EMFF Operational Programme 2014-2020

Marine Biodiversity Scheme

Marine Institute Bird Studies

Winter Waterbird Survey

Bannow Bay SPA, County Wexford.

2020-2021

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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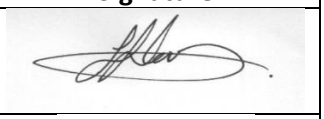
Version	Date		Author(s)	Signature
1	19/05/21	Report prepared by:	Dr Lesley J Lewis BSc PhD CIEEM	
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Title		**Bannow Bay Waterbird Survey – Winter 2020-21 Bird Survey Report**		

Notice

This report was produced by INIS Environmental Consultants Ltd. (INIS) on behalf of Hookhead Shellfish Ltd. and the Marine Institute for the specific purpose of assessing wintering bird populations in Bannow Bay SPA, Co. Wexford, with all reasonable skill, care and due diligence within the terms of the contract with the client, incorporating our terms and conditions and taking account of the resources devoted to it by agreement with the client.

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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. INTRODUCTION

INIS Environmental Consultants Ltd were contracted to co-ordinate a series of waterbird surveys at Bannow Bay, Co. Wexford during the 2020/21 winter season. Following standard methodologies 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 2020/21 waterbird survey. The results are examined and discussed in light of similar surveys undertaken during the six 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 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 17 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). After November 2014, Lesley was 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 project management of both the Irish Wetland Bird Survey (I-WeBS) and the Countryside Bird Survey (CBS).

Dr. Alex Copland BSc PhD is Technical Director (Ecology) with INIS and has over 25 years of bird survey experience. He is proficient in experimental design and data analysis and has been working on bird populations in Ireland for over 20 years. He has managed several large-scale, multi-disciplinary conservation projects, including research and conservation work for species of conservation concern, the design and delivery of practical conservation actions, education and interpretation on the environment and the development of co-ordinated, strategic plans for birds and biodiversity in Ireland.

He has written numerous scientific papers, developed and contributed to evidence-based position papers, visions and strategies on birds and habitats in Ireland. He has supervised the successful completion of research theses for several post-graduate students, including doctoral candidates. He lectures to both undergraduate and post-graduate students at UCD, as well as being a collaborative researcher with both UCD and UCC. He sits on the Editorial Panel of the scientific journal, *Irish Birds*.

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. 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 within Bannow Bay. Saltmarsh is well-developed in the sheltered inner 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.

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*)

[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 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).

Baseline data for the waterbird SCIs species of Bannow Bay SPA are shown in Table 2.2.1. Waterbird population trends for SCI species of Bannow Bay, based on I-WeBS data, were reported in the SPA Conservation Objectives Supporting Document (NPWS, 2012) (Table 2.2.1) at both site and national level. However, based on data from the Irish Wetland Bird Survey (I-WeBS) for the period 1995/96 – 2007/08, the site trends for wintering waterbirds of Bannow Bay are now considered out-of-date.

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[c]	Reported trend (95/96 – 07/08)[d]
Light-bellied Brent Goose *Branta bernicla hrota*	561	International Importance	Intermediate (Unfavourable)
Shelduck *Tadorna tadorna*	500	All-Ireland Importance	Highly Unfavourable
Pintail *Anas acuta*	52	All-Ireland Importance	n/c
Oystercatcher *Haematopus ostralegus*	711	All-Ireland Importance	Favourable
Golden Plover *Pluvialis apricaria*[b]	1,955	All-Ireland Importance	Intermediate (Unfavourable)
Grey Plover *Pluvialis squatarola*	142	All-Ireland Importance	Highly Unfavourable
Lapwing *Vanellus vanellus*	2,950	All-Ireland Importance	Intermediate (Unfavourable)
Knot *Calidris canutus*	508	All-Ireland Importance	Highly Unfavourable
Dunlin *Calidris alpina*	3,038	All-Ireland Importance	Highly Unfavourable
Black-tailed Godwit *Limosa limosa*	546	International Importance	Favourable
Bar-tailed Godwit *Limosa lapponica*[b]	471	All-Ireland Importance	Favourable
Curlew *Numenius arquata*	891	All-Ireland Importance	Intermediate (Unfavourable)
Redshank *Tringa totanus*	377	All-Ireland Importance	Intermediate (Unfavourable)

[a]Five year peak mean for the period 1995/96-1999/00 (Source: NPWS, 2012);
[b]Annex I species.
[c]numbers of all-Ireland importance (Baseline: after Crowe & Holt, 2013); numbers of international importance (Baseline: after Wetlands International, 2012)
[d]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)

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.

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 2020/21 winter season therefore followed the standard methodology developed by the NPWS waterbird survey programme. Similar surveys were also undertaken during the six previous winter seasons (2014/15, 2015/16, 2016/17, 2017/18, 2018/19 and 2019/20).

3.2. Survey design and count area

During the 2020/21 season, a standard survey programme of four low tide counts and one high tide count was undertaken. Low tide surveys were carried out on 20th October, 17th November and the 5th December 2020, and the 13th February 2021. The high tide survey was undertaken on 9th January 2021.

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 2020/21 season fieldworkers were Barry O'Mahony (BOM), Mark Shorten (MS) and Alex Copland (AC); all highly experienced bird surveyors.

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

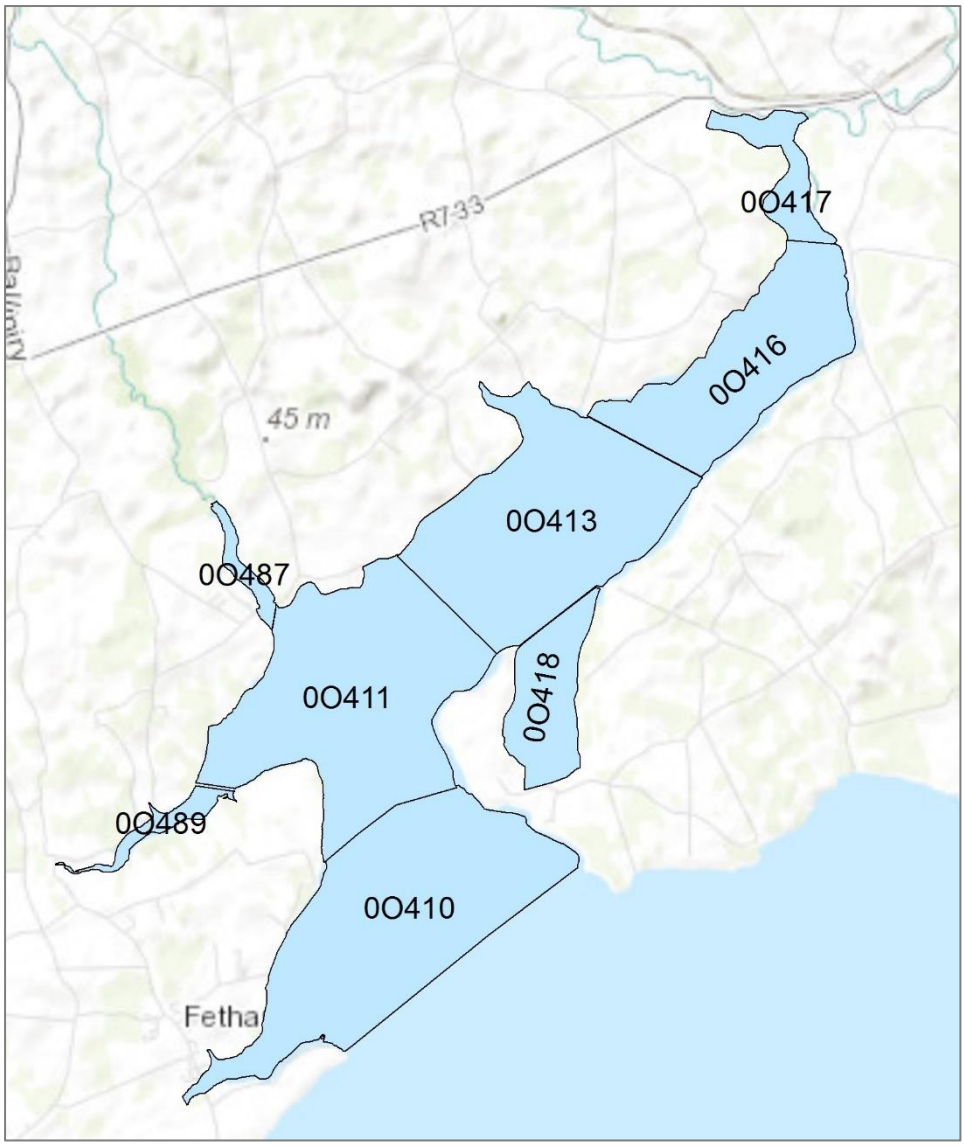


Figure 3.2.1: Count subsites used for the Bannow Bay waterbird surveys.

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).

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, simple rank numbers are presented.

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

Trends were calculated for waterbird SCI species of Bannow Bay SPA. The species peak count from the 2020/21 winter season, along with the six previous seasons (2019/20, 2018/19, 2017/18, 2016/17, 2015/16 and 2014/15) were compiled. Annual peak counts from either low tide or high tide surveys were used to calculate annual indices. An index number can be defined as a measure of population size in one year expressed in relation to the size of the population in another selected year (Leech *et al.*, 2002). An index for the first season (2014/15) 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 by fitting a trend line (line-of-best-fit) to the data points. The equation of that straight line was then obtained ($y = mx + c$). The gradient (slope) gives a measure of the annual percentage change in index numbers, representing the short-term trend i.e. the annual change in numbers between 2014/15 and 2020/21.

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 recent five-year mean peak count was calculated (winters 2016/17, 2017/18, 2018/19, 2019/20 and 2020/21) and compared to the baseline mean peak as used for SPA designation.

4. RESULTS

4.1. Survey schedule and conditions

The 2020/21 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 2020/21 survey programme.

Date	Survey	Wind	Cloud (%)	Rain	Visibility	Notes
20.10.20	LT1	Breezy	1-100	None	Good	No survey constraints
17.11.20	LT2	Breezy	66-100	Showers	Moderate	No survey constraints
05.12.20	LT3	Light-breezy	0-66	None/showers	Good	No survey constraints
09.01.21	HT1	Light	0-33%	None	Good	No survey constraints
13.02.21	LT4	Light/Breezy	0-66%	None/showers	Good/Moderate	No survey constraints

4.2. Species assemblage and diversity

A total of 37 waterbird species were recorded during the winter 2020/21 surveys at Bannow Bay, which included 16 wildfowl and allies, 15 wader species, five gull species and the Kingfisher (Table 4.2.1). The species list includes six species (Red-throated Diver, Great Northern Diver, Little Egret, Golden Plover, Bar-tailed Godwit and Kingfisher) listed on Annex I of the EU Bird's Directive, and 30 species that are on the *Birds of Conservation Concern in Ireland* lists (Gilbert *et al*., 2021), including 13 that are Red-listed and are of highest concern, and a further 17 species that are Amber-listed. All Special Conservation Interest (SCI) species listed for Bannow Bay SPA were recorded except Pintail.

Whole site species diversity ranged from 29 species (October 2020) to a peak of 33 species recorded during the January 2021 high tide survey. 22 species were recorded in all five surveys undertaken. The most infrequently recorded species were Scaup, Goldeneye and Kingfisher, recorded in a single survey each only.

Table 4.2.1: Species recorded during the winter surveys at Bannow Bay 2020/21. The table highlights Annex I species (EU Bird's Directive) and Red and Amber-listed species under 'Birds of Conservation Concern 4' (Gilbert et al*., 2021). A* √ means that a species was present during the monthly survey.

Species name	*Latin name*	sp	Annex 1	BoCCI-4	LT1	LT2	LT3	LT4	HT1
Mute Swan	*Cygnus olor*	MS		Amber			√	√	√
Light-bellied Brent Goose	*Branta bernicla hrota*	PB			√	√	√	√	√
Shelduck	*Tadorna tadorna*	SU		Amber	√	√	√	√	√
Wigeon	*Anas penelope*	WN		Amber	√	√	√	√	√
Teal	*Anas crecca*	T.		Amber	√	√	√	√	√
Mallard	*Anas platyrhynchos*	MA		Amber	√	√	√	√	√
Scaup	*Aythya marila*	SP		Red					√
Goldeneye	*Bucephala clangula*	GN		Red					√

Red-breasted Merganser	*Mergus serrator*	RM		Amber		√	√	√	√
Red-throated Diver	*Gavia stellata*	RH	Yes	Amber	√	√	√		√
Great Northern Diver	*Gavia immer*	ND	Yes	Amber	√	√	√	√	√
Little Grebe	*Tachybaptus ruficollis*	LG			√	√	√	√	√
Great Crested Grebe	*Podiceps cristatus*	GG		Amber		√		√	√
Cormorant	*Phalacrocorax carbo*	CA		Amber	√	√	√	√	√
Little Egret	*Egretta garzetta*	ET	Yes		√	√	√	√	√
Grey Heron	*Ardea cinerea*	H.			√	√	√		√
Oystercatcher	*Haematopus ostralegus*	OC		Red	√	√	√	√	√
Ringed Plover	*Charadrius hiaticula*	RP		Amber			√	√	√
Golden Plover	*Pluvialis apricaria*	GP	Yes	Red	√	√	√	√	
Grey Plover	*Pluvialis squatarola*	GV		Red	√	√	√	√	√
Lapwing	*Vanellus vanellus*	L.		Red	√	√	√	√	√
Knot	*Calidris canutus*	KN		Red		√	√	√	√
Sanderling	*Calidris alba*	SS			√		√	√	√
Dunlin	*Calidris alpina*	DN		Red	√	√	√	√	√
Snipe	*Gallinago gallinago*	SN		Red	√	√			
Black-tailed Godwit	*Limosa limosa*	BW		Red	√	√	√	√	√
Bar-tailed Godwit	*Limosa lapponica*	BA	Yes	Red	√	√	√	√	√
Curlew	*Numenius arquata*	CU		Red	√	√	√	√	√
Greenshank	*Tringa nebularia*	GK			√	√	√	√	√
Redshank	*Tringa totanus*	RK		Red	√	√	√	√	√
Turnstone	*Arenaria interpres*	TT		Amber	√	√	√		√
Black-headed Gull	*Chroicocephalus ridibundus*	BH		Amber	√	√	√	√	√
Common Gull	*Larus canus*	CM		Amber	√	√	√	√	√
Lesser Black-backed Gull	*Larus fuscus*	LB		Amber	√	√	√	√	√
Herring Gull	*Larus argentatus*	HG		Amber	√	√	√	√	√
Great Black-backed Gull	*Larus marinus*	GB			√	√	√	√	
Kingfisher	*Alcedo atthis*	KF	Yes	Amber		√			

Subsite species diversity ranged from a total 11 species (0O487 Tintern Abbey to Tintern Bridge and 0O489 Pollfur) to a peak of 31 species (0O411 St Kiernans to Saltmills to Big Burrow and 0O413 Saint Kiernans to Newtown) (Figure 4.2.1, Table 4.2.2).

Within low tide surveys, highest species diversity was found in three subsites (0O411, 0O413 and 0O416) (Figure 4.2.2), and more than double recorded for either 0O487 or 0O489 in any survey.

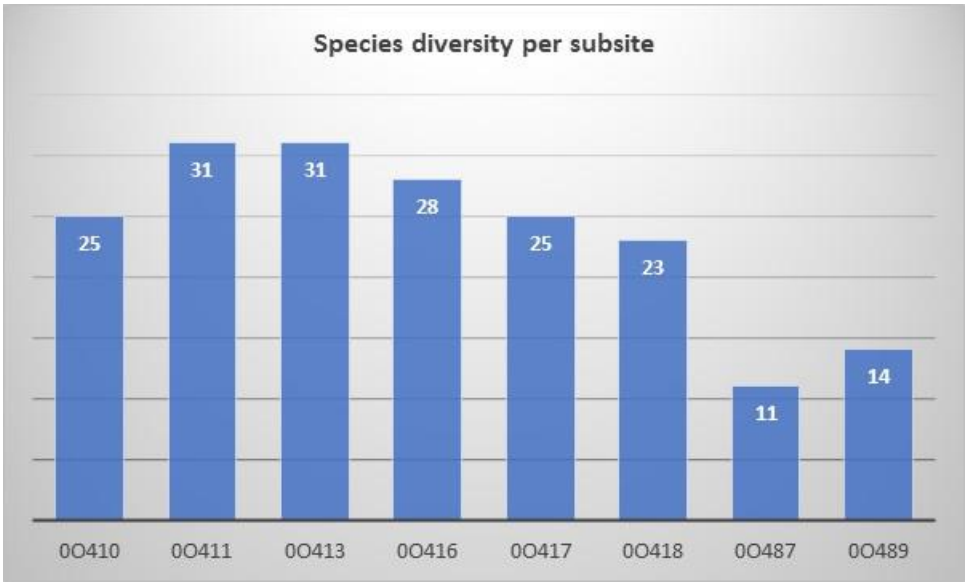


Figure 4.2.1: Subsite diversity overall

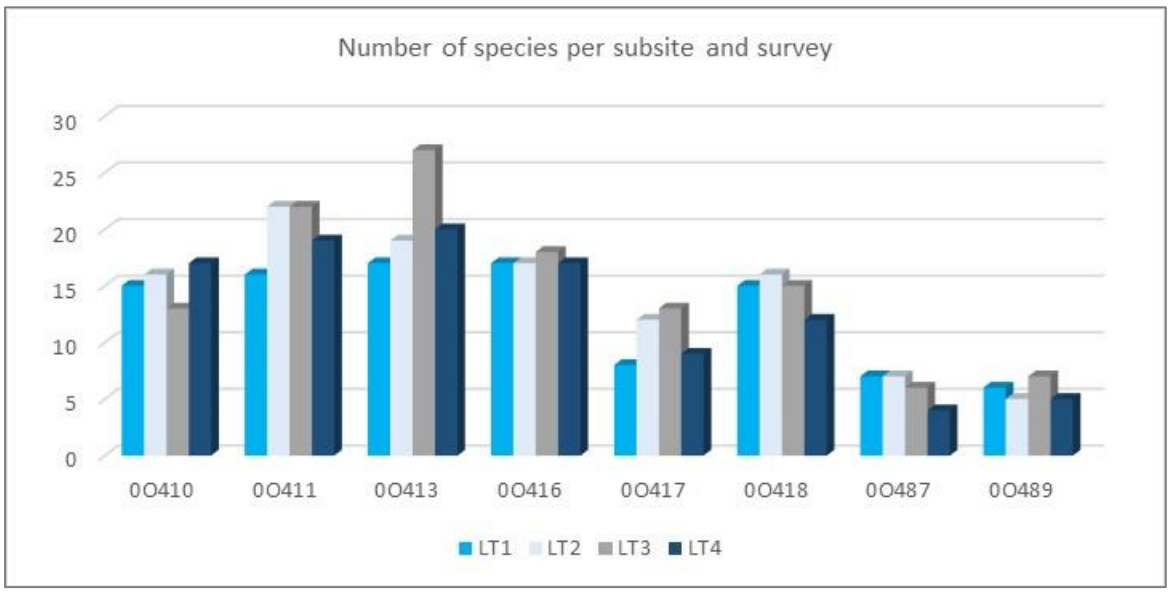


Figure 4.2.2: Subsite diversity per survey

Eight species (Teal, Mallard, Little Egret, Curlew, Greenshank, Redshank, Black-headed Gull and Herring Gull) occurred in all eight subsites and were therefore the most widespread, while Light-bellied Brent Goose, Wigeon, Oystercatcher and Grey Plover all occurred within seven subsites.

The most uncommon species, occurring within one subsite only were Scaup, Goldeneye, Snipe and Kingfisher. Other uncommon species (2 subsites only) were Mute Swan, Red-throated Diver, Great Crested Grebe and Sanderling.

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		√	√	√	√	√	√	√
Teal	√	√	√	√	√	√	√	√
Mallard	√	√	√	√	√	√	√	√
Scaup		√						
Goldeneye				√				
Red-breasted Merganser	√	√	√	√				
Red-throated Diver	√	√						
Great Northern Diver	√	√	√	√				
Little Grebe	√	√	√		√			
Great Crested Grebe		√	√					
Cormorant	√	√	√	√	√			
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	√	√	√	√	√	√		
Kingfisher					√			

4.3. Total numbers of waterbirds

During winter 2020/21, total numbers of waterbirds during low tide surveys ranged from 5,291 (February 2021), to a peak count of 9,128 waterbirds (December 2020). A total of 7,667 waterbirds was counted during the January 2021 high tide survey (Table 4.3.1). The low tide peak count was lower than any previous such count from previous survey programmes (Figure 4.3.1) while the high tide count was the second lowest on record.

Table 4.3.1: Total numbers of waterbirds counted at Bannow Bay during winter 2020/21, plus totals from previous survey programmes undertaken at the site.

Winter	Total Numbers of Waterbirds (Site totals)				
	LT1	LT2	LT3	LT4	HT
2020/21	8,078	7,118	9,128	5,291	7,667
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).

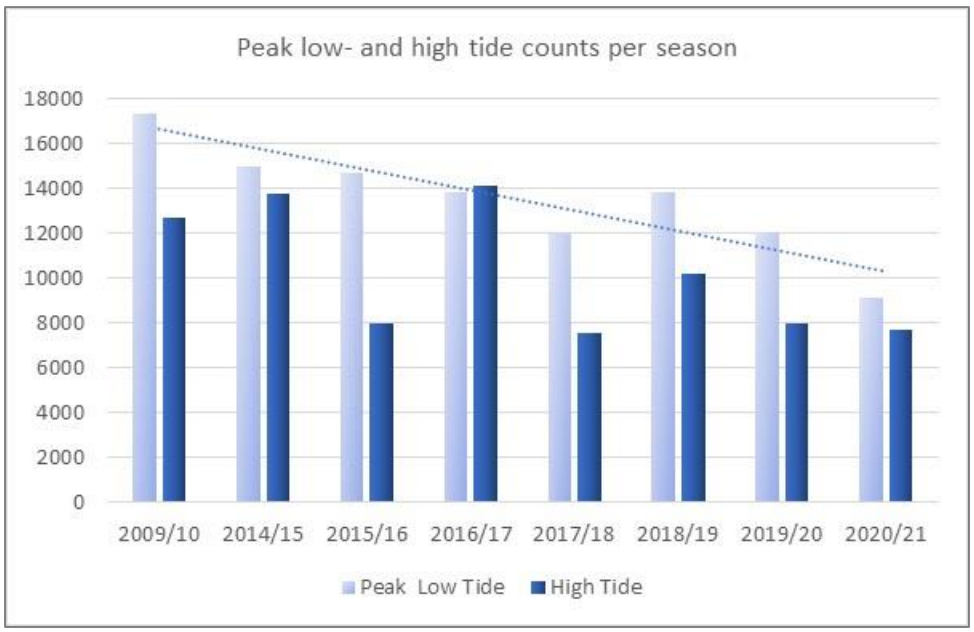


Figure 4.3.1: Peak low-and high-tide counts per season.

4.4. Species totals

Waterbird species peak counts for the 2020/21 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 13 species occurred in numbers of all-Ireland (national) importance.

During the high tide survey, one species was recorded in numbers of international importance (Light-bellied Brent Goose) and a further eight 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 2020/21, plus peaks from the previous six 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 for earlier. Waterbird SCI species for Bannow Bay SPA are in bold font.*

Species	2020/21		2019/20		2018/19		2017/18		2016/17		2015/16		2014/15	
	L	H	L	H	L	H	L	H	L	H	L	H	L	H
Mute Swan	2	2	2	2	2		1	2	2			1		
Light-bellied Brent Goose	709 (i)	585 (I)	489 (i)	778 (i)	489 (i)	415 (i)	557 (i)	575 (i)	841 (i)	615 (i)	609 (i)	640 (i)	787 (i)	484 (i)
Shelduck	207 (n)	206 (n)	203 (n)	120 (n)	325 (n)	353 (n)	470 (n)	202 (n)	413 (n)	395 (n)	308 (n)	279 (n)	518 (n)	244 (n)
Wigeon	371	307	715 (n)	65	564 (n)	140	493	283	661 (n)	528	356	300	781 (n)	550
Teal	487 (n)	537 (n)	278	309	915 (n)	298	293	170	619 (n)	806 (n)	478 (n)	219	472 (n)	546 (n)
Mallard	253	246	359 (n)	141	359 (n)	250	151	113	206	117	228	113	258	142
Scaup		1												
Goldeneye		1	2		1	4	5	2		7	5	3	9	3
Red-breasted Merganser	15	34 (n)	9	10	12	4	27 (n)	36 (n)	20 (n)	28 (n)	13	5	39 (n)	26 (n)
Red-throated Diver	1	8												
Great Northern Diver	8	4	12	8	5		6	6	2		11	5	1	2
Little Grebe	4	4	9	5	14	3	4	6	8	2	2	6	14	12
Great Crested Grebe	3	1	5	7	13		2		9	2	1	2	5	1
Cormorant	212 (n)	12	151 (n)	17	51	28	28	33	34	43	38	7	23	14
Little Egret	22 (n)	7	40 (n)	14	38 (n)	24 (n)	13	5	62 (n)	18	68 (n)	6	53 (n)	14
Grey Heron	6	4	7	4	15	15	11	5	23	11	16	1	19	6
Oystercatcher	829 (n)	582	686 (n)	233	1,120 (n)	639 (n)	754 (n)	590	1,237 (n)	482	1036 (n)	719 (n)	962 (n)	1146 (n)
Ringed Plover	30	7	80		23	2	86	0	179 (n)	0	74	0	37	118 (n)
Golden Plover	1,150 (n)		2,131 (n)	800	4,958 (n)	2,000 (n)	3,075 (n)	681	3,850 (n)	0	8020 (n)	281	4459 (n)	550
Grey Plover	34 (n)	33 (n)	111 (n)		74 (n)	148 (n)	39 (n)	9	105 (n)	197 (n)	83 (n)	91 (n)	59 (n)	265 (n)

Lapwing	1,260 (n)	26	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
Knot	1,119 (n)	990 (n)	963 (n)	40	613 (n)	33	247	142	344 (n)	315 (n)	555 (n)	313 (n)	959 (n)	709 (n)
Sanderling	57	20	200 (n)		145 (n)		12	0	72 (n)					
Dunlin	1,758 (n)	1,829 (n)	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)
Snipe	4		15	3	37		3*		13	4	8	11	0	18
Black-tailed Godwit	1,437 (i)	286 (n)	2,752 (i)	84	390 (n)	62	523 (n)	437 (n)	555 (n)	433 (n)	413 (n)	132	633 (i)	127
Bar-tailed Godwit	403 (n)	69	494 (n)		245 (n)	850 (n)	610 (n)	2	559 (n)	656 (n)	470 (n)	700 (n)	644 (n)	1202 (i)
Curlew	458 (n)	270	1,064 (n)	921 (n)	690 (n)	297	562 (n)	608 (n)	796 (n)	434 (n)	1171 (n)	254	690 (n)	930 (n)
Greenshank	9	17	16	8	17	13	10	13	19	34 (n)	18	22 (n)	22 (n)	37 (n)
Redshank	383 (n)	382 (n)	469 (n)	489 (n)	454 (n)	326 (n)	355 (n)	309	525 (n)	277	588 (n)	293	385 (n)	396 (n)
Turnstone	66	45	34	31	15	57	26	29	31	50	47	18	34	46
Black-headed Gull	1,912	1,048	1,435	258	1,433	937	1,031	101	2,565	1,057	2951	920	1504	3160
Common Gull	47	20	268	98	50	14	317	128	632	71	178	40	307	182
Lesser Black-backed Gull	60	10	24	5	48	4	62	16	150	8	64	83	432	65
Herring Gull	247	74	328	579	139	24	277	60	357	61	147	38	203	48
Great Black-backed Gull	97		120	31	40	9	39	10	53	7	28	3	33	3
Kingfisher	1													

4.5. Trends in waterbird numbers

Following methods described in Section 3.4.3, the mean annual change was calculated to represent a short-term trend reflecting the change in waterbird numbers between 2014/15 and 2020/21. 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 express the trend as either increasing or decreasing.

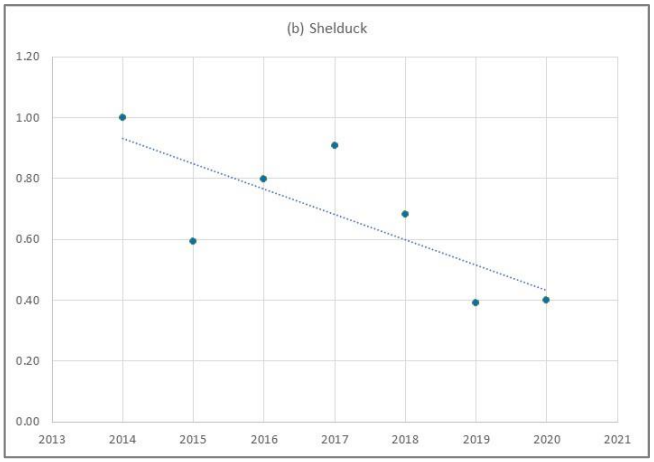
Table 4.5.1: Trend (mean annual change %) for the period 2014/15 - 2020/21

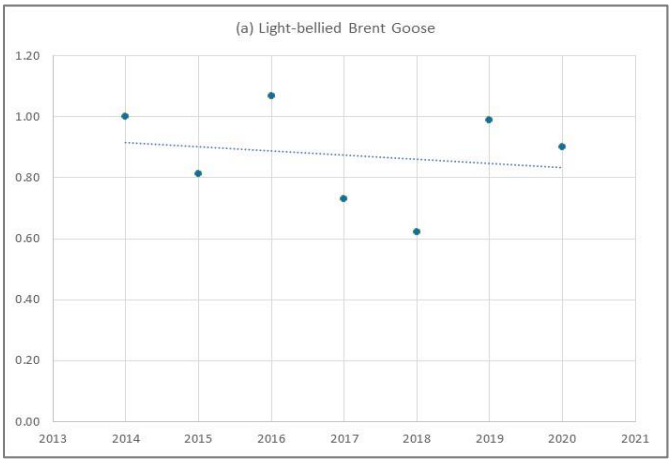
Special Conservation Interest Species	Mean Annual Change (%) 2014/15 – 2020/21	Trend
Light-bellied Brent Goose	- 1.65	Decrease
Shelduck	- 12.5	Decrease
Wigeon	- 3.5	Decrease
Teal	- 1.3	Decrease
Red-breasted Merganser	- 6.1	Decrease
Oystercatcher	- 6.5	Decrease
Golden Plover	- 20.6	Decrease
Grey Plover	- 19.4	Decrease
Lapwing	- 10.0	Decrease
Knot	+ 8.0	Increase
Dunlin	- 5.0	Decrease
Black-tailed Godwit	+ 23.4	Increase
Bar-tailed Godwit	- 12.4	Decrease
Curlew	- 8.4	Decrease
Redshank	- 5.3	Decrease

