EMFF Operational Programme 2014-2020

Marine Biodiversity Scheme

Marine Institute Bird Studies

Winter Waterbird Survey

Bannow Bay SPA, County Wexford.

2022-2023

Lead Agency: Marine Institute.

Authors: INIS Environmental Consultants Ltd.

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An Roinn Talmhaíochta, Bia agus Mara
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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) good practice guidelines. Where pertinent CIEEM Guidelines used in the preparation of this report include the *Guidelines for Ecological Report Writing* (CIEEM, 2017a), *Guidelines for Preliminary Ecological Appraisals* (CIEEM, 2017b) and *Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial, Freshwater, Coastal and Marine*, (CIEEM, 2019). 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 Acts, 1976-2021,* the *European Communities (Birds and Natural Habitats) Regulations 2011-2021,* EU Regulation on Invasive Alien Species under *EU Regulation 1143/2014*, the EU Birds *Directive 2009/147/EC* and *Habitats Directive 92/43/EEC*.

No method of assessment can completely remove the possibility of obtaining partially imprecise or incomplete information. Any limitation to the methods applied or constraints however are clearly identified within the main body of this document.

Version	**Date**		**Name**	**Signature**
1	05/05/2023	**Report prepared by:**	Dr Lesley Lewis BSc PhD MCIEEM	
1	23/08/2023	**Report checked by:**	Dr. Alex Copland BSc PhD MIEnvSc	
1	24/08/2023	**Report signed off by:**	Howard Williams BSc CEnv MCIEEM CBiol MRSB MIFM	
Title		Bannow Bay Waterbird Survey: Winter 2022-23 Bird Survey Report		

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1. INTRODUCTION

Inis Environmental Consultants Ltd. (INIS) were contracted to co-ordinate a series of waterbird surveys at Bannow Bay, Co. Wexford during the 2022/23 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 this survey programme. The results are examined and discussed in light of similar surveys undertaken during recent 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

Dr. Lesley Lewis BSc PhD MCIEEM is a specialist waterbird ecologist and wrote this report. 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 19 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). She manages a team of four and is responsible for the delivery of these projects for the National Parks and Wildlife Service.

Dr Alex Copland BSc PhD MIEnvSc is Technical Director with INIS and reviewed this report. He has over 25 years of professional experience working in both statutory and private companies, in third-level research institutions and with environmental NGOs. He is proficient in experimental design and data analysis and has managed several large-scale, multi-disciplinary ecological projects. These have included research and targeted management work for species of conservation concern, the design and delivery of practical conservation actions with a range of stakeholders and end-users, education and interpretation on the interface between people and the environment and the development of coordinated, strategic plans for birds and biodiversity.

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 also sits on the Editorial Panel of the scientific journal, *Irish Birds*, which publishes original ornithological research relevant to Ireland's avifauna.

Mr Howard Williams MCIEEM CEnv CBiol MRSB MIFM is Lead Ecologist with Inis and reviewed and signed off on this report. He 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.

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 north-east of Hook Head Lighthouse (see **Figure 2.1.1**). The bay is approximately 14 km along its north-east/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 south-east Ireland. 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 A**.

2.2. Bannow Bay waterbirds

2.2.1. Waterbird Special Conservation Interests (SCIs)

Bannow Bay SPA (**see Figure 2.1.1**) covers a total area of 1,364ha and is of special conservation interest for 13 waterbird species (see **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).*

Figure 2.1.1: *Location of Bannow Bay SPA, Co. Wexford including the boundary of Bannow Bay SPA (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]	Status under BoCCI4[d]
Light-bellied Brent Goose *Branta bernicla hrota*	561	International Importance	Amber
Shelduck *Tadorna tadorna*	500	All-Ireland Importance	Amber
Pintail *Anas acuta*	52	All-Ireland Importance	Amber
Oystercatcher *Haematopus ostralegus*	711	All-Ireland Importance	Red
Golden Plover *Pluvialis apricaria*[b]	1,955	All-Ireland Importance	Red
Grey Plover *Pluvialis squatarola*	142	All-Ireland Importance	Red
Lapwing *Vanellus vanellus*	2,950	All-Ireland Importance	Red
Knot *Calidris canutus*	508	All-Ireland Importance	Red
Dunlin *Calidris alpina*	3,038	All-Ireland Importance	Red
Black-tailed Godwit *Limosa limosa*	546	International Importance	Red
Bar-tailed Godwit *Limosa lapponica*[b]	471	All-Ireland Importance	Red
Curlew *Numenius arquata*	891	All-Ireland Importance	Red
Redshank *Tringa totanus*	377	All-Ireland Importance	Red

[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]Status under Birds of Conservation Concern 4 (BoCCI4) (after Gilbert *et al.,* 2021).

3. METHODOLOGICAL APPROACH

3.1. Background to the low tide survey programme

The Irish Wetland Bird Survey (I-WeBS) is the primary method of monitoring wintering waterbird populations at Irish wetland sites (Lewis *et al.*, 2019). 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; Kennedy *et al.*, 2022). I-WeBS surveys are undertaken primarily on a rising or high tide, when birds move 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 2022/23 winter season therefore followed the standard methodology developed by the NPWS waterbird survey programme. Similar surveys were also undertaken during the eight previous winter seasons (2014/15, 2015/16, 2016/17, 2017/18, 2018/19, 2019/20, 2020/21 and 2021/22).

3.2. Survey design and count area

During winter 2022/23, a standard survey programme of four low tide counts and one high tide count was undertaken. 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. Low tide surveys were carried out on the 26th October, 9th November and the 10th December 2022, and the 8th February 2023. The high tide survey was undertaken on 18th January 2023.

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 2022/23 season fieldworkers were Barry O'Mahony (BOM), Kevin Collins (KC) 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

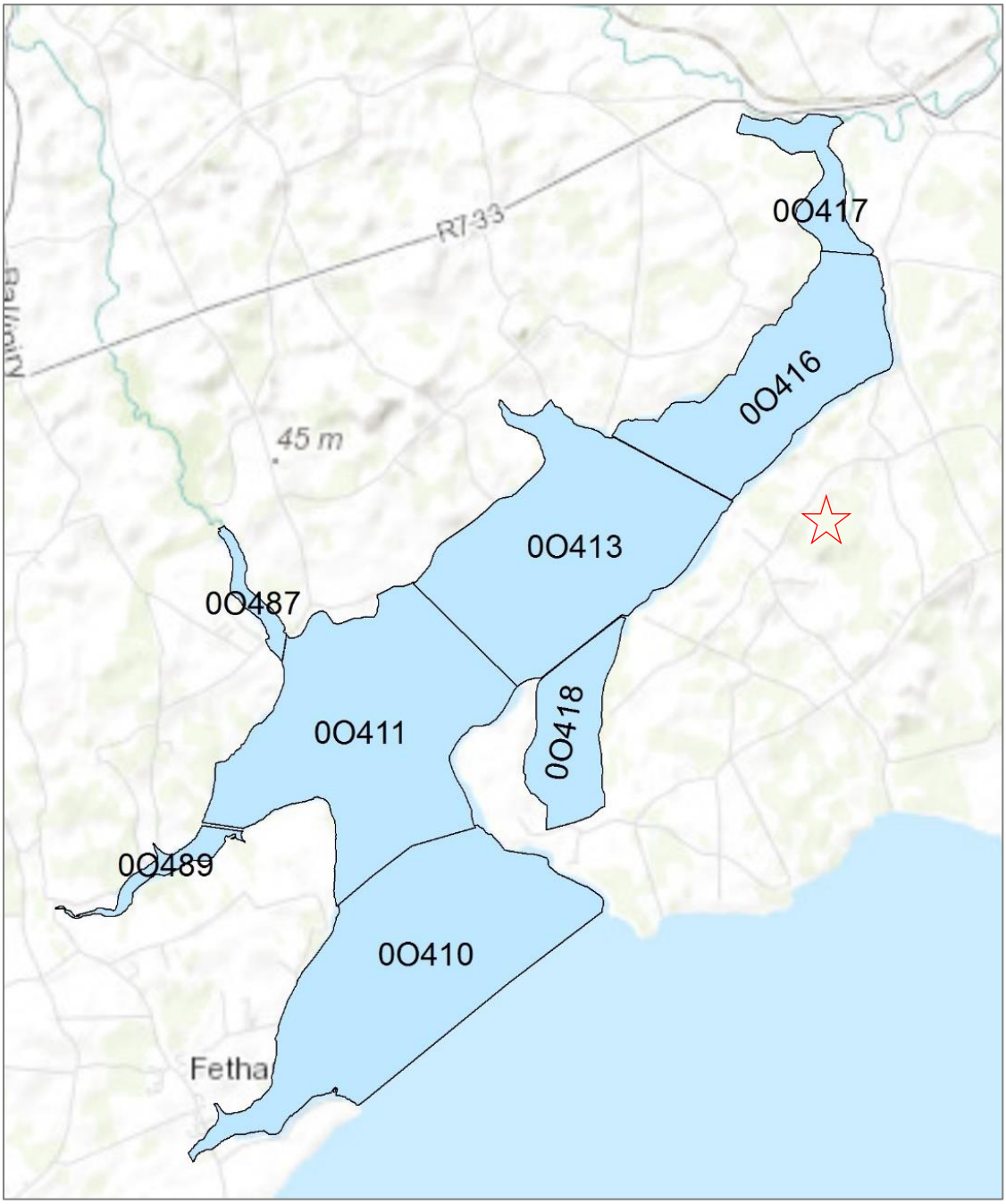


Figure 3.2.1: *Count subsites used for the Bannow Bay waterbird surveys.*

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 on field maps, and later transferred by field surveyors into MS Excel datasheets. At the end of the survey season the Excel datasheets were compiled and validated before being formatted and entered into a MS Access database. From Access, data summaries were produced such as site totals, subsite totals, etc. Flock aggregations, marked on field maps, were digitized.

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),

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

A time-series of waterbird data now exists for Bannow Bay waterbirds, running from winter 2014/15 to winter 2022/23 (nine years). For this current report, trends were calculated for waterbird SCI species of Bannow Bay SPA in a different way to previous. Previously, the species peak count from each winter season was compiled; the peak counts taken from either low tide or high tide surveys. These peak counts were then used to calculate annual indices.

This year we have amended the methods. Now the five winter counts for each winter season are summed before indexing. This is to bring the method in line with that used to produce site-specific trends in I-WeBS (Kennedy *et al.*, 2022).

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). The 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 2022/23. These calculated trends were then compared with the recent 'official' waterbird site trends for Bannow Bay as published by the I-WeBS Office in 2022 (Kennedy *et al.*, 2022).

4. RESULTS

4.1. Survey schedule and conditions

The 2022/23 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 2022/23 survey programme.*

Date	Survey	Wind	Cloud (%)	Rain	Visibility	Notes
26.10.22	LT1	Breezy	34-66	None	Good	No survey constraints
09.11.22	LT2	Breezy	0-33	None	Good	No survey constraints
10.12.22	LT3	Light - Breezy	0-33	None	Good	No survey constraints
18.01.23	HT1	Light	0-33	None	Good	No survey constraints
08.02.23	LT4	Light	0-33	None	Good	No survey constraints

4.2. Species assemblage, diversity and occurrence

A total of 37 waterbird species were recorded during the winter 2022/23 surveys at Bannow Bay. The species list includes 16 wildfowl and allies, 16 wader species and five gull species (**Table 4.2.1**). A total of five Annex I species (EU Bird's Directive) was recorded as follows: Red-throated Diver, Great Northern Diver, Little Egret, Golden Plover and Bar-tailed Godwit. The species list also includes 30 species that are on the *Birds of Conservation Concern in Ireland* lists (Gilbert *et al.,* 2021), including 12 that are Red-listed and are of highest concern. All Special Conservation Interest (SCI) species listed for Bannow Bay SPA were recorded with the exception of Pintail.

