EMFF Operational Programme 2014-2020

Marine Biodiversity Scheme

Marine Institute Bird Studies

Winter Waterbird Survey

Bannow Bay SPA, County Wexford.

2019-2020

Lead Agency: Marine Institute, Hookhead Shellfish Ltd.

Authors: INIS Environmental Consultants Ltd.

Ireland's EU Structural and Investment Funds Programmes 2014 - 2020
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An Roinn Talmhaíochta, Bia agus Mara
Department of Agriculture, Food and the Marine

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Foras na Mara
Marine Institute

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Quality Assurance

The findings outlined within this report and the data we have provided are to our knowledge true and express our bona fide professional opinions. This report has been prepared and provided in accordance with the Chartered Institute of Ecology and Environmental Management (CIEEM) Code of Professional Conduct. Where pertinent, CIEEM Guidelines used in the preparation of this report include the *Guidelines for Ecological Report Writing* (CIEEM, 2017), *Guidelines for Preliminary Ecological Appraisals* (CIEEM, 2015) and *Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial, Freshwater, Coastal and Marine*, (CIEEM, 2018). CIEEM Guidelines include model formats for Preliminary Ecological Appraisal and Ecological Impact Assessment. Also, where pertinent, evaluations presented herein take cognisance of recommended Guidance from the EPA such as *Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports* (EPA, 2017), and in respect of European Sites, *Managing Natura 2000 sites: The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC* (European Commission, 2018).

Due cognisance has been given at all times to the provisions of the *Wildlife Act (1976),* the *Wildlife (Amendment) Act (2000)*, the *European Union (Natural Habitats) Regulations (SI 378/2005)*, the *European Communities (Birds and Natural Habitats) Regulations (2011),* EU Regulation on Invasive Alien Species under *EU Regulation 1143/2014*, the *EU Birds Directive 2009/147/EC* and the *EU Habitats Directive 92/43/EEC*.

No method of assessment can completely remove the possibility of obtaining partially imprecise or incomplete information. In line with Best Practice, any limitation to the methods applied or constraints however are clearly identified within the main body of this document.

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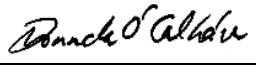
1	11/06/20	Report checked by:	Donncha Ó Catháin BSc MSc GradCIEEM	
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1. INTRODUCTION

INIS Environmental Consultants Ltd were contracted to co-ordinate a series of waterbird surveys at Bannow Bay, Co. Wexford during the 2019/20 winter season. Following standard methodology used for surveying wintering waterbirds at low tide (Lewis & Tierney, 2014), the surveys included four low tide surveys and a single high tide survey.

This report details the results of the 2019/20 waterbird survey programme at Bannow Bay. The results are examined and discussed in light of similar surveys undertaken during the five previous winter seasons, and a baseline low tide survey undertaken during 2009/10 as part of the National Parks & Wildlife Service (NPWS) Waterbird Survey Programme (NPWS, 2012).

1.1. Constraints and limitations

There are a number of limitations inherent to field-based surveying. These particularly relate to availability of suitable weather conditions for completing surveys, with good visibility and little wind or rain of paramount importance. As such, when undertaking and completing fieldwork, careful consideration and planning is made to ensure optimal weather conditions during survey periods. The data presented here were all collected in optimal weather conditions.

When counting shorebirds, disturbance can substantially impact on the birds present within small areas if they are able to disperse away from the source of disturbance to adjacent areas of similar habitat but out with the areas where surveying is taking place. Such disturbance may happen in advance of the count taking place or during the survey period. To gauge levels of disturbance Best Practice methods include an assessment of disturbance levels encountered during the recording period. Such an assessment of disturbance allows the likely impact on shorebird numbers and distribution to be determined, particularly when looking at likely response to different disturbance events. Details of recorded disturbance are therefore provided.

Constraints and any limitations to available datasets used for comparative analysis are presented in where known.

1.2. Statement of Authority

Mr Howard Williams MCIEEM CEnv CBiol MRSB MIFM is Lead Ecologist with Inis and has more than 20 years' experience as a professional ecologist, specialising in birds. Following his degree, he worked as a biologist for the ESB for three years (1997-2000). Mr Williams has completed in excess of 500 separate ecology assessments in Ireland and the UK since 2000. Mr Williams is a full member of the Chartered Institute of Ecology and Environmental Management (CIEEM). He is a Chartered Environmentalist (CEnv) with the Society for the Environment (Soc Env) and a Chartered Biologist (CBiol) with the Society of Biology. He is also a full member of the Institute of Fisheries Management. Mr Williams is principal ecologist with INIS Environmental Consultants Ltd and currently project manager on all INIS projects in the Republic of Ireland and the UK.

Dr. Lesley Lewis BSc PhD MCIEEM is a specialist waterbird ecologist. Lesley has a first-class honours degree in Zoology and a PhD in waterbird ecology (PhD Title: Ecological disturbance and its effects on estuarine benthic invertebrate communities and their avian predators).Lesley has run the ecological consultancy 'Limosa Environmental' for the past 16 years. Lesley acts as Project Manager for each contract and over the years has gained considerable experience working on a range of contracts including Environmental Impact Assessments, Ecological Assessments (EcIA), Stage I Screening for Appropriate Assessment and Natura Impact Statements (NIS).

In addition, Lesley has worked part-time for BirdWatch Ireland since 2009, and from 2009 to 2014 was contracted to the National Parks and Wildlife Service (NPWS) as a Waterbird Ecologist. In this role, Lesley was responsible for the design and implementation of the NPWS baseline low tide waterbird survey programme and the preparation of site-specific Conservation Objectives for 32 coastal SPA sites. This work culminated in the publication of standard low-tide survey methods for waterbirds (Lewis & Tierney, 2014). Since November 2014, Lesley has been engaged in a number of BirdWatch Ireland projects including various aspects of the Irish Wetland Bird Survey (I-WeBS), as well as work on forestry birds, seabirds and the Hen Harrier. In 2015 she was assistant project manager on the Seabird4 Survey (survey of cliff-nesting seabirds 2015, NPWS). From September 2017, Lesley took over the management of both the Irish Wetland Bird Survey (I-WeBS) and the Countryside Bird Survey (CBS).

2. EXISTING ENVIRONMENT

2.1. Site Description

Bannow Bay in County Wexford is a large and sheltered estuarine system located on the southeast coast of Ireland on the east side of the Hook Peninsula, seven miles northeast of Hook Head Lighthouse (Figure 2.1.1). The bay is approximately 14 km along its northeast/south-west axis and has an average width of about 2 km (NPWS, 2012). The bay is relatively isolated with the surrounding landscape dominated by agricultural land and the main nearby settlements are Wellingtonbridge, at the estuary head, and Saltmills to the south-west, both relatively small villages with populations of less than 250 (DoEHLG, 2009). Fethard-on-Sea lies at the south-eastern extremity of the bay and is a small fishing village and holiday resort (NPWS, 2012).

At low tide, extensive intertidal mud and sand flats are exposed. Saltmarsh is well-developed in the sheltered parts of the site while some freshwater habitats occur at the northern end of the site (mosaic of marsh, reedbed and willows). These collectively provide good habitats for wintering waterbirds and Bannow Bay is one of the most important sites for non-breeding (wintering) waterbirds in the south-east. Consequently, the bay is designated as a Special Protection Area (SPA) under the EU Birds Directive (2009/147/EC)[1] and 13 waterbird species are listed as Special Conservation Interests (SCIs) for this site. Bannow Bay is also a designated Special Area of Conservation (SAC; Site Code 00697) under the EU Habitats Directive[2]. The SPA and SAC site synopses are given in Appendix 1.

[1] Directive 2009/147/EC on the conservation of wild birds (the codified version of Council Directive 79/409/EEC as amended).

[2] Council Directive 92/43/EEC on the conservation of natural habitats and wild flora and fauna, as amended by Council Directive 97/62/EC. The Directive was transposed into Irish law by the European Communities (Natural

2.2. Bannow Bay Waterbirds

2.2.1. Waterbird Special Conservation Interests (SCIs)

Bannow Bay SPA (Figure 2.1.1) covers a total area of 1,364ha and is of special conservation interest for 13 waterbird species (Table 2.2.1), two of which (Light-bellied Brent Goose and Black-tailed Godwit) have occurred in numbers of international importance in the past. In addition to the 13 waterbird SCI species, a further 15 species occur regularly at the site during winter (NPWS, 2012):

Wigeon *(Anas penelope)*
Mallard (*Anas platyrhynchos*)
Cormorant *(Phalacrocorax carbo)*
Grey Heron *(Ardea cinerea)*
Greenshank *(Tringa nebularia)*
Black-headed Gull (*Chroicocephalus ridibundus*)
Lesser Black-backed Gull *(Larus fuscus)*
Great Black-backed Gull *(Larus marinus)*
Teal *(Anas crecca)*
Red-breasted Merganser *(Mergus serrator)*
Little Egret *(Egretta garzetta)*
Ringed Plover *(Charadrius hiaticula)*
Turnstone *(Arenaria interpres)*
Common Gull *(Larus canus)*
Herring Gull *(Larus argentatus)*

Baseline data for the waterbird SCIs species of Bannow Bay SPA are shown in Table 2.2.1.

Habitats) Regulations, SI 94/1997 which were amended and later consolidated by the European Communities (Birds and Natural Habitats) Regulations 2011 – 2015 (S.I. 355/2015).

Figure 2.2.1: Location of Bannow Bay SPA, Co. Wexford (source: NPWS, 2012)

Table 2.2.1: Waterbird Special Conservation Interest (SCI) species listed for Bannow Bay SPA

Special Conservation Interests	Baseline Population[a]	Population status at baseline
Light-bellied Brent Goose *Branta bernicla hrota*	561	International Importance
Shelduck *Tadorna tadorna*	500	All-Ireland Importance
Pintail *Anas acuta*	52	All-Ireland Importance
Oystercatcher *Haematopus ostralegus*	711	All-Ireland Importance
Golden Plover *Pluvialis apricaria*[b]	1,955	All-Ireland Importance
Grey Plover *Pluvialis squatarola*	142	All-Ireland Importance
Lapwing *Vanellus vanellus*	2,950	All-Ireland Importance
Knot *Calidris canutus*	508	All-Ireland Importance
Dunlin *Calidris alpina*	3,038	All-Ireland Importance
Black-tailed Godwit *Limosalimosa*	546	International Importance
Bar-tailed Godwit *Limosa lapponica*[b]	471	All-Ireland Importance
Curlew *Numenius arquata*	891	All-Ireland Importance
Redshank *Tringa totanus*	377	All-Ireland Importance

[a]Five year peak mean for the period 1995/96 – 1999/00; [b]Annex I species

2.2.2 Published status ad trends of Bannow Bay waterbirds

The site trends for waterbird SCI species of Bannow Bay, based on I-WeBS data, were reported in the SPA Conservation Objectives Supporting Document (NPWS, 2012) (Table 2.2.2 column d). However, based on data for the period 1995/96 – 2007/08, these site trends are now considered out-of-date. Examining baseline data (Table 2.2.2, column a) against the most recently available I-WeBS data (column b) in Table 2.2.2 suggests a decline in numbers for ten of the SCI species, while three species have occurred recently in numbers greater than recorded during the baseline period. It should be borne in mind however that full count cover during I-WeBS has not been achieved in any of the recent five I-WeBS seasons (maximum 2-3 counts per season) and this may have a bearing on the peak counts recorded.

Table 2.2.2: Baseline and recent data for waterbird SCI species of Bannow Bay (I-WeBS data) plus the reported site trend (NPWS, 2012)

Special Conservation Interests	(a) Baseline data (95/96 – 99/00)[I]	(b) Recent data (13/14 – 17/18)[II]	(c) Comparison (a) vs (b)	(d) Reported trend (95/96 – 07/08)[III]
Light-bellied Brent Goose	561 (i)	611 (i)	Increase	Intermediate (Unfavourable)
Shelduck	500 (n)	315 (n)	Decrease	Highly Unfavourable
Pintail	52 (n)	0	Decrease	n/c
Oystercatcher	711 (n)	692 (n)	Decrease	Favourable
Golden Plover	1,955 (n)	4,660 (n)	Increase	Intermediate (Unfavourable)
Grey Plover	142 (n)	56 (n)	Decrease	Highly Unfavourable
Lapwing	2,950 (n)	1,209 (n)	Decrease	Intermediate (Unfavourable)
Knot	508 (n)	229 (n)	Decrease	Highly Unfavourable
Dunlin	3,038 (n)	1,062 (n)	Decrease	Highly Unfavourable
Black-tailed Godwit	546 (i)	191	Decrease	Favourable
Bar-tailed Godwit	471 (n)	855 (n)	Increase	Favourable
Curlew	891 (n)	664 (n)	Decrease	Intermediate (Unfavourable)
Redshank	377 (n)	264 (n)	Decrease	Intermediate (Unfavourable)

[I]Five year peak mean for the period 1995/96 to 1999/00;
[II]Five year peak mean for the period 2013/14 to 2017/18;
[III]Favourable (stable/increasing); intermediate unfavourable (population declines 1.0 – 24.9%); unfavourable (population declines 25.0 – 49.9%); highly unfavourable (population declines > 50%) (NPWS, 2012);
n = numbers of all-Ireland importance (Baseline: after Crowe & Holt, 2013; Current: Burke et al. 2019);
i = numbers of international importance (Baseline: after Wetlands International, 2012; Current: after AEWA, 2018).

3. METHODOLOGIES

3.1. Background to the low tide survey programme

The Irish Wetland Bird Survey (I-WeBS) is the primary method by which data are collected for wintering waterbird populations at Irish wetland sites. These data, largely collected by volunteer field surveyors since the winter season of 1994/95, have underpinned the designation of Special Protection Areas (SPAs), and have enabled the production of waterbird population estimates and trends at national and at site level (e.g. Crowe & Holt, 2013; Burke *et al*. 2019; Lewis *et al*. 2019). I-WeBS surveys are undertaken primarily on a rising or high tide, when birds are pushed closer to shore or are gathering at roost sites and are therefore easier to count than when widely distributed across exposed tidal flats.

However, while I-WeBS surveys are designed to obtain the most accurate peak counts of waterbirds at a site, they cannot provide information about waterbird abundance or distribution during the low tide period, when many waterbirds are feeding. This gap in knowledge was addressed somewhat in 2009/10, when the National Parks and Wildlife Service (NPWS) initiated a programme of low tide surveys which took place over the three winter seasons of 2009/10, 2010/11 and 2011/12 at 32 coastal SPAs (The NPWS Waterbird Survey Programme). Each SPA site was surveyed in a single winter season and Bannow Bay was surveyed in 2009/10. Standard methodology was designed to ensure consistency in data capture and recording at each site (Lewis & Tierney, 2014).

Waterbird surveys at Bannow Bay during the 2019/20 winter season therefore followed the standard methodology developed by the NPWS waterbird survey programme. Similar surveys were also undertaken during the five previous winter seasons (2014/15, 2015/16, 2016/17, 2017/18 and 2018/19).

3.2. Survey design and count area

During the 2019/20 season, a standard survey programme of four low tide counts and one high tide count was undertaken. Low tide surveys were carried out on 29th October 2019, 12th November 2019, 12th December 2019 and 11th February 2020. The high tide survey was undertaken on 17th January 2020.

Optimum dates were chosen in each month when the survey period spanned midday to facilitate travel to/from the site, but also to ensure surveys were carried out in the best weather and light conditions.

The surveys covered the same count area and count subdivisions (subsites) of Bannow Bay as used during the 2009/10 NPWS Waterbird Survey Programme. The survey area covering *c.* 1,400 ha was subdivided into eight count subsites (Table 3.2.1; Figure 3.2.1) which were counted by three fieldworkers on each survey day. The 2019/20 season fieldworkers were Barry O'Mahony (BOM), Seán Doyle (SD), Mark Shorten (MS) and Sam Bayley (SB).

Table 3.2.1 Count Subsites of Bannow Bay

Subsite Code	Subsite Name
0O410	Fethard Bay
0O411	St Kiernans to Saltmills to Big Burrow
0O413	Saint Kiernans to Newtown
0O416	Kiltra
0O417	Clonmines Castle
0O418	Bannow Island to Newquay
0O487	Tintern Abbey to Tintern Bridge
0O489	Pollfur

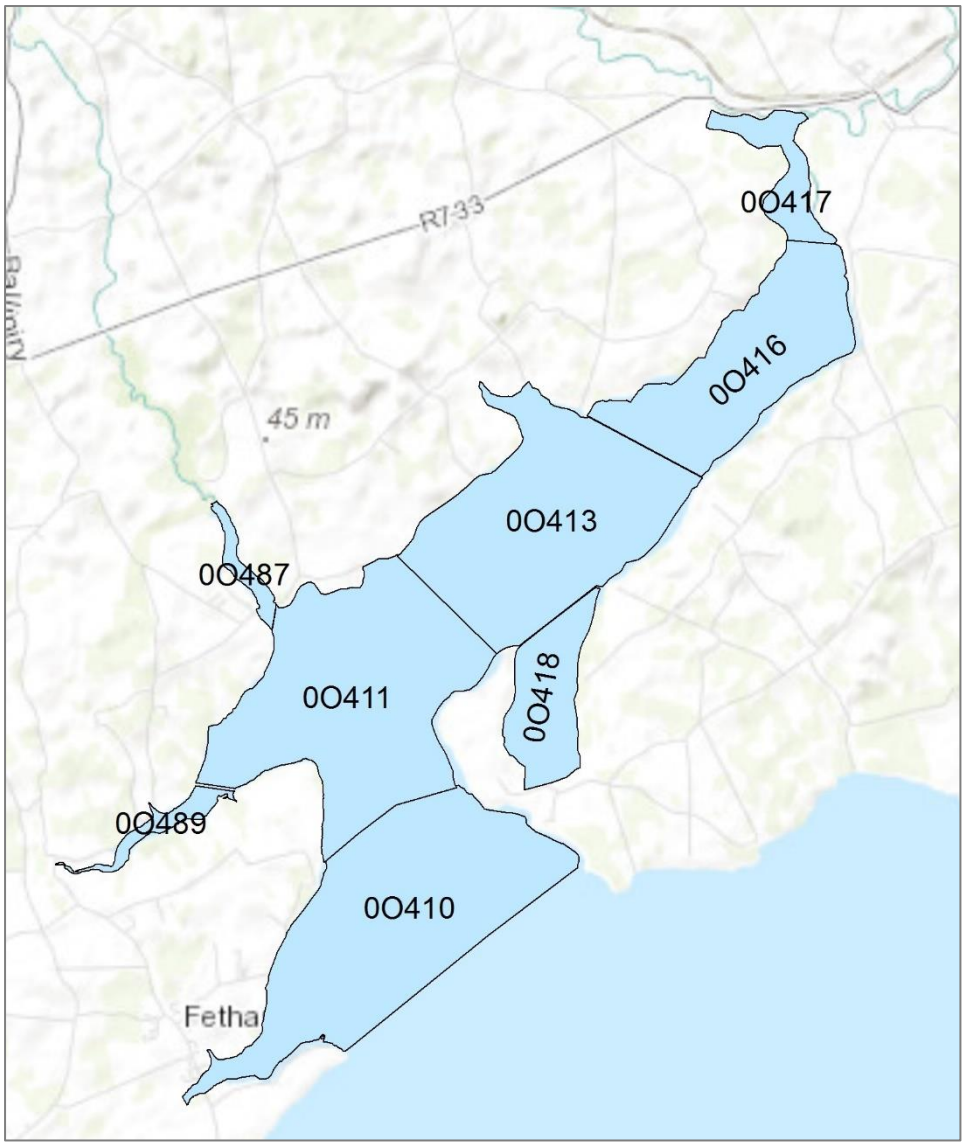

Figure 3.2.1: Count subsites used for the Bannow Bay waterbird surveys.

3.3. Field survey methods

The survey period on each day extended from two hours either side of low or high tide (depending on the survey being undertaken). Waterbirds were counted within each count subsite, and the data for each subsite were recorded separately. Waterbird counts were conducted on the 'look-see' basis (Bibby et al. 2000) which involves scanning across the survey area and counting all birds seen. Birds were recorded according to their species code following the two-letter coding system used by I-WeBS and developed by the British Trust for Ornithology.

In addition to counts of each species, the behaviour of waterbirds during counts was attributed to one of two categories (foraging or roosting/other) while the position of the birds was recorded as per one of four broad habitat types (intertidal, subtidal, supratidal and terrestrial). Field maps of count subsites were used to map significant flocks of foraging/roosting birds ('flock maps').

Information on the presence of activities that could cause disturbance to waterbirds was also recorded. Following Lewis & Tierney (2014), activity types were categorised as follows:

(1) human, on-foot - shoreline (2) human, on foot – intertidal aquaculture, (3) bait-diggers (4) non-powered watercraft (5) powered watercraft, (6) water-based recreation (e.g. wind-surfers) (7) horse-riding (8) dogs (9) aircraft (10) shooting (11) other (12) winkle pickers (13) aquaculture machinery (14) other vehicles.

When an activity was observed to cause a disturbance, the waterbird species affected were recorded and a letter code system used to indicate the bird's response to the activity as follows:-

W - Weak response, waterbirds move slightly away from the source of the disturbance.

M - Moderate response, waterbirds move away from the source of the disturbance to another part of your subsite; they may return to their original position once the activity ceases.

H - High response, waterbirds fly away to areas outside of your subsite and do not return during the current count session.

The length of the activity was also recorded by adding by the codes **A – D** (see below) and a record was made as to whether the activity was already occurring within the subsite when the count started.

A – short/discrete event.

B – activity occurs for up to 50% of the count period.

C – activity length estimated at >50% but < 100% of the count period.

D – activity continues after the count period has ended.

3.4. Data analysis

3.4.1. General

Field data were collected in notebooks and later transferred by field surveyors into Excel datasheets. At the end of the survey season the Excel datasheets were compiled and validated before being

formatted and entered into an Access database. From Access, data summaries were produced such as site totals, subsite totals etc.

Waterbird numbers were assessed with reference to national and international threshold levels as follows:

- A waterbird species that occurs in numbers that correspond to 1% or more of the individuals in the all-Ireland population of the species is said to occur in numbers of all-Ireland importance. Current population threshold values are published in Burke *et al*. (2019).

- A waterbird species that occurs in numbers that correspond to 1% or more of the individuals in the biogeographic population of the species or subspecies is said to occur in 'internationally important numbers.' Current international population threshold values are published by the African-Eurasian Migratory Waterbird Agreement (AEWA) Conservation Status Review 7 (CSR7) (AEWA 2018) (published online at wpe.wetlands.org).

3.4.2. Waterbird distribution

Following the methods used in NPWS (2012), data analyses were undertaken to determine the proportional use of subsites by each waterbird Special Conservation Interest (SCI) species, relative to the whole area surveyed on each survey occasion. This gives an indication of the preferred distribution of each species. Analyses were undertaken on datasets as follows:

- Total numbers (low tide surveys);
- Total numbers (high tide survey);
- Total numbers of foraging birds (low tide surveys);
- Intertidal foraging densities (low tide surveys).

For each of the analyses listed above and for each survey date completed, subsites were ranked in succession from the highest to the lowest in terms of their relative contribution to each species' distribution across all subsites surveyed. Subsite rank positions were then converted to categories (see box below). The highest rank position for each subsite across any of the low tide count dates is presented for each SCI species in a subsite by species matrix. For high tide surveys and peak densities, simple rank numbers are presented. Intertidal foraging density was calculated for SCI species and for each low tide survey occasion, by dividing the number of the species within a subsite by the area of intertidal habitat within the same subsite. Subsites were then ranked based on the peak foraging density recorded.

Subsite Rank Position - Categories

Very High (V)	Any section ranked as 1.
High (H)	Top third of ranking placings (where n = total number of count sections species was observed in)
Moderate (M)	Mid third of ranking placings (where n = total number of count sections species was observed in)
Low (L)	Lower third of ranking placings (where n = total number of count sections species was observed in).

3.4.3. Trends

The peak count from the low tide surveys of the 2019/20 season, along with the five previous seasons (2018/19, 2017/18, 2016/17, 2015/16 and 2014/15) were compiled together with the peak counts from the 2009/10 NPWS Waterbird Survey Programme. Peak counts were taken from either low tide or high tide surveys and were used to calculate annual indices. An index for the first season (2009/10) was constrained to a value of one, and indices for all seasons after this were expressed relative to this base value. The mean annual change was then calculated to represent a short-term trend reflecting the mean annual change between 2009/10 and 2019/20.

It is standard practice to calculate mean peak numbers for waterbirds over a five-winter period, as the average value dampens down the natural annual variation in numbers (Crowe, 2005). Therefore, as an additional assessment of trends, the five-year mean peak count was calculated for the surveys undertaken across the winters 2015/16, 2016/17, 2017/18, 2018/19 and 2019/20. This mean peak value was then compared to the baseline mean peak as used for SPA designation.

4. RESULTS

4.1. Survey schedule and conditions

The 2019/20 winter waterbird survey season proceeded relatively unhampered by weather conditions. All surveys were carried out in good weather conditions (Table 4.1.1).

Table 4.1.1: Weather conditions for the 2019/20 survey programme.

Date	Survey	Wind	Cloud	Rain	Visibility	Notes
29.10.19	LT1	Light-breezy	34-100%	None	Good	No survey constraints
12.11.19	LT2	Light-breezy	0-33%	None	Good	No survey constraints
12.12.19	LT3	Light-breezy	34-100%	None	Good	No survey constraints
17.01.20	HT1	Light-breezy	0-33%	None	Good	No survey constraints
11.02.20	LT4	Breezy	0-66%	None	Good	No survey constraints

4.2. Species assemblage and diversity

A total of 38 waterbird species were recorded during the 2019/20 surveys, which included 17 wildfowl and allies, 15 wader species, five gull species and one unidentified gull species (Table 4.2.1).The total species list includes four species (Great Northern Diver, Little Egret, Golden Plover and Bar-tailed Godwit) listed on Annex I of the EU Bird's Directive, and 28 species that are on the *Birds of Conservation Concern in Ireland* lists (Colhoun & Cummins, 2013), including six that are Red-listed and are of highest concern, and a further 22 species that are Amber-listed. All Special Conservation Interest (SCI) species listed for Bannow Bay SPA were recorded except Pintail which was not recorded during any survey.

Whole site species diversity during low tide surveys ranged between 27 species (October) and 33 species (February), and 32 species were recorded during the January high tide survey. 23 species were recorded in all five surveys undertaken. Subsite species diversity ranged from a total 19 species (0O487 Tintern Abbey to Tintern Bridge and 0O489 Pollfur) to a peak 33 species (0O413 Saint Kiernans to Newtown) (Figure 4.2.1, Table 4.2.2).

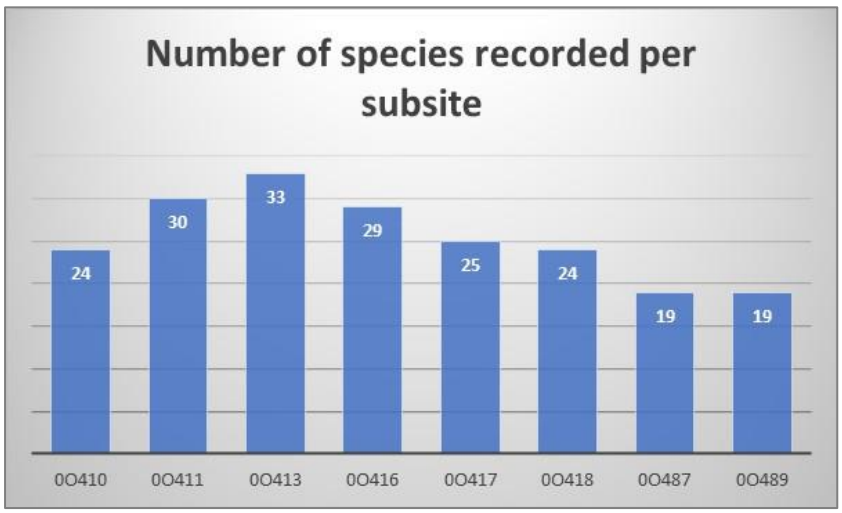

Figure 4.2.1: Subsite diversity

Twelve species (Light-bellied Brent Goose, Shelduck, Mallard, Little Egret, Oystercatcher, Lapwing, Curlew, Greenshank, Redshank, Black-headed Gull, Lesser Black-backed Gull & Herring Gull) occurred in all eight subsites.