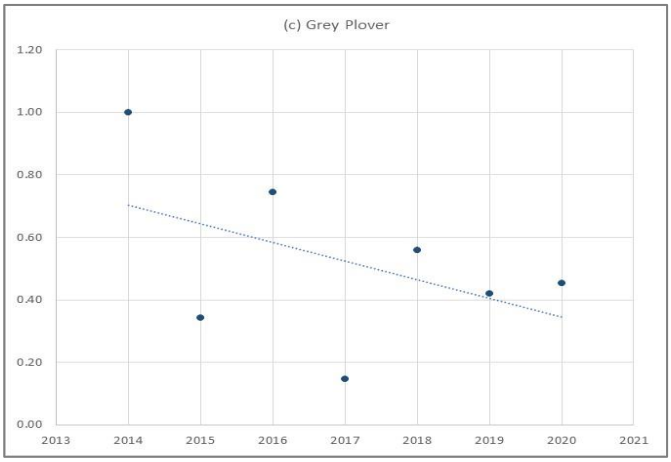
The trends shown in Table 4.5.1 differ somewhat to those shown in previous annual reports of winter surveys as data from 2009 was used previously. In the current report, as seven consecutive years of data are now available, the trends shown are the most robust produced to-date, based on seven years of data collected in a standardised way.

The results indicate declining trends for 13 of the 15 species assessed, with only two species (Black-tailed Godwit and Knot) showing increasing numbers. The largest declines are observed for Golden Plover, Grey Plover, Shelduck and Bar-tailed Godwit. Golden Plover, for example, has gone from a peak count of over 4,000 birds in 2014/15 to a peak count of 1,150 during 2020/21. Shelduck peak counts have more than halved in seven seasons, and for Oystercatcher, it was the second winter in a row when over 1,000 individuals were not counted (Table 4.4.1). Numbers of Knot, while appearing to decline through the period 2014 to 2017, have now stabilised/increased over time.

Selected species trends are shown in Figure 4.5.1.







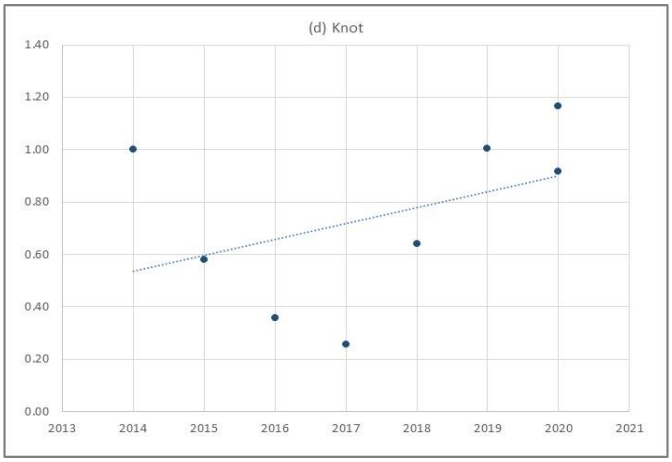


Figure 4.5.1 (a-e): Selected waterbird species trends.

As an additional assessment of trends, the five-year mean peak was calculated for selected species using data from surveys undertaken across the winters 2016/17 – 2020/21 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).

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 (2016/17 – 2020/21). The change of direction arrow indicates if the most recent mean peak is greater or less than the baseline value.

Special Conservation Interests (SCIs)	Baseline Period (1995/96 – 1999/00)[I]	5-year mean peak (2016/17 – 2020/21[II]	Change in direction
Light-bellied Brent Goose	561 (i)	678 (i)	↑
Shelduck	500 (n)	329 (n)	↓
Pintail	52 (n)	0	↓
Oystercatcher	711 (n)	925 (n)	↑
Golden Plover	1,955 (n)	3,033 (n)	↑
Grey Plover	142 (n)	106 (n)	↓
Lapwing	2,950 (n)	2,172 (n)	↓
Knot	508 (n)	657 (n)	↑
Dunlin	3,038 (n)	2,075 (n)	↓
Black-tailed Godwit	546 (i)	1,131 (n)	↑
Bar-tailed Godwit	471 (n)	603 (n)	↑
Curlew	891 (n)	723 (n)	↓
Redshank	377 (n)	441 (n)	↑

[I]Five year peak mean for the period 1995/96 to 1999/00 (based on I-WeBS data in NPWS, 2012).
[II]Five year peak mean for the period 2016/17 to 2020/21. 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 2020/21 survey season, 0O418 (Bannow Island to Newquay) held peak numbers of waterbirds during two low tide surveys and during the January 2021 high tide survey. 0O416 (Kiltra) and 0O413 (St Kiernans to Newtown) held peak numbers during October and November 2020 respectively. 0O413 however, supported notably reduced numbers of waterbirds for the remaining surveys. Also of note was that 0O417 (Clonmines Castle) in the inner bay did not hold peak numbers of waterbirds during any survey, this possibly related to the infrequency of which Golden Plover was recorded, a species that has previously been dominant in terms of numbers, within this subsite. Peak counts within five subsites were lower than recorded during 2019/20 (0O413, 0O416, 0O417, 0O418 and 0O487) (Table 4.6.1).

Table 4.6.1: Total numbers of waterbirds within subsites during winter 2020/21. Peak count per survey shown in bold font.

Subsite Code	Subsite Name	LT1	LT2	LT3	LT4	HT	Peak Count 2019/20
0O410	Fethard Bay	242	451	465	526	322	365 (LT)
0O411	St Kiernans to Saltmills to Big Burrow	993	1,323	1,818	406	1,657	1,575 (LT)
0O413	Saint Kiernans to Newtown	**2,128**	804	845	388	678	3,663 (LT)
0O416	Kiltra	1,987	**1,760**	1,667	1,448	1,043	4,030 (LT)
0O417	Clonmines Castle	442	1,381	1,242	518	1,180	3,703 (HT)
0O418	Bannow Island to Newquay	1,663	1,145	**2,699**	**1,864**	**2,414**	4,151 (LT)
0O487	Tintern Abbey to Tintern Bridge	179	170	226	49	270	753 (HT)
0O489	Pollfur	444	84	166	92	103	365 (LT)

Over time, peak counts in five of the seven count seasons winters have been recorded for 0O416 (Kiltra). However, this was not the case in the current and previous winter, with 0O418 (Bannow Island to Newquay) supporting peak numbers of birds during 2019/20 and 2020/21. Notably, peak counts in 0O416 (Kiltra) and 0O417 (Clonmines Castle) were much lower during winter 2020/21 than in previous winters. Subsite peak counts overall, have got much lower over time (Table 4.6.2, Figure 4.6.1).

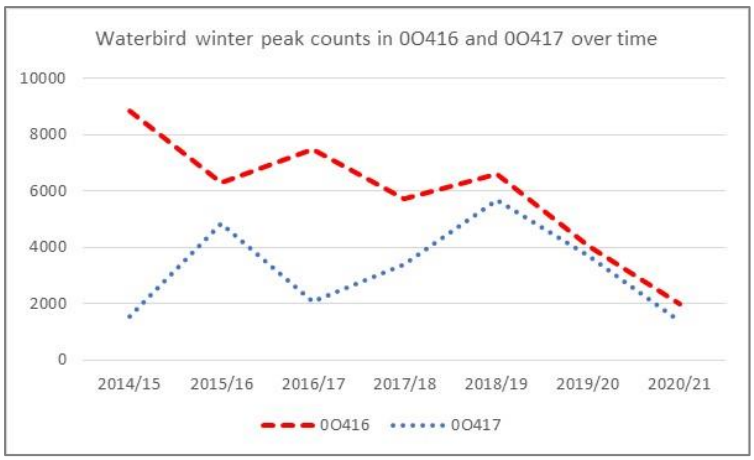


Figure *4.6.1: Waterbird peak counts within subsites 0O416 and 0O417 over time.*

Table 4.6.2: Peak numbers of waterbirds within subsites during 2020/21 and the six previous survey seasons. Overall peak for each winter shown in bold.

Subsite Code	Subsite Name	2020/21	2019/20	2018/19	2017/18	2016/17	2015/16	2014/15
0O410	Fethard Bay	526 (LT)	365 (LT)	582 (LT)	586 (LT)	797 (LT)	291 (LT)	916 (LT)
0O411	St Kiernans to Saltmills to Big Burrow	1,818 (LT)	1,575 (LT)	1,115 (LT)	1,097 (LT)	2,006 (LT)	2,477 (LT)	2,551 (LT)
0O413	Saint Kiernans to Newtown	2,128 (LT)	3,663 (LT)	1,084 (LT)	825 (LT)	2,304 (LT)	1,600 (LT)	898 (LT)
0O416	Kiltra	1,987 (LT)	4,030 (LT)	**6,603 (LT)**	**5,711 (LT)**	**7,482 (LT)**	**6,285 (LT)**	**8,849 (LT)**
0O417	Clonmines Castle	1,381 (LT)	3,703 (HT)	5,668 (HT)	3,383 (HT)	2,075 (HT)	4,838 (LT)	1,527 (HT)
0O418	Bannow Island to Newquay	**2,699 (LT)**	**4,151 (LT)**	2,518 (LT)	1,415 (LT)	3,385 (HT)	2,813 (LT)	2,101 (LT)
0O487	Tintern Abbey to Tintern Bridge	270 (HT)	753 (HT)	522 (LT)	219 (LT)	354 (LT)	217 (LT)	248 (LT)
0O489	Pollfur	444 (LT)	365 (LT)	273 (LT)	488 (LT)	354 (HT)	320 (LT)	234 (LT)

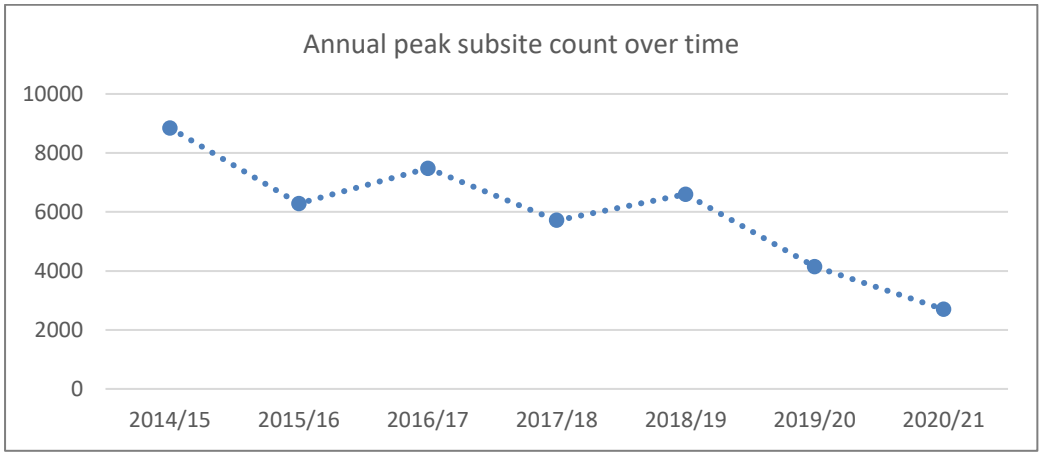


Figure *4.6.2: Overall peak subsite counts over time.*

4.7 Waterbird distribution

During low tide surveys, 0O411 supported the largest number of species (eight) in numbers ranked as 'very high' (Table 4.7.1), followed by 0O416 (seven species) and 0O418 (six species). Based on numbers ranked as 'very high' and 'high', 0O411, 0O413, 0O416 and 0O418 are the most favoured subsites at low tide.

Table 4.7.1: Relative importance of each subsite based on total numbers of waterbird SCI species during low tide surveys of 2020/21.

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

Four subsites held peak numbers of waterbird species during the high tide survey (0O411, 0O416, 0O417 and 0O418). 0O417 and 0O418 held peak numbers of four and three waterbird species respectively (Table 4.7.2). Notably, despite holding peak numbers in previous winter surveys, 0O413 did not support numbers of waterbirds ranked as very high, high or moderate during the high tide survey.

Table 4.7.2: 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			GV, PB
0O411	St Kiernans to Saltmills to Big Burrow	BA, CU, GV	OC, PB, SU	DN, KN, RK
0O413	Saint Kiernans to Newtown			
0O416	Kiltra	PB	BW, L.	CU, OC, SU
0O417	Clonmines Castle	L. RK	BA, CU, DN, KN	BW
0O418	Bannow Island to Newquay	BW, DN, KN, OC, SU	GV, RK	
0O487	Tintern Abbey to Tintern Bridge			
0O489	Pollfur			

Tables 4.7.3 – 4.7.5 provide an assessment of waterbird distribution. 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). The tables show the current rankings and in brackets, the rankings from all previous low tide survey programmes over time.

*Table 4.7.3: Subsite ranking (categories) based on **total numbers** during low tide surveys.*

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

NOTE: letters in brackets refers to the category recorded during the 2019/20, 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 4.7.4: Subsite ranking based on **total numbers** during the high tide survey.*

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

NOTE: letters in brackets refers to the category recorded during the 2019/20, 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 4.7.5: Subsite ranking based on numbers **foraging intertidally** during low tide surveys.*

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

NOTE: letters in brackets refers to the category recorded during the 2019/20 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.

4.8.1 Waterbird distribution and status – species summaries

The following species accounts examines the low tide distribution of waterbird SCI species at Bannow Bay during winter 2020/21 and assesses patterns in light of previous low tide survey programmes at the site. The species' status and trends are also assessed in light of those at national and international level.

4.8.1 Light-bellied Brent Goose

In terms of total numbers, two subsites 0O411 (St Kiernans to Saltmills to Big Burrow) (three surveys), and 0O416 (Kiltra) (one survey) held peak numbers during low tide surveys. While counts for these subsites remain consistent with previous low tide surveys at the site, 0O413 (Saint Kiernans to Newtown) did not support peak numbers during winter 2020/21 and the peak number recorded (122) was less than half that recorded the previous winter. Over the whole site however, numbers recorded were reasonably consistent with recent previous years. Over time, site numbers have shown annual variation, although the trend across the period 2014/15 – 2020/21 is now for decline. This is consistent with the national trend over five- and ten-years (Lewis *et al.*, 2019). By way of comparison, over 2,000 geese were recorded during winter 2009/10 at Bannow Bay, compared with site total counts of generally less than 800 geese in recent years. Light bellied Brent geese are amber-listed as a wintering species (Gilbert *et al.*, 2021).

Highest numbers foraging intertidally were located within 0O410 (Fethard Bay) and 0O411 (St Kiernans to Saltmills to Big Burrow). This distribution is most likely related to food supply. 0O411 has been noted previously 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). Given that these records are now over a decade old, whether the seagrass still thrives at the site is unknown. 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.

At high tide, 76% of the geese present were located within 0O416 (Kiltra) (450 individuals) with 60 geese present in the outer site (0O410 Fethard Bay).

Consistent with previous surveys, subsites 0O487 (Tintern Abbey to Tintern Bridge) supported relatively few geese on few survey occasions. The geese were not recorded within 0O489 (Pollfur) during winter 2020/21.

4.8.2 Shelduck

Over time, one subsite (0O418 Bannow Island to Newquay) has consistently held peak numbers of Shelduck during low and high tide surveys. The surveys of winter 2020/21 again showed that this subsite is the most important area of the whole site for Shelduck at both low and high tide. This represents a remarkable level of subsite faithfulness. The sediment of 0O418 was shown to comprise

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.

Apart from 0O418, this duck was regularly occurring within 0O411 (St Kiernans to Saltmills to Big Burrow), again consistent with previous winter surveys.

While Shelduck still occur in numbers of national importance at Bannow Bay, it must be borne in mind that the threshold for this status has reduced over the years. It is clear that numbers of Shelduck have declined (Table 4.5.1) at the site across the period 2014/15 – 2020/21. The species is also in decline nationally over five, ten and 22 years, while the species trend is stable at flyway level (Wetlands International, 2017). Shelduck are amber-listed as a wintering species (Gilbert *et al.*, 2021).

4.8.3 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 2020/21, they were recorded from within seven of the subsites (not in 0O487). Two subsites recorded numbers ranked as 'very high' – 0O416 (Kiltra) and 0O418 (Bannow Island to Newquay). 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. As in previous winter surveys, 0O413 (Saint Kiernans to Newtown) also 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, 0O418 (Bannow Island to Newquay) supported the largest number of Oystercatchers; nearly half of all these wading birds recorded during the survey.

Oystercatcher numbers have declined at Bannow Bay. Once numbering over 1,000 individuals at the site, no site count has exceeded this number since winter of 2019/19 (Figure 4.8.1). Nationally, this wading bird is showing declining numbers over the past five and 12 years (Lewis *et al.*, 2019) while at flyway level the trend is uncertain (stable/decline?) (Wetlands International, 2017).

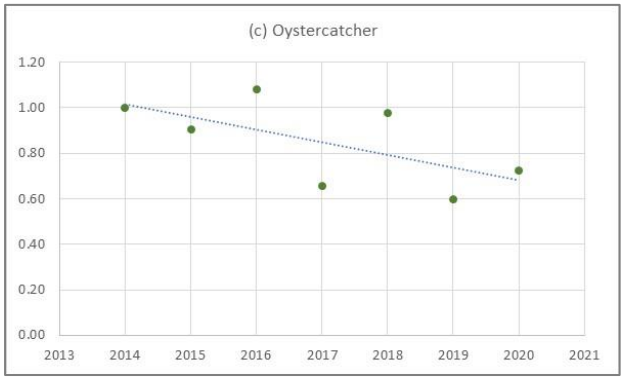


Figure 4.8.1: *Trend in Oystercatcher numbers 2014/15 – 2020/21.*

4.8.4 Golden Plover

During winter, Golden Plovers are attracted to winter cereals, stubbles, fallows and close-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). That said, roost locations of Golden Plover within Bannow Bay have been highly consistent over the past seven years of winter surveys with the subsite 0O416 (Kiltra) having been the favoured subsite throughout all surveys (ranked 'very high' in terms of total numbers across all surveys). The survey results from winter 2020/21 are therefore surprising as 0O416 supported few plovers, in fact only a relatively low number on one low tide survey occasion. The largest flock was recorded in October 2020 in 0O418 (Bannow Island to Newquay) and numbers dropped in all subsequent months. With a flock size once well over 4,000 individuals, the drop in numbers in recent winters is notable, given the known site fidelity of the species. The trend analyses confirmed these findings with a substantial decline in numbers now evident, at site level and within the favoured subsite 0O416 (Figure 4.8.2). Nationally, Golden Plover numbers have been in decline over the long-term (Lewis *et al.*, 2019) while at flyway level the trend is uncertain (stable/decline?) (Wetlands International, 2017). Golden Plover are red-listed as both a breeding and wintering species in Ireland (Gilbert *et al.*, 2021).

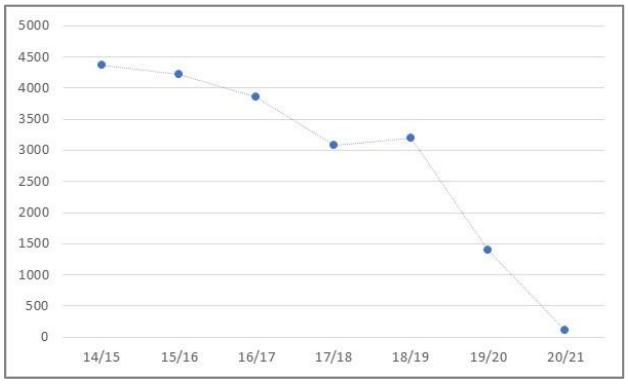


Figure 4.8.2: *Peak counts of Golden Plover within 0O416 over time.*

4.8.5 Grey Plover

Total site numbers of Grey Plover peaked at just 34 individuals during winter 2020/21, compared to a peak count of 111 birds in winter 2019/20. Peaks numbers were recorded within 0O411 (St Kiernans to Saltmills to Big Burrow), 0O413 (St Kiernans to Newtown) and 0O418 (Bannow Island to Newquay). Given relatively low numbers, no single subsite has appeared to be more favoured than another across low tide surveys of Bannow Bay. Results across the years however have been relatively consistent with this wader species distributed across mid estuarine subsites, and absent or rare in the inner or outer estuary.

The trend analyses confirm that numbers of Grey Plover have declined at Bannow Bay. Nationally, the species has been in decline over the long-term (Lewis *et al.*, 2019) while the flyway trend is also for decline (Wetlands International, 2017). Grey Plover are now red-listed as a wintering species (Gilbert *et al.*, 2021).

4.8.6 Lapwing

Like Golden Plover, Lapwing are generally known to forage terrestrially and use intertidal flats as safe roosting habitat during periods of low tide.

During 2020/21 Lapwing were recorded in six subsites of Bannow Bay. However, 0O417 (Clonmines Castle) supported peak numbers during low tide surveys and held peak numbers during the high tide survey. This subsite preference has been very consistent over time. 0O416 (Kiltra) is also notable for supporting good numbers of Lapwing, and 0O417 and 0O416 collectively held most of the Lapwings counted.

While site total numbers have varied greatly over the years, it is clear that numbers have declined over time at Bannow Bay. Nationally, the species has been in decline over the long-term (Lewis *et al.* 2019) while the flyway trend is also for decline (Wetlands International, 2017). Lapwing are red-listed as a breeding and wintering species (Gilbert *et al.*, 2021).

4.8.7 Knot

Knot was recorded in four subsites overall (0O411 (St Kiernans to Saltmills to Big Burrow), 0O413 (Saint Kiernans to Newtown), 0O417 (Clonmines Castle) and 0O418 (Bannow island to Newquay), consistent with the results from the previous winter surveys. However, the species was observed only sporadically, and their numbers varied greatly. The peak number of Knot (1,119) was the highest count recorded within the seven-year series of winter surveys.

Unlike many other waders that show great site fidelity during winter, Knot are known to be more mobile and may move between sites during winter to locate food resources as their shellfish prey becomes depleted. Counts at Bannow Bay over the years however have remained relatively stable and the peak count of 2020/21 results in a trend for increase. This contrasts to the national trend which is indicates that Knot is declining (Burke *et al.*, 2018). Knot are red-listed as a wintering species (Gilbert *et al.*, 2021).

4.8.8 Dunlin

Dunlin have consistently been distributed across five subsites during all of the previous seven winter surveys (0O411, 0O413, 0O416, 0O417 and 0O418). The same distribution was apparent during winter 2020/21 although a single count of a small number of Dunlin (5) was also made for 0O410 (Fethard Bay).

Peak numbers during 2020/21 were recorded in 0O411 (St Kiernans to Saltmills to Big Burrow) and 0O416 (Kiltra), with numbers ranked as 'high' recorded for 0O413 (Saint Kiernans to Newtown) and 0O418 (Bannow Island to Newquay). These results are highly consistent with previous winter surveys.

While the site total numbers were higher than recorded for winter 2019/20, and appear relatively stable over time, the trend analysis suggests some decline over time. The species has been in long term decline in Ireland (Lewis *et al.*, 2019) and is consequently red-listed as a wintering species (Gilbert *et al.*, 2021).

4.8.9 Black-tailed Godwit

Black-tailed Godwits were recorded in five of the eight count subsites during winter 2020/21. Subsite distribution remains relatively consistent with previous surveys, in that 0O413 (Saint Kiernans to Newtown), recorded peak numbers during low tide along with 0O416 (Kiltra). However, 0O417 (Clonmines Castle) previously noted as being an important subsite for this species, did not support this wader during any low tide survey this winter, 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 forementioned subsites (0O413, 0O416 0O417 and 0O418) appear the most important for Black-tailed Godwits.

Site total numbers varied greatly between months which suggests that the birds are mobile between sites during winter. For example, the site total count in December 2020 was 1,437, while only 215 godwits were counted the month before.

Based on peak numbers, the trend in godwit numbers at Bannow Bay is increasing. Nationally, Black-tailed Godwits are one of only a few wading bird species showing a trend for increasing numbers (Lewis *et al.*, 2019).

4.8.10 Bar-tailed Godwit

Bar-tailed Godwits occurred in five subsites during winter 2020/21: (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 highly consistent with previous surveys.

0O411, 0O413 and 0O416 held peak numbers during low tide surveys and collectively supported the majority of these birds during low tide surveys. 0O411 also held the largest number 950) during the January high tide survey.

Numbers of Bar-tailed Godwits at Bannow Bay have declined over the years. This is consistent with a short-term (5-year) decline now evident nationally (Lewis *et al.*, 2019). Bar-tailed Godwits are red-listed as a wintering species (Gilbert *et al.*, 2021).

4.8.11 Curlew

The Curlew has a widespread distribution across Bannow Bay, occurring in all eight subsites. Over time a subsite preference has been evident for 0O416 (Kiltra) and 0O411 (St Kiernans to Saltmills to Big Burrow) which have both supported peak numbers on the majority of survey occasions. During winter 2020/21 however, these subsites were also joined by 0O417 (Clonmines Castle) in supporting peak numbers. Apart from these three aforementioned subsites, all other subsites generally support low numbers.

It is clear that numbers of Curlew have declined over time at Bannow Bay. Nationally, the species has been in decline over the long-term (Lewis *et al.*, 2019) while the flyway trend is also for decline

(Wetlands International, 2017). This wader is red-listed as a breeding and wintering species (Gilbert *et al.*, 2021).

4.8.12 Redshank

Redshanks were widespread and recorded within all eight subsites during low tide surveys of winter 2020/21. Two subsites held peak numbers during low tide – 0O411 (St Kiernans to Saltmills to Big Burrow) and 0O418 (Bannow Island to Newquay) but good numbers were also recorded in 0O413 (St Kiernans to Newtown) and 0O416 (Kiltra). Subsite numbers vary widely between subsites and months and overall it appears that all subsites are important for Redshank at Bannow Bay with no clear subsite preference.

Numbers of Redshank at Bannow Bay have declined over the years. This is consistent with a short-term (5-year) decline now evident nationally (Lewis *et al.*, 2019). This wader is red-listed as a breeding and wintering species (Gilbert *et al.*, 2021).

4.9 Activities and disturbance

Counts during winter 2020/21 were undertaken largely on weekends which may explain the very low level of activities recorded. Overall a vehicle (two dates) and people walking along the shore (one day) was recorded within 0O413 (Saint Kiernans to Newtown) while two occasions of people walking along the shore (on one occasion with dogs) was recorded for 0O411.

5 DISCUSSION

The 2020/21 winter waterbird survey programme at Bannow Bay marks the seventh 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 has enabled important detailed comparisons over time.

A total of 37 waterbird species were recorded during the winter 2020/21 surveys at Bannow Bay, which included 16 wildfowl and allies, 15 wader species, five gull species and the Annex I Kingfisher. Species diversity remains relatively consistent with previous low tide surveys at the site and relatively similar to the species list (42) recorded during the baseline survey of 2009/10 (NPWS Waterbird Survey Programme).

As noted previously, several species continue to show a high degree of within-site fidelity (subsite faithfulness). In particular, 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 periods. Good consistency in subsite use has also been shown for Lapwing and Dunlin. 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. Over the seven-year survey period, Golden Plover retained a consistent roost location within 0O416 (Kiltra). The survey results from winter 2020/21 are therefore notable as 0O416 supported few plovers; in fact only a relatively low number on one low tide survey occasion. The once so consistent large flock of Golden Plover at Bannow Bay was missing during winter 2020/21. Also of note is the drop in waterbird numbers now apparent for subsites 0O413, 0O416 and 0O417; these being the mid estuarine and upper subsites. This cannot be explained. Future and continued monitoring is even more key to determine whether such negative trends persist into the future.

The total number of waterbirds recorded at Bannow Bay during winter 2020/21 was lower than recorded previously. Indeed, the low tide peak count was lower than any previous such count from previous survey programmes while the high tide count was the second lowest on record. 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).

While low tide survey programmes are generally recommended to assess waterbird spatial distribution, the consistent and repeated nature of the winter surveys at Bannow Bay have also provided good quality count data from which to assess trends in waterbird numbers. The trend analyses undertaken this year differed somewhat to those shown in previous annual reports of winter surveys, because data from 2009 were used previously. In the current report, as seven consecutive years of data are now available, the trends shown are the most robust produced to-date, based on seven years of data collected in a standardised way. Notwithstanding the fact that some half of the waterbird SCI species can now occur in peak numbers that are higher than the baseline period for SPA designation, the trend analysis for the period 2014/15 – 2020/21 (six-year trend) showed some nogtable trends - with 13 of 15 species assessed in decline over this time period.

The largest decline is observed for Golden Plover, which is a species not wholly reliant on Bannow Bay because this is a species that fields terrestrially. However, these birds roost intertidally at low tide and are highly faithful to their roost sites, not only in terms of the site, but the position within the site as well (L J Lewis *pers. obs*). The decline in numbers to an all-time low during 2020/21 is therefore notable. The annual index for Shelduck has halved in the time period assessed, and a major decline in Grey Plover numbers is also now apparent. By contrast, numbers of Knot, while appearing to decline through the period 2014 to 2017, have now increased to above that recorded in winter 2014/15. 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 now evident, 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.

Clearly, waterbirds are in decline at Bannow Bay so it may be timely to re-assess site-based factors. Benthic data for the site are now old and out-of-date, and the distribution and abundance of benthic

macroinvertebrates, critical to the over-winter survival of waterbirds, may also be experiencing pressures from a variety of sources, including climate change. Evidence of an increased level of aquaculture at the site may be at odds with the conservation objectives for the site, which should aim to reverse the negative trends in waterbird numbers.

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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, birdwatching, 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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