

Baltray Little Tern Colony Report 2022

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Final

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**An Roinn Tithíochta,
Rialtais Áitiúil agus Oidhreachta**
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Abstract

Wardening of the Little Tern (*Sternula albifrons*) colony at Baltray began in mid-May 2022 and ended on Friday 18th August 2022. Night wardening (thus 24-hour colony-coverage) was initiated on June 12th. A total of 82 nesting attempts were made by an estimated 84 breeding pairs of Little Tern in 2022. The first eggs were found on May 24th. The last clutch was completed on July 20th. A total of 178 eggs were laid, the mean clutch size was 2.3 per nest. The largest loss of eggs related to 10 eggs from 4 nests which were lost to high tide (5m early morning) and fresh South west winds on the night of Friday June 17th. Other losses included 10 eggs due to abandonment, 2 on the North strand on May 20th, 2 on pen 5 in June (adults not seen for over two weeks) and 6 were discovered on the northern pens 6 and 7 during the end of season inspection on August 24th. A total of 146 chicks were known to have hatched out of 78 nests between 21st June and 31st July. The mean incubation period was 22 days. 2 out of 3 eggs were found near adults in the morning of the high tide of Friday June 17th and relocated near initial nest; after 20 minutes the adults found them but probably due to exposure the incubation for these two eggs were of 34 days. They nonetheless hatched on Friday July 15th and Saturday July 16th just in time before the next big tide as they were able to move up. Known as "The Buffer Chicks" they successfully fledged on August 8th. Fifty-nine pairs produced 90 fledglings, giving an overall productivity of 1.52 fledglings per pair. Due to the day and night hours attended by volunteers and wardens, no predation has been witnessed in or outside the pens. The only kills found were of a Wood Pigeon on the north strand and a ringed plover in the south dunes, suspected peregrine for the first (a young female was recorded nearly every day on the site) and a Sparrowhawk for the latter. This year's colony was incredibly effective at chasing avian threats (Rooks, Hooded Crows, Sparrowhawk and Kestrel). We have also put a very strong emphasis

on preventing any human disturbances including limiting our own – even if at times necessary- and communicating with members of the public has been very well received through dialogue, observations and conversations. There has been no bird ringing this year due to the threats of avian flu. A Roseate Tern has been found dead between the Boyne and our HQ on May 22nd, ringed on Rockabill Island in June 2012 and a Common Tern was brought to us by a member of the public on June 24th but died shortly after; it had been ringed on Rockabill Island in July 2005; Cause of death were unknown for both birds.

1. Introduction

1.1 Background

The Little Tern (*Sternula albifrons*) is the smallest and scarcest of Ireland's five breeding tