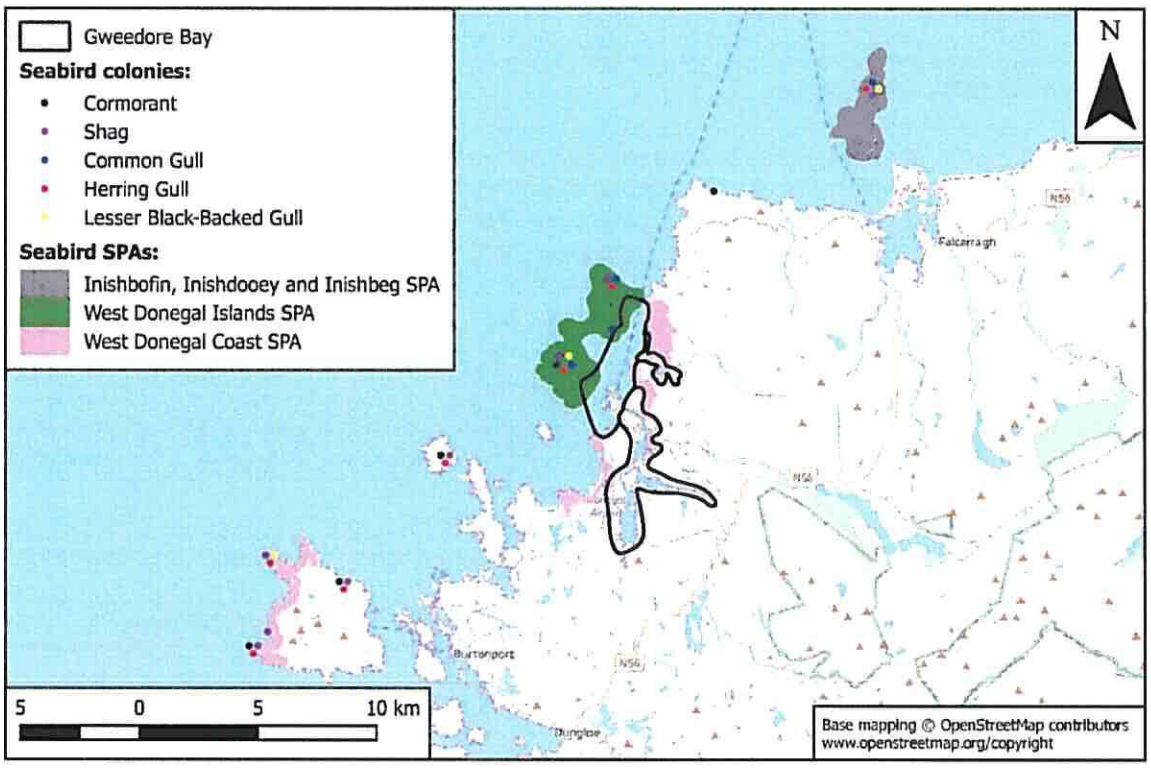

Figure 4. Seabird colonies in the vicinity of Gweedore Bay, as recorded in the JNCC seabird colony dataset. Note, where multiple species were recorded at the same location, points have been displaced for clarity.

Other SPAs

While the brief for this assessment refers specifically to SPAs adjacent to, or within close proximity to, Gweedore Bay, for Appropriate Assessment purposes it is also necessary to consider more distant SPAs if there is potential for interaction with the aquaculture sites. For this purpose, all coastal SPAs within 72 km, and all inland SPAs within 20 km, of Gweedore Bay were reviewed. These distances represent the mean/core foraging rages of the species with the largest foraging ranges in Thaxter *et al.* (2012; Lesser Black-backed Gull) and SNH (2016; Greylag Goose), that have potential to interact with the aquaculture sites. Gweedore Bay is not within the likely core foraging range of any seabird SCIs of any of these additional SPAs. There are no additional inland SPAs within 20 km of Gweedore Bay. The nearest major estuarine SPAs are Donegal Bay SPA and Lough Swilly SPA, both around 45 km from Gweedore Bay. While there is little information on waterbird movements between coastal sites during winter, given the distances involved, it seems unlikely that there is any significant interchange between these SPAs and Gweedore Bay.

Potential impacts

Introduction

This section does not address a specific part of the brief but provides a background review of the potential impacts of suspended oyster cultivation using bags and trestles (referred to hereafter as intertidal oyster cultivation) on bird populations, which is then used to inform the assessment of the vulnerability of the species of interest in the next section.

Habitat structure

Intertidal oyster cultivation causes a significant alteration to the three-dimensional structure of the intertidal habitat (which includes the airspace occupied by birds feeding on the habitat) through the placement of physical structures (oyster trestles) on the intertidal habitat. This alteration may alter the suitability of the habitat for waterbirds by interfering with sightlines and/or creating barriers to movement. Based on the characteristics of species showing positive/neutral or negative responses to trestles, it has been hypothesised that trestles may interfere with flocking behaviour causing species that typically occur in large, tightly packed flocks to avoid the trestles. Trestles could also interfere with the visibility of potential predators causing increased vigilance and reduced foraging time (Gittings and O'Donoghue, 2012, 2016b).

Food resources

Benthic fauna

Oyster trestle cultivation may cause impacts to benthic invertebrates and this could potentially affect food resources for waterbird species.

In a review of the literature, Dumbauld *et al.* (2009) found variation in the effects of intertidal oyster cultivation on the benthic fauna. In studies in England, France and New Zealand, intertidal oyster cultivation caused increased biodeposition, lower sediment redox potential and reduced diversity and abundance of the benthic fauna. However in studies in Ireland and Canada, few changes in the benthic fauna were reported, due to high currents preventing accumulation of biodeposits.

The Irish study referred to above was carried out at Dungarvan Harbour (De Grave *et al.*, 1998). This study compared an oyster trestle block with a control site approximately 300 m away, with both areas being at the mean tide level. Within the trestle block, areas underneath trestles and areas in access lanes were compared. The study found no evidence of elevated levels of organic matter or high densities of organic enrichment indicator species within the trestle blocks. There were minor differences in the benthic community between the control area and the areas sampled under the trestles (higher densities of *Nephtys hombergii*, *Bathyporeia guiiliamsoniana*, *Gammarus crinicomis*, *Microprotopus maculatus* and *Tellina tenuis* including increased abundance of *Capiteila capitata* in the latter area), but these were considered to be probably due to increased predation by epifaunal decapods and fishes. There appeared to be stronger changes in the benthic community in the access lanes with increased densities of three polychaete species (*Scolopos armiger*, *Eteone longa* and *Sigalion mathildae*) and higher overall diversity, and these changes were considered to be due to the compaction of the habitat by vehicular traffic.

In more recent work, Forde *et al.* (2015) looked at benthic invertebrates along access tracks, under trestles and in close controls at a four sites along the west and south coasts of Ireland. There was a strong site effect from the study in that significant differences were observed using a variety of invertebrate response (dependent) variables among the sites. Access routes were considered more disturbed than trestle and control locations; most likely due to the influence of compaction from regular vehicle movements. Abundance (among other variables) was significantly higher in control and trestle samples when compared with those derived from access routes. No noticeable difference between control and trestle samples was detected. This research indicates that oyster trestle cultivation in typical Irish sites is unlikely to have had major impacts on food resources for waterbirds that feed on benthic fauna.

Nekton

Dumbauld *et al.* (2009) reviewed studies of the effects of bivalve shellfish aquaculture on nekton (fish and mobile invertebrates such as crabs). There was only one study that specifically examined intertidal oyster cultivation using bags and trestles (Laffargue *et al.*, 2006). This study found that, in an experimental pond mesocosm, sole used the oyster trestles as resting areas during the day, moving out into the open areas (which simulated tidal flats) to forage at night and the authors considered that the "oyster trestles offered cover, camouflage, and safety and were therefore attractive to sole (as artificial reef-structuring effects)". Similarly, De Grave *et al.*, (1998) noted that the trestles in their Dungarvan Harbour study site acted as refuges for scavenging crabs and shrimps. There were also a number of studies reviewed by Dumbauld *et al.* (2009) of related types of oyster cultivation (included suspended culture in subtidal waters, rack and bag systems, longlines and oyster grow-out cages). These all involve placing physical structures in the intertidal or subtidal waters and the potential impacts from organic enrichment and benthic community changes associated with oyster cultivation, so provide some degree of analogous situations to intertidal oyster cultivation using bags and trestles. These have generally found either little differences between oyster cultivation areas and nearby uncultivated habitats, or higher densities of nekton in the oyster cultivation areas.

In addition to the alteration of the physical habitat, aquaculture could also, theoretically, have impacts on fish populations through reduced recruitment (due to direct consumption of eggs and larvae by the cultured bivalves), and/or through indirect food web effects (e.g., consumption of organic matter by the cultured bivalves that would have otherwise been available to support fishes; Gibbs, 2004). Carrying capacity modelling of the proposed introduction of suspended culture of green mussels into a New Zealand bay indicated that large-scale bivalve culture could cause the replacement of zooplankton by the cultured bivalves as the major grazers in the system with consequent impacts on pelagic fish (Jiang and Gibbs, 2005). However, Leguerrier *et al.*'s (2004) model of the impact of oyster cultivation on a food web in a French bay indicated that oyster cultivation caused secondary production to increase benefitting fish populations, particularly those that used the mudflats as a nursery area. Lin *et al.*'s (2009) model and observations of the removal of oyster cultivation from a eutrophic lagoon in Taiwan indicated that reef fish populations were enhanced by oyster cultivation but pelagic and soft-bottom fish increased following the removal of the oyster cultivation.

Overall, intertidal oyster cultivation is likely to have immediate neutral or positive impacts on nekton abundance. Longer-term ecosystem changes, affecting fish populations, are possible, but are presumably only likely when the scale of intertidal oyster cultivation is very high relative to the size of the estuary or bay. Assessment of potential ecosystem impacts on fish populations are outside the scope of the present review.

Disturbance

Oyster trestle cultivation requires intensive husbandry activity and this may cause impacts to waterbirds using intertidal and/or shallow subtidal habitats through disturbance. Disturbance will not affect high tide roosts, or waterbirds that mainly, or only, use trestle areas when they are covered at high tide (such as Red-throated Diver, Cormorant and Shag), because no husbandry activity takes place during the high tide period.

There is a very extensive literature on the impact of disturbance from human activity on waterbirds. However, the trestle study (Gittings and O'Donoghue, 2012, 2016b) examined the combined potential effects of habitat alteration and disturbance from husbandry activity. The sites included in the study included some with very high levels of husbandry activity. Therefore, it is not necessary to

consider the disturbance component of the potential impacts separately for the species covered by the trestle study.

Vulnerability of the species of interest

Introduction

This section addresses the following part of the brief:

An assessment of the vulnerability of the species of interest, for which each identified site is designated, to the proposed and current oyster farming activity in Gweedore Bay, with specific comments on the species identified as being of concern by the Appellants.

This section covers the SCIs that have been screened in for assessment (Barnacle Goose, Red-throated Diver, Cormorant, Shag, Golden Plover, Golden Plover, Common Gull, Lesser Black-backed Gull and Herring Gull), and the additional species/populations identified as being of concern by the Appellants (Ringed Plover, Bar-tailed Godwit, Knot and wintering Golden Plover and Dunlin). For each of these species, an initial review of their distribution patterns and habitat preferences has been undertaken together with their potential sensitivity to impacts from intertidal oyster cultivation. These reviews are then used to assess their vulnerability to aquaculture activity in Inner Gweedore Bay, based on the likely occurrence patterns in the area and the likely impacts of the aquaculture activity on the birds.

Barnacle Goose

Distribution and habitat preferences

There is rather limited information available on the distribution of Barnacle Geese in the vicinity of Gweedore Bay. In the five-yearly spring census counts, the only records from the Gweedore Bay area have been from Inishmeane and Inishsirrer (Figure 3), and, during the site visit carried out for this assessment in January 2018, a flock of 80 Barnacle Geese were recorded on Inishmeane. Between 2000 and 2003, the then NPWS Conservation Ranger in the Gweedore Bay area noted that she did not record the west Donegal Barnacle Goose flock foraging on the mainland, although the Inishbofin flock used to forage on the mainland at Falcarragh and Dunfanaghy, and the Illancrone and Inishkeeragh SPA flock forage on the mainland at Maghery (Emer Magee, NPWS, pers. comm.). There has not been much NPWS ranger coverage in the Gweedore Bay area since 2003 (Emer Magee, NPWS, pers. comm.), but no information has been received to date from the NPWS District Conservation Officer for that area. A response is also awaited from the NPWS Birds Unit.

The Department of Agriculture, Food and the Marine holds "data on target areas for Barnacle Goose outside of SPAs in connection with the GLAS scheme" (Jochen Roller, NPWS, pers. comm.).

Wintering Barnacle Geese in Ireland typically feed on coastal grasslands in their offshore island wintering sites, and coastal pastures and saltmarshes in their mainland wintering sites. They do not use intertidal mudflats or sandflats for feeding. However, they may use intertidal mudflats or sandflats for roosting and/or as a disturbance refuge, and this behaviour has been recorded at Drumcliff Bay (Nairn *et al.*, 2015) and Trawbreaga Bay (O'Donoghue and Deasy, 2016).

Sensitivity

There is no specific information available on the response of Barnacle Geese to oyster trestles. The closely related Light-bellied Brent Goose often shows a positive response to oyster trestles, but this is because the geese feed on algae attached to the oyster bags (Gittings and O'Donoghue, 2012, 2016b). Barnacle Geese are unlikely to utilise this food resource, so no analogies can be drawn between the two species in terms of their likely response to oyster trestles. Based on the general characteristics of their behaviour, it seems unlikely that Barnacle Geese would roost within trestle blocks, while geese roosting on intertidal areas adjacent to the trestle blocks are likely to be sensitive to disturbance from husbandry activity. It is also possible that geese feeding on coastal pastures and saltmarshes could be disturbed by tractor access routes.

Assessment

The available information indicates that Barnacle Geese in the Gweedore Bay area only occur on the offshore islands and do not appear to use fields around Gweedore Bay for feeding, or tidal habitats within Inner Gweedore Bay for roosting. Therefore, based on this information, the Barnacle Goose SCIs of the Horn Head to Fanad Head SPA, the Illancrone and Inishkeeragh SPA, the Inishbofin, Inishdooey and Inishbeg SPA, the Inishkeel SPA, the Roaninish SPA and the West Donegal Islands SPA are unlikely to have any significant interactions with the aquaculture sites in Inner Donegal Bay. However, the limited nature of the data available on the distribution of Barnacle Geese in the Gweedore Bay area has to be acknowledged.

Red-throated Diver (Derryveagh and Glendowan Mountains SPA),

Distribution and habitat preferences

No detailed information on the distribution of breeding Red-throated Divers within the Derryveagh and Glendowan Mountains SPA was available for this review. However, the outlying section of the SPA close to Inner Gweedore Bay, around Lough Fad and Lough Annillan, seems most likely to have been included for this species. This may have been for its role as a known, or potential, breeding site, or as feeding habitat. Breeding Red-throated Diver were recorded in the hectad containing this part of the SPA in the Bird Atlas 2007-11 survey, although the hectad contains other suitable areas of breeding habitat. Other peripheral/outlying sections of the SPA at Lough Anure (around 4 km from the aquaculture sites) and Lough Nacung Lower (around 8 km from the aquaculture sites) are also most likely to have been included for this species.

The aquaculture sites are within the likely core foraging range distance of the SPA sections at Lough Fad/Lough Annillan and Lough Anure, and within the mean maximum foraging range distance of the SPA section at Lough Nacung Lower.

In general, breeding Red-throated Divers "usually fly to marine waters to feed" (Pendlebury *et al.*, 2011) although the NPWS site synopsis for the SPA states that they feed on various lakes within the SPA. In winter, Red-throated Divers typically occur in open coastal waters and rarely come into enclosed estuaries and bays. However, Cromie (2002) refers to "sea inlets" as being used for foraging by breeding Red-throated Diver, possibly indicating that they use more sheltered waters in summer.

Sensitivity

There does not appear to be any specific information about interactions between Red-throated Divers and oyster trestles. However, Red-throated Diver is a fish-eating species. In general, intertidal

oyster cultivation is likely to either have no effect on, or increase local abundances of fish and will, therefore, have neutral or positive effects on the availability of prey resources for Red-throated Divers. If Red-throated Divers visit the oyster trestle areas, they will only do so at high tide when no husbandry activity will be taking place. Therefore, they will not be exposed to potential disturbance impacts from husbandry activities.

Assessment

Red-throated Divers may breed close to Inner Gweedore Bay and are likely to visit marine waters around Gweedore Bay to feed. They are probably more likely to use the open waters in the outer bay, rather than the enclosed estuarine habitat within the inner bay. In any case, oyster trestles are likely to have neutral or positive impacts on the suitability of the habitat for Red-throated Divers.

Cormorant (West Donegal Coast SPA)

Distribution and habitat preferences

The only recorded Cormorant colony in the sections of the West Donegal Coast SPA close to Gweedore Bay is on Illanran, a small islet off the south-western corner of Aranmore. This colony is around 16 km (straight line distance) from the nearest aquaculture site in Gweedore Bay, which is well outside the likely core foraging range distance (5.2 km), but within the mean maximum foraging range distance (25 km). There are closer Cormorant colonies to Gweedore Bay on Owey Island and Gola Island, but even these are colonies are farther way from the nearest aquaculture site than the likely core foraging range distance. In any case, these colonies do not form part of the Cormorant SCI of the West Donegal Coast SPA, and, while the colony on Gola Island is within the West Donegal Islands SPA, Cormorant is not a SCI of the West Donegal Islands SPA.

Cormorants regularly occur in sheltered coastal bays and estuaries. At some marine colonies, Cormorant diets can include a significant component of estuarine fish species (West *et al.*, 1975; Tierney *et al.*, 2011), indicating that such areas can provide high quality food resources for this species. Therefore, Inner Gweedore Bay is likely to provide suitable foraging habitat for this species. However, non-breeding Cormorant populations are often present in summer, away from breeding colonies. Therefore, the simple presence of Cormorant in Inner Gweedore Bay during the summer would not necessarily indicate that it provides significant food resources for any of the nearby colonies.

Sensitivity

There does not appear to be any detailed research into whether the presence of trestles have positive, neutral, or negative effects on habitat quality for foraging Cormorants. However, Cormorants have been observed feeding within oyster trestles area (personal observations), while individual birds occasionally using trestles as daytime roosts at low tide (Gittings and O'Donoghue, 2012). In general, intertidal oyster cultivation is likely to either have no effect on, or increase, local abundances of fish and will, therefore, have neutral or positive effects on the availability of prey resources for Cormorants. If Cormorants visit the oyster trestle areas for foraging, they will only do so at high tide when no husbandry activity will be taking place. Therefore, foraging Cormorants will not be exposed to potential disturbance impacts from husbandry activities.

Assessment

The aquaculture sites in Gweedore Bay are outside the likely core foraging range distance of the nearest breeding colony in the West Donegal Coast SPA, although the possibility that birds from this

colony utilise habitat within Inner Gweedore Bay for foraging cannot entirely be discounted. In any case, oyster trestles are likely to have neutral or positive impacts on the suitability of the habitat for Cormorants.

Shag (West Donegal Coast SPA and West Donegal Islands SPA)

Distribution and habitat preferences

The nearest Shag colony to the aquaculture sites in the West Donegal Islands SPA is the colony on Gola Island. The nearest aquaculture site is 4.5 km (straight line distance), or 6.5 km (marine route distance). Shags generally do not fly overland, so the nearest aquaculture site is just outside the likely core foraging range distance of this colony (5.9 km). However, the aquaculture sites are within the mean maximum foraging range distance (14.5 km) of both colonies in the West Donegal Islands SPA.

The nearest Shag colony to the aquaculture sites in the West Donegal Coast SPA is the colony at Rinwaros Point on Aranmore. The nearest aquaculture site is 15 km (straight line distance), or 18 km (marine route distance). Therefore, the aquaculture sites are outside the mean maximum foraging range distances (14.5 km) of all the colonies in the West Donegal Coast SPA.

Shags generally utilise open coastal waters for foraging. Some birds will come into sheltered bays and estuaries, particularly after storms, but these habitats rarely support large numbers of Shags. Any Shags coming into Inner Gweedore Bay are most likely to occur in the northern part around Dunmore and Bunbeg.

Sensitivity

There does not appear to be any specific information about interactions between Shags and oyster trestles. In general, intertidal oyster cultivation is likely to either have no effect on, or increase, local abundances of fish and will, therefore, have neutral or positive effects on the availability of prey resources for Shags. If Shags visit the oyster trestle areas for foraging, they will only do so at high tide when no husbandry activity will be taking place. Therefore, foraging Shags will not be exposed to potential disturbance impacts from husbandry activities.

Assessment

The aquaculture sites in Gweedore Bay are just outside the likely core foraging range distance of the nearest breeding colony in the West Donegal Islands SPA. Therefore, given the likely imprecision of the core foraging range distance, the possibility that birds from this colony utilise habitat within Inner Gweedore Bay for foraging cannot be discounted on distance grounds alone. However, most of the aquaculture sites in Inner Gweedore Bay are in the southern part of the bay, away from the area most likely to be used by any Shags that do come into the bay. In any case, oyster trestles are likely to have neutral or positive impacts on the suitability of the habitat for Shags.

Golden Plover (Derryveagh and Glendowan Mountains SPA)

Distribution and habitat preferences

In the upland bird survey in 2002, breeding Golden Plover were recorded quite widely in hectads overlapping the SPA. In particular, they were recorded in hectad B82, which includes the outlying section of the SPA close to Inner Gweedore Bay. Further information has been requested from

NPWS as to whether breeding Golden Plover were recorded in the outlying section of the SPA close to Inner Gweedore Bay.

In Britain, the highest densities of breeding Golden Plovers nest in "alpine blanket mire or southern sub-alpine blanket mire/ wet heath, with the mires characterised by much exposure of erosion haggs and bare peat" (Byrkjedal and Thompson, 1998). The adults travel to nearby enclosed fields to feed during incubation, although, after the chicks hatch, they mainly feed in moorland (Whittingham *et al.*, 2000).

Sensitivity

The trestle study did not collect enough data on Golden Plover to assess their patterns of association with oyster trestles. Monitoring work at Dungarvan Harbour (Gittings and O'Donoghue, 2015, 2018, and unpublished data for 2017/18) indicates that roosting flocks avoid trestle blocks. This is not surprising, as such flocks typically occur in open expanses of mudflat or sandflat away from shorelines, etc., and are also likely to be very sensitive to disturbance from husbandry activity. While these observations do not necessarily indicate the response of feeding Golden Plovers to trestle blocks, the similarity in feeding behaviour between Golden Plover (in intertidal habitats) and Grey Plover indicates that feeding Golden Plovers will show a similarly strong avoidance of trestles to that shown by feeding Grey Plovers (see Gittings and O'Donoghue, 2012, 2016b).

Assessment

Based on the NPWS hectad data, the main concentration of breeding Golden Plover in the Derryveagh and Glendowan Mountains SPA appears to be in the southern/central area of the SPA, while Dempsey and O'Clery (2014) note that Golden Plover in Glenveagh National Park occur in the high plateaus.

No specific information has been obtained to date about whether breeding Golden Plover have been recorded in the outlying section of the SPA close to Inner Gweedore Bay, although further information is awaited from NPWS. However, the cutover bog habitat in this section of the SPA appears to be unremarkable and typical of large areas on non-SPA habitat in Donegal. The available information on Golden Plover breeding habitat and distribution indicates that the SPA breeding population is likely to be associated with high altitude bogs. Therefore, it seems unlikely that breeding Golden Plover occur in the outlying section of the SPA close to Inner Gweedore Bay. This is the only section of the SPA for which the aquaculture sites in Inner Gweedore Bay would be within the likely Golden Plover core foraging range distance.

While most breeding Golden Plover occur at a distance from the coast so that intertidal habitats would not be within their foraging ranges, there does not appear to be any references in the extensive literature on the foraging behaviour and diet of breeding Golden Plovers to feeding in intertidal habitats. Even in winter, when Golden Plover do utilise intertidal habitat, they mainly do so for roosting, rather than for feeding (but see discussion later in this briefing note for exceptions). Therefore, even if breeding Golden Plover did occur in the section of the SPA close to Inner Gweedore Bay, it seems unlikely that they would make significant use of intertidal habitat for foraging.

Overall, therefore, it seems unlikely that there is any significant interaction between the Golden Plover SCI of the Derryveagh and Glendowan Mountains SPA and the aquaculture sites in Inner Gweedore Bay. However, the limited information on Golden Plover distribution within the SPA has to be acknowledged.

Common Gull (Inishbofin, Inishdooey and Inishbeg SPA and West Donegal Islands SPA)

Distribution and habitat preferences

The three Common Gull colonies in the West Donegal Islands SPA are 4-7 km from the nearest aquaculture site in Gweedore Bay, while the Common Gull colony in the Inishbofin, Inishdooey and Inishbeg SPA is around 17 km from the nearest aquaculture site in Gweedore Bay (straight line distances). Therefore, the aquaculture sites in Gweedore Bay are well within the likely core foraging range distance (25 km) of all of these colonies.

Like other gull species, Common Gulls can use a wide variety of habitats for foraging including open marine waters, coastal and littoral habitats, and inland waters and fields. The variety of foraging habitats used is reflected in the wide range of prey items consumed. There can be big differences in Common Gull diets between colonies, presumably reflecting local differences in the availability, and productivity, of foraging habitats. In general, terrestrial prey, such as insects, earthworms and grain, is often a major component of the diet, and fish is a less significant component compared to larger gulls (Götmark, 1984). However, prey such as crustaceans, bivalves and polychaete worms, from intertidal habitats can be a significant component of Common Gull diets at some breeding colonies (Kubetzki *et al.*, 1999; Kubetzki and Garthe, 2003; Kelly *et al.*, 2012).

Sensitivity

In the trestle study, across all sites Common Gull showed generally negative patterns of association with oyster trestles with mean D indices of –0.52 (± 0.36) at the all sectors scale, and –0.69 (± 0.27) at the close sectors scale (Gittings and O'Donoghue, 2016). However, Common Gull showed an overall positive pattern of association with oyster trestles at one of the five sites analysed. Furthermore, in the intensive study at Dungarvan Harbour, the mean D index of –0.20 (± 0.37), while still negative, was not significantly different from zero and, while the densities within trestles blocks were lower than outside (43.0 vs 19.7 birds/10 ha), the difference was not significant ($F_{1,11}$ = 3.58, P = 0.085). Therefore, while the general pattern of association between Common Gull and oyster trestles appears to be negative, the evidence is not conclusive and there may be some variability in this pattern.

Assessment

The aquaculture sites in Gweedore Bay are within the likely core foraging range distances of the Common Gull breeding colonies in the Inishbofin, Inishdooey and Inishbeg SPA and the West Donegal Islands SPA. NPWS do not have any information on the diet of, and foraging ranges, of these colonies (Jochen Roller, NPWS, pers. comm.). While breeding Common Gull diets often have a high component of terrestrial food items, the generally unproductive nature of the terrestrial habitats, and the lack of arable habitats, in the likely core foraging ranges of the Inishbofin, Inishdooey and Inishbeg SPA and the West Donegal Islands SPA colonies suggest that these colonies may have a higher reliance on coastal and littoral habitats for foraging. As Inner Gweedore Bay is the closest estuarine habitat to the colonies in the West Donegal Islands SPA, it may be particularly important for these colonies, if intertidal habitat provides important foraging resources for these colonies. The colony at Inishbofin, Inishdooey and Inishbeg SPA has a significant area of intertidal habitat in Ballyness Bay, which is much closer than Inner Gweedore Bay. However, the possibility that Inner Gweedore Bay provides important foraging resources for the Inishbofin, Inishdooey and Inishbeg SPA colony cannot be discounted.

The evidence about the nature of the association between Common Gull and oyster trestles is not conclusive. However, given the generally negative pattern of the association, for the purposes of this assessment, a precautionary assumption has been made that oyster trestles will have a negative impact on the availability of Common Gull foraging habitat.

The aquaculture sites occupy around 14% of all the intertidal habitat in Inner Gweedore Bay, and 20% of the intertidal habitat in the upper section of Inner Gweedore Bay (Table 5). However, the aquaculture sites may occupy a much higher percentage of the most productive intertidal habitat. Most of the intertidal habitat in the lower section of Inner Gweedore Bay and in the northern part of the inner section appears to consist of unproductive sandflats, as indicated by the virtual absence of birds from these areas observed on the site visit in January 2018. The most productive habitat may be concentrated between Rinnamona and Rough Point, with the sráthogá area, and adjacent sandflats, holding the highest number of birds on the site visit in January 2018. Furthermore, the aquaculture sites occupy most of the length of the edges of the main tidal channel in the upper section, and, at low tide, it is the tidal channel edges, and adjacent areas of intertidal, that are likely to provide the most productive foraging habitat, particularly in the sandflat areas.

The above assessment indicates that Inner Gweedore Bay may provide important foraging habitat for the Common Gull SCI of the West Donegal Islands SPA, and possibly also the Common Gull SCI of the Inishbofin, Inishdooey and Inishbeg SPA, and that development of the aquaculture sites in Inner Gweedore Bay may affect significant areas of this foraging habitat reducing the overall availability of foraging resources for these Common Gull populations. Therefore, while there is a lot of uncertainty about this assessment, it is not possible to rule out, beyond reasonable scientific doubt, the possibility that development of the aquaculture sites in Inner Gweedore Bay will cause significant negative impacts to the conservation condition of the Common Gull SCIs of the West Donegal Islands SPA and the Inishbofin, Inishdooey and Inishbeg SPA.

Table 5. Indicative areas of intertidal habitat in Inner Gweedore Bay.

Section	Total area (ha)	Intertidal habitat in aquaculture sites (ha)	% area occupied by aquaculture sites
Lower	73	6	8%
Upper	237	47	20%
Gweedore River	52	0	0%
Total	362	52	14%

Extent of intertidal habitat in Inner Gweedore Bay based on Bing aerial imagery.

Lesser Black-backed Gull (Inishbofin, Inishdooey and Inishbeg SPA)

Distribution and habitat preferences

The Lesser Black-backed Gull colony in the Inishbofin, Inishdooey and Inishbeg SPA is around 17 km from the nearest aquaculture site in Gweedore Bay (straight line distance). Therefore, the aquaculture sites in Gweedore Bay are well within the likely core foraging range distance (71.9 km) of this. NPWS do not have any information on the diet of, and foraging range, of this colony (Jochen Roller, NPWS, pers. comm.).

Lesser Black-backed Gulls have wide habitat associations and can feed in open marine waters, coastal waters and estuaries, and inland fields and wetlands. Dietary studies have helped in understanding the range of habitats used by nesting Lesser Black-backed Gulls, and the variation in habitat usage between colonies.

Lesser Black-backed Gulls are omnivorous and can utilise a wide array of energy sources, consuming fish, small mammals, invertebrates, plant material, rubbish, fish discards, etc. (Cramp and Simmons, 2004). While they are capable of obtaining food by dipping to surface, shallow plunging and aerial pursuit of prey, a large portion of their diet seems to come from kleptoparasiting food from other birds (both inter- and intra-specific). It is also generally accepted that open sea fish feeding contributes more to the diet of the Lesser Black Backed Gull than scavenging compared to other large gulls (studies quoted by Cramp and Simmons, 2004).

The diet of Lesser Black-backed Gull has been studied at the Magharee Islands in Kerry (Kelly, 2009). The diet was dominated by terrestrial beetles, marine fish and anthropogenic garbage (54%, 27% and 20%, respectively). At two German North Sea colonies, the diet was dominated by marine fish and open sea crabs indicating that the birds were mainly feeding at sea (Kubetzki and Garthe, 2003). However, at another German North Sea colony, during the incubation period the gulls fed mainly upon crustaceans and molluscs from the intertidal zone, but during chick-rearing, they took mainly crustaceans and fish which were gathered mostly as trawler discards (Garthe *et al.*, 1999). At a breeding colony at Texel, the diet was dominated by marine fish but the polychaete worm *Nereis longissimi* comprised 3-25% of the diet over the five seasons studied, which indicates that the birds made significant use of the intertidal zone in at least some seasons (Camphuysen, 2011). At an Irish Sea colony in Cumbria, marine molluscs comprised 10-14% of the diet (Kim and Monaghan, 2006).

Therefore, while Lesser Black-backed Gull may be more likely to use food resources in the open sea compared to some other gull species, food resources in the intertidal zone can be a significant component of the diet in at least some breeding colonies.

Sensitivity

The trestle study classified the response of Lesser Black-backed Gull as possibly negative, based on apparent strong negative associations with oyster trestles at three sites (Gittings and O'Donoghue, 2016b). However, the overall numbers of Lesser Black-backed Gull recorded in the trestle study were not sufficient to calculate mean D indices with associated confidence intervals, meaning that the overall response of Lesser Black-backed Gull to oyster trestles could not be statistically analysed. Therefore, there is a high degree of uncertainty about the response of Lesser Black-backed Gull to oyster trestles.

The apparent response of Lesser Black-backed Gull to oyster trestles contrasts with the neutral/positive response of the closely related Herring Gull, and there is stronger evidence supporting the latter response (see below). While this might suggest that the apparent negative response of Lesser Black-backed Gull is questionable, there are significant ecological differences between the two species and it would be dangerous to infer that they have a similar response to oyster trestles. In particular, it is notable that in the trestle study, 18% of the total number of Herring Gulls recorded across all sites and counts were on trestles, but none of the Lesser Black-Backed Gulls were on trestles (total numbers: 958 Lesser Black-Backed Gulls and 1437 Herring Gulls). However, most of the Lesser Black-backed Gulls recorded in the extensive study were roosting birds often in large flocks. It would not be surprising that roosting flocks of Lesser Black-backed Gulls, which typically occur on open intertidal flats, avoid trestle blocks. But this does not necessarily mean that feeding Lesser Black-backed Gulls similarly avoid trestle blocks.

Assessment

The aquaculture sites in Gweedore Bay are within the likely core foraging range distances of the Lesser Black-backed Gull breeding colony in the Inishbofin, Inishdooey and Inishbeg SPA. Breeding Lesser Black-backed Gull diets at some colonies can have a high component of intertidal food items.

However, compared to other gulls, open sea fish are often a more important component of Lesser Black-backed Gull diets and, given the position of the Inishbofin, Inishdooey and Inishbeg SPA colony, it seems likely that this resource is an important component of their diet. If the colony does make use of intertidal habitat for foraging, there is a significant area of intertidal habitat in Ballyness Bay, which is much closer than Inner Gweedore Bay, while major intertidal complexes in Donegal Bay and Lough Swilly are also within the likely core foraging range of the colony. However, the intertidal habitat in Inner Gweedore Bay is relatively close to the colony, so the possibility that Inner Gweedore Bay provides important foraging resources for the Inishbofin, Inishdooey and Inishbeg SPA colony cannot be discounted. It should also be noted that there is another Lesser Black-backed Gull colony on Gola Island, which is closer to Inner Gweedore Bay, so the mere presence of foraging Lesser Black-backed Gulls in Inner Gweedore Bay in summer would not be enough to prove a linkage with the Inishbofin, Inishdooey and Inishbeg SPA colony.

The evidence about the nature of the association between Lesser Black-backed Gulls and oyster trestles is rather weak. However, given the generally negative pattern of the association, for the purposes of this assessment, a precautionary assumption has been made that oyster trestles will have a negative impact on the availability of Lesser Black-backed Gull foraging habitat.

As discussed above in the assessment for Common Gull, the aquaculture sites in Inner Gweedore Bay may occupy a significant proportion of the most productive intertidal habitat in the bay.

The above assessment indicates that Inner Gweedore Bay could possibly provide important foraging habitat for the Lesser Black-backed Gull SCI of the Inishbofin, Inishdooey and Inishbeg SPA, and that development of the aquaculture sites in Inner Gweedore Bay may affect significant areas of this foraging habitat reducing the overall availability of foraging resources for this population. Therefore, while there is a lot of uncertainty about this assessment, it is not possible to rule out, beyond reasonable scientific doubt, the possibility that development of the aquaculture sites in Inner Gweedore Bay will cause significant negative impacts to the conservation condition of the Lesser Black-backed Gull SCI of the Inishbofin, Inishdooey and Inishbeg SPA.

Herring Gull (West Donegal Coast SPA and West Donegal Islands SPA)

Distribution and habitat preferences

The two Herring Gull colonies in the West Donegal Islands SPA are 4-7 km from the nearest aquaculture site in Gweedore Bay, while the nearest Herring Gull colony in the West Donegal Coast SPA is around 15 km from the nearest aquaculture site in Gweedore Bay (straight line distances). Therefore, the aquaculture sites in Gweedore Bay are within the likely core foraging range distance (10.5 km) of the West Donegal Islands SPA colonies. The sites are outside the likely core foraging range distance, but within the mean maximum foraging range distance (61.1 km) of the nearest West Donegal Coast SPA colony.

The Herring Gull has a very wide and varied diet. At some breeding colonies Herring Gulls have been found to predominantly feed on fish (Furness and Barrett, 1985) or fish and garbage (Nogales *et al.*, 1995), with fish being mainly obtained from scavenging behind trawlers rather than by direct predation (Nogales *et al.*, 1995). However, both these examples were located on offshore islands (Ailsa Craig in south-west Scotland and Hornøy in north Norway) without any extensive intertidal habitat nearby. A number of other studies have shown that breeding Herring Gulls at other colonies often rely heavily on food resources from the intertidal zone (Garthe *et al.*, 1999; Kim and Monaghan, 2006; Kubetzki and Garthe, 2003; Pierotti and Annett, 1991; Rome and Ellis, 2004).

Sensitivity

The trestle study found that Herring Gull had a neutral or positive response to intertidal oyster cultivation across all the scales analysed (Gittings and O'Donoghue, 2016b)[4]. Given, this consistent pattern, a high degree of confidence can be attached to this response. In fact, Herring Gulls frequently feed on the trestles and, in the trestle study, 43% of all the Herring Gulls recorded at one site (Waterford Harbour) were on the trestles (Gittings and O'Donoghue, 2012).

Assessment

As Herring Gull has a neutral or positive response to intertidal oyster cultivation, the development of the aquaculture sites in Inner Gweedore Bay is unlikely to have negative effects on the conservation condition of the Herring Gull SCIs of the West Donegal Coast SPA and West Donegal Islands SPA.

Merlin (Derryveagh and Glendowan Mountains SPA)

Distribution and habitat preferences

Detailed information on the distribution of Merlin nest sites within the Derryveagh and Glendowan Mountains SPA was not available for this review. In the Bird Atlas 2007-11 survey (Balmer *et al.*, 2013), Merlin was not recorded in hectad B82, which contains the outlying section of the SPA around Lough Fad and Lough Annillan. However, breeding Merlin can be very hard to detect (Lusby *et al.*, 2011), so the lack of any records from the hectad does not necessarily mean they were absent. The habitat within this outlying section of the SPA (cutover bog/heath) is broadly suitable, with contiguous areas of similar habitat adjoining, outside the SPA. The aquaculture sites in Inner Gweedore Bay would be within the likely core foraging range distance (5 km) of any Merlin breeding in this outlying section of the SPA.

Merlin mainly feed on small birds, caught by pursuit in open country. In the breeding season, these are mainly moorland passerines and waders (Cramp and Simmons, 2004). In the winter, many Merlin move to the coast and estuarine waders can be an important component of their diet (Cramp and Simmons, 2004).

Sensitivity

There does not appear to be any specific information about interactions between Merlin and oyster trestles. However, it seems likely that oyster trestles will interfere with their foraging behaviour by obscuring potential prey and providing refuges for prey to escape to.

Assessment

If Merlin breed in the outlying section of the Derryveagh and Glendowan Mountains SPA around Lough Fad and Lough Annillan, the aquaculture sites in Inner Gweedore Bay would be within their likely core foraging range. Intertidal habitat provides important foraging resources for Merlin in winter. In summer, most Merlin breed at distance from the coast. In situations, where Merlin breed close to the coast, intertidal habitat is probably of lower importance as a foraging resource, compared to winter, due to the low numbers of waders that are present at this time of year. This is particularly likely to be the case for Inner Gweedore Bay, which appears to have low numbers of

[4] The original report for the trestle study (Gittings and O'Donoghue, 2012) reported that Herring Gull had a negative response to trestles in the intensive study at Dungarvan Harbour. However, re-analysis of this data has shown that this was due to data entry mistakes and that Herring Gull had a neutral or positive response to intertidal oyster cultivation across all the scales analysed (Gittings and O'Donoghue, 2016a).

waders, even in winter. The potential impact of intertidal oyster cultivation (oyster trestles interfering with prey pursuit/capture) is a rather weak impact. Therefore, it is unlikely that, even if Merlin do breed in the outlying section of the Derryveagh and Glendowan Mountains SPA around Lough Fad and Lough Annillan, development of the aquaculture sites in Inner Gweedore Bay would have a negative effect on the conservation condition of the Merlin SCI of the Derryveagh and Glendowan Mountains SPA.

Peregrine (Derryveagh and Glendowan Mountains SPA and West Donegal Coast SPA)

Distribution and habitat preferences

Detailed information on the location of Peregrine nest sites is not normally made available due to the risk of persecution.

The outlying section of the Derryveagh and Glendowan Mountains SPA, and adjoining areas, around Lough Fad and Lough Annillan do not appear to contain suitable nesting habitat for Peregrine (crags and cliffs). Therefore, it is unlikely that this section of the SPA holds any breeding Peregrine.

The large section of the West Donegal Coast SPA around 30 km to the south of Gweedore Bay is likely to hold the majority of the West Donegal Coast SPA Peregrine population. The section of the West Donegal Coast SPA along the western side of Aranmore is likely to hold suitable nesting habitat but the aquaculture sites in Inner Gweedore Bay would be well outside the likely core foraging range distance (2 km) of any Peregrine nesting here. The sections of the West Donegal Coast SPA along the coastline adjacent to Inner Gweedore Bay appear to mainly comprise sandy beach and low rocky shores. But there are some taller sections of cliff, and there may be suitable Peregrine nest sites along this coastline within 2 km of the aquaculture sites.

Peregrine regularly feed in intertidal areas during winter, exploiting the availability of large numbers of waterbirds, which provide them with potential prey, and inland breeding Peregrines will often move to the coast in winter for this reason. They are likely to hunt over Gweedore Bay during winter. During the breeding season, the importance of intertidal areas diminishes as there are few waterbirds present to provide potential prey for Peregrine. However, where Peregrine are breeding, they will presumably continue to hunt over intertidal areas at times during the breeding season. Also, juvenile Peregrine will remain around their nest sites into July/August, when the numbers of waterbirds will build up again. Data on prey taken by breeding Peregrine in northern Britain during March-July (Ratcliffe, 1996) show that Peregrine continue to take significant numbers of waterbirds during this period. However, most of the frequently taken wader species (Lapwing, Golden Plover, Snipe, Woodcock and Curlew) were likely to be locally breeding in terrestrial habitats.

Sensitivity

There does not appear to be any specific information about interactions between Peregrine and oyster trestles. However, it seems likely that oyster trestles will interfere with their foraging behaviour by obscuring potential prey and providing refuges for prey to escape to.

Assessment

There does not appear to be any suitable nesting habitat for Peregrine in the outlying section of the Derryveagh and Glendowan Mountains SPA around Lough Fad and Lough Annillan. Therefore, the aquaculture sites in Inner Gweedore Bay are outside the likely core foraging range of the Derryveagh and Glendowan Mountains SPA Peregrine population.

If Peregrine breed in the sections of the West Donegal Coast SPA adjacent to Inner Gweedore Bay, the aquaculture sites in Inner Gweedore Bay would be within their likely core foraging range. Intertidal habitat provides important foraging resources for Peregrine in winter. In situations, where Peregrine breed close to the coast, intertidal habitat is probably of lower importance as a foraging resource, compared to winter, due to the low numbers of waders that are present at this time of year. This is particularly likely to be the case for Inner Gweedore Bay, which appears to have low numbers of waders, even in winter. The potential impact of intertidal oyster cultivation (oyster trestles interfering with prey pursuit/capture) is a rather weak impact. Therefore, it is unlikely that, even if Peregrine breed in the sections of the West Donegal Coast SPA adjacent to Inner Gweedore Bay, development of the aquaculture sites in Inner Gweedore Bay would have a negative effect on the conservation condition of the Peregrine SCI of the West Donegal Coast SPA..

Other populations (Ringed Plover, Bar-tailed Godwit, Knot and wintering Golden Plover and Dunlin)

Distribution and habitat preferences

Wintering populations

The available information on the status of wintering populations of Golden Plover, Ringed Plover, Bar-tailed Godwit, Knot and Dunlin in the Gweedore Bay area is summarised in Table 6. Inner Gweedore Bay does not appear to have ever been covered by I-WeBS counts. There has been limited coverage by I-WeBS counts of Inishfree Bay and Maghera Strand, while the Bird Atlas 2007-11 survey provided a broad qualitative assessment of relative abundances.

The data sources all indicate that relatively high numbers of Ringed Plover occur in the Gweedore Bay area, and this is matched by the count from Maghera Strand during the site visit carried out for this assessment in January 2018. No Ringed Plover were recorded in Inner Gweedore Bay on this site visit, but a count of 43 Ringed Plover was recorded at Braade Strand in April 2009 (Suddaby *et al.*, 2010). Similarly, the sources all indicate that relatively low numbers of Dunlin occur in this area. Bar-tailed Godwit and Knot were not recorded in the I-WeBS counts of Inishfree Bay and Maghera Strand, and only a handful of Bar-tailed Godwit were recorded on the site visit carried out for this assessment in January 2018. The Bird Atlas assessment of moderate relative abundances appears to be at variance with the above data, but this may reflect the broad scale of the interpolation methods used to produce the relative abundance maps.

While wintering Golden Plover were recorded in the hectads overlapping Inner Gweedore Bay in the Bird Atlas 2007-11 survey, the relative abundances of Golden Plover were not assessed for these hectads, presumably due to a lack of records from the timed tetrad visits. However, moderate numbers of Golden Plover have been recorded in I-WeBS counts of Inishfree Bay and on the site visit carried out for this assessment in January 2018. Notably, the latter involved a flock of around 200 Golden Plover feeding in the sráthogá area in the vicinity of the aquaculture sites in the upper section of Inner Gweedore Bay. Golden Plover normally use intertidal habitats for roosting and feed on surrounding agricultural land (but see Mason and Macdonald, 1999). While small numbers of birds in roosting flocks (usually less than 10% of the flock) may feed on the intertidal habitat it is very unusual for an entire flock to be feeding. It may be that the generally unproductive nature of the surrounding agricultural land means that wintering Golden Plover in the Gweedore Bay area have a higher reliance of intertidal food resources than is typical for Irish wintering Golden Plover populations. However, further observations would be required to determine whether the behaviour observed in January 2018 is typical of this population.

Overall, the apparent status of these species in the Inner Gweedore Bay area is in line with what might be expected. Bar-tailed Godwit, Knot and Dunlin are all species mainly associated with large areas of productive intertidal habitats, and the small, fragmented and often unproductive intertidal habitats in the Inner Gweedore Bay area would not be expected to hold significant numbers of these species. Ringed Plover are more widely distributed and around 40% of the all-Ireland population is estimated to occur on non-estuarine coasts (Crowe and Holt, 2013), while wintering Golden Plover populations are widespread throughout Ireland.

Table 6. Status of wintering Golden Plover, Ringed Plover, Bar-tailed Godwit, Knot and Dunlin populations in the Gweedore Bay area.

Species	National importance	Bird Atlas relative abundances	I-WeBS counts		January 2018 counts	
			Inishfree Bay	Maghera Strand	Inner Gweedore Bay	Maghera Strand
Golden Plover	1200	not assessed	20	170	200	4
Ringed Plover	100	high	90	95	0	70
Bar-tailed Godwit	150	moderate	0	0	5	2
Knot	280	moderate	0	0	0	0
Dunlin	570	low	90	70	0	22

National importance thresholds are 1% of the estimated all-Ireland population (Crowe and Holt, 2013).

Bird Atlas relative abundances are as indicated by the colouring on the *Winter Relative Abundance* maps in Balmer *et al.* (2013).

The I-WeBS counts are the peak counts (1994/95-2000/01) given in Crowe (2005) for the I-WEBS sites Inishfree Bay (five counts across four seasons) and Gweedore Bay (five counts in one season). Note that the grid reference given for the Gweedore Bay I-WeBS site refers to Maghera Strand.

The January 2018 counts are estimated totals for Inner Gweedore Bay, and accurate counts of Maghera Strand, taken during the site visit for this assessment on 20th January 2018.

Breeding populations

Ringed Plover is a widely distributed breeding species around the Irish coastline. It was not recorded breeding in the hectads containing Inner Gweedore Bay and the adjoining coastline (B72 and B82) in the Bird Atlas 2007-11 survey, but there is plenty of suitable breeding habitat along this coastline.

The breeding status of Golden Plover and Dunlin in the Derryveagh and Glendowan Mountains SPA has been reviewed above. Dunlin also breed in coastal machair habitat in north-west Ireland. There is machair habitat adjacent to the outer part of Gweedore Bay (NPWS, 2015). Other areas of non-machair coastal grassland may also provide wader breeding habitat. A national survey of breeding machair waders in 2009 included an area of coastal grassland on the western side of the upper section of Inner Gweedore Bay, adjacent to the northern section of Braade Strand. No breeding waders were recorded at this site, although 43 Ringed Plover and a single Dunlin were recorded on the adjacent intertidal area in April 2009 (Suddaby *et al.*, 2010).

Bar-tailed Godwit and Knot do not breed in Ireland.

Sensitivity

Ringed Plover, Knot, Bar-tailed Godwit and Dunlin all show strong negative patterns of association with oyster trestles. The trestle study found that Ringed Plover and Knot appear to be completely excluded from areas occupied by oyster trestles (Gittings and O'Donoghue, 2012, 2016b). While the evidence for this was rather limited, particularly for Ringed Plover, subsequent monitoring at Dungarvan Harbour has provided further supporting evidence (Gittings and O'Donoghue, 2015, 2018, and unpublished data for 2017/18). The trestle study found that Bar-tailed Godwit and Dunlin can occur within oyster trestle blocks but generally occur at much lower densities compared to in similar habitat outside the trestle blocks (Gittings and O'Donoghue, 2012, 2016b). However, subsequent monitoring at Dungarvan Harbour has found some indications of some variability in the response of Dunlin to oyster trestles (Gittings and O'Donoghue, 2018, and unpublished data for 2017/18).

The sensitivity of Golden Plover to intertidal oyster cultivation is discussed above.

Assessment

While the available data is very limited, Ringed Plover seems to be the only one of the four species that has a large wintering population in the Inner Gweedore Bay area, and the overall population may be of national importance. The importance of Inner Gweedore Bay, itself, for this species is unclear. However, if Ringed Plover do make significant use of intertidal habitat in the upper section of Inner Gweedore Bay, it is likely that development of the aquaculture sites will significantly reduce the availability of suitable foraging habitat for the wintering population of this species.

The wintering Golden Plover population in the Inner Gweedore Bay area is likely to be of local importance only, while wintering Bar-tailed Godwit, Knot and Dunlin appear to only occur in very low numbers in the Inner Gweedore Bay area, although the data is very limited.

Ringed Plover are likely to breed in the Inner Gweedore Bay area, and Dunlin could also possibly breed. However, as the overall numbers will be very low, and they may also be more likely to forage close to the shoreline, or (Dunlin), in grassland habitats, it seems unlikely that development of the aquaculture sites will significantly reduce the availability of suitable foraging habitat for breeding populations of these species

Cumulative impacts

Introduction

This section addresses the following part of the brief:

An evaluation of the potential cumulative or combined impacts of the wider maritime activity in Gweedore Bay, with an assessment of the contribution to direct and indirect adverse impacts (if any) that the additional activities is likely to make on the bird resource.

In addition, the potential cumulative impacts of additional aquaculture activities, in combination with intertidal oyster cultivation activity in Inner Gweedore Bay, is also assessed. The activities assessed are licensed intertidal oyster cultivation activity in other areas outside Inner Gweedore Bay and applications for Manila clam cultivation in Kinclassagh Bay.

The cumulative assessment focuses on the populations for which the potential for significant negative impacts from intertidal oyster cultivation in Inner Gweedore Bay were identified: the Common Gull SCIs of the Inishbofin, Inishdooey and Inishbeg SPA and the West Donegal Coast SPA, the Lesser Black-backed Gull SCI of the Inishbofin, Inishdooey and Inishbeg SPA, and the wintering Ringed Plover population of the Gweedore Bay area.

It would also be relevant to consider the potential for cumulative impacts to any species for which non-significant but non-negligible negative impacts from intertidal oyster cultivation in Inner Gweedore Bay were identified. However, no such species have been identified in the above assessment.

Maritime activity in Gweedore Bay

Activities

In addition to intertidal oyster cultivation, the Technical Advisor's Report notes the following other coastal/maritime activities taking pace in Gweedore Bay:

- Sea angling, including boat fishing in the central Gweedore Bay channel, the "Gola Roads" between Gola and Inishinny Islands, and to the west of Gola Island, and shore angling from Bunbeg Harbour.
- River angling in the Clady and Gweedore rivers.
- Inshore fishing activity, mainly pot fishing for lobster and brown crab, with line and net fishing further offshore.
- Recreational activities, including swimming, kayaking, boating, windsurfing and other land-based activities such as football and kite flying, etc., at various beaches around Gweedore Bay. In addition kayaking and some walking takes place in Gweedore Bay itself, rock-climbing takes place on Gola and Cruit Islands, and activities such as recreational diving, sailing, and boat tours take place in Outer Gweedore Bay and offshore.

On the site visit in January 2018, the road along the edge of Braade Strand was noted to be very popular with walkers and cyclists, with some people walking out into the intertidal habitat.

Impacts

The potential impacts of the coastal/maritime activities are:

- Depletion of prey resources (sea angling, river angling and inshore fishing).
- Disturbance (all activities).

The depletion of prey resources by sea angling, river angling and inshore fishing will not affect the intertidal prey resources. However, it is possible that depletion of these prey resources could affect the availability of food resources for the Common Gull SCIs of the Inishbofin, Inishdooey and Inishbeg SPA and the West Donegal Coast SPA, and/or the Lesser Black-backed Gull SCI of the Inishbofin, Inishdooey and Inishbeg SPA, with the latter species being more likely to be affected (due to its generally greater reliance on fish). Therefore, the possibility that sea angling and inshore fishing in the Gweedore Bay area will have significant cumulative impacts in combination with intertidal oyster cultivation in Inner Gweedore Bay on the Common Gull SCIs of the Inishbofin, Inishdooey and Inishbeg SPA and the West Donegal Coast SPA, and/or the Lesser Black-backed Gull SCI of the Inishbofin, Inishdooey and Inishbeg SPA cannot be discounted at this stage, although this is a highly speculative possibility.

The sea angling, river angling and inshore fishing activity are not likely to cause significant disturbance impacts to birds using intertidal habitats, while Common Gulls and Lesser Black-backed Gulls fishing at sea are generally very tolerant of boat activity.