Whole site species diversity ranged between 27 and 33 species; the peak number recorded during the October low tide survey (**Figure 4.2.1**). Twenty-four species were recorded in all five surveys undertaken. Four species were recorded on one survey date only and were therefore the most scarce (Goosander, Red-throated Diver, Sanderling and Whimbrel).

Subsite diversity ranged from a total of 12 species (0O489 Polfur) to a peak of 32 species (0O411 St Kiernans to Saltmills to Big Burrow) (**Figure 4.2.2**).

Eight species (Teal, Little Egret, Oystercatcher, Curlew, Greenshank, Redshank, Black-headed Gull and Herring Gull) occurred in all eight subsites and were therefore the most widespread (**Table 4.2.2**). The most uncommon species, occurring within one subsite only, and on one survey occasion only were (Goldeneye, Goosander, Red-throated Diver, Sanderling and Whimbrel).

Table 4.2.1: *Waterbird species recorded during the winter surveys at Bannow Bay 2022/23. 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.*

Common name	*Latin name*	BoCCI-4	LT1	LT2	LT3	LT4	HT1
Light-bellied Brent Goose	*Branta bernicla hrota*	Amber	√	√	√	√	√
Shelduck	*Tadorna tadorna*	Amber	√	√	√	√	√
Wigeon	*Anas penelope*	Amber	√	√	√	√	√
Teal	*Anas crecca*	Amber	√	√	√	√	√
Mallard	*Anas platyrhynchos*	Amber	√	√	√	√	√
Goldeneye	*Bucephala clangula*	Red			√	√	
Red-breasted Merganser	*Mergus serrator*	Amber			√	√	√
Goosander	*Mergus merganser*	Amber					√
Red-throated Diver	*Gavia stellata*	Amber				√	
Great Northern Diver	*Gavia immer*	Amber	√	√	√	√	√
Little Grebe	*Tachybaptus ruficollis*		√	√			√
Cormorant	*Phalacrocorax carbo*	Amber	√	√	√	√	√
Shag	*Phalacrocorax aristotelis*	Amber	√		√	√	√
Little Egret	*Egretta garzetta*		√	√	√	√	√
Grey Heron	*Ardea cinerea*		√	√	√	√	√
Oystercatcher	*Haematopus ostralegus*	Red	√	√	√	√	√
Ringed Plover	*Charadrius hiaticula*	Amber	√		√	√	√
Golden Plover	*Pluvialis apricaria*	Red	√	√	√	√	√
Grey Plover	*Pluvialis squatarola*	Red	√	√	√	√	
Lapwing	*Vanellus vanellus*	Red	√	√	√	√	√
Knot	*Calidris canutus*	Red	√	√	√	√	√
Sanderling	*Calidris alba*		√				
Dunlin	*Calidris alpina*	Red	√	√	√	√	√
Snipe	*Gallinago gallinago*	Red	√			√	√
Black-tailed Godwit	*Limosa limosa*	Red	√	√	√	√	√
Bar-tailed Godwit	*Limosa lapponica*	Red	√	√	√	√	√
Whimbrel	*Numenius phaeopus*		√				
Curlew	*Numenius arquata*	Red	√	√	√	√	√
Greenshank	*Tringa nebularia*		√	√	√	√	√
Redshank	*Tringa totanus*	Red	√	√	√	√	√
Turnstone	*Arenaria interpres*	Amber	√	√	√	√	√
Black-headed Gull	*Chroicocephalus ridibundus*	Amber	√	√	√	√	√
Common Gull	*Larus canus*	Amber	√	√	√	√	√
Lesser Black-backed Gull	*Larus fuscus*	Amber	√	1	5	5	
Herring Gull	*Larus argentatus*	Amber	√	√	√	√	√
Great Black-backed Gull	*Larus marinus*		√	√	√	√	√
Kingfisher	*Alcedo atthis*	Amber	√		√		

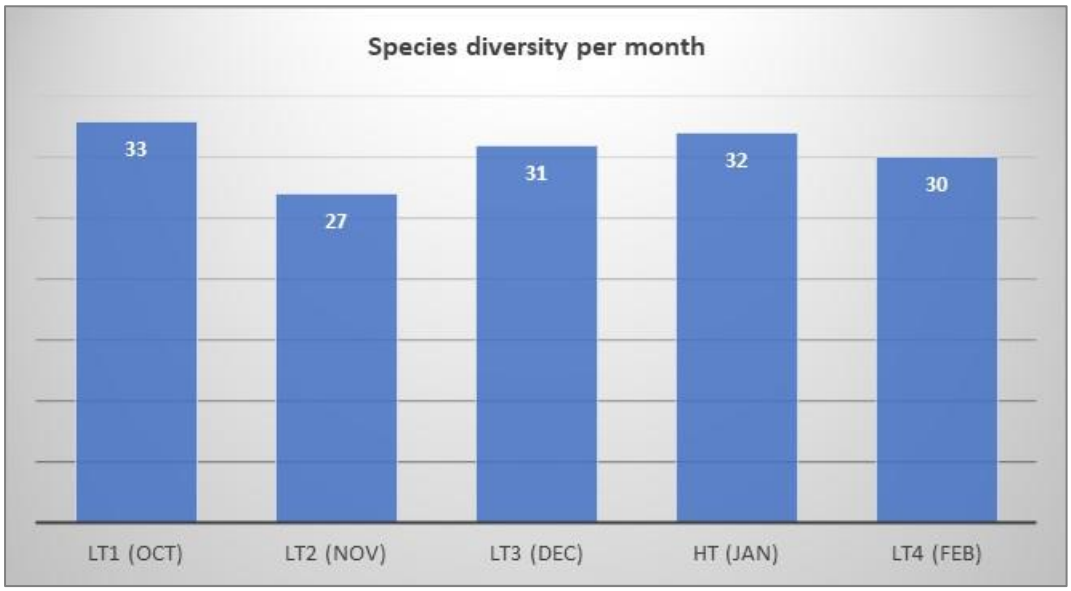


Figure 4.2.1: *Overall species diversity during the monthly surveys.*

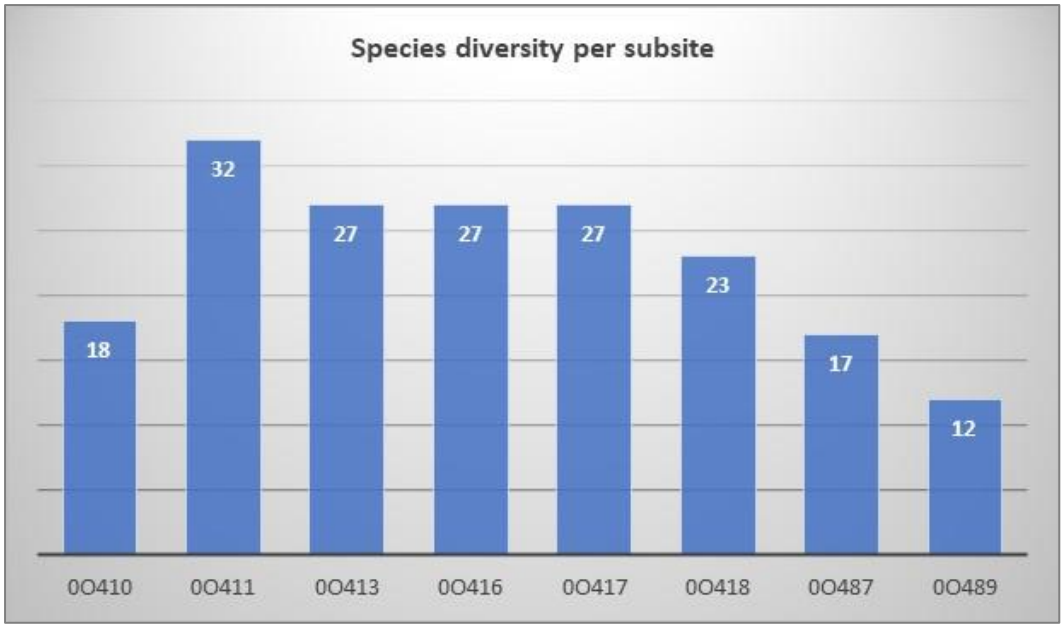


Figure 4.2.2: *Species diversity per subsite.*

***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
Light-bellied Brent Goose	√	√	√	√		√	√	
Shelduck		√	√	√	√	√		
Wigeon		√	√	√	√		√	√
Teal	√	√	√	√	√	√	√	√
Mallard	√	1		√	√		√	√
Goldeneye				√				
Red-breasted Merganser		√	√	√	√			
Goosander	√							
Red-throated Diver	√							
Great Northern Diver	√	√	√					
Little 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		√	√	√	√	√		
Whimbrel						1		
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 2022/23, total numbers of waterbirds during low tide surveys ranged from 6,557 (December 2022), to a peak count of 14,673 waterbirds during February 2023. A total of 4,460 waterbirds was counted during the January 2023 high tide survey (**Table 4.3.1**). The low tide peak count of 14,673 waterbirds during February 2023 is the first time that a count of 14,000 has been exceeded since winter 2016/17. A month earlier however, the high tide count of 4,460 waterbirds during January 2023 reflects an all-time low count collected during a high tide survey.

Plotting peak low tide counts per season suggests that the overall trend in total waterbird numbers is for decline, despite the particularly high count recorded during February 2023 (**Figure 4.3.1**). While total numbers during the high tide period are highly variable, the apparent trend is also for a decline in numbers.

***Table 4.3.1**: Total numbers of waterbirds counted at Bannow Bay during winter 2022/23, plus totals from previous survey programmes undertaken at the site.*

Winter	Total Numbers of Waterbirds (Site totals)				
	LT1	LT2	LT3	LT4	HT
2022/23	7,154	6,691	6,557	14,673	4,460
2021/22	7,307	8,680	11,727	6,080	11,628
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).

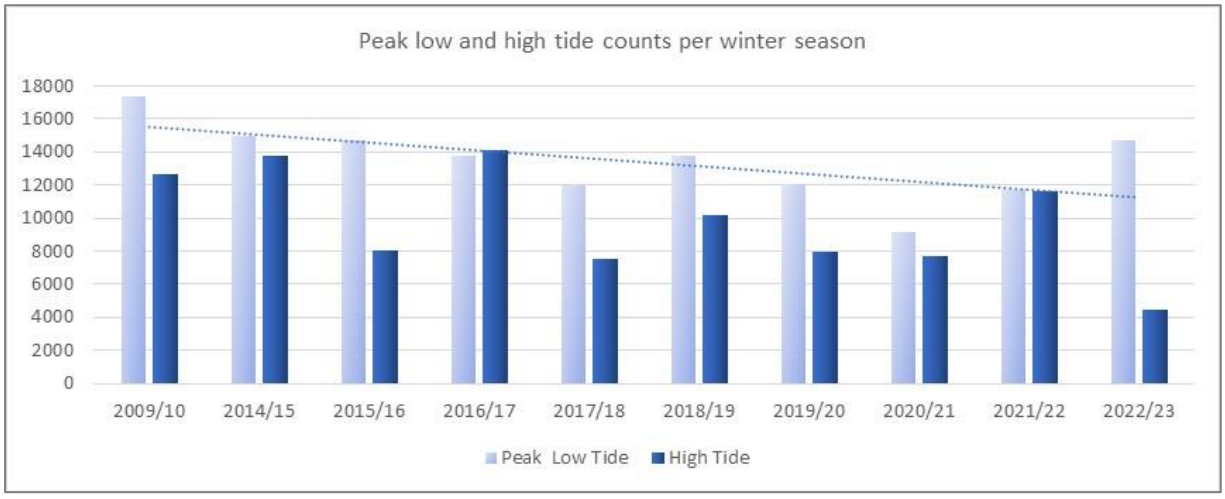


***Figure 4.3.1**: Peak low-and high-tide counts per season.*

4.4. Species totals

Waterbird species peak counts for the 2022/23 winter season at Bannow Bay are shown in **Table 4.4.1**.

During low tide surveys, eleven waterbird species occurred in numbers of national importance, namely: Shelduck, Little Egret, Oystercatcher, Golden Plover, Lapwing, Dunlin, Knot, Black-tailed Godwit, Bar-tailed Godwit, Curlew and Redshank. Five species occurred in numbers of national importance during the high tide count in January 2023: Shelduck, Knot, Black-tailed Godwit, Curlew and Greenshank.

Of note was that numbers of Light-bellied Goose during winter 2022/23 did not exceed the international (or national) threshold, the first time this has been observed in the nine-year data set (Table 4.4.1).

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 (9-year) trend reflecting the change in waterbird numbers between 2014/15 and 2022/23. Results are shown in **Table 4.5.1** for waterbird SCI species of Bannow Bay SPA. These trends are compared with the published trends for waterbirds at Bannow Bay, and the national trends (Kennedy *et al.,* 2022). Graphs for selected species are shown in **Figure 4.5.1**.

Based on our calculations using data from the low tide survey programmes, only one of the 12 waterbird species examined has a stable or increasing trends (Black-tailed Godwit). The current calculated site trend for Dunlin is for stable numbers (**Table 4.5.1**). 'Official' trends based on I-WeBS data are only available for seven of the SCI species[3], and trends for all except one species (Bar-tailed Godwit) indicate declines.

[3] Note -only species are included in I-WeBS site trend analyses that fulfil certain criteria in terms of the level of available data over months and years. This explains why trends are not available for all waterbird species.

***Table 4.4.1**: Peak counts of waterbird species during low tide (LT) and high tide (HT) surveys at Bannow Bay during winter 2022/23, plus peaks from the previous eight 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 years. Waterbird SCI species for Bannow Bay SPA are in bold font.*

	2022/23		2021/22		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**	**L**	**H**	**L**	**H**
Mute Swan			2		2	2	2	2	2		1	2	2			1		
Whooper Swan			29															
Light-bellied Brent Goose	257	253	668 (i)	415 (i)	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	114 (n)	142 (n)	429 (n)	625 (n)	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	429	177	352	839 (n)	371	307	715 (n)	65	564 (n)	140	493	283	661 (n)	528	356	300	781 (n)	550
Teal	345	307	273	299	487 (n)	537 (n)	278	309	915 (n)	298	293	170	619 (n)	806 (n)	478 (n)	219	472 (n)	546 (n)
Mallard	236	192	237	363 (n)	253	246	359 (n)	141	359 (n)	250	151	113	206	117	228	113	258	142
Pintail			5															
Scaup						1												
Goldeneye	6			3		1	2		1	4	5	2		7	5	3	9	3
Red-breasted Merganser	23	3	19	36 (n)	15	34 (n)	9	10	12	4	27 (n)	36 (n)	20 (n)	28 (n)	13	5	39 (n)	26 (n)
Goosander		2																
Red-throated Diver	1		18	11	1	8												
Great Northern Diver	6	3	4	6	8	4	12	8	5		6	6	2		11	5	1	2
Little Grebe	3	12	7	15	4	4	9	5	14	3	4	6	8	2	2	6	14	12
Great Crested Grebe			1	2	3	1	5	7	13		2		9	2	1	2	5	1
Cormorant	30	4	82	138 (n)	212 (n)	12	151 (n)	17	51	28	28	33	34	43	38	7	23	14
Shag	3	9	31	12														

	2022/23		2021/22		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	L	H	L	H
Little Egret	35 (n)	14	41 (n)	14	22 (n)	7	40 (n)	14	38 (n)	24 (n)	13	5	62 (n)	18	68 (n)	6	53 (n)	14
Grey Heron	13	4	12	10	6	4	7	4	15	15	11	5	23	11	16	1	19	6
Oystercatcher	629 (n)	498	678 (n)	411	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	33	1	30	12	30	7	80		23	2	86	0	179 (n)	0	74	0	37	118 (n)
Golden Plover	4,960 (n)	380	342	1,600 (n)	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	18		48 (n)	46 (n)	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	3,739 (n)	126	705	3,014 (n)	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	710 (n)	595 (n)	542 (n)		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	5				57	20	200 (n)		145 (n)		12	0	72 (n)					
Dunlin	1,663 (n)	196	2,252 (n)	2,157 (n)	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	1	9	2	4		15	3	37		3		13	4	8	11	0	18
Black-tailed Godwit	854 (n)	246 (n)	637 (n)	184	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	492 (n)	67	208 (n)	184 (n)	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	556 (n)	483 (n)	628 (n)	289	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)
Whimbrel	1																	
Greenshank	26	26 (n)	26 (n)	14	9	17	16	8	17	13	10	13	19	34 (n)	18	22 (n)	22 (n)	37 (n)
Redshank	307 (n)	225	566 (n)	406 (n)	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	23	9	15	7	66	45	34	31	15	57	26	29	31	50	47	18	34	46
Black-headed Gull	1,033	396	4,362	611	1,912	1,048	1,435	258	1,433	937	1,031	101	2,565	1,057	2951	920	1504	3160

	2022/23		2021/22		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	L	H	L	H
Common Gull	129	11	128	154	47	20	268	98	50	14	317	128	632	71	178	40	307	182
Lesser Black-backed Gull	5		35	11	60	10	24	5	48	4	62	16	150	8	64	83	432	65
Herring Gull	180	62	439	48	247	74	328	579	139	24	277	60	357	61	147	38	203	48
Great Black-backed Gull	1		59	50	97		120	31	40	9	39	10	53	7	28	3	33	3
Kingfisher	1				1													

***Table 4.5.1**: Waterbird SCIs of Bannow Bay SPA – population trends (mean annual change %) calculated for the period 2014/15 - 2022/23 using survey data, plus the site trends for Bannow Bay and national trends after Kennedy et al., (2022).*

Species	Mean annual change 2014-21	5-year site trend (I-WeBS)	12-year site trend (I-WeBS)	23-year site trend (I-WeBS)	Trend classification (I-WeBS)	5-year national trend	12-year national trend	23-year national trend	National trend (I-WeBS)
Light-bellied Brent Goose	-8.0	-	-	-	-	-11.2	1.2	93.3	Stable/increasing
Shelduck	-10.7	-	-	-	-	6.3	-0.8	9.3	Stable/increasing
Oystercatcher	-6.14	-	-	-	-	-17.5	-31.1	10.8	Stable/increasing
Golden Plover	-17.1	-				-16.9	-58.1	-54.1	Large decline
Grey Plover	-19.5	-61.2	-42.6	-82.2	Large decline	-30.6	-39.4	-57.8	Large decline
Lapwing	-6.0	-	-	-	-	-6.5	-45.1	-63.9	Large decline
Knot	-1.5	-15.5	2.9	-35.5	Moderate decline	0	-12.2	-9.8	Intermediate decline
Dunlin	+0.7	-28.8	-18	-75.3	Large decline	5.9	-21.2	-45.2	Moderate decline
Black-tailed Godwit	+5.6	-48.2	-48.8	-35.5	Moderate decline	22.5	25	92.3	Stable/increasing
Bar-tailed Godwit	-14.9	-27.1	2.6	14.7	Stable/increasing	-32.6	-13.9	-5.1	Intermediate decline
Curlew	-4.4	-34.3	-39.2	-42.5	Moderate decline	-9.4	-23.7	-43.1	Moderate decline
Redshank	-1.3	-30.6	-45.6	-39.4	Moderate decline	-14	-28.4	6.7	Stable/increasing

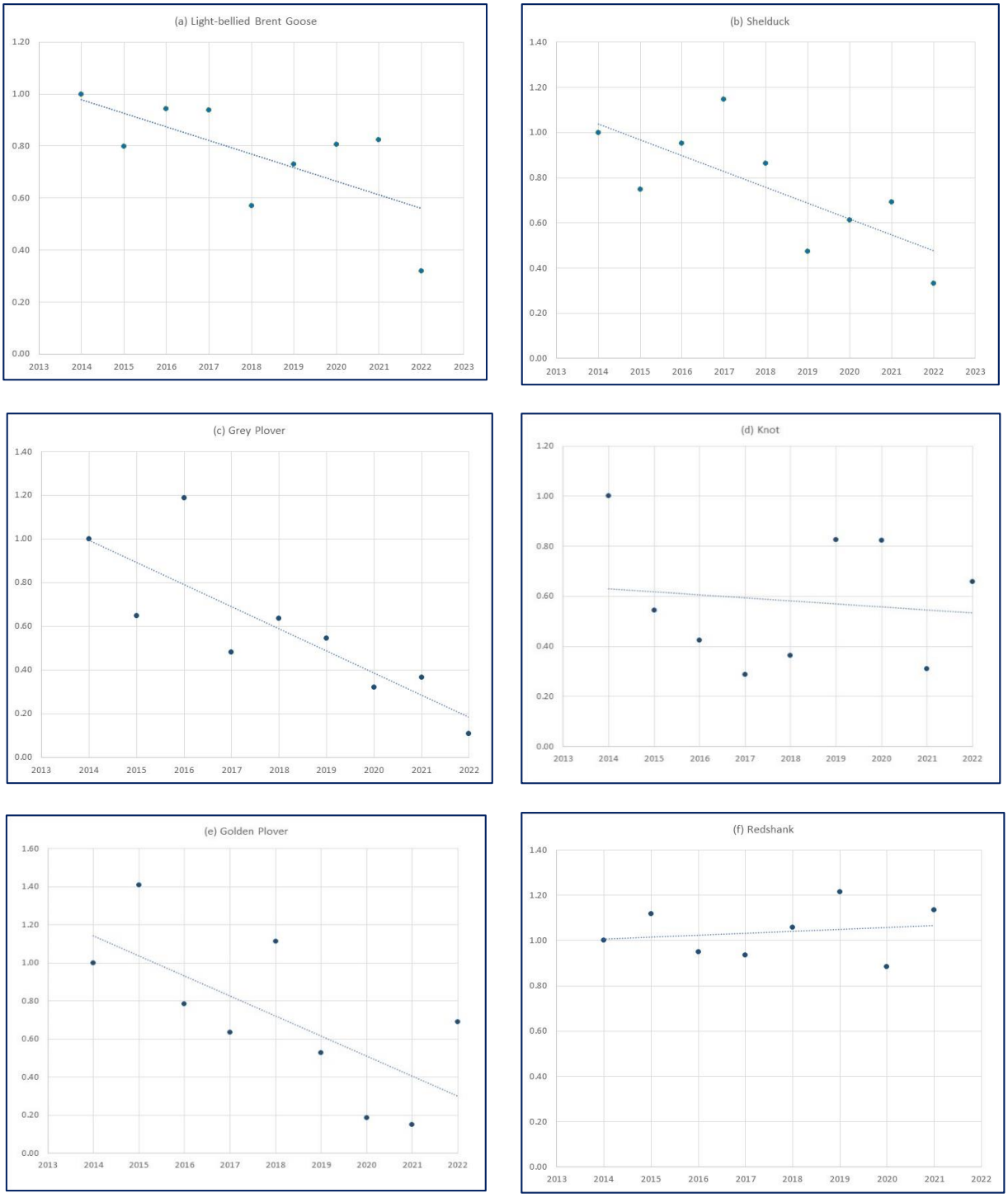


***Figure 4.5.1 (a-f)**: Selected waterbird species trends.*

4.6. Subsite Totals

During the 2022/23 survey season, 0O416 (Kiltra) held peak numbers of waterbirds during three low tide surveys (November, December and February) and second highest waterbird numbers during October 2022 and the January 2023 high tide survey. This count subsite also recorded the overall subsite peak count of 9,297 waterbirds during February 2023 (**Table 4.6.1**). 0O417 (Clonmines Castle) in the inner bay was notable for supporting peak numbers in one low tide survey, and peak numbers during high tide.

All but one subsite (0O416) recorded a subsite peak count during winter 2022/23 that was lower than that recorded during the previous winter (**Table 4.6.1**). The overall subsite peak count of 9,297 waterbirds during February (0O416) however, is the highest subsite count in the nine-year data period (**Figure 4.6.1, Table 4.6.2**). Monthly subsite count data (raw data) are given in Appendix B.