Table 4.2.1: Species recorded during the winter surveys at Bannow Bay. The table highlights Annex I species (EU Bird's Directive) and Red and Amber-listed species under 'Birds of Conservation Concern' (Colhoun & Cummins, 2013).

Species name	Scientific name		Code	BoCCI	Annex I
Mute Swan	*Cygnus olor*		MS	A	
Light-bellied Brent Goose	*Branta bernicla hrota*		PB	A	
Shelduck	*Tadornatadorna*		SU	A	
Wigeon	*Anas penelope*		WN	A	
Gadwall	*Anas strepera*		GA	A	
Teal	*Anas crecca*		T.	A	
Mallard	*Anas platyrhynchos*		MA		
Common Scoter	*Melanitta nigra*		CX	R	
Goldeneye	*Bucephala clangula*		GN	A	
Red-breasted Merganser	*Mergus serrator*		RM		
Great Northern Diver	*Gavia immer*		ND		Yes
Little Grebe	*Tachybaptus ruficollis*		LG	A	
Great Crested Grebe	*Podiceps cristatus*		GG	A	
Cormorant	*Phalacrocorax carbo*		CA	A	
Shag	*Phalacrocorax aristotelis*		SA		
Little Egret	*Egretta garzetta*		ET		Yes
Grey Heron	*Ardea cinerea*		H.		
Oystercatcher	*Haematopus ostralegus*		OC	A	
Ringed Plover	*Charadrius hiaticula*		RP	A	
Golden Plover	*Pluvialis apricaria*		GP	A	Yes
Grey Plover	*Pluvialis squatarola*		GV	A	
Lapwing	*Vanellusvanellus*		L.		
Knot	*Calidris canutus*		KN	R	
Sanderling	*Calidris alba*		SS		
Dunlin	*Calidris alpina*		DN	A	
Snipe	*Gallinago gallinago*		SN	A	
Black-tailed Godwit	*Limosalimosa*		BW	A	
Bar-tailed Godwit	*Limosa lapponica*		BA	A	Yes
Curlew	*Numenius arquata*		CU	R	
Greenshank	*Tringa nebularia*		GK	A	
Redshank	*Tringa totanus*		RK	R	
Turnstone	*Arenaria interpres*		TT		
Black-headed Gull	*Chroicocephalus ridibundus*		BH	R	
Common Gull	*Larus canus*		CM	A	
Lesser Black-backed Gull	*Larus fuscus*		LB	A	
Herring Gull	*Larus argentatus*		HG	R	
Great Black-backed Gull	*Larus marinus*		GB	A	
Unidentified gull	*Larus sp.*		UU		

Table 4.2.2: Subsite diversity (tick marks indicate that a species was recorded in that subsite)

Species name	0O410	0O411	0O413	0O416	0O417	0O418	0O487	0O489
Mute Swan	√							
Light-bellied Brent Goose	√	√	√	√	√	√	√	√
Shelduck	√	√	√	√	√	√	√	√
Wigeon		√	√	√	√	√		√
Gadwall					√			
Teal	√		√		√	√	√	√
Mallard	√	√	√	√	√	√	√	√
Common Scoter			√					
Goldeneye			√					
Red-breasted Merganser	√	√	√	√		√		
Great Northern Diver	√	√	√	√				√
Little Grebe	√	√		√	√		√	
Great Crested Grebe		√	√	√		√		
Cormorant	√	√	√	√	√		√	√
Shag	√		√					
Little Egret	√	√	√	√	√	√	√	√
Grey Heron	√	√	√				√	
Oystercatcher	√	√	√	√	√	√	√	√
Ringed Plover			√		√			
Golden Plover	√	√	√	√	√	√		
Grey Plover		√	√	√	√	√		
Lapwing	√	√	√	√	√	√	√	√
Knot		√	√	√		√		
Sanderling		√	√	√				
Dunlin		√	√	√	√	√		
Snipe								√
Black-tailed Godwit		√	√	√	√	√	√	√
Bar-tailed Godwit		√	√	√	√	√		
Curlew	√	√	√	√	√	√	√	√
Greenshank	√	√	√	√	√	√	√	√
Redshank	√	√	√	√	√	√	√	√
Turnstone	√	√	√	√	√			
Black-headed Gull	√	√	√	√	√	√	√	√
Common Gull	√	√	√	√		√	√	√
Lesser Black-backed Gull	√	√	√	√	√	√	√	√
Herring Gull	√	√	√	√	√	√	√	√
Great Black-backed Gull	√	√	√	√	√	√	√	
Unidentified gull		√		√				

4.3. Total numbers of waterbirds

During winter 2019/20, total numbers of waterbirds during low tide surveys ranged from 8,124 (February 2020), to a peak count of 12,032 waterbirds (November 2019). A total of 7,982 waterbirds was counted during the January 2020 high tide survey (Table 4.3.1).

Table 4.3.1: Total numbers of waterbirds counted at Bannow Bay during winter 2019/20, plus totals from previous survey programmes undertaken at the site.

Winter	Total Numbers of Waterbirds (Site totals)				
	LT1	LT2	LT3	LT4	HT
2019/20	11,318	12,032	11,300	8,124	7,982
2018/19	6,991	12,411	10,680	13,801	10,192
2017/18	7,988	6,433[a]	11,942	6,555	7,542
2016/17	9,372	13,705	13,792	10,166[b]	14,135
2015/16	9,105	13,190	11,965	14,677	8,014
2014/15	10,155	14,415	14,974	11,795	13,741
2009/10	17,323	10,212	13,865	10,879	7,103 (Jan 10) 12,666 (Feb 10)

[a]count affected by fog, [b] incomplete count (only partial count of 0O411).

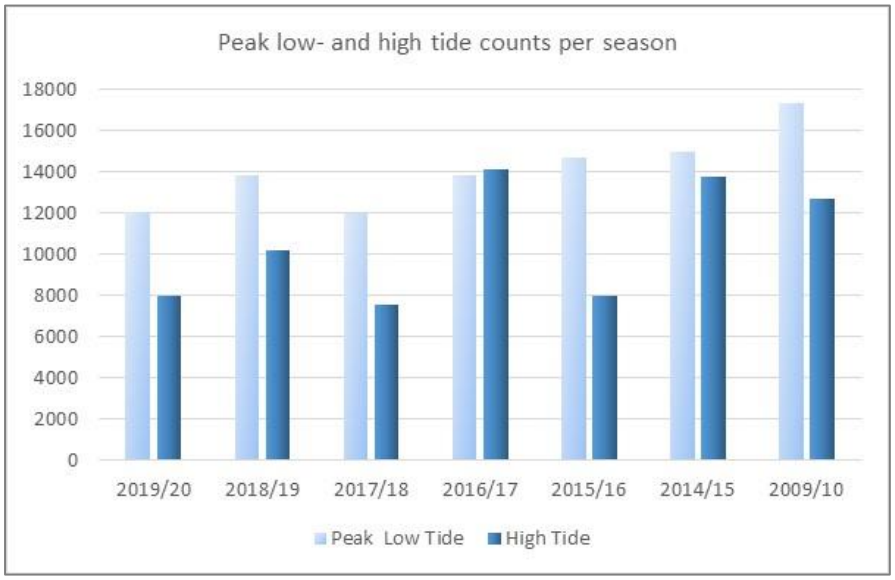

Figure 4.3.1: Peak low-and high-tide counts per season.

4.4. Species totals

Waterbird species peak counts for the 2019/20 at Bannow Bay are shown in Table 4.4.1.

During low tide surveys, two species were recorded in numbers of international importance (Light-bellied Brent Goose and Black-tailed Godwit). A further 15 species occurred in numbers of all-Ireland (national) importance, ten of which are listed as waterbird SCI species for Bannow Bay SPA.

During the high tide survey, one species was recorded in numbers of international importance (Light-bellied Brent Goose) and a further six species occurred in numbers of all-Ireland importance.

Table 4.4.1: Peak counts of waterbird species during low tide (LT) and high tide (HT) surveys at Bannow Bay during 2019/20, plus peaks from the previous five low tide survey seasons, highlighting numbers of international (i) and national (n) (all-Ireland) importance. The thresholds used are applicable to the timing of the survey hence all-Ireland thresholds currently follow (Burke et al*. 2019) with Crowe & Holt (2013) for previous surveys, while international thresholds currently follow AEWA (2018) with Wetlands International, 2012 used previously. Waterbird SCI species for Bannow Bay SPA are in bold font.*

Species	LT	HT	LT	HT	LT	HT	LT	HT	LT	HT	LT	HT	LT	HT
	2019/20		2018/19		2017/18		2016/17		2015/16		2014/15		2009/10	
Mute Swan	2	2	2		1	2	2			1				
Greylag Goose			1											
Light-bellied Brent Goose	489 (i)	778 (i)	489 (i)	415 (i)	557 (i)	575 (i)	841 (i)	615 (i)	609 (i)	640 (i)	787 (i)	484 (i)	2158 (i)	1354 (i)
Shelduck	203 (n)	120 (n)	325 (n)	353 (n)	470 (n)	202 (n)	413 (n)	395 (n)	308 (n)	279 (n)	518 (n)	244 (n)	393 (n)	354 (n)
Wigeon	715 (n)	65	564 (n)	140	493	283	661 (n)	528	356	300	781 (n)	550	226	438
Gadwall		20 (n)												
Teal	278	309	915 (n)	298	293	170	619 (n)	806 (n)	478 (n)	219	472 (n)	546 (n)	259	193
Mallard	359 (n)	141	359 (n)	250	151	113	206	117	228	113	258	142	66	36
Common Scoter	2													
Goldeneye	2		1	4	5	2		7	5	3	9	3	11	16
Red-breasted Merganser	9	10	12	4	27 (n)	36 (n)	20 (n)	28 (n)	13	5	39 (n)	26 (n)	30 (n)	18
Great Northern Diver	12	8	5		6	6	2		11	5	1	2	12	1
Little Grebe	9	5	14	3	4	6	8	2	2	6	14	12	7	4
Great Crested Grebe	5	7	13		2	0	9	2	1	2	5	1	9	1
Cormorant	151 (n)	17	51	28	28	33	34	43	38	7	23	14	49	21
Shag	4	5	4		3*		23		54	21	34	9	3	6
Little Egret	40 (n)	14	38 (n)	24 (n)	13	5	62 (n)	18	68 (n)	6	53 (n)	14	145 (n)	4
Grey Heron	7	4	15	15	11	5	23	11	16	1	19	6	34 (n)	0
Oystercatcher	686 (n)	233	1,120 (n)	639 (n)	754 (n)	590	1,237 (n)	482	1036 (n)	719 (n)	962 (n)	1146 (n)	1477 (n)	1676 (n)
Ringed Plover	80		23	2	86	0	179 (n)	0	74	0	37	118 (n)	47	11

Species	LT	HT	LT	HT	LT	HT	LT	HT	LT	HT	LT	HT	LT	HT
	2019/20		2018/19		2017/18		2016/17		2015/16		2014/15		2009/10	
Golden Plover	2,131 (n)	800	4,958 (n)	2,000 (n)	3,075 (n)	681	3,850 (n)	0	8020 (n)	281	4459 (n)	550	3517 (n)	503
Grey Plover	111 (n)		74 (n)	148 (n)	39 (n)	9	105 (n)	197 (n)	83 (n)	91 (n)	59 (n)	265 (n)	118 (n)	232 (n)
Lapwing	1,880 (n)	1,908 (n)	2,498 (n)	2,267 (n)	1,235 (n)	1,229 (n)	1,905 (n)	3,957 (n)	1878 (n)	1875 (n)	2782 (n)	720	3401 (n)	2116 (n)
Knot	963 (n)	40	613 (n)	33	247	142	344 (n)	315 (n)	555 (n)	313 (n)	959 (n)	709 (n)	329 (n)	866 (n)
Sanderling	200 (n)		145 (n)		12	0	72 (n)							
Dunlin	1,706 (n)	789 (n)	1,580 (n)	976 (n)	943 (n)	1,739 (n)	2,437 (n)	3,519 (n)	2060 (n)	613 (n)	1992 (n)	1947 (n)	1238 (n)	2438 (n)
Snipe	15	3	37		3*		13	4	8	11	0	18	10	33
Black-tailed Godwit	2,752 (i)	84	390 (n)	62	523 (n)	437 (n)	555 (n)	433 (n)	413 (n)	132	633 (i)	127	5653 (i)	390 (n)
Bar-tailed Godwit	494 (n)		245 (n)	850 (n)	610 (n)	2	559 (n)	656 (n)	470 (n)	700 (n)	644 (n)	1202 (i)	1050 (n)	1736 (i)
Curlew	1,064 (n)	921 (n)	690 (n)	297	562 (n)	608 (n)	796 (n)	434 (n)	1171 (n)	254	690 (n)	930 (n)	824 (n)	1043 (n)
Greenshank	16	8	17	13	10	13	19	34 (n)	18	22 (n)	22 (n)	37 (n)	63 (n)	7
Redshank	469 (n)	489 (n)	454 (n)	326 (n)	355 (n)	309	525 (n)	277	588 (n)	293	385 (n)	396 (n)	905 (n)	307 (n)
Turnstone	34	31	15	57	26	29	31	50	47	18	34	46	32	123 (n)
Black-headed Gull	1,435	258	1,433	937	1,031	101	2,565	1,057	2951	920	1504	3160	2119	286
Common Gull	268	98	50	14	317	128	632	71	178	40	307	182	628	6
Lesser Black-backed Gull	24	5	48	4	62	16	150	8	64	83	432	65	56	0
Herring Gull	328	579	139	24	277	60	357	61	147	38	203	48	97	6
Great Black-backed Gull	120	31	40	9	39	10	53	7	28	3	33	3	50	16

4.5. Trends in waterbird numbers

Using peak count data from the current (2019/20) and previous six seasons (2018/19, 2017/18, 2016/17, 2015/16, 2014/15 and 2009/10) of co-ordinated low and high tide surveys at Bannow Bay, an estimation of trends was calculated following the methods described in Section 3.4. This provides a short-term trend for the period 2009 – 2019 and these results are shown in Table 4.5.1 for waterbird SCI species as well as three additional species: Wigeon, Teal and Red-breasted Merganser. A threshold value of 1.2% was used to determine whether a species was showing an increasing or decreasing trend, values between that determined to be stable. The results indicate declining trends for 12 of the 15 species assessed, with three species (Wigeon, Teal and Black-tailed Godwit) showing increasing numbers. The largest declines are observed for Shelduck, Light-bellied Brent Goose and Bar-tailed Godwit. Selected species trends are shown in Figure 4.5.1.

Table 4.5.1: Trend (mean annual change %) for the period 2009/10-2019/20

Special Conservation Interest Species	Mean Annual Change (%) 2009/10 – 2019/20	Trend
Light-bellied Brent Goose	- 11.2	Decrease
Shelduck	- 12.0	Decrease
Wigeon	+ 6.5	Increase
Teal	+ 5.6	Increase
Red-breasted Merganser	- 8.8	Decrease
Oystercatcher	- 7.2	Decrease
Golden Plover	-2.6	Decrease
Grey Plover	- 9.4	Decrease
Lapwing	- 5.1	Decrease
Knot	- 4.4	Decrease
Dunlin	- 3.5	Decrease
Black-tailed Godwit	+ 11.1/-14.0*	Increase/Decrease*
Bar-tailed Godwit	- 10.9	Decrease
Curlew	- 2.8	Decrease
Redshank	- 6.5	Decrease

*Note that two trends are shown for Black-tailed Godwit. During the 2009/10 season, a very large peak count of 5,653 individuals was recorded. However, this peak count is considered a 'one-off' and attributed to staging birds that had stopped off *en route* on migration during early October 2009 (NPWS, 2012). No survey since has recorded this wading bird in such numbers. Therefore, the trend calculations were performed using the second highest count value from 2009/10 to result in an overall positive (increasing) trend over time, but if the very high count is used as a baseline then the resulting trend is negative.

As an additional assessment of trends, the five-year mean peak was calculated for selected species using data from surveys undertaken across the winters 2015/16 – 2019/20 inclusive. The mean peak value was then compared to the baseline mean peak as used for SPA designation (Table 4.5.2). This assessment reveals that seven of the waterbird SCI species now occur in numbers higher than the baseline average (Light-bellied Brent Goose, Oystercatcher, Golden Plover, Knot, Bar-tailed Godwit, Black-tailed Godwit and Redshank). Six species have declined in recent seasons with lower numbers than during the baseline period (Shelduck, Pintail, Grey Plover, Lapwing, Dunlin and Curlew) (Table 4.5.2).

Figure 4.5.1 (a-e): Selected waterbird species trends.

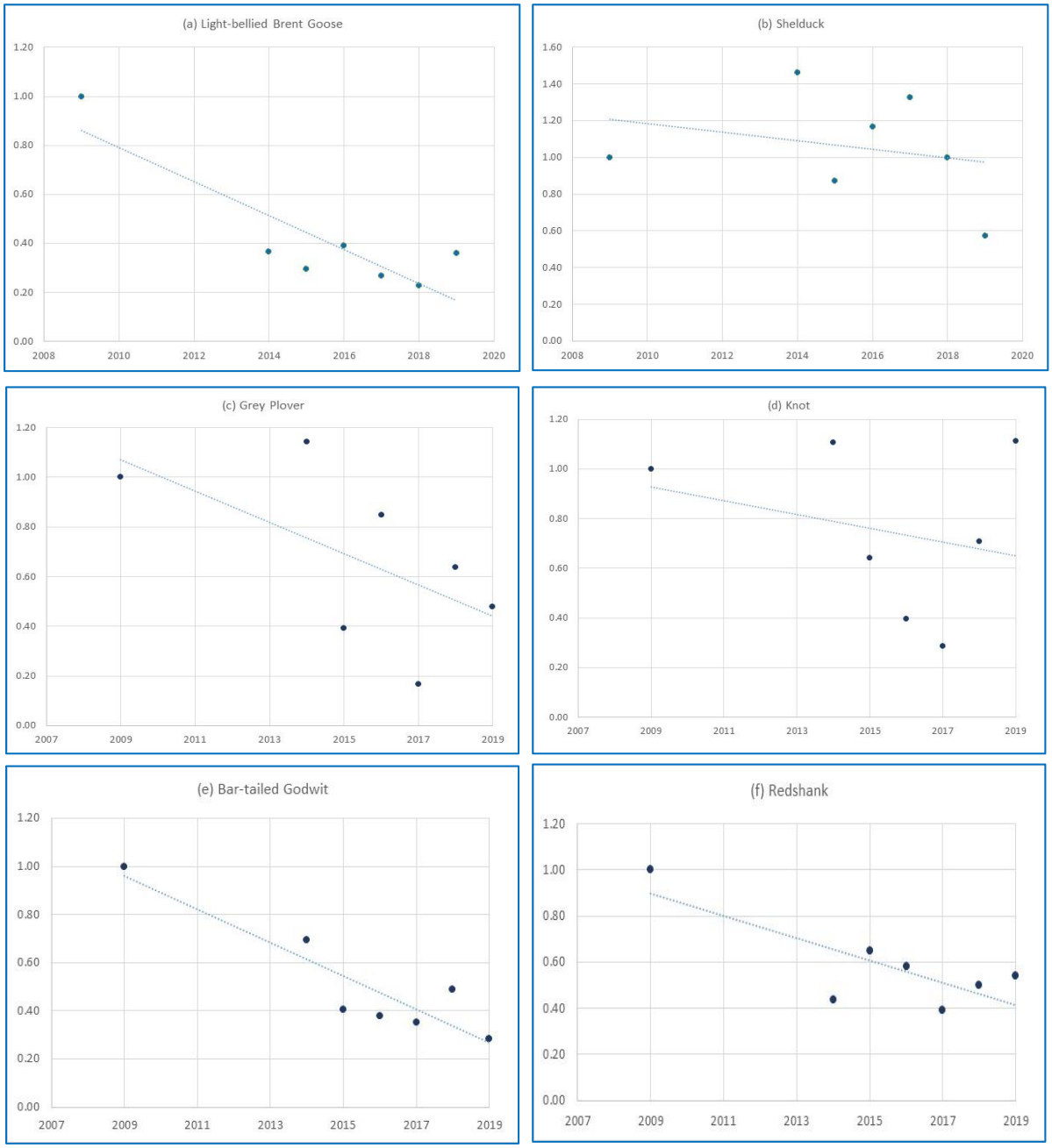

Table 4.5.2: Comparison of baseline data 5-year mean peak for waterbird SCI species of Bannow Bay with the 5-year mean peak from recent waterbird survey seasons at Bannow Bay (2015/16 – 2019/20). The change of direction arrow indicates if the most recent mean peak is greater or less than the baseline value.

Special Conservation Interests	5-year mean peak (1995/96 – 1999/00)[I]	5-year mean peak (2015/16 – 2019/20[II]	Change in direction
Light-bellied Brent Goose	561 (i)	665 (i)	↑
Shelduck	500 (n)	349 (n)	↓
Pintail	52 (n)	0	↓
Oystercatcher	711 (n)	967 (n)	↑
Golden Plover	1,955 (n)	4,407 (n)	↑
Grey Plover	142 (n)	117 (n)	↓
Lapwing	2,950 (n)	2,295 (n)	↓
Knot	508 (n)	544 (n)	↑
Dunlin	3,038 (n)	2,121 (n)	↓
Black-tailed Godwit	546 (i)	927 (n)	↑
Bar-tailed Godwit	471 (n)	662 (n)	↑
Curlew	891 (n)	866 (n)	↓
Redshank	377 (n)	482 (n)	↑

[I]Five year peak mean for the period 1995/96 to 1999/00.
[II]Five year peak mean for the period 2015/16 to 2019/20. Peak counts from either low or high tide surveys.
n = numbers of all-Ireland importance (Baseline = after Crowe & Holt, 2013; Current = Burke et al. 2019).
i = numbers of international importance (Baseline = after Wetlands International, 2012; Current = after AEWA, 2018).

4.6. Subsite totals

During the 2019/20 season, 0O416 (Kiltra) supported the largest number of waterbirds on two low tide survey occasions (October & December). 0O417 (Clonmines Castle) supported peak low tide numbers during February 2020 and 0O418 (Bannow Island to Newquay) during November 2019 (Table 4.6.1), the latter being the highest low tide subsite count (4,151 birds) during the winter.

0O417 (Clonmines Castle) supported the largest number of waterbirds during the high tide survey with numbers equivalent to 46% of the total number of birds counted on that date, consistent with previous annual surveys.

Peak counts within five of the subsites (0O411, 0O413, 0O418, 0O487 and 0O89) were higher during the 2019/20 season that recorded during the previous winter 2018/19 (Table 4.6.1).

The summed counts for four subsites 0O413, 0O16, 0O17 and 0O418) represent between 75-90% of the total number of waterbirds on low tide surveys, highlighting the importance of these four subsites relative to the others.

Table 4.6.1: Total numbers of waterbirds within subsites during winter 2019/20.

Subsite Code	Subsite Name	LT1	LT2	LT3	LT4	HT	Peak Count 2018/19

0O410	Fethard Bay	121	238	365	205	225	582 (LT)
0O411	St Kiernans to Saltmills to Big Burrow	520	1,531	1,575	1,503	1,093	1,115 (LT)
0O413	Saint Kiernans to Newtown	3,663	2,321	708	951	209	1,084 (LT)
0O416	Kiltra	3,697	1,427	4,030	1,226	651	6,603 (LT)
0O417	Clonmines Castle	1,013	1,984	2,001	2,289	3,703	5,668 (HT)
0O418	Bannow Island to Newquay	1,865	4,151	2,090	1,682	998	2,518 (LT)
0O487	Tintern Abbey to Tintern Bridge	241	150	166	128	753	522 (LT)
0O489	Pollfur	198	230	365	140	350	273 (LT)

Peak counts in four of the six seasons winters have been recorded for 0O416 (Kiltra). Peak counts for 0O413 (Saint Kiernans to Newtown) and 0O418 (Bannow Island to Newquay) during 2019/20 were the highest for these subsites across all low tide surveys undertaken in recent winters (Table 4.6.2). The number of birds within 0O487 (Tintern Abbey to Tintern Bridge) during the high tide survey was the largest recorded in this subsite across the winters (Table 4.6.2). Of note is the pattern of peak counts recorded for 0O417 (Clonmines castle) – peak counts from five of the six winters were recorded at high, rather than at low tide.

Table 4.6.2: Peak numbers of waterbirds within subsites for 2019/20 and the five previous survey seasons. Overall peak for each winter shown in bold.

Subsite Code	Subsite Name	2019/20	2018/19	2017/18	2016/17	2015/16	2014/15
0O410	Fethard Bay	365 (LT)	582 (LT)	586 (LT)	797 (LT)	291 (LT)	916 (LT)
0O411	St Kiernans to Saltmills to Big Burrow	1,575 (LT)	1,115 (LT)	1,097 (LT)	2,006 (LT)	2,477 (LT)	2,551 (LT)
0O413	Saint Kiernans to Newtown	3,663 (LT)	1,084 (LT)	825 (LT)	2,304 (LT)	1,600 (LT)	898 (LT)
0O416	Kiltra	4,030 (LT)	6,603 (LT)	**5,711 (LT)**	**7,482 (LT)**	**6,285 (LT)**	**8,849 (LT)**
0O417	Clonmines Castle	3,703 (HT)	**5,668 (HT)**	3,383 (HT)	2,075 (HT)	4,838 (LT)	1,527 (HT)
0O418	Bannow Island to Newquay	**4,151 (LT)**	2,518 (LT)	1,415 (LT)	3,385 (HT)	2,813 (LT)	2,101 (LT)
0O487	Tintern Abbey to Tintern Bridge	753 (HT)	522 (LT)	219 (LT)	354 (LT)	217 (LT)	248 (LT)
0O489	Pollfur	365 (LT)	273 (LT)	488 (LT)	354 (HT)	320 (LT)	234 (LT)

4.7. Waterbird densities

During 2019/20, 0O417 (Clonmines Castle) supported the greatest average density of total waterbirds (Table 4.7.1) and recorded the greatest maximum density. This is consistent with previous winters.

Table 4.7.1: Average density of total waterbirds (min-max) within count subsites 2019/20.

Subsite Code	Subsite Name	Average density (birds/ha)	Min	Max
0O410	Fethard Bay	3.2	1.7	5.1
0O411	St Kiernans to Saltmills to Big Burrow	4.6	1.8	5.6
0O413	Saint Kiernans to Newtown	7.3	2.7	14.0
0O416	Kiltra	14.9	6.9	22.6
0O417	Clonmines Castle	105.6	58.7	132.7
0O418	Bannow Island to Newquay	32.1	22.1	54.4
0O487	Tintern Abbey to Tintern Bridge	15.6	11.7	22.0
0O489	Pollfur	15.0	9.0	23.5

Peak foraging densities during the 2019/20 season ranged from 1 bird/ha (Light-bellied Brent Goose 0O489) to 20.3 Dunlin/ha (0O417) (Table 4.7.2). Highest densities of Shelduck were recorded for 0O418 (Bannow Island to Newquay), highly consistent with the results from all previous surveys. Four of the ten species assessed occurred in higher densities in 0O418 (Bannow Island to Newquay). The peak foraging densities of Knot, Dunlin, Black-tailed Godwit and Redshank were the highest recorded to date.

Table 4.7.2: Peak intertidal foraging densities (birds/ha^{-1}) recorded during the 2019/20 surveys for selected waterbird SCIs and the subsite it was recorded for (in brackets); plus results from previous surveys.

Special Conservation Interests (SCIs)[a]	2019/20	2018/19	2017/18	2016/17	2015/16	2014/15	2009/10
Light-bellied Brent Goose	1.0 (0O489)	1.8 (0O410)	2.0 (0O410)	1.6 (0O410)	1.8 (0O418)	2.8 (0O418)	1.8 (0O410)
Shelduck	1.3 (0O418)	2.5 (0O418)	4.6 (0O418)	4.0 (0O418)	2.9 (0O418)	2.4 (0O418)	3.4 (0O418)
Oystercatcher	5.9 (0O418)	11.9 (0O417)	7.0 (0O418)	5.1 (0O417)	6.1 (0O418)	8.4 (0O418)	9.0 (0O418)
Grey Plover	1.3 (0O417)	0.3 (0O417)	0.2 (0O417)	1.0 (0O418)	0.3 (0O416)	0.3 (0O417)	11.0 (0O418)
Knot	7.2 (0O418)	3.2 (0O418)	2.5 (0O418)	1.7 (0O416)	4.7 (0O418)	2.1 (0O416)	2.4 (0O418)
Dunlin	20.3 (0O417)	15.8 (0O417)	15.8 (0O417)	9.4 (0O416)	5.1 (0O416)	11.0 (0O416)	4.9 (0O487)
Black-tailed Godwit	10.5 (0O418)	5.7 (0O417)	7.2 (0O489)	1.7 (0O417)	1.7 (0O417)	6.0 (0O489)	3.2 (0O487)
Bar-tailed Godwit	2.6 (0O416)	0.7 (0O417)	3.0 (0O416)	2.2 (0O416)	5.5 (0O417)	2.4 (0O416)	3.8 (0O416)

Special Conservation Interests (SCIs)[a]	2019/20	2018/19	2017/18	2016/17	2015/16	2014/15	2009/10
Curlew	1.1 (0O487)	3.6 (0O417)	1.4 (0O416)	7.5 (0O417)	3.9 (0O417)	2.4 (0O417)	3.5 (0O487)
Redshank	7.3 (0O417)	5.9 (0O417)	4.9 (0O489)	1.9 (0O489)	3.0 (0O418)	2.0 (0O418)	4.9 (0O418)

[a] Note- not calculated for Golden Plover and Lapwing that do not forage to a great extent in intertidal habitat.

Four of the ten waterbird species assessed were recorded in highest foraging densities in 0O418 during winter 2019/20. The densities of a further three other species were ranked second highest for this subsite. Three species (Grey Plover, Dunlin and Redshank) foraged in highest densities in 0O417 (Clonmines Castle) (Table 4.7.3).

Table 4.7.3: Top three count subsites ranked in terms of peak intertidal foraging density recorded during 2019/20.

Special Conservation Interests (SCIs)[A]	00410	0O411	0O413	0O416	0O417	0O418	0O487	0O489
Light-bellied Brent Goose			2			3		1
Shelduck		3			2	1		
Oystercatcher				2	3	1		
Grey Plover				3	1	2		
Knot			3		2	1		
Dunlin				3	1	2		
Black-tailed Godwit					2	1	3	
Bar-tailed Godwit				1	3	2		
Curlew				3	2		1	
Redshank					1		2	3

4.8. Waterbird distribution

During low tide surveys, 0O418 (Bannow Island to Newquay) supported the largest number of species (eight) in numbers ranked as 'very high' (Table 4.8.1), followed by 0O416 (Kiltra) (six species). Based on numbers ranked as 'very high'and 'high', five of the eight subsites appear to be the most favoured at low tide (0O418, 0O417, 0O416, 0O413 and 0O411).

Table 4.8.1: Relative importance of each subsite based on total numbers of waterbird SCI species during low tide surveys.

Subsite Code	Subsite Name	Very High	High	Moderate
0O410	Fethard Bay		PB,	SU, OC, GP, L., BW
0O411	St Kiernans to Saltmills to Big Burrow	PB, SU, DN, CU	GP, KN, RK	OC, L., BA
0O413	Saint Kiernans to Newtown	PB, DN, BW, BA, RK	GP, KN, CU	SU, L.
0O416	Kiltra	PB, OC, GP, KN, BA, CU	SU, L., DN, RK	GV, BW

0O417	Clonmines Castle	GV, L., BW, RK	SU, CU	OC, GP, DN
0O418	Bannow Island to Newquay	SU, OC, GP, GV, KN, DN, BW, RK	L.	PB, BA, CU
0O487	Tintern Abbey to Tintern Bridge			PB, BW, RK
0O489	Pollfur		CU, RK	SU, OC, BW

Table shows waterbird species by their standard two-letter codes: BA Bar-tailed Godwit, BW Black-tailed Godwit, CU Curlew, DN Dunlin, GP Golden Plover, GV Grey Plover, KN Knot, OC Oystercatcher, PB Light-bellied Brent Goose, RK Redshank, SU Shelduck.

Four subsites held peak numbers of waterbird species during the high tide survey (0O411, 0O413, 0O417 and 0O418). 0O417 and 0O418 held peak numbers of four and three waterbird species respectively (Table 4.8.2). Neither Grey Plover nor Bar-tailed Godwit were recorded during the high tide survey.

Table 4.8.2: Relative importance of each subsite ranked by total numbers during the high tide survey.

Subsite Code	Subsite Name	Ranked 1	Ranked 2	Ranked 3
0O410	Fethard Bay			L.
0O411	St Kiernans to Saltmills to Big Burrow	CU		PB, OC, RK
0O413	Saint Kiernans to Newtown			DN
0O416	Kiltra	OC, BW		CU
0O417	Clonmines Castle	GP, L., DN, RK	PB, SU, OC	
0O418	Bannow Island to Newquay	PB, SU, KN	DN	
0O487	Tintern Abbey to Tintern Bridge		CU	
0O489	Pollfur		L., RK	SU

Table shows waterbird species by their standard TWO-LETTER codes: BA Bar-tailed Godwit, BW Black-tailed Godwit, CU Curlew, DN Dunlin, GP Golden Plover, GV Grey Plover, KN Knot, OC Oystercatcher, PB Light-bellied Brent Goose, RK Redshank, SU Shelduck.

Tables 4.8.3 – 4.8.5 provide an assessment of waterbird distribution where subsites are ranked in succession from the highest to the lowest in terms of their relative contribution to each species' distribution during low tide, high tide, and for selected species foraging intertidally. Note that subsite rankings for low tide surveys are based on categories (Very high, High, Moderate and Low), while for waterbird numbers at high tide, subsites are ranked by number (1-8).

*Table 4.8.3: Subsite ranking (categories) based on **total numbers** during low tide surveys.*

Subsites / Species	0O410	0O411	0O413	0O416	0O417	0O418	0O487	0O489
PB	H (V, V, V, M, H, H)	V (V, V, V, V, V, V)	V (V, M, V, V, V, V)	V (V, M, V, V, H, V)	- (- - - - - M)	M (M, L, H, V, V, V)	M (- - - - - -)	L (M, M, - - - M)
SU	L (- - L, - - H)	V (M, V, M, H, M, H)	M (H, L, H, H, V, M)	H (H, H, V, H, H, V)	H (- L, M, L, L, H)	V (V, V, V, V, V, V)	L (- - - L, - M)	M (- M, M - - H)
OC	L (M, M, M, M, M, H)	M (M, H, M, M, H, H)	H (H, V, V, H, H, V)	V (H, H, H, V, H, V)	M (M, L, M, M, H, M)	V (V, V, V, V, V, V)	L (- - L, L, L, L)	M (L, L, L, L, L, L)
GP	M (- - - - - -)	H (- H, V, H, H, V)	H (M, - - - M, H)	V (V, V, V, V, V, V)	V (V, - - H, H, H)	V (V, H, H, H, M, V)	- (- - - - - -)	- (- - - - - M)
GV	- (- M, - - - -)	L (V, V, V, M, H, V)	L (H, V, H, M, -, V)	M (H, V, V, V, V, M)	V (V, H, V, H, H, M)	V (H, H, V, V, V, V)	- (- - - - - -)	- (- L, - - - M)
L.	M (V, M, L, L, M, M)	M (M, M, M, V, H, H)	M (M, H, L, L, M, H)	H (V, V, V, V, V, V)	V (V, V, V, V, H, V)	H (H, - H, H, H, M)	L (- - - - - H)	L (L, - - - L, -)
KN	- (- - - - - -)	H (- - H, H, H, V)	H (V, H, M, H, -, H)	V (V, V, V, V, V, V)	- (H, - - - - -)	V (H, V, V, V, H, V)	- (- - - - - -)	- (- - - - - -)
DN	- (- - - - - -)	V (V, H, V, H, H, V)	V (V, H, H, V, M, H)	H (V, V, V, V, V, V)	H (H, V, M, V, H, M)	V (H, M, V, V, H, V)	- (- - - - -, M)	- (- - - - - -)
BW	- (L, - - - - -)	M (H, M, H, M, H, M)	V (V, H, H, V, H)	H (V, V, V, V, V, V)	V (V, H, V, M, H, M)	V (H, M, V, V, H, M)	M (M, M, M, L, M, H)	M (M, V, M, M, H, H)
BA	- (- - - - -, L)	M (M, H, H, H, H, H)	V (M, H, H, H, H, V)	V (V, V, V, V, V, V)	L (H, M, H, H, M, M)	H (H, M, - -, M, M)	- (- - - - - -)	- (- - L, - - M)
CU	L (L, M, M, L, L, L)	V (V, V, H, H, H, H)	H (H, H, H, H, H, H)	V (V, V, V, V, V, V)	H (H, M, V, V, H, H)	M (M, H, H, H, M, V)	L (M, M, L, L, L, M)	M (M, M, M, M, L, M)
RK	L (M, L, L, L, L, M)	H (V, H, M, H, V, V)	V (H, M, H, H, H, H)	H (H, H, V, V, V, H)	V (V, H, M, M, L, M)	V (V, V, V, V, V, V)	M (M, L, L, L, L, L)	H (H, V, M, M, H, M)

NOTE: letters in brackets refers to the category recorded during the 2018/19, 2017/18, 2016/17, 2015/16, 2014/15 and 2009/10 surveys respectively; a line (-) refers to a previous zero count in the subsite.

*Table 4.8.4: Subsite ranking based on **total numbers** during the high tide survey.*

Subsites / Species	0O410	0O411	0O413	0O416	0O417	0O418	0O487	0O489
PB	5 (2, 6, 2, -, 6, 4)	3 (3, 4, 3, 2, 1,1)	- (5, 2, 4, -, 5, 3)	6 (1, 1, 6, 1, 3,2)	2 (- - - -, 4,-)	1 (- 3, 1, -, 2,1)	- (- - - - - -)	4 (4, 5, 5, - -,5)
SU	- (- - - - - -)	4 (- 2, 2, 2,2,2)	- (- - - 1, -,4)	5 (2, - 4, 4, -,5)	2 (- - 5, 3, -,3)	1 (1, 1, 1, 1, 1,1)	- (- - - - - -)	3 (- 3, 3, 3, 1,2)
OC	4 (4, 3, 6, -, 5, 4)	4 (6, 4, 2, 1, 3,2)	6 (5, 5, 4, 5, 4,4)	1 (2, 2, 3, 3, 2, 2)	2 (3, - - 4, -,3)	5 (1, 1, 1, 2, 1,1)	- (- - - - - -)	- (7, 5 - - - -)
GP	- (- - - - - -)	- (- - -, -, 3,3)	- (- - - - -,1)	- (- - - -, 1,1)	1 (1, 1, -, 1, -,2)	- (- 2, - -, 2,2)	- (- - - - - -)	- (- - - - - -)
GV	- (- - - - - -)	- (- - - - - -)	- (- - - - -,3)	- (- - 1, 2, 1,1)	- (2, - 3, -, 3, 2)	- (1, 1, 2, 3, 2,1)	- (- - - - - -)	- (- - - - -,5)
L.	3 (- - 6, 5, - -)	- (2, 3, 4, 2, 2,3)	4 (5, 3, 5, 4, 6,5)	- (3, 2, 1, 3, 1,2)	1 (1, 1, 2, 1, 3,1)	5 (3, 5, 3, 5, 4,4)	- (- - - - -,2)	2 (6, - - - - -)
KN	- (- - - - - -)	- (- - - -, -, 4)	- (- - - - -,3)	- (- - -, 2, 1,2)	- (- - - -, 2,1)	1 (1, 1, 1, - -,1)	- (- - - - - -)	- (- - - - - -)
DN	- (- - - - - -)	- (2, - 4, 1, -,3)	3 (- - - - -,4)	- (- 2, 1, 3, 2,1)	1 (1, 1, 3, 2, 1,2)	2 (3, 3, 2, 4, 3,1)	- (- - - - - -)	- (- - - - - -)
BW	- (- - - - - -)	- (4, - - -, 1,3)	- (5, - 2, - - -)	1 (- 2 - - -,1)	- (- 1, 4, - -,1)	- (1, - 1 -, 2 -)	- (2, - - - - -)	- (3, - 3, - - -)
BA	- (- - - - - -)	- (- - 3, 3, -,4)	- (- 1, - - -,3)	- (- - 1, 1, 1,1)	- (1, -, 2, 2, -,2)	- (- - - -, 2,2)	- (- - - - - -)	- (- - - - - -)
CU	8 (- 4, 7, -, 2, 6)	1 (7, 5, 4, 5, 4,3)	4 (3, 3, 1, 3, 6,4)	3 (2, 6, 2, 1, 1,1)	5 (1, 1, 3, 4, 3,3)	6 (5, 6, 5, 2, 5,2)	2 (6, -, 6- -,1)	7 (- 2, 6, - -,5)
RK	8 (7, 7, 7, -, 8,5)	3 (4, 5, 5, 5, 3,3)	4 (3, 2, 1, 3, 2,4)	7 (6, 4, 2, 2, 4,1)	1 (2, 1, 6, 4, 5,2)	5 (1, 3, 3, 1, 1,1)	6 (5, 8, 8, 6, 6,7)	2 (- 6, 4, - 7,5)

NOTE: letters in brackets refers to the category recorded during the 2018/19, 2017/18, 2016/17, 2015/16, 2014/15 and 2009/10 surveys respectively; a line (-) refers to a previous zero count in the subsite.

*Table 4.8.5: Subsite ranking based on numbers **foraging intertidally** during low tide surveys.*

Subsites / Species	0O410	0O411	0O413	0O416	0O417	0O418	0O487	0O489
PB	H (V, V, V, M, V, H)	V (V, H, V, V, H, V)	V (V, M, V, V, V,V)	- (- M, V, V, M, -)	- (- - - - - -)	H (H, L, V, V, V, H)	- (- - - - - -)	M (M, - - - -, L)
SU	M (- - - - - -)	V (H, V, M, V, M, H)	M (M, L, H, -, M, L)	M (V, H, V, M, V, V)	H (- - L, M, M, H)	V (V, V, V, V, V, V)	L (- - -, L, -, M)	M (- M, - - -, H)
OC	M (M, M, M, M, M, H)	M (H, M, H, H, H, H)	H (M, H, H, H, H, H)	V (H, H, V, V, V, V)	M (H, L, M, M, H, M)	V (V, V, V, V, V, V)	L (- - L, L, L, L)	L (L, L, L, L, L, M)
GV	- (- - -, L, - -)	- (V, V, V, M, H, V)	H (V, V, H, M, -, H)	H (H, V, M, V, V, M)	V (V, H, V, H, H, L)	V (H, H, V, V, V, V)	- (- - - - - -)	- (- L - - - -)
KN	- (- - - - - -)	H (- - V, -, H, V)	V (V, H, H, H, -, H)	H (V, V, V, V, V, V)	V (- - - - - -)	V (V, V, V, V, H, V)	- (- - - - - -)	- (- - - - - -)
DN	- (- - - - - -)	H (V, H, V, H, H, V)	V (V, H, H, V, M, H)	H (V, V, V, V, V, V)	V (H, V, M, L, H, M)	V (H, M, V, V, H, V)	- (- - - - -, M)	- (- - - - - -)
BW	- (- - - - - -)	L (H, M, V, M, H, M)	V (V, H, V, V, H, V)	V (V, V, V, V, V, V)	H (V, H, H, M, V, H)	V (H, V, M, V, V, H)	H (- H, -, L, H, V)	M (M, V, -, L, V, H)
BA	- (- - - - -, L)	M (H, H, H, M, H, H)	H (H, H, H, V, V, V)	V (V, V, V, V, V, V)	M (V, H, H, H, L, M)	H (H, M, -, L, M, M)	- (- - - - - -)	- (- - - - -, L)
CU	L (L, M, L, L, L, M)	V (V, H, H, H, H, H)	H (H, H, V, V, H, H)	V (V, V, V, V, V, V)	M (H, M, V, V, H, M)	H (M, H, M, H, M, V)	M (L, M, L, L, M, M)	L (M, M, L, L, L, M)
RK	L (M, L, L, L, L, L)	H (H, H, M, H, V, V)	H (H, M, H, H, H, H)	V (H, H, V, V, V, H)	V (V, M, M, M, L, M)	V (V, V, V, V, V, V)	M (M, L, L, L, L, M)	H (H, V, M, M, H, M)

NOTE: letters in brackets refers to the category recorded during the 2018/19, 2017/18, 2016/17, 2015/16, 2014/15 and 2009/10 surveys respectively; a line (-) refers to a previous zero count in the subsite.

4.9. Waterbird distribution – species summaries

The following species accounts examines the low tide distribution of waterbird SCI species at Bannow Bay during winter 2019/20 and assesses patterns in light of previous low tide survey programmes at the site.

4.9.1. Light-bellied Brent Goose

In terms of total numbers, three subsites held peak numbers of Light-bellied Brent Goose (hereafter called Brent Goose) during the four low tide surveys of 2019/20 - 0O411 (St Kiernans to Saltmills to Big Burrow) (twice), 0O413 (Saint Kiernans to Newtown) and 0O416 (Kiltra). This result is highly consistent with previous low tide surveys at the site. The peak subsite low tide count was recorded for 0O413 (November 2019) when a count of 250 individuals represented just over half the Brent geese recorded on that day.

Overall, the distribution across subsites 0O410, 0O411, 0O413 and 0O416 remains consistent with previous low tide surveys (refer to Table 4.8.3). This distribution is most likely related to food supply. 0O411 has been noted for the presence of a *Zostera noltii*-dominated community that occurs in the upper and mid shore between Gorteens and Saltmills (NPWS, 2011). The seagrass occurs as a patchy meadow intermixed with the filamentous green alga *Ulva* spp. and is difficult to map with accuracy (ASU, 2010), but has a potential to occur as a patchy habitat across a wider area which may explain the general observations of small but widely distributed flocks of Brent Geese within this subsite. Across the wider site, the geese are likely foraging on a range of algae species and particularly in 0O410 (Fethard Bay) where it occurs widely along the tideline as well as being washed up in certain conditions.

Consistent with previous surveys, subsites 0O487 (Tintern Abbey to Tintern Bridge) and 0O489 (Pollfur) supported relatively few geese on few survey occasions. Total numbers of Brent Goose were greater during high tide (Table 4.1.1) and two-thirds of the birds were recorded roosting. Just over 55% of the total site number of geese were in 0O418 (Bannow Island to Newquay) and these birds were roosting in various locations intertidally, supratidally and terrestrially (Figure 4.9.1).

Figure 4.9.1: Roosting locations of Light-bellied Brent Goose within 0O418 (Bannow Island to Newquay) during the January 2020 high tide survey.

4.9.2. Shelduck

Consistent with previous surveys, 0O418 (Bannow Island to Newquay) held peak numbers of Shelduck during three low tide surveys and during the high tide survey where the numbers represented 78% of the total recorded across the site. Peak numbers within 0O418 also translate into the peak density of Shelduck recorded within this subsite, again consistent with previous surveys (refer to Table 4.7.2) (Figure 4.9.2).

0O411 (St Kiernans to Saltmills to Big Burrow) supported peak numbers during the final low tide survey representing 60% of the Shelduck recorded on that date. 0O416 (Kiltra) was the only other subsite to support good numbers of Shelduck (maximum number 51), while 0O410 (Fethard Bay), 0O417 (Clonmines Castle), 0O487 (Tintern Abbey to Tintern Bridge) and 0O489 (Pollfur) held very low numbers irregularly. The consistency with previous survey results points to a high level of subsite faithfulness. The sediment of 0O418 comprises fine sand and silt particles, and based on previous macroinvertebrate sampling (NPWS, 2011) the mollusc *Hydrobia ulvae*, is likely to be found. This is a favoured prey of Shelduck, and the distribution of this small mud snail has been shown to determine the distribution of Shelduck across a site (e.g. Buxton, 1981). Such a high degree of site faithfulness is important in terms of site management.

Figure 4.9.2: Low tide distribution of Shelduck – total numbers across all four low tide surveys. Dots are placed randomly within subsites and one dot = 2 birds.

4.9.3. Oystercatcher

Oystercatchers are a widely distributed wading bird and are found within estuarine sites, foraging terrestrially and along non-estuarine shores (Lewis *et al.* 2017). During winter 2019/20, they were recorded within all eight of the count subsites at Bannow Bay and two subsites recorded numbers ranked as 'very high' – 0O416 (Kiltra) and 0O418 (Bannow Island to Newquay), the latter on three survey occasions. This is highly consistent with previous surveys, with 0O418 being the only subsite to have supported numbers ranked as 'very high' in all low tide surveys undertaken across the site. In addition, 0O413 (Saint Kiernans to Newtown) supported good proportions of birds, with all counts ranked as 'high' or 'moderate', again highly consistent with previous annual surveys. These results suggest not only a high degree of subsite faithfulness, but also that these subsites provide a good food resource all winter. While Cockles (*Cerastoderma edule*) are known to occur in 0O418, benthic data for Bannow Bay are not detailed enough to fully understand the subsite preference of Oystercatchers.

During the high tide survey, 0O416 (Kiltra) supported the largest number of Oystercatchers, representing nearly half of all these wading birds recorded during the survey, and double the number found in any other subsite.

4.9.4. Golden Plover

During winter, Golden Plovers are attracted to winter cereals, stubbles, fallows, harvest-fields and closed-grazed pastures, with the use of intertidal habitats restricted to roosting behaviour at low tide (Béchet, 2006). Wintering Golden Plovers are considered to be site faithful but individual roosting and foraging sites within the sites have the potential to differ within and between years (Wernham *et al*. 2002).

Roost locations within Bannow Bay have been highly consistent over time with the subsite 0O416 (Kiltra) having been the favoured subsite throughout all surveys (ranked 'very high' in terms of total numbers across all surveys). During the 2019/20 season the main Golden Plover flock was recorded in 0O416 on two low tide survey occasions (October and December 2019) with a flock size of 1,400 and 1,100 birds respectively (Figure 4.9.3). In December 2019, 0O411 (St Kiernans to Saltmills to Big Burrow) also supported 1,000 Golden Plover bringing the site total numbers on this day to over 2,000 birds. 0O418 (Bannow Island to Newquay) supported 1,800 Golden Plover in November 2019, while 0O417 supported 350 Golden Plover during February 2020, the entire flock on this date. Clearly the flock moves and subsites 0O411, 0O416, 0O417 and 0O418 are the favoured areas of the bay, although 0O416 (Kiltra) has consistently held the greatest number over the years.

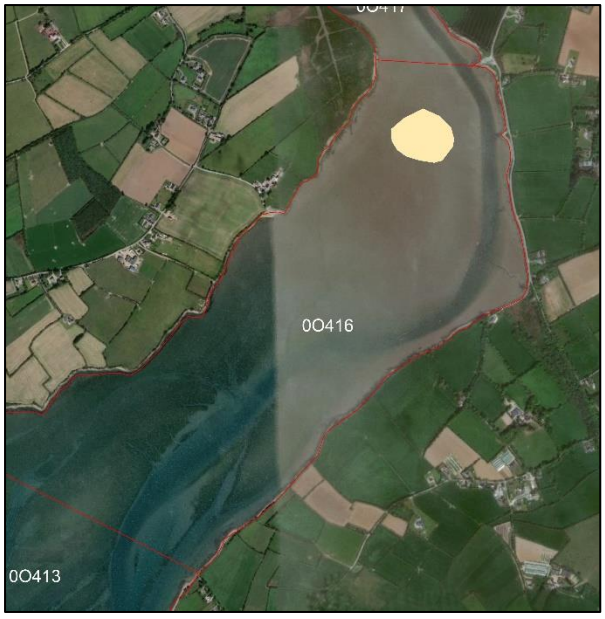

Figure 4.9.3: *Approximate position of the low tide roosting Golden Plover flock in 0O416 (Kiltra).*

During the high tide survey, all recorded Golden Plover (800 birds) were located within 0O417. The plovers roosted as part of a large mixed-species flock which also included 1,500 Lapwing, 400 Dunlin and 200 Redshank (Figure 4.9.4). This mixed-species roost position is consistent with previous surveys and highlights the within-site faithfulness of the waterbird species.

Figure 4.9.4: Position of the Golden Plover and mixed species roost within 0O417 during the high tide survey January 2020.

4.9.5. Grey Plover

Total site numbers of Grey Plover ranged from 20 (February 2020) to a peak count of 111 birds (November 2019). This wading bird occurred most frequently within 0O418 (Bannow Island to Newquay) (all 4 low tide surveys), and peak subsite numbers were held by 0O418 and 0O417

(Clonmines Castle). A further three subsites held the species on one survey occasion only (0O411, 0O413 and 0O413).

Given relatively low numbers, no single subsite has appeared to be more favoured than another across low tide surveys of Bannow Bay but results across the years have been relatively consistent with this wader species distributed across mid estuarine subsites, and absent or rare in the inner or outer estuary.

Grey Plover were not recorded during the January 2020 high tide survey.

4.9.6. Lapwing

Lapwings are generally known to forage terrestrially and use intertidal flats as safe roosting habitat during periods of low tide. However, Lapwing are often observed foraging intertidally and this is examined below.

During 2019/20 Lapwing were recorded in all eight subsites of Bannow Bay. 0O417 (Clonmines Castle) supported peak numbers during all four low tide surveys, with numbers representing between 48% and 88% of the total site numbers. This subsite also held peak numbers during the high tide survey when 1,823 Lapwing represented 95% of this species recorded on that date. When examining previous survey results (Table 4.8.3) it becomes apparent that 0O417 along with 0O416 (Kiltra) are the inner estuary subsites favoured by Lapwing, and this has been very consistent over time (Figure 4.9.5).

Intertidally foraging Lapwing were observed in seven subsites. Numbers were generally low but a peak count of 400 Lapwing foraged in Kiltra (0O416) during December 2019.

The largest flock of roosting Lapwing during high tide were part of the large mixed-species roost in 0O417 (refer to Figure 4.9.4).

Figure 4.9.5: Low tide distribution of Lapwing – total numbers (all behaviours) across all four low tide surveys. Dots are placed randomly within subsites and one dot = 15 birds.

4.9.7. Knot

Knot was recorded in four subsites overall (0O411 (St Kiernans to Saltmills to Big Burrow) 0O413 (Saint Kiernans to Newtown), 0O416 (Kiltra) and 0O418 (Bannow island to Newquay)), highly consistent with the results from the previous winter surveys.

0O418 (Bannow island to Newquay) supported peak numbers on three low tide survey occasions and was the only subsite to record this species on all four low tide survey occasions. 0O416 (Kiltra) recorded peak numbers on a single low tide survey occasion (October 2019). The distribution of Knot can therefore be described as mid-estuarine, with no birds recorded in the very inner or outer subsites (Figure 4.9.6). The peak intertidal foraging density was 7.2 Knot/ha^{-1}) recorded for 0O418; this higher density evident in Figure 4.9.6.

Just 40 Knot were recorded during the high tide survey and these birds were located within 0O418 (Bannow island to Newquay).

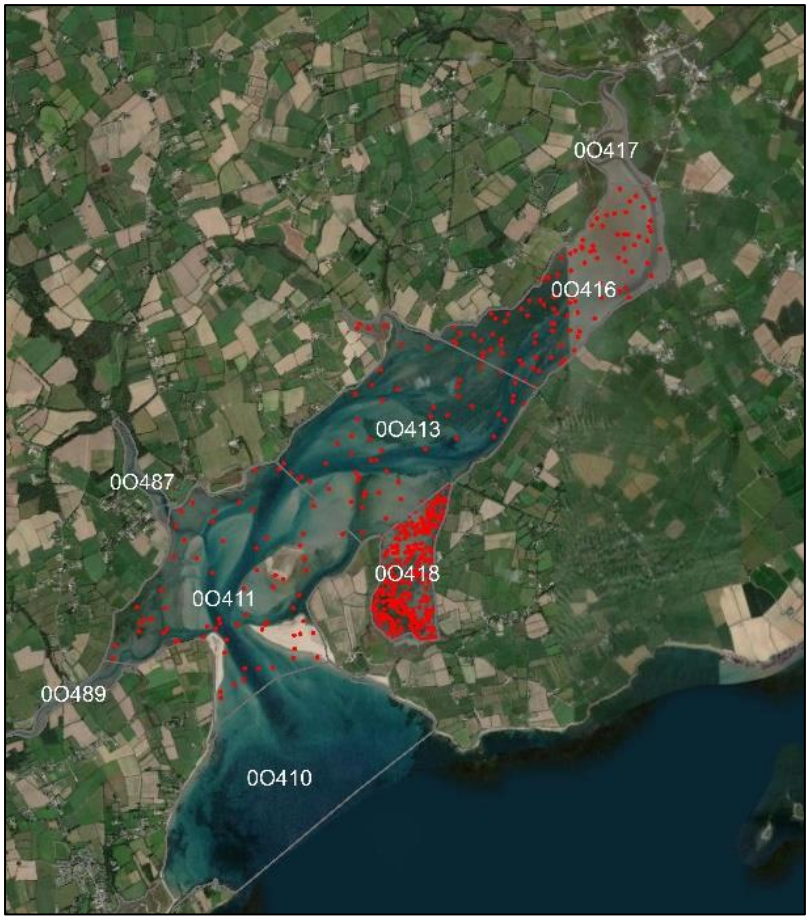

Figure 4.9.6: Low tide distribution of Knot – total numbers (all behaviours) across all four low tide surveys. Dots are placed randomly within subsites and one dot = 5 birds.

4.9.8. Dunlin

Dunlin have consistently used five subsites during the 2019/20 and previous six winter surveys (0O411, 0O413, 0O416, 0O417 and 0O418).

Peak numbers during 2019/20 were recorded in 0O411 (St Kiernans to Saltmills to Big Burrow), 0O413 (Saint Kiernans to Newtown) and 0O418 (Bannow Island to Newquay), while numbers ranked as 'high' were recorded in 0O416 (Kiltra) and 0O417 (Clonmines Castle). These results are highly consistent with previous winter surveys and as with Knot, the distribution of Dunlin can be described as mid-estuarine, with no birds recorded in the very inner or outer subsites.

During the January 2020 high tide survey, Dunlin were largely distributed across two subsites - 0O417 and 0O418, these collectively holding 99% of the Dunlin recorded. The inner estuary subsite 0O417 supported the largest number of Dunlin (480) and the largest single roost was of 400 individuals located alongside Golden Plover (refer to Figure 4.9.4).

4.9.9. Black-tailed Godwit

Black-tailed Godwits were recorded in seven of the eight count subsites during winter 2019/20. Subsite distribution remains relatively consistent with previous surveys, in that 0O413 (Saint Kiernans to Newtown), 0O417 (Clonmines Castle) and 0O418 (Bannow Island to Newquay) recorded peak

numbers during low tide. 0O416 (Kiltra) held numbers ranked as 'high' on one count occasion and based on numbers (total and foraging intertidally), all four aforementioned subsites (0O413, 0O416 0O417 and 0O418) appear the most important for Black-tailed Godwits, with intertidal foraging density being highest in 0O418.

AS with previous annual surveys, numbers of godwits were higher during the October and November low tide surveys and much lower thereafter. As at other sites (L.J. Lewis *pers. comm*), it is likely that many of these waders move onto land to forage terrestrially in mid-winter, although this was not recorded to any great extent close to the estuary. The high tide survey also recorded relatively few (84) individuals in 0O416 (Kiltra) and it is also likely that many more godwits were foraging terrestrially at this time.

4.9.10. Bar-tailed Godwit

Bar-tailed Godwits occurred in five subsites during winter 2019/20: (0O411 (St Kiernans to Saltmills to Big Burrow), 0O413 (Saint Kiernans to Newtown), 0O416 (Kiltra), and 0O417 (Clonmines Castle) and 0O418 (Bannow Island to Newquay). This is consistent with previous surveys (Figure 4.9.7).

0O416 (Kiltra) held peak number during three low tide surveys with up to 92% of the total site number of this species. 0O416 was also the only subsite to support the species during all four low tide surveys. 0O413 (Saint Kiernans to Newtown) held peak numbers once (November 2019) when 272 individuals represented 60% of the site total number.

Bar-tailed Godwits were not recorded during the high tide survey and as this species does not move inland, this suggests that the flock moved to non-estuarine coast or to another site such as Ballyteigue Bay further along the coast.

Figure 4.9.7: Low tide distribution of bar-tailed Godwit – total numbers (all behaviours) across all four low tide surveys. Dots are placed randomly within subsites and one dot = 5 birds.

4.9.11. Curlew

The Curlew has a widespread distribution across Bannow Bay, occurring in all eight subsites. Despite this widespread distribution however, a subsite preference has been evident over time as 0O416 (Kiltra) and 0O411 (St Kiernans to Saltmills to Big Burrow) have both supported peak numbers on the majority of survey occasions. This pattern was again evident during winter 2019/20 when 0O416 (Kiltra) held peak numbers during October and December 2019, and 0O411 (St Kiernans to Saltmills to Big Burrow) held peak numbers during November 2019 and February 2020.

Peak numbers during the high tide survey were recorded in 0O411, when 507 Curlew represented over 50% of the total site count. The small inner subsite 0O487 (Tintern Abbey to Tintern Bridge) was notable for supporting 200 Curlew, the second highest subsite count, during the high tide survey. These birds were foraging terrestrially beside the estuary. Other records of terrestrially foraging Curlew were also made during the winter, and this activity is likely to occur widely around the bay.

4.9.12. Redshank

Redshanks were widespread and recorded within all eight subsites during low tide surveys of winter 2019/20. Three subsites held peak numbers during low tide - 0O413 (Saint Kiernans to Newtown),

0O417 (Clonmines Castle) and 0O418 (Bannow Island to Newquay), while 0O416 (Kiltra), 0O417 and 0O418 held peak numbers foraging intertidally.

Given that numbers can vary greatly between differing counts of the same subsite, and that sometimes seemingly unimportant subsites such as 0O489 (Pollfur) can hold good numbers on occasion (e.g. 50 during LT4), leads to a widespread distribution pattern for Redshank with all subsites being important for this wader, with only perhaps 0O410 Fethard Bay being the exception.

The site peak count of Redshank was recorded during high tide when 489 individuals were distributed across the eight subsites of Bannow Bay. Peak numbers roosting (200) were in 0O417 (Clonmines Castle) (refer to Figure 4.9.4) followed by 0O489 (Pollfur) (120 individuals).

Figure 4.9.8: Position of mixed-species roost in 0O489 (Pollfur) during the high tide survey, including 200 Redshank.

4.10. Activities and disturbance

During the 2019/20 season, activities at Bannow Bay centred upon 0O411 (St Kiernans to Saltmills to Big Burrow) and 0O413 (Saint Kiernans to Newtown) where four different activities were recorded, together with aquaculture activities recorded within 0O413.

With the exception of bait-diggers, all forms of activity were observed to result in a behavioural response from waterbirds but these were almost always weak (no response) or moderate responses where birds moved to another part of the count subsite.

Of note is that a White-tailed Sea Eagle (*Haliaeetus albicilla*) was again present at Bannow Bay during winter 2019/20 and on 29th October 2019 attempted predation caused a moderate response from Lapwing and Redshank within 0O417 (Clonmines Castle).

Of the three records of aquaculture activities within 0O413, only weak responses from waterbirds were observed but the counters also noted that there were not any waterbirds in the vicinity of the activity to be disturbed. This suggests that waterbirds may have been displaced at the onset of the activity i.e. and before the count took place.

Table 4.10.1 Activities recorded at Bannow Bay 2019/20.

Subsite Code	Subsite Name	Activity	Number of survey occasions activity recorded
0O411	St Kiernans to Saltmills to Big Burrow	Bait digger	1
		Sea angler	1
0O413	Saint Kiernans to Newtown	Horse riding	1
		Human on foot, shoreline	1
		Aquaculture machinery	2
		Aquaculture personnel on shoreline	1
0O416	Kiltra	Bai diggers	1
0O417	Clonmines Castle	Predation - disturbance	1
0O487	Tintern Abbey to Tintern Bridge	Human on foot, near shoreline (leaf blower)	1

5. DISCUSSION

5.1. Overview of the 2019/20 season

The 2019/20 winter waterbird survey programme at Bannow Bay marks the sixth consecutive season that this survey programme has been carried out. This makes Bannow Bay one of the most comprehensively surveyed estuarine sites at low tide in the Republic of Ireland, and together with the baseline survey carried out by NPWS during 2009/10 enables important detailed comparisons over time.

A total of 38 waterbird species were recorded during the 2019/20 surveys, which included 17 wildfowl and allies, 15 wader species, five gull species and one unidentified gull species. Species diversity was consistent with previous low tide surveys at the site and relatively similar to the species list (42) recorded during the 2009/10 NPWS baseline survey. Some 46 species have been recorded in the most recent 5-year period during I-WeBS, but this includes 12 once-off records of relatively scarce waterbird species in Ireland.

The 2019/20 species list includes four species (Great Northern Diver, Little Egret, Golden Plover and Bar-tailed Godwit) listed on Annex I of the EU Bird's Directive, and 28 species that are on the *Birds of Conservation Concern in Ireland* (BoCCI) lists (Colhoun & Cummins, 2013), including six that are Red-listed and are of highest concern, and a further 22 species that are Amber-listed. Note that the BoCCI lists are due to be updated later in 2020. All Special Conservation Interest (SCI) species listed for Bannow Bay SPA were recorded except Pintail which was not recorded during any survey. As noted previously, this dabbling duck was last recorded at Bannow Bay during the 2005/06 I-WeBS season,

with very low numbers also recorded during the 2016/17 low tide surveys. While the flyway population of Pintail is stable/fluctuating (AEWA, 2018) there has been a long-term decline in this species throughout I-WeBS (e.g. Burke *et al.* 2019; Lewis *et al.* 2019).

5.2. Waterbird numbers and trends

The total number of waterbirds recorded across Bannow Bay each winter clearly shows great variation between months. There was a difference of nearly 4,000 waterbirds between the minimum and maximum low tide counts recorded during 2019/20, and a difference of 4,050 between the highest low tide count and the high tide count. Across the years, site total low tide counts have generally been higher than high tide counts, but this is likely to vary at individual species level as well as at different times. These results underpin the need to have replicated surveys (i.e. monthly) each winter and serve also to highlight that adequate monitoring of coastal wetland sites requires a combination of both high and low tide counts (e.g. Lewis *et al.* 2016).

The time series of data collected enabled species site trends to be examined. Using the NPWS survey of 2009/10 as a baseline resulted in declining trends for 12 of the 15 species assessed, with three species (Wigeon, Teal and Black-tailed Godwit) showing increasing numbers. The largest declines are observed for Light-bellied Brent Goose, Shelduck, and Bar-tailed Godwit. Light-bellied Brent Goose has shown an increasing trend in Ireland over the past 20 years (Lewis *et al.* 2019) suggesting that the trend at Bannow contrasts to the national total, however the species has shown a decline in numbers over the recent ten- and five-year periods, which is consistent with the drop in numbers at Bannow Bay. By way of comparison, over 2,000 geese were recorded during winter 2009/10 compared with site total counts of generally less than 800 geese in recent years. A drop in the flyway population, attributed to poor breeding success (Colhoun *et al.* 2017) is undoubtably having an impact on numbers on coastal sites around the country (Lewis *et al.* 2019). Similarly numbers of Shelduck have declined at the national and all-Ireland level both historically and over a more recent time period, while Bar-tailed Godwit, formerly thought to be stable, is now known to have declined in numbers nationally over the most recent five-year period assessed (2011/12-2015/16).

5.3. Waterbird distribution

Despite the inherent variability in estuarine ecosystems, broad-scale low tide distribution of waterbirds is expected to remain relatively consistent over time, so long as major changes do not occur at a site (Musgrove *et al*. 2003; Lewis & Kelly, 2012; Lewis *et al.* 2016). It is therefore noteworthy that on the whole, distribution of the waterbird SCI species across Bannow Bay has remained highly consistent over time.

Of note was that peak counts for 0O413 (Saint Kiernans to Newtown) and 0O418 (Bannow Island to Newquay) during 2019/20 were the highest for these subsites across all low tide surveys undertaken in recent winters. Similarly, the number of waterbirds within 0O487 (Tintern Abbey to Tintern Bridge) during the high tide survey was also the largest recorded in this subsite across the winters. Given the largely negative whole-site waterbird population trends, these within-site trends are therefore positive. An interesting pattern is also evident for 0O417 (Clonmines castle) where peak counts from five of the six winters were recorded at high, rather than at low tide. This importance at high tide is

important for site management because a large number of several waterbird species rely on relatively small areas within this subsite for safe roosting.

While the count subsite 0O416 (Kiltra) remains very important for a range of species at low tide, its importance during 2019/20 was superceded by 0O418, which supported eight waterbird species in numbers ranked as 'very high' (i.e. peak numbers). But while the importance of certain subsites remains high, the results also show how all subsites can be important at certain times. For example, the outer bay (0O410 Fethard Bay) can support high numbers of foraging Light-bellied Brent Goose on occasion and particularly on spring low tides when areas with algae are uncovered that offer opportunistic foraging opportunities. Similarly, the small inner estuarine subsite 0O489 (Polfur) which is largely ignored by species such as Dunlin, Grey Plover and Knot, can support high numbers of Redshank.

As noted previously, several species continue to show a high degree of within-site fidelity (subsite faithfulness). Shelduck has a very high degree of within-site fidelity to subsite 0O418 (Bannow Island to Newquay) and this extends to both low and high tide. A similar result has been found for Lapwing and 0O417 (Clonmines Castle). While these are good examples of site faithfulness, it also suggests that adequate food resources are available all winter, with the species not needing to distribute more widely to feed because of prey depletion. However, such a high degree of within-site faithfulness is also relevant in terms of site management i.e. any future changes in the human use or habitat quality of these subsites could potentially lead to displacement of a large proportion of the wintering population of Bannow Bay. Golden Plover also continues to retain a relatively consistent roost location within 0O416 (Kiltra) as well as the same high tide roost within 0O417 (Clonmines Castle). Such consistency is quite remarkable for a species that has flown some 1,500km from breeding grounds to winter in Ireland.

6. CONCLUSION

This report has provided results from the sixth consecutive season of low tide monitoring of wintering waterbirds at Bannow Bay. Although not specifically designed for trend analyses, the time series of data at Bannow Bay has enabled species trends to be assessed. The results are largely negative. But these results can be viewed alongside the national/all-Ireland picture. Updated waterbird population estimates for Ireland were published in 2018 and contained stark messages including the loss of 40% of our wintering waterbirds over the past nearly 20 years (Burke *et al.* 2018). Such large declines nationally obviously have implications for numbers at individual sites, but conversely, declines at individual sites across the country will have driven the observed national trends. While the impacts of climate change are being mooted as a possible explanation for declining numbers of some species, with some waterbirds simply not migrating as far as Ireland for winter, site-level factors no doubt have, and continue to contribute to such observed trends, especially when various activities and human use of wetland sites are considered in a cumulative way. How such declines can be addressed and/or reversed is not known. However, annual monitoring is essential in order to continue building on the solid database of good quality and co-ordinated count data, which ultimately can underpin our knowledge of both waterbird site distribution and trends.

On a more positive note is the high level of within-site faithfulness in distribution exhibited by various waterbird species across the site. In addition to being good examples of site faithfulness, it also

suggests that adequate food resources are available all winter, with the species not needing to distribute more widely to feed because of prey depletion. And perhaps more importantly, the results are useful in terms of practical site management, i.e. any future changes in the human use or habitat quality of these subsites could potentially lead to displacement of a large proportion of the wintering population of Bannow Bay, and therefore can be avoided due to the level of species-specific knowledge gained for this site to-date.

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APPENDIX I: BANNOW BAY SPA/SAC SITE SYNOPSES

Site Name: Bannow Bay SPA

Site Code: 004033

Bannow Bay is a large, very sheltered, estuarine system with a narrow outlet to the sea, situated on the south coast of Co. Wexford. It is up to 14 km long along its north-east/south-west axis and has an average width of about 2 km. A number of small- to medium-sized rivers flow into the site, the principal being the Owenduff and the Corock which enter at the top end of the estuary. Very extensive intertidal mud and sand flats are exposed at low tide. The sediments have a rich macroinvertebrate fauna, with such species as Peppery Furrow-shell (*Scrobicularia plana*), Ragworm (*Hediste diversicolor*) and Lugworm (*Arenicola arenaria*) occurring frequently. Mats of green algae (*Ulva* spp.) are present on the intertidal flats and shorelines. Salt marshes are well-developed in the sheltered areas of the site and are characterised by species such as Common Saltmarsh-grass (*Puccinellia maritima*), Sea Aster (*Aster tripolium*), Thrift (*Armeria maritima*), Sea Plantain (*Plantago maritima*), Red Fescue (*Festuca rubra*), Saltmarsh Rush (*Juncus gerardi*) and Sea Rush (*Juncus maritimus*). Swards of Glasswort (*Salicornia* spp.) occur on the lower zones of the salt marshes and extend onto the intertidal flats.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Light-bellied Brent Goose, Shelduck, Pintail, Oystercatcher, Golden Plover, Grey Plover, Lapwing, Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit, Curlew and Redshank. The E.U. Birds Directive pays particular attention to wetlands and, as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.

Bannow Bay supports an excellent diversity of wintering waterfowl and is one of the most important sites in the south-east. Of particular note is an internationally important population of Light-bellied Brent Goose (561) and Black-tailed Godwit (546) - all figures are mean peaks for the 5 winters 1995/96-1999/2000. The site also supports nationally important numbers of a further eleven species: Shelduck (500), Pintail (52), Oystercatcher (711), Golden Plover (1,955), Grey Plover (142), Lapwing (2,950), Knot (508), Dunlin (3,038), Bar-tailed Godwit (471), Curlew (891) and Redshank (377). The populations of Shelduck and Bar-tailed Godwit are of particular note as they comprise 3.4% and 3.0% of the respective all-Ireland totals. Other species which occur in numbers of regional importance include Wigeon (412), Teal (256), Ringed Plover (38) and Turnstone (50). The intertidal sand and mud flats provide excellent feeding for the waterfowl species, while suitable high tide roosts are provided by the salt marshes and other shoreline habitats. Part of the site is a Wildfowl Sanctuary.

Bannow Bay SPA is an excellent example of an enclosed estuarine system. It supports internationally important populations of Light-bellied Brent Goose and Black-tailed Godwit as well as nationally important populations of a further eleven species. Two of the species that occur, i.e. Golden Plover and Bar-tailed Godwit, are listed on Annex I of the E.U. Birds Directive.

Site Name: Bannow Bay

SAC Site Code: 000697

Bannow Bay SAC is a relatively large estuarine site, approximately 14 km long, on the south coast of Co. Wexford. Small rivers and streams to the north and south-west flow into the bay and their sub-estuaries from part of the site. The bay contains large areas of mud and sand, and the underlying geology is mainly of Ordovician slates with the exception of the areas to the east of Bannow Island which are underlain by Cambrian slates.
The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[1130] Estuaries
[1140] Tidal Mudflats and Sandflats
[1210] Annual Vegetation of Drift Lines
[1220] Perennial Vegetation of Stony Banks
[1310] Salicornia Mud
[1330] Atlantic Salt Meadows
[1410] Mediterranean Salt Meadows
[1420] Halophilous Scrub
[2110] Embryonic Shifting Dunes
[2120] Marram Dunes (White Dunes)
*[2130] Fixed Dunes (Grey Dunes)**

The estuary, including the saltmarshes, makes up just over 80% of the site. At low tide up to three-quarters of the substrate is exposed. There are mudflats in the narrow northern part and also in the south-west and south-east. The sediments of the inner estuary associated with the Corock and Owenduff Rivers are generally black anoxic mud, with some fine sand and broken shell. Mats of green algae (*Enteromorpha* spp.) are present and seaweeds (*Fucus* spp.) have colonised stony substrates, particularly further south.

Saltmarshes of exceptional species diversity are found above the sand and mudflats, particularly at the south of the site. Communities associated with cord-grass (*Spartina* sp.) and glassworts (*Salicornia* spp.) occur in the saltmarsh and on its fringes. A diverse range of glassworts has been recorded, including *Salicornia pusilla, S. ramosissima, S. europaea, S. fragilis* and *S. dolichostachya.*

The main areas of saltmarsh are on the islands at Clonmines, at the mouth of the tributary at Clonmines, at the mouth of the tributary at Taulaght, close to Saint Kieran's House, at the north-west of Big Burrow, at the south-east of Bannow Island and at the west of Rabbit Burrow in Fethard Bay. Very small fragmented linear strips of saltmarsh occur in the upper estuary as far north as the confluence of the Corock and Owenduff Rivers and along the other tributaries. The main type of saltmarsh present is Atlantic salt meadow, although the Mediterranean type is also found. Typical species of the former include Common Saltmarsh-grass (*Puccinellia maritima*), Sea Aster (*Aster tripolium*), Thrift (*Armeria maritima*), Sea Plantain (*Plantago maritima*), Red Fescue (*Festuca rubra*), Creeping Bent (*Agrostis stolonifera*), Saltmarsh Rush (*Juncus gerardi*), Sea Arrowgrass (*Triglochin maritima*) and Sea Beet (*Beta vulgaris subsp. maritima*). An abundance of Sea Purslane (*Halimione portulacoides*) is found in Fethard and in part of the Taulaght saltmarshes. In the larger areas of saltmarsh Sea Rush (*Juncus maritimus*), a species more typical of Mediterranean salt meadows, is found. Other plants recorded are Lax-flowered Sea-lavender (*Limonium humile*) and Common Scurvygrass (*Cochlearia officinalis).*

Good conditions for the community 'annual vegetation of drift lines' exist on the seaward side of dune systems at this site. Typical species which have been recorded include Sea Rocket (*Cakile maritima*), mayweed (*Matricaria* sp.), Sea Spurge (*Euphorbia paralias*), Sea-holly (*Eryngium maritimum*), orache species (*Atriplex* spp.), *Polygonum* spp. and Sea Beet (*Beta vulgaris* subsp. *maritima*). Areas of habitat which are likely to be

suitable for the development of the community 'perennial vegetation of stony banks' exist at this site, but are small in area.

Also linked with saltmarshes in places are stony beaches and reedbeds. Narrow shingle beaches up to 30 m wide occur in places along the edge of the estuary. The fringing reed communities are mainly confined to the tributaries and are relatively small in extent. They support Sea Club-rush (*Scirpus maritimus*), Grey Club-rush (*S. tabernaemontani*), Hemlock Water-dropwort *(Oenanthe* crocata) and abundant Common Reed (*Phragmites australis*). Halophilous scrub occurs in four of the larger saltmarsh areas. It is characterised by the presence of the legally protected (Flora (Protection) Order, 1999) and Red Data Book-listed plant Perennial Glasswort (*Arthrocnemum perenne*), which occurs in only a few sites in the country.
A mosaic of sand dune habitats occurs in three areas at the edge of the estuary. Embryonic shifting dunes and white dunes are characterised by the presence of Lyme-grass (*Leymus arenarius),* Marram (*Ammophila arenaria*), Sea Spurge and Seaholly in both Big Burrow and to the south east of Bannow Island.

The priority habitat fixed grey dune is also present. Typical species here include Common Bird's-foot-trefoil (*Lotus corniculatus*), Kidney Vetch (*Anthyllis vulneraria*), Wild Thyme (*Thymus praecox*), stork's-bill species (*Erodium* spp.), Ribwort Plantain (*Plantago lanceolata*), Common Restharrow (*Ononis repens*), Mouse-ear Hawkweed (*Hieracium pilosella*), Field Wood-rush (*Luzula campestris*) and Wild Carrot (*Daucus carota*). Some areas of this dune type contain a carpet of the moss Tortula ruraliformis and lichens *(Cladonia* sp.). There is some gorse (*Ulex* sp.) present beside the mossy area at the south-east of the site. Bee Orchid (*Ophrys apifera*) and Pyramidal Orchid (*Anacamptis pyramidalis*) have also been recorded. Sharp Rush (*Juncus acutus*) occurs in a dune slack associated with the grey dunes at Big Burrow. At the west of the system, east of Bannow Island, the dunes are quite high, reaching almost 15m. Non-native plant species, including Tree Mallow (*Lavatera arborea*), occur in several parts of the site.

Some freshwater habitats occur at the northern end of the site. These consist mainly of a mosaic of marsh, reedbed and willows (*Salix* spp.). Species present include Common Reed, with young willows scattered throughout and Hemlock Waterdropwort abundant in the ground layer. In other areas the wetland vegetation consists of a mosaic of Phragmites reedbed, patches of Hard Rush (*Juncus inflexus*), Meadowsweet (*Filipendula ulmaria*), Creeping Buttercup (*Ranunculus repens*), Marsh Bedstraw (*Galium palustre*), Greater Tussock-sedge (*Carex paniculata*), Marshmarigold (*Caltha palustris*) and occasional Bulrush (*Typha latifolia*), along some old drains. The wetland areas generally merge into a narrow band of dense scrub dominated by Blackthorn (*Prunus spinosa*) and Hawthorn (*Crataegus monogyna*), with some Ash (*Fraxinus excelsior*), willow and gorse.

Most of the estuary has been designated a Special Protection Area (SPA) under the E.U. Birds Directive because of its significant bird interest, particularly during the winter. Parts of this area have also been designated a Wildfowl Sanctuary. Large numbers of wintering wildfowl and waders feed on the mudflats and sandflats, and use the fringing vegetation of reedbed and saltmarsh for roosting and feeding. Populations present include internationally important numbers of Light-bellied Brent Goose (819), and nationally important numbers of Shelduck (475), Pintail (85), Golden Plover (3,144) - a species listed on Annex I of the E.U. Birds Directive, Lapwing (2,000), Knot (508), Dunlin (3,850), Black-tailed Godwit (697), Bar-tailed Godwit (334) and Redshank (377) (all figures mean peaks 1994/95 to 1997/98).

Important breeding populations found within the site include two species listed on Annex I of the E.U. Birds Directive (Little Tern and Kingfisher), a colony of Sand Martins in the cliffs at the west of the site and a heronry

Otter and Common Seal occur within the site.

Land use at the site consists mainly of shellfish farming; approximately 20 ha of the intertidal area is under cultivation. Current annual production of oysters is approximately 100 tonnes, concentrated mainly on three farms. There are other farms, but these are in the initial stages of cultivation and current production is negligible.

There is evidence of poor farm management in some locations. There are numerous abandoned trestles in the intertidal zone and along the top of the shore. Grading equipment is permanently left on the shore and some areas of saltmarsh are being used as a grading area for oysters. In some areas damage is caused to the shingle vegetation and to the substrate by tractors accessing the aquaculture farms. Any further increase in aquaculture poses a threat.

Other land uses include shooting, bird-watching, conservation management, grazing in some of the dune areas, horse-riding on the beach and Big Burrow sand dunes, picnicing, swimming, sailboarding, jet-skiing, line fishing and bait digging. The removal of sand and beach material also occurs at the site.

The site is of considerable conservation significance for the large number of E.U. Habitats Directive Annex I habitats that it contains, including the priority habitat fixed grey dune. The legally protected and Red Data Book plant species Perennial Glasswort also occurs. The site is also an SPA because of the important numbers of wintering wildfowl it supports, including an internationally important population of Light-bellied Brent Goose.

Further details available on www.emff.marine.ie

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