Recreational activity on/adjacent to Braade Strand will cause some disturbance impacts to birds using intertidal habitat in Inner Gweedore Bay. The significance of the disturbance impacts will depend upon the timing and intensity of the activity and, particularly, the extent to which activity occurs on the intertidal. Therefore, the possibility that recreational activity on/adjacent to Braade Strand will have significant cumulative impacts in combination with intertidal oyster cultivation in Inner Gweedore Bay on the Common Gull SCIs of the Inishbofin, Inishdooey and Inishbeg SPA and the West Donegal Coast SPA, the Lesser Black-backed Gull SCI of the Inishbofin, Inishdooey and Inishbeg SPA, and the potentially nationally important Ringed Plover population of the Gweedore Bay area, cannot be discounted at this stage, although this is a highly speculative possibility.

Aquaculture activity

Intertidal oyster cultivation

Within the likely core foraging ranges of the Common Gull SCI of the West Donegal Islands SPA, there are significant additional areas of intertidal oyster cultivation in Tawenagh Bay and Dunglow Bay. Therefore, the possibility that intertidal oyster cultivation in Tawenagh Bay and Dunglow Bay will have significant negative cumulative impacts in combination with intertidal oyster cultivation in Inner Gweedore Bay on the Common Gull SCI of West Donegal Coast SPA cannot be discounted at this stage.

The likely core foraging range of the Common Gull SCI of the Inishbofin, Inishdooey and Inishbeg SPA includes small additional areas of intertidal oyster cultivation in Sheephaven and the western part of Mulroy Bay. However, the extent of intertidal oyster cultivation in these areas seems unlikely to have a significant impact on the availability of intertidal foraging habitat for Common Gull.

The likely core foraging range of the Lesser Black-backed Gull SCI of the Inishbofin, Inishdooey and Inishbeg SPA includes all of the above additional areas of intertidal oyster cultivation, as well as significant additional areas of intertidal oyster cultivation in Donegal Bay and Mulroy Bay, and smaller additional areas in Lough Swilly and Loughros More Bay. Therefore, the possibility that intertidal oyster cultivation in these areas will have significant negative cumulative impacts in combination with intertidal oyster cultivation in Inner Gweedore Bay on the Lesser Black-backed Gull SCI of the Inishbofin, Inishdooey and Inishbeg SPA cannot be discounted at this stage.

Wintering Ringed Plover populations generally have high site fidelity (NPWS, 2011; Wright *et al.*, 2014). Therefore, there is likely to be relatively low interchange between the Gweedore Bay area and Tawenagh Bay, which is the nearest other site with significant areas of intertidal oyster cultivation likely to support significant Ringed Plover wintering populations. Therefore, additional areas of intertidal oyster cultivation in other coastal sites in Donegal are unlikely to have significant cumulative impacts in combination with intertidal oyster cultivation in Inner Gweedore Bay on the wintering Ringed Plover population of the Inner Gweedore Bay area.

Manila clam cultivation

There are three applications for intertidal cultivation of Manila clams in Kinclassagh Bay, around 4 km west of Inner Gweedore Bay (Marine Institute, 2016). Intertidal clam cultivation is likely to have negative effects on Ringed Plovers (Gittings and O'Donoghue, 2011). Therefore, the possibility that Manila clam cultivation in Kinclassagh Bay will have significant negative cumulative impacts in

combination with intertidal oyster cultivation in Inner Gweedore Bay on the wintering Ringed Plover population of the Inner Gweedore Bay area cannot be discounted at this stage.

Evaluation of the existing EIS and EIA

Introduction

This section addresses the following part of the brief:

An evaluation of the existing EIA screening and Appropriate Assessment and their robustness consistent with Article 6(3) and 6(4) of the Habitats Directive (92/43/EEC), providing an opinion on whether further or supplementary screening is appropriate.

EIA screening

Content

Four EIA screening assessments have been provided for review. Each assessment deals with an individual application. However, the content of the assessments are largely identical. The assessments make no reference to birds.

Evaluation

The assessments are clearly inadequate as they make no reference to potential impacts on bird populations, while the assessment presented in this briefing note shows that there is potential for significant impacts on three SCIs of two SPAs and on another bird population of potential national importance.

Specifically, information on potential impacts on bird populations should have been included in the following sections of the assessments:

- *Are there any areas on or around the location which are protected under international or national or local legislation for their ecological, landscape, cultural or other value, which could be, affected by the project?* The potential impacts on the Common Gull SCIs of the West Donegal Islands and Inishbofin, Inishdooey and Inishbeg SPAs and the Lesser Black-backed Gull SCI of the Inishbofin, Inishdooey and Inishbeg SPA should have been assessed here.
- *Are there any areas on or around the location which are used by protected, important or sensitive species of fauna or flora e.g. for breeding, nesting, foraging, resting, overwintering, migration, which could be affected?* The potential impact on the Ringed Plover population should have been assessed here. This is a protected species and the population in the Gweedore Bay area may be of national importance.

It should also be noted that, as specified in the brief, the assessment in this briefing note has only considered potential impacts on bird species that are either SCIs of nearby SPAs, or were identified as of concern by the appellants. There may be additional important bird populations that should also be considered in the EIA screening.

Appropriate Assessment

Content

An Appropriate Assessment Conclusion Statement was provided for review. This appears to be based on the Appropriate Assessment report prepared by the Marine Institute (2016).

The Appropriate Assessment report includes reference to the West Donegal Coast SPA in Table 4.2 of the report, entitled *SAC sites adjacent to the Gweedore Bay & Islands SAC and qualifying features with initial screening assessment on likely interactions with aquaculture activities*. This table lists the SCIs of the SPA and states that:

No spatial overlap with aquaculture activities (including access routes). The foraging range of the species identified in the COs is extensive and while some may utilise the aquaculture areas for feeding (which are proximate to a small portion of the SPA), it is unlikely the activities or structures used will impact on the conservation objectives and targets. For the most part the bird species will range beyond the scope or influence of the shellfish culture operations. Therefore, shellfish culture and associated activities considered in this report does not pose significant risk to the conservation features found in the West Donegal Coast SPA and is excluded from further analysis.

The Appropriate Assessment Conclusion Statement is concerned solely with the impacts on the Gweedore Bay & Islands SAC and makes no reference to any potential impacts on bird populations.

Evaluation

The assessment in the Appropriate Assessment report is inadequate as it only considers potential impacts on one SPA, while the assessment presented in this briefing note shows that there are potential interactions with SCIs from eight SPAs. As the assessment does not consider potential interactions with the SCIs of the Inishbofin, Inishdooey and Inishbeg SPA and the West Donegal Islands SPA, it fails to identify the potential for significant impacts on the Common Gull SCIs of the West Donegal Islands and Inishbofin, Inishdooey and Inishbeg SPAs and the Lesser Black-backed Gull SCI of the Inishbofin, Inishdooey and Inishbeg SPA.

The Appropriate Assessment Conclusion Statement is inadequate as it fails to identify the potential for significant impacts on the Common Gull SCIs of the West Donegal Islands and Inishbofin, Inishdooey and Inishbeg SPAs and the Lesser Black-backed Gull SCI of the Inishbofin, Inishdooey and Inishbeg SPA.

Further Appropriate Assessment requirements

The EIA and Appropriate Assessment are inadequate, as discussed above. Therefore, further Appropriate Assessment screening is required. The present briefing note largely contains the information required for this screening. However, based on the assessment presented here, a stage 2 Appropriate Assessment of the potential impact on the Common Gull SCIs of the West Donegal Islands and Inishbofin, Inishdooey and Inishbeg SPAs and the Lesser Black-backed Gull SCI of the Inishbofin, Inishdooey and Inishbeg SPA may be required. This is likely to require targeted survey work to establish whether these populations make significant use of intertidal habitat in the upper section of Inner Gweedore Bay as a foraging resource. If this is found to be the case, the potential impact of development of the aquaculture sites in Inner Gweedore Bay, on these populations will need to be assessed, taking into account the potential for cumulative impacts in combination with fishing activity, recreational activity, and intertidal oyster cultivation in other bays, as identified above.

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