***Table 4.6.1**: Total numbers of waterbirds within subsites during winter 2022/23. Peak count per monthly survey shown in bold font.*

Subsite	LT1	LT2	LT3	LT4	HT1	Peak count 2022/23	Peak count 2021/22
0O410	90	109	252	207	152	252	1,049 (LT)
0O411	1,208	1,065	916	1,717	343	1,717	2,754 (LT)
0O413	695	890	1,626	1,381	402	1,626	2,037 (LT)
0O416	1,955	**2,761**	**2,230**	**9,297**	1,031	9,297	3,461 (LT)
0O417	**2,223**	793	627	1,128	**1,544**	2,223	5,180 (HT)
0O418	623	872	656	578	650	872	1,630 (LT)
0O487	68	132	110	247	159	247	364 (HT)
0O489	292	69	140	118	179	292	672 (HT)

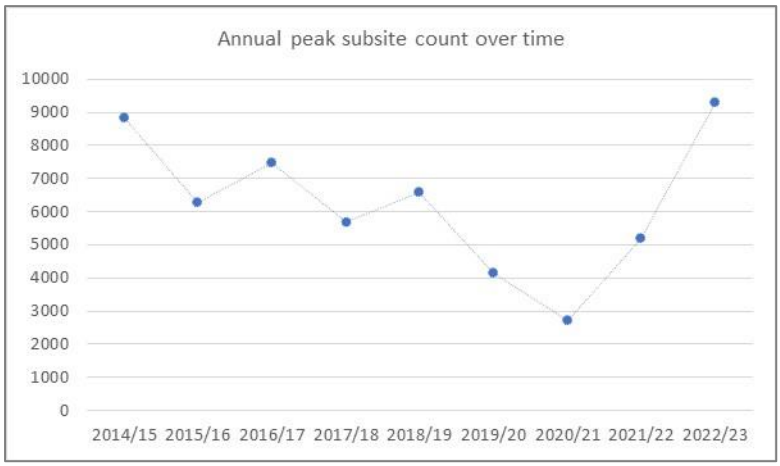


Figure *4.6.1: Winter peak subsite counts over time, winter 2014/15 – 2022/23.*

***Table 4.6.2**: Peak numbers of waterbirds within subsites during 2022/23 and the previous survey seasons. Overall peak for each winter shown in bold.*

Subsite	2022/23	2021/22	2020/21	2019/20	2018/19	2017/18	2016/17	2015/16	2014/15
0O410	252 (LT)	1,049 (LT)	526 (LT)	365 (LT)	582 (LT)	586 (LT)	797 (LT)	291 (LT)	916 (LT)
0O411	1,717 (LT)	2,754 (LT)	1,818 (LT)	1,575 (LT)	1,115 (LT)	1,097 (LT)	2,006 (LT)	2,477 (LT)	2,551 (LT)
0O413	1,626 (LT)	2,037 (LT)	2,128 (LT)	3,663 (LT)	1,084 (LT)	825 (LT)	2,304 (LT)	1,600 (LT)	898 (LT)
0O416	**9,297 (LT)**	3,461 (LT)	1,987 (LT)	4,030 (LT)	**6,603 (LT)**	**5,711 (LT)**	**7,482 (LT)**	**6,285 (LT)**	**8,849 (LT)**
0O417	2,223 (LT0	**5,180 (HT)**	1,381 (LT)	3,703 (HT)	5,668 (HT)	3,383 (HT)	2,075 (HT)	4,838 (LT)	1,527 (HT)
0O418	872 (LT)	2,370 (HT)	**2,699 (LT)**	**4,151 (LT)**	2,518 (LT)	1,415 (LT)	3,385 (HT)	2,813 (LT)	2,101 (LT)
0O487	247 (LT)	364 (HT)	270 (HT)	753 (HT)	522 (LT)	219 (LT)	354 (LT)	217 (LT)	248 (LT)
0O489	292 (LT)	672 (HT)	444 (LT)	365 (LT)	273 (LT)	488 (LT)	354 (HT)	320 (LT)	234 (LT)

4.7. Waterbird Distribution

During low tide surveys, 0O416 (Kiltra) supported seven waterbird species in numbers ranked as 'very high' (**Table 4.7.1**). This was closely followed by 0O413 (Saint Kiernans to Newtown) and 0O418 (Bannow Island to Newquay) that supported six waterbird species in numbers ranked as 'very high'. In terms of species collectively ranked as very high, high and moderate, 0O411 and 0O413 supported the largest number of species (12).

Two subsites held peak numbers of three waterbird species each during the high tide survey (0O416, 0O417) **(Table 4.7.2**). Collectively, 0O417 (Clonmines Castle) supported the most species ranked in the top, second, or third in terms of the proportion of birds during high tide.

To aid interpretation over time, **Figure 4.7.1** shows the percentage of low tide surveys across the ten-year survey period that each species was recorded in Very high, High, Moderate or Low numbers within subsites. To interpret, the longer the red or blue lines in the graphs, the more preferred the subsite was at low tide (assessment based on total numbers at low tide).

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.

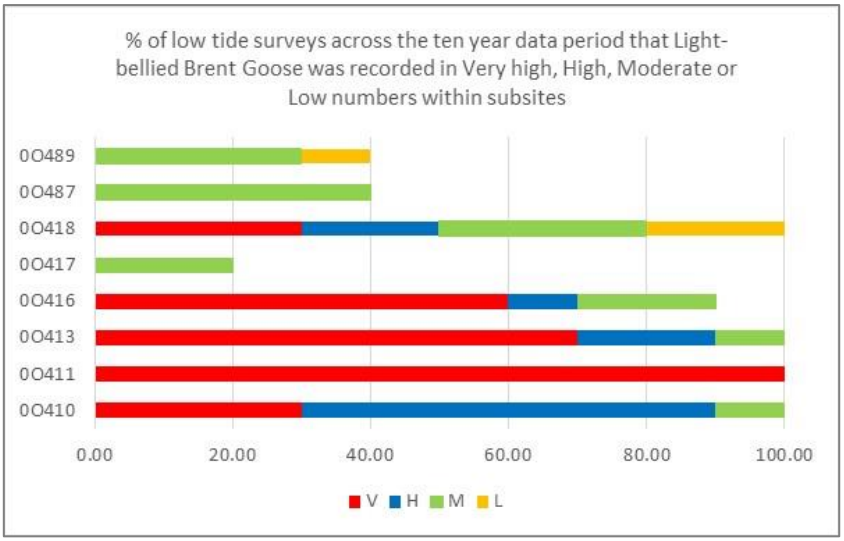
***Table 4.7.1**: Ranked relative importance of each subsite based on total numbers of waterbird SCI species during low tide surveys of winter 2022/23.*

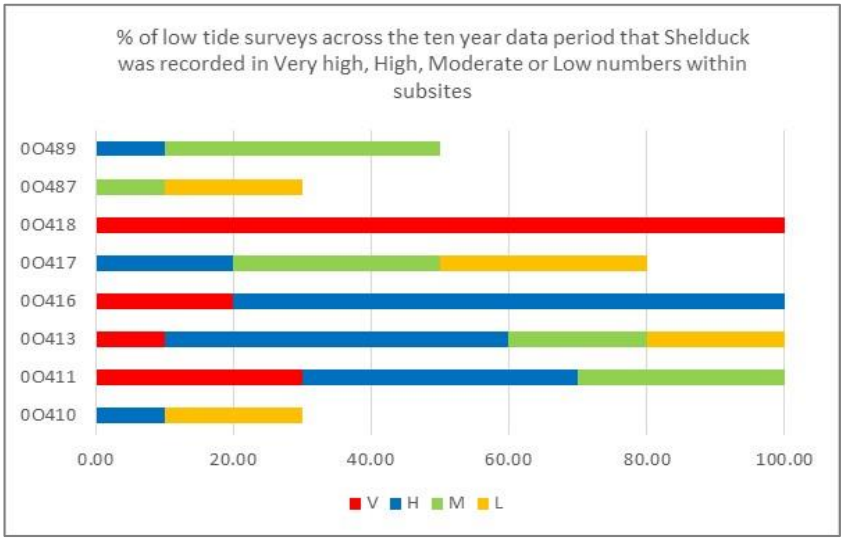
Subsite Code	Subsite Name	Very High	High	Moderate	Total species across all
0O410	Fethard Bay		PB	OC, CU	3
0O411	St Kiernans to Saltmills to Big Burrow	PB, GV, DN, CU, RK	SU, GP, BW	OC, L. KN, BA	12
0O413	Saint Kiernans to Newtown	PB, GP, GV, KN, BW, BA	SU, OC, DN, CU, RK	L.	12
0O416	Kiltra	OC, GP, L. KN, BA, BW, CU	SU, DN, RK	GV	11
0O417	Clonmines Castle	GP, GV, L. CU, RK	BA	SU, DN, BW	9
0O418	Bannow Island to Newquay	SU, OC, GV, BW, BA, RK	L. KN, DN, CU	GP	11
0O487	Tintern Abbey to Tintern Bridge			PB	1
0O489	Pollfur		RK	BW, CU	3

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, L. Lapwing, KN Knot, OC Oystercatcher, PB Light-bellied Brent Goose, RK Redshank, SU Shelduck.

***Table 4.7.2**: Ranked relative importance of each subsite based on total numbers of waterbird SCI species during the high tide survey January 2023.*

Subsite Code	Subsite Name	Ranked 1	Ranked 2	Ranked 3	Total species across all
0O410	Fethard Bay			KN	1
0O411	St Kiernans to Saltmills to Big Burrow	KN, RK	SU	PB, OC	5
0O413	Saint Kiernans to Newtown	PB	BA	CU, RK	4
0O416	Kiltra	GP, L., BW	PB, OC	SU	6
0O417	Clonmines Castle	KN, BA, CU	L., DN, BW, RK		7
0O418	Bannow Island to Newquay	SU, OC	KN	BW	4
0O487	Tintern Abbey to Tintern Bridge				
0O489	Pollfur		CU	L.	2





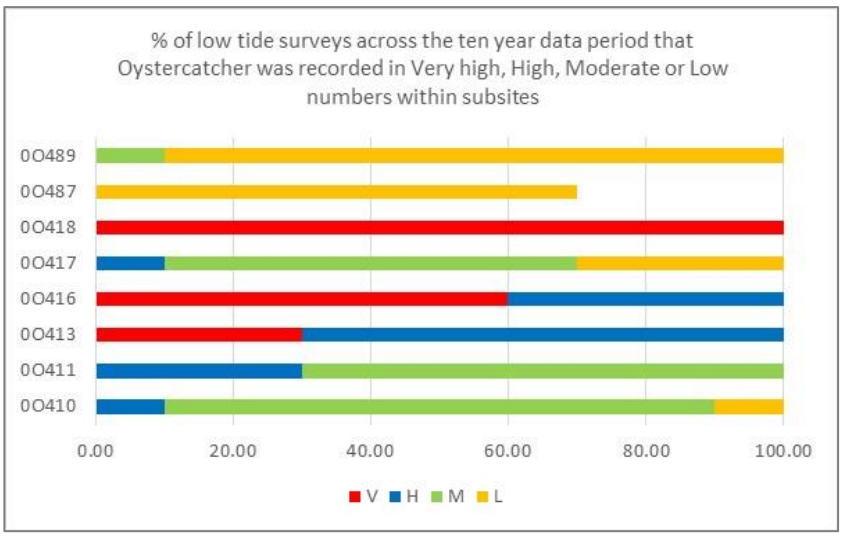
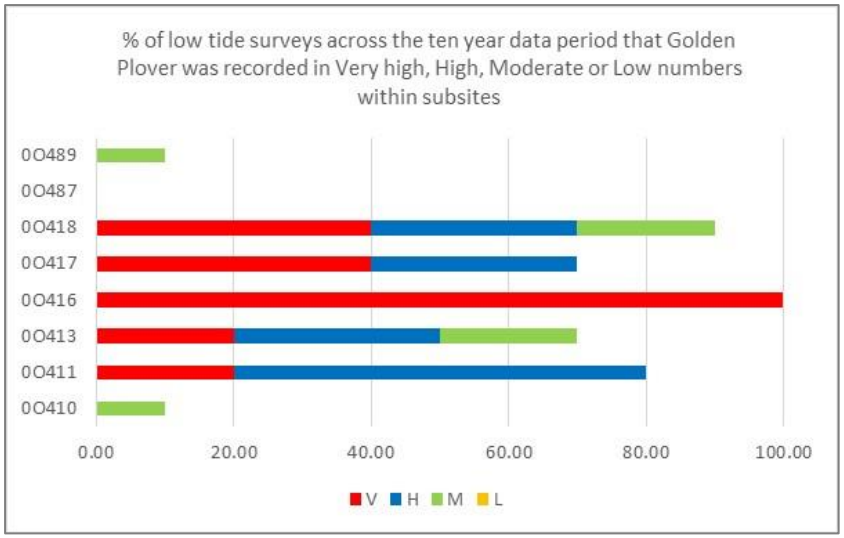
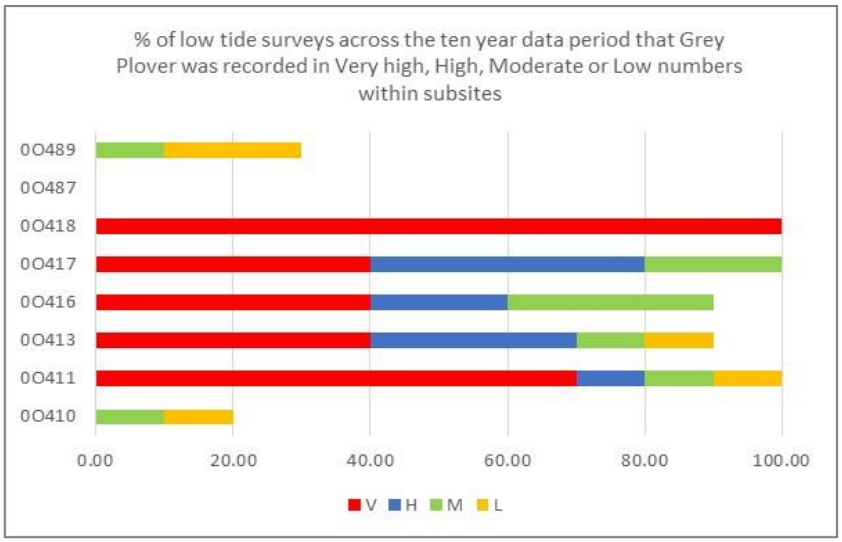


Figure 4.7.1: *Graphs showing the percentage of low tide surveys across the nine-year survey period that each species was recorded in Very high, High, Moderate or Low numbers within subsites.*





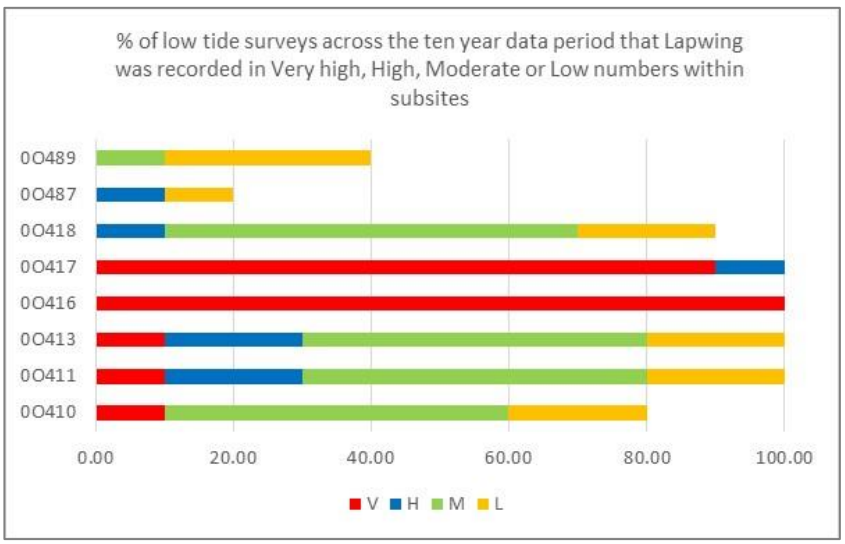
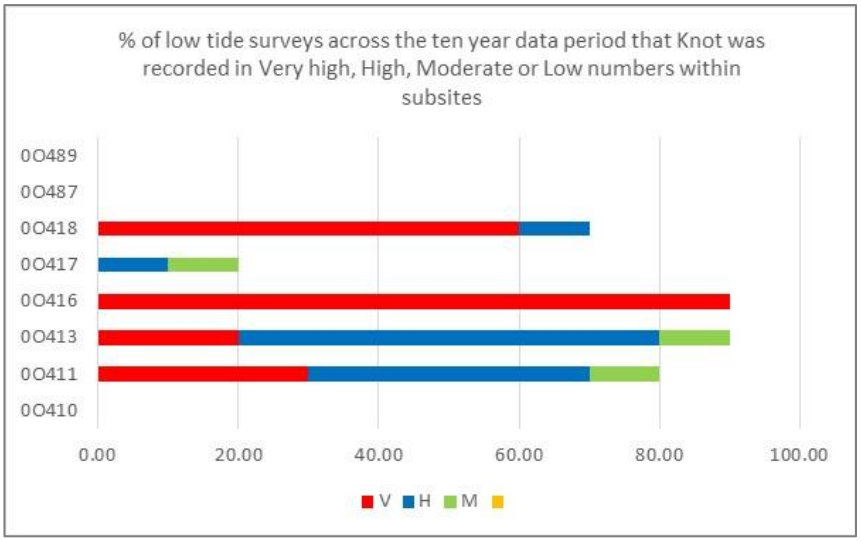
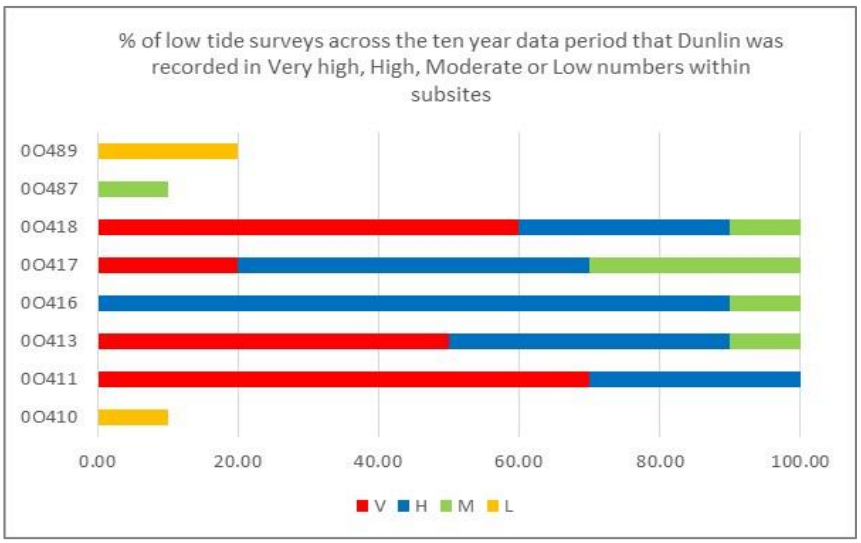


Figure 4.7.1 *(continued): Graphs showing the percentage of low tide surveys across the nine-year survey period that each species was recorded in Very high, High, Moderate or Low numbers within subsites.*





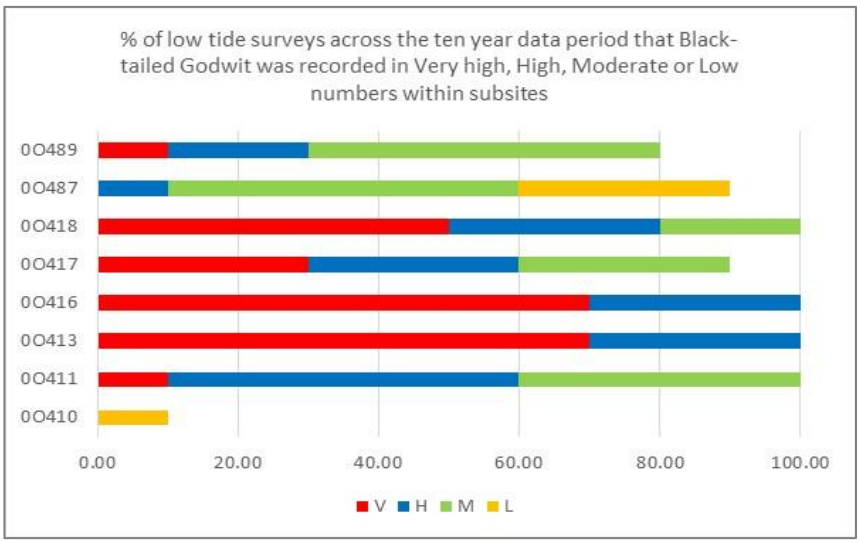


Figure 4.7.1 *(continued): Graphs showing the percentage of low tide surveys across the nine-year survey period that each species was recorded in Very high, High, Moderate or Low numbers within subsites.*

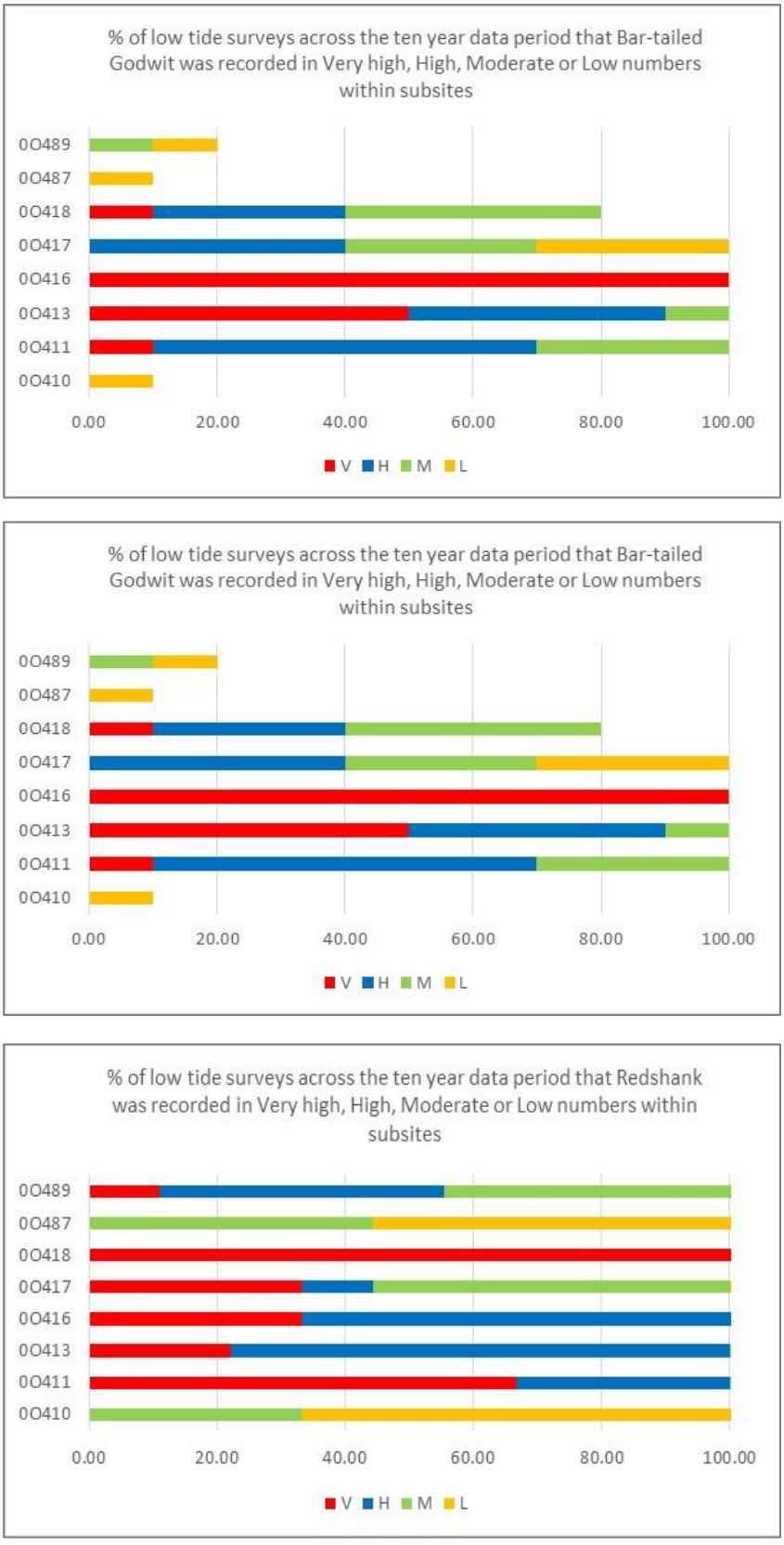


Figure 4.7.1 *(continued): Graphs showing the percentage of low tide surveys across the nine-year survey period that each species was recorded in Very high, High, Moderate or Low numbers within subsites.*

***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, H, H, V, V, V, M, H, H)	V (V, V, V, V, V, V, V, V, V)	V (H, H, V, V, M, V, V, V, V)	- (V, V, V, M, V, V, H, V)	- (- M- - - - - - M)	L (L, H, M, M, L, H, V, V, V)	M (M, M, M - - - - - -)	- (- -, L, M, M, - - - M)
SU	- (L, L, L, - - L, - - H)	H (V, H, V, M, V, M, H, M, H)	H (H, L, M, H, L, H, H, V, M)	H (H, H, H, H, H, V, H, H, V)	-M (- H, - L, M, L, L, H)	V (V, V, V, V, V, V, V, V, V)	- (- L, - - - L, - M)	- (M, M, - M, M - - H)
OC	M (M, M, L, M, M, M, M, M, H)	M (M, M, M, M, H, M, M, H, H)	H (H, H, H, H, V, V, H, H, V)	V (V, V, V, H, H, H, V, H, V)	L (M, L, M, M, M, L, M, M, H, M)	V (V, V, V, V, V, V, V, V, V)	L (- L - L, - - L, L, L, L)	- (L, L, M, L, L, L, L, L)
GP	- (- M, - - - - - -)	H (H, - H, - H, V, H, H, V)	V (H, H, M, - - - M, H)	V (V, V, V, V, V, V, V, V, V)	V (V, V, V, V, - - H, H, H)	M (V, V, V, V, H, H, H, M, V)	- (- - - - - - - - -)	- (- - - - - - - - M)
GV	- (- - L - - M, - - - -)	V (V, V, L, V, V, V, M, H, V)	V (H, V, L, H, V, H, M, -, V)	M (- H, M, H, V, V, V, V, M)	(H, M, V, V, H, V, H, H, M)	V (H, V, V, H, H, V, V, V, V)	- (- -- - - - - - -)	- (- L - - L, - - - M)
L.	- (- M, M, V, M, L, L, M, M)	M (M, L, M, M, M, M, V, H, H)	M (V, M, M, M, H, L, L, M, H)	V (V, H, H, V, V, V, V, V, V)	V (V, V, V, V, V, V, V, H, V)	H (H, H, H, - H, H, H, M)	- (- - L, - - - - - H)	- (- - L, L, - - - L, -)
KN	- (- - - - - - - - -)	M (H, V, V, H, - - H, H, H, V)	V (H, H, H, H, V, H, M, H, -, H)	V (V, V, -, V, V, V, V, V, V)	- (- M - -, H, - - - - -)	H (V, H, V, V, H, V, V, V, H, V)	- (- - - - -- - - - -)	- (- - - - -- - - - - -)
DN	- (- L, - - - - - - -)	V (V, V, V, H, V, H, H, V)	H (V, V, V, H, H, V, M, H)	V (H, V, H, V, V, V, V, V, V)	M (H, H, H, V, M, V, H, M)	H (V, V, H, M, V, V, H, V)	- (-- - - - - - -, M)	L (L - - - -- - - -)
BW	- (- - - L, - - - - -)	H (V, H, M, H, M, H, M, H, M)	V (V, V, V, V, H, H, V, H)	V (V, V, H, V, V, V, V, V, V)	M (H, - V, V, H, V, M, H, M)	V (V, H, V, H, M, V, V, H, M)	L (L- M, M, M, M, L, M, H)	M (- - M, M, V, M, M, H, H)
BA	- (- - - - - - - -, L)	M (H, V, M, M, H, H, H, H, H)	V (V, V, V, M, H, H, H, H, V)	V (V, V, V, V, V, V, V, V, V)	H (L, L, L, H, M, H, H, M, M)	V (V, V, H, H, H, M, - -, M, M)	- (-L- - - - - - - -)	- (- - - - L, - - M)
CU	M (L, L, L, L, M, M, L, L, L)	V (V, V, V, V, V, H, H, H, H)	H (H, H, H, H, H, H, H, H, H)	V (V, V, V, V, V, V, V, V, V)	V (H, H, H, H, M, V, V, H, H)	H (M, M, M, M, H, H, H, M, V)	L (M, L, L, M, M, L, L, L, M)	M (M, L, L, M, M, M, M, L, M)
RK	L (L, M, L, M, L, L, L, L, M)	V (V, V, H, V, H, M, H, V, V)	H (V, H, V, H, M, H, H, H, H)	H (H, H, H, H, H, V, V, V, H)	V (M, M, V, V, H, M, M, L, M)	V (V, V, V, V, V, V, V, V, V)	L (M, M, M, M, L, L, L, L, L)	H (M, M, H, H, V, M, M, H, M)

NOTE: letters refer to the category recorded during the 2022/23, 2021/22, 2020/21, 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)	3 (2, 2, 3, 3, 4, 3, 2, 1,1)	1 (- 5, -, 5, 2, 4, -, 5, 3)	2 (1, 1, 6, 1, 1, 6, 1, 3,2)	- (- - 2, - - - -, 4, -)	4 (3, 4, 1, - 3, 1, -, 2,1)	- (- - - - - - - - -)	- (- - 4, 4, 5, 5, - - ,5)
SU	- (- - - - - - - - -)	2 (2, 2, 4, - 2, 2, 2,2,2)	4 (- - - - - - 1, -,4)	3 (3, 3, 5, 2, - 4, 4, -,5)	- (4, - 2, - - 5, 3, - ,3)	1 (1, 1, 1, 1, 1, 1, 1, 1,1)	- (-- -- - - - - -)	- (5,- 3, - 3, 3, 3, 1,2)
OC	4 (4, 5, 4, 4, 3, 6, -, 5, 4)	3 (3, 2, 4, 6, 4, 2, 1, 3,2)	7 (5, 6, 6, 5, 5, 4, 5, 4,4)	2 (5, 3, 1, 2, 2, 3, 3, 2, 2)	5 (1, 2, 3, - - 4, -,3)	1 (1, 1, 5, 1, 1, 1, 2, 1,1)	- (- - - - - - -- - -)	6 (7- - 7, 5 - - - -)
GP	- (--- - - - - - -)	- (- -- - - - -, -, 3,3)	- (- -- - - - - - -,1)	1(- -- - - - - -, 1,1)	- (1- 1, 1, 1, -, 1, - ,2)	- (- -- - 2, - -, 2,2)	- (- - - - - -- - -)	- (- - - - - -- - -)
GV	- (-3 - - - - - - -)	- (-1 - - - - - - -)	- (- -- - - - - -,3)	- (-- - - - 1, 2, 1,1)	- (-- 1, 2, - 3, -, 3, 2)	- (1, 2, 1, 1, 1, 2, 3, 2,1)	- (- -- - - - - -)	- (- - - - - - -,5)
L.	- (- - 3, - - 6, 5, - -)	- (4, - -, 2, 3, 4, 2, 2,3)	5 (5, - 4, 5, 3, 5, 4, 6,5)	1 (6, 2 - 3, 2, 1, 3, 1,2)	2 (1, 1, 1, 1, 2, 1, 3,1)	4 (3, - 5, 3, 5, 3, 5, 4,4)	3 (-- - - - - - -,2)	- (2, - 2, 6, - - - - -)
KN	- (- - -- - - - - -)	- (- -- - - - -, -, 4)	- (- - - - -- - - -,3)	- (- - - - -- -, 2, 1,2)	1 (- 2 - - - - -, 2,1)	2 (-1, 1, 1, 1, 1, - - ,1)	- (- - -- - - - - -)	- (- --- - - - - -)
DN	3 (- - - - - - - - -)	1 (- 3 - 2, - 4, 1, - ,3)	- (- 5, 3, - - - - -,4)	- (- 4, - - 2, 1, 3, 2,1)	2 (2, 2, 1, 1, 1, 3, 2, 1,2)	4 (1, 1, 2, 3, 3, 2, 4, 3,1)	- (- - - -- - - - -)	- (- - - - -- - - -)
BW	- (- - - - - - - - -)	- (5, - - 4, - - -, 1,3)	4 (4, - - 5, - 2, - - -)	-1 (- 2, 1, - 2 - - -,1)	2 (2, 3 - - 1, 4, - - ,1)	3 (1, 1 - 1, - 1 -, 2 -)	3 (- - - 2, - - - - -)	- (6, - -3, - 3, - - -)
BA	- (- --- - - - - -)	- (2, 1 - - - 3, 3, -,4)	2 (3, - - - 1, - - -,3)	- (- - - - - 1, 1, 1,1)	1 (1, 2 - 1, -, 2, 2, - ,2)	- (- - - - - - -, 2,2)	- (- -- - - - - - -)	- (- - -- - - - - -)
CU	5 (7, 5, 8, - 4, 7, -, 2, 6)	8 (3, 1, 1, 7, 5, 4, 5, 4,3)	3 (5, - 4, 3, 3, 1, 3, 6,4)	4 (- 3, 3, 2, 6, 2, 1, 1,1)	1 (2, 2, 5, 1, 1, 3, 4, 3,3)	7 (5, 4, 6, 5, 6, 5, 2, 5,2)	2 (1, - 2, 6, -, 6- - ,1)	6 (4, - 7, - 2, 6, - - ,5)
RK	6 (7, 4, 8, 7, 7, 7, -, 8,5)	1 (3, 3, 3, 4, 5, 5, 5, 3,3)	3 (4, 6, 4, 3, 2, 1, 3, 2,4)	8 (8, 7, 7, 6, 4, 2, 2, 4,1)	2 (1, 1, 1, 2, 1, 6, 4, 5,2)	7 (2, 2, 5, 1, 3, 3, 1, 1,1)	5 (56, , 6, 5, 8, 8, 6, 6,7)	4 (5, 8, 2, - 6, 4, - 7, 5)

NOTE: letters refer to the category recorded during the 2022/23, 2021/22, 2020/21 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. Waterbird distribution and status – species summaries

The following species accounts examines the distribution of waterbird SCI species at Bannow Bay during winter 2022/23 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

The calculated site trend for Light-bellied Goose at Bannow Bay is for declining numbers. Notably, total site numbers of Light-bellied Goose during winter 2022/23 did not exceed the international (or national) threshold. This is the first time this has been observed in the nine-year data set for the site. While this result is unusual, it is in line with some recent trends from other coastal sites. Nationally, Light-bellied Goose has a long-term trend for increase, but the recent five-year trend is for decline (Kennedy *et al.*, 2022). This is evidenced by reports of lower counts at several coastal sites in recent winters. Continued monitoring at a national level, both by I-WeBS and the autumn census undertaken at Strangford Lough, will be key to understanding the status of this species in the coming years.

In line with previous seasons, 0O411 (St Kiernans to Saltmills to Big Burrow) and 0O413 (Saint Kiernans to Newtown) held peak numbers during low tide surveys. Of note was that no Light-bellied Brent Goose were observed within 0O416 (Kiltra) during winter 2022/23, despite this subsite regularly holding numbers ranked as 'very high' previously.

4.8.2. Shelduck

While Shelduck still occur in numbers of national importance at Bannow Bay, the site trend is for a decline in total numbers. Nationally, the species trend is classed as stable/increasing. Over the nine-year data period, one subsite (0O418 Bannow Island to Newquay) has consistently held peak numbers of Shelduck during low and high tide surveys. This pattern was again observed during winter 2022/23 and 0O418 was the only count subsite to support this species during all five surveys undertaken. 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.

4.8.3. Pintail

Five Pintail were recorded at Bannow Bay during winter 2021/22 which was the first time that the species has been recorded in any of the low tide survey programmes since 2014/15. No Pintail were observed during winter 2022/23.

During I-WeBS, the species was last recorded at Bannow Bay during winter 2005/06. Nationally, Pintail numbers are in decline (-13.7% over 23 years) (Kennedy *et al.*, 2022)

4.8.4. Oystercatcher

While Oystercatchers still occur in numbers of national importance at Bannow Bay, the site trend is for a decline in total numbers. Once numbering over 1,000 individuals at the site, no site count has exceeded this number since winter of 2018/19. The species is declining at national level over the 5- and 12-year trend period (Kennedy *et al.,* 2022).

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 2022/23, they were recorded within all eight subsites of Bannow Bay. Two subsites recorded numbers ranked as 'very high' – 0O416 (Kiltra) and 0O418 (Bannow Island to Newquay). This is highly consistent with previous surveys suggesting favourable foraging conditions prevail within these two subsites. The results indicate 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.

4.8.5. Golden Plover

The site total count of 4,960 Golden Plover during winter 2022/23 exceeded the national threshold and was the first time that over a thousand Golden Plover have been counted since winter 2018/19. Despite this large count however, the overall site trend for Golden Plover remains a decline in numbers, in line with the current national trend for decline of this Red-listed wading bird (Gilbert *et al.,* 2021)

During winter, Golden Plovers are attracted to winter cereals, stubbles, fallows, harvest-fields and closed-grazed pastures, with the use of intertidal habitats largely 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 of Golden Plover within Bannow Bay have been highly consistent over the years at Bannow Bay with the subsite 0O416 (Kiltra) being favoured throughout nearly all surveys. This was again the case during winter 2022/23, with only 0O417 supporting comparable numbers (Clonmines Castle) on one occasion.

4.8.6. Grey Plover

Total site numbers of Grey Plover peaked at just 18 individuals during winter 2022/23. This is the lowest total count in the nine-year dataset. The site trend is for decline, which is against the backdrop of a national trend for decline. Reasons for the decline in numbers wintering in Ireland is unknown, but satellite tracking results have shown Ireland to be on the extreme western edge of the species' flyway, and therefore short-stopping, i.e. the birds simply not migrating as far west as Ireland, may be a reason (Exo *et al.,* 2019).

Count subsites 0O411 and 0O418 appear to have been the most favoured subsites over time, this wader favouring mid estuarine subsites, and absent or rare in the inner or outer estuary. This pattern was again observed during winter 2022/23.

4.8.7. Lapwing

Like Golden Plover, Lapwing are generally known to forage terrestrially and use intertidal flats as safe roosting habitat during periods of low tide. The largest site total count (3,739 individuals) was recorded in February 2023, and represents numbers of national importance.

The calculated site trend shows a decline in numbers at Bannow Bay. Nationally, the species has been in decline over the long-term (Lewis *et al.,* 2019; Kennedy *et al.*, 2022) while the flyway trend is also for decline (Wetlands International, 2017). Lapwing is Red-listed as a breeding and wintering species (Gilbert *et al.*, 2021).

During winter 2022/23 Lapwing were recorded in six count subsites of Bannow Bay. The pattern for preferred use of 0O417 (Clonmines Castle) and 0O416 (Kiltra) was again observed during the winter of 2022/23 and this subsite preference has been very consistent over time.

4.8.8. Knot

Site total numbers of Knot have been highly variable over the years, but consistently exceeding the threshold for national importance. The calculated site trend from these data for Bannow is for a small decline in numbers, however the site trend for Bannow I-WeBS is for moderate decline (Kennedy *et al.,* 2022). The national trend is for decline (Burke *et al.*, 2018; Kennedy *et al.*, 2022) and the species is Red-listed as a wintering species (Gilbert *et al.*, 2021).

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

4.8.9. Dunlin

The peak low tide site count of Dunlin represents numbers of national importance. While the calculated site trend suggests a stable wintering population, the I-WeBS trend is for a large decline in numbers at the site (-75% over 23 years). The species has been in long term decline in Ireland (Lewis *et al.*, 2019; Kennedy *et al.*, 2022) and is consequently Red-listed as a wintering species (Gilbert *et al.,*2021).

Dunlin have consistently been distributed across five subsites during all of the previous winter surveys (0O411, 0O413, 0O416, 0O417 and 0O418). The same distribution was apparent during winter 2022/23 although a single count of a small number of Dunlin (22) was also made for 0O489 (Pollfur).

4.8.10. Black-tailed Godwit

Numbers of Black-tailed Godwit of national importance were recorded during both low and high tide surveys during winter 2022/23. Total numbers over the years have been highly variable and the calculated site trend from these data suggest stable numbers, although the site trend through I-WeBS suggests a moderate decline in the site population. Nationally, Black-tailed Godwits are one of only a few wading bird species showing a trend for increasing numbers (Lewis *et al.,* 2019; Kennedy *et al.*, 2022).

The pattern for 0O413 (Saint Kiernans to Newtown) and 0O416 (Kiltra) to support the largest numbers most frequently remains consistent, although this wading bird does have a wide distribution across Bannow Bay.

4.8.11. Bar-tailed Godwit

Bar-tailed Godwits occurred in numbers of national importance during the low tide period with the site total count the largest since winter 2019/20. Our calculated site trend shows a decline in numbers over time. This is in agreement with the I-WeBS site trend which suggests stable numbers over the long-term, but a decline in numbers in the past five years. This is also consistent with the national trend for decline (Lewis *et al.*, 2019; Kennedy *et al.*, 2022) and Bar-tailed Godwits are Red-listed as a wintering species (Gilbert *et al.*, 2021).

Bar-tailed Godwits occurred in five subsites during winter 2022/23: (0O411 (St Kiernans to Saltmills to Big Burrow), 0O413 (Saint Kiernans to Newtown), 0O416 (Kiltra), 0O417 (Clonmines Castle) and 0O418 (Bannow Island to Newquay). 0O413, 0O416 and 0O418 held peak numbers during low tide surveys, highly consistent with previous surveys.

4.8.12. Curlew

Curlew occurred in numbers of national importance during both low tide and high tide surveys of winter 2022/23. The calculated site trend and the I-WeBS site trend shows that numbers of Curlew have declined at Bannow Bay over time. Nationally, the species has been in decline over the long-term (Lewis *et al.*, 2019; Kennedy *et al.*, 2022) 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).

The Curlew has a widespread distribution across Bannow Bay, occurring in all eight subsites. Despite their widespread nature, the long-term dataset for Bannow Bay has shown a subsite preference over time, with 0O416 (Kiltra) and 0O411 (St Kiernans to Saltmills to Big Burrow) having supported peak numbers on the majority of survey occasions. This pattern remained during winter 2022/23 although 0O417 (Clonmines Castle) also supported peak numbers on one survey occasion.

4.8.13. Redshank

Redshank occurred in numbers of national importance during the low tide period with a site total of 307 individuals. The calculated site trend shows that numbers of Redshank are exhibiting relatively stable at Bannow Bay (small decline only), but the I-WeBS site trend suggests a decline in numbers. Nationally, while the species has been stable across the long-term (Lewis *et al.*, 2019; Kennedy *et al.*, 2022), the species has declined in numbers over the recent five-year period assessed. This wader is Red-listed as a breeding and wintering species (Gilbert *et al.*, 2021).

As in previous surveys, Redshanks were widespread and recorded within all eight subsites during low tide surveys of winter 2022/2. Despite their widespread nature, the long-term dataset shows that 0O418 (Bannow Island to Newquay) has consistently held peak numbers in all ten surveys undertaken previously, with a preference also shown for 0O411 (St Kiernans to Saltmills to Big Burrow).

5. DISCUSSION

The 2022/23 winter waterbird survey programme at Bannow Bay marks the ninth 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.

While such a long-term dataset can be important in determining trends in species numbers, the dataset has also been invaluable at highlighting species distribution patterns over time. As noted previously, several species continue to show a high degree of within-site fidelity (subsite faithfulness). Such long-term, formally documented within-site fidelity is likely unprecedented at an Irish estuarine system. Even species that are known to be widely distributed across estuarine systems, such as Redshank and Curlew, have exhibited a level of subsite preference that is discernible over time. Of particular note is the very high degree of within-site fidelity of Shelduck to subsite 0O418 (Bannow Island to Newquay) which exists during both low and high tide periods. Good consistency in subsite use has also been shown for Lapwing, Dunlin and the widely distributed Oystercatcher. These patterns are important because such a high degree of within-site faithfulness is 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 with associated implications for species conservation objectives). Given that such patterns can only become discernible over time, these results also highlight how short-term studies, or one-winter studies as often used for Appropriate Assessment, cannot collect adequate data to understand a species distribution. This highlights the value of the long-term monitoring at Bannow Bay, which although occurs in relation to aquaculture, is also extremely important for overall site management.

The overall trend in total waterbird numbers at Bannow Bay during the low tide and high tide periods indicates a decline. In addition, despite updating the methods of our calculated species trends, this analysis revealed little change to earlier results, with the majority of special conservation interest species exhibiting a decline in numbers over time. Updated site trends, published by BirdWatch Ireland in spring 2022 (Kennedy *et al.*, 2022), are largely consistent with our calculated site trends using data from the low-tide survey programme. These declining trends are not unique to Bannow Bay however and updated national trends for 35 waterbird species published in spring 2022 (Kennedy *et al.*, 2022) showed that 57% of the species analysed are in decline, with 43% species stable/increasing. The largest declines are for diving ducks (Goldeneye, Pochard and Scaup) as well as three wading birds (Lapwing, Grey Plover and Golden Plover). Dunlin and Curlew are exhibiting moderate declines over the long-term period. The reasons for these declines are likely to be numerous, and while climate change is undoubtably having an effect, we cannot rule out impacting factors on the wintering grounds that may be leading to 'carry-over' effects i.e. factors on the wintering grounds that can influence future reproduction (e.g. O'Connor *et al.,* 2014; Clausen *et al.,* 2015).

A positive result from winter 2022/23 was the observation of the large flock of Golden Plover at the site, absent in large numbers for the last few winters. As noted previously, this may have been linked to the presence of a White-tailed Eagle in the Kiltra subsite during previous winters, which may have deterred the use of parts of the estuary by species seeking a safe roosting location. Of additional note this winter was the drop in numbers of Light-bellied Brent Goose. Numbers did not exceed the international (or national) threshold for this species, the first time this has been observed in the nine-year data set. Although possible impacts of the H5N1 avian influenza outbreak in the summer of 2022

may have impacted Light-bellied Brent Goose (and other waterbird species), 'Brent geese' are now exhibiting a decline in numbers in the short-term (5-year trend) nationally, and lower numbers have been observed at other sites during winter 2022/23. Future monitoring will be important to track the status of this species.

Clearly waterbirds are in decline at Bannow Bay and at many other sites around Ireland. It may be timely to re-assess site-based factors. For instance, benthic data for the site, captured for SAC conservation objectives, are now rather 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. There is now very much a need to examine the drivers of the waterbird declines that we are witnessing at site and national level (Kennedy *et al.,* 2023).

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APPENDIX A: BANNOW BAY SPA AND BANNOW BAY 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.

APPENDIX B: MONTHLY SUBSITE COUNT DATA

Subsite	Subsite	Species	LT1	LT2	LT3	LT4	HT1
0O410	Fethard Bay	Light-bellied Brent Goose			36	29	
0O411	St Kiernans to Saltmills to Big Burrow		104	57	40	207	21
0O413	Saint Kiernans to Newtown		22	85	49	11	125
0O416	Kiltra						105
0O418	Bannow Island to Newquay			9	4	10	2
0O487	Tintern Abbey to Tintern Bridge			14			
0O411	St Kiernans to Saltmills to Big Burrow	Shelduck		28		5	18
0O413	Saint Kiernans to Newtown		1			10	2
0O416	Kiltra				22	29	3
0O417	Clonmines Castle				2		
0O418	Bannow Island to Newquay		46	49	82	70	119
0O411	St Kiernans to Saltmills to Big Burrow	Wigeon		2	13	2	41
0O413	Saint Kiernans to Newtown		20		96	6	32
0O416	Kiltra		41	79	6		24
0O417	Clonmines Castle		53	116	309	190	75
0O487	Tintern Abbey to Tintern Bridge			4	5		
0O489	Pollfur						5
0O410	Fethard Bay	Teal				37	16
0O411	St Kiernans to Saltmills to Big Burrow				45	56	
0O413	Saint Kiernans to Newtown		55		130	51	84
0O416	Kiltra				32	12	58
0O417	Clonmines Castle		10	40	5		23
0O418	Bannow Island to Newquay				93		31
0O487	Tintern Abbey to Tintern Bridge		15	56	15	66	10
0O489	Pollfur		113		25	29	85
0O410	Fethard Bay	Mallard			6	8	15
0O411	St Kiernans to Saltmills to Big Burrow		2	18	1		
0O416	Kiltra			2	149	41	111
0O417	Clonmines Castle					2	
0O487	Tintern Abbey to Tintern Bridge		7	3	28		14
0O489	Pollfur		72	46	52	36	52
0O416	Kiltra	Goldeneye			2	6	
0O411	St Kiernans to Saltmills to Big Burrow	Red-breasted Merganser			4	4	1
0O413	Saint Kiernans to Newtown				2	6	1
0O416	Kiltra				16	8	1
0O417	Clonmines Castle					5	
0O410	Fethard Bay	Goosander					2
0O410	Fethard Bay	Red-throated Diver				1	
0O410	Fethard Bay	Great Northern Diver	1			1	1
0O411	St Kiernans to Saltmills to Big Burrow		1	6	2		1
0O413	Saint Kiernans to Newtown		1				1
0O411	St Kiernans to Saltmills to Big Burrow	Little Grebe		1			4
0O413	Saint Kiernans to Newtown		1				

0O417	Clonmines Castle			2			8
0O411	St Kiernans to Saltmills to Big Burrow	Cormorant	1	24	21		2
0O413	Saint Kiernans to Newtown		4	6	1		2
0O416	Kiltra		1		2	2	
0O417	Clonmines Castle					1	
0O410	Fethard Bay	Shag				1	3
0O411	St Kiernans to Saltmills to Big Burrow		1		1	2	6
0O410	Fethard Bay	Little Egret				1	2
0O411	St Kiernans to Saltmills to Big Burrow		3	7	5	5	1
0O413	Saint Kiernans to Newtown		9	6	4	5	
0O416	Kiltra		5	8	1	1	5
0O417	Clonmines Castle			5	4	2	
0O418	Bannow Island to Newquay		4	7	4	2	4
0O487	Tintern Abbey to Tintern Bridge		9	2	5	5	
0O489	Pollfur		1			1	2
0O410	Fethard Bay	Grey Heron			1		
0O411	St Kiernans to Saltmills to Big Burrow		1	5	2		
0O413	Saint Kiernans to Newtown		2	3	2	5	
0O416	Kiltra						2
0O417	Clonmines Castle				1		
0O418	Bannow Island to Newquay						1
0O487	Tintern Abbey to Tintern Bridge		4	5		1	1
0O410	Fethard Bay	Oystercatcher	11	19	17	14	30
0O411	St Kiernans to Saltmills to Big Burrow		29	41	25	34	45
0O413	Saint Kiernans to Newtown		116	100	76	90	1
0O416	Kiltra		173	166	158	118	78
0O417	Clonmines Castle		58	24			28
0O418	Bannow Island to Newquay		242	206	248	83	308
0O487	Tintern Abbey to Tintern Bridge				1		
0O489	Pollfur						8
0O411	St Kiernans to Saltmills to Big Burrow	Ringed Plover	30		6	6	1
0O413	Saint Kiernans to Newtown				1		
0O416	Kiltra		1		2		
0O417	Clonmines Castle		2				
0O411	St Kiernans to Saltmills to Big Burrow	Golden Plover	1		6		
0O413	Saint Kiernans to Newtown				170		
0O416	Kiltra			1800	72	4960	380
0O417	Clonmines Castle		1655				
0O418	Bannow Island to Newquay				19		
0O411	St Kiernans to Saltmills to Big Burrow	Grey Plover		4	6		
0O413	Saint Kiernans to Newtown				7		
0O416	Kiltra				2		
0O417	Clonmines Castle			11			
0O418	Bannow Island to Newquay		9	3	2	1	
0O411	St Kiernans to Saltmills to Big Burrow	Lapwing		128	17	541	
0O413	Saint Kiernans to Newtown		6	50	10		2
0O416	Kiltra		33	27	76	2400	50
0O417	Clonmines Castle		200	354	55	542	36

0O418	Bannow Island to Newquay			212		256	8
0O487	Tintern Abbey to Tintern Bridge						30
0O411	St Kiernans to Saltmills to Big Burrow	Knot			5		
0O413	Saint Kiernans to Newtown			30	443	710	
0O416	Kiltra		81	206			
0O417	Clonmines Castle						475
0O418	Bannow Island to Newquay				36		120
0O411	St Kiernans to Saltmills to Big Burrow	Sanderling	5				
0O410	Fethard Bay	Dunlin					9
0O411	St Kiernans to Saltmills to Big Burrow		820	370	183	375	100
0O413	Saint Kiernans to Newtown		27	32	184	98	
0O416	Kiltra		541	72	842	797	
0O417	Clonmines Castle		75	1	145		81
0O418	Bannow Island to Newquay		178	113	7		6
0O489	Pollfur		22				
0O411	St Kiernans to Saltmills to Big Burrow	Snipe					1
0O417	Clonmines Castle		4				
0O418	Bannow Island to Newquay					1	
0O411	St Kiernans to Saltmills to Big Burrow	Black-tailed Godwit	24	50	50	21	
0O413	Saint Kiernans to Newtown		15	93	168	27	7
0O416	Kiltra		124		517	47	170
0O417	Clonmines Castle			1	41	20	50
0O418	Bannow Island to Newquay			2	11	52	19
0O487	Tintern Abbey to Tintern Bridge				31	14	
0O489	Pollfur			6	36	6	
0O411	St Kiernans to Saltmills to Big Burrow	Bar-tailed Godwit	9	27	14	53	
0O413	Saint Kiernans to Newtown		146	75	63	194	17
0O416	Kiltra		18	54	3	224	
0O417	Clonmines Castle		1	3	18	18	50
0O418	Bannow Island to Newquay			141		3	
0O418	Bannow Island to Newquay	Whimbrel	1				
0O410	Fethard Bay	Curlew	2	3	2	20	10
0O411	St Kiernans to Saltmills to Big Burrow		85	70	133	227	1
0O413	Saint Kiernans to Newtown		47	40	28	45	75
0O416	Kiltra		126	72	73	126	38
0O417	Clonmines Castle		9	178	9	111	265
0O418	Bannow Island to Newquay		48	26	12	20	4
0O487	Tintern Abbey to Tintern Bridge		12	12	6	11	84
0O489	Pollfur		47	4	8	6	6
0O410	Fethard Bay	Greenshank				1	1
0O411	St Kiernans to Saltmills to Big Burrow		2	5	4		2
0O413	Saint Kiernans to Newtown		9	3	3		1
0O416	Kiltra			3	2	1	4
0O417	Clonmines Castle		1			1	2
0O418	Bannow Island to Newquay		2	3		3	14
0O487	Tintern Abbey to Tintern Bridge		1	1	3	1	
0O489	Pollfur		1	1	3	4	2
0O410	Fethard Bay	Redshank		25	4	4	12

0O411	St Kiernans to Saltmills to Big Burrow		43	83	33	29	83
0O413	Saint Kiernans to Newtown		44	57	35	16	22
0O416	Kiltra		31	32	72	54	1
0O417	Clonmines Castle		65	16	33	15	62
0O418	Bannow Island to Newquay		15	50	99	68	11
0O487	Tintern Abbey to Tintern Bridge		18	18	15	13	15
0O489	Pollfur		31	10	16	32	19
0O411	St Kiernans to Saltmills to Big Burrow	Turnstone		23	18	3	8
0O417	Clonmines Castle		1				
0O418	Bannow Island to Newquay						1
0O410	Fethard Bay	Black-headed Gull		15	144	8	8
0O411	St Kiernans to Saltmills to Big Burrow		30	69	79	51	
0O413	Saint Kiernans to Newtown		132	215	124	91	16
0O416	Kiltra		751	198	151	442	
0O417	Clonmines Castle		79	28	5	218	365
0O418	Bannow Island to Newquay		39	17	17	1	2
0O487	Tintern Abbey to Tintern Bridge			15	1	132	5
0O489	Pollfur		2	2			
0O410	Fethard Bay	Common Gull			7	4	10
0O411	St Kiernans to Saltmills to Big Burrow		3	10	49	18	
0O413	Saint Kiernans to Newtown		4	56	21	6	
0O416	Kiltra		11	28	12	16	1
0O417	Clonmines Castle			5			
0O418	Bannow Island to Newquay		36	30	22	5	
0O487	Tintern Abbey to Tintern Bridge					2	
0O411	St Kiernans to Saltmills to Big Burrow				3		
0O416	Kiltra	Lesser Black-backed Gull	2	1	2	5	
0O410	Fethard Bay	Herring Gull	66	38	23	60	21
0O411	St Kiernans to Saltmills to Big Burrow		9	34	143	54	7
0O413	Saint Kiernans to Newtown		28	34	8	8	14
0O416	Kiltra		10	8	6	6	
0O417	Clonmines Castle		5	5		1	20
0O418	Bannow Island to Newquay		2	4		3	
0O487	Tintern Abbey to Tintern Bridge		1	1		2	
0O489	Pollfur		3			4	
0O410	Fethard Bay	Great Black-backed Gull	10	9	12	18	12
0O411	St Kiernans to Saltmills to Big Burrow		5	3	8	24	
0O413	Saint Kiernans to Newtown		6	5		2	
0O416	Kiltra		6	5	10	2	
0O417	Clonmines Castle		5	4		2	4
0O418	Bannow Island to Newquay		1				
0O487	Tintern Abbey to Tintern Bridge			1			
0O413	Saint Kiernans to Newtown	Kingfisher			1		
0O487	Tintern Abbey to Tintern Bridge		1				

Further details available on www.emff.marine.ie

Managing Authority EMFF 2014-2020	Specified Public Beneficiary Body
Department of Agriculture Food & the Marine Clogheen, Clonakilty, Co. Cork. P85 TX47 Tel: (+)353 (0)23 885 9500 www.agriculture.gov.ie/emff	Marine Institute Rinville, Oranmore, Co. Galway, H91 R673 Phone: (+)353 (0)91 38 7200 www.marine.ie

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Department of Agriculture, Food and the Marine

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Foras na Mara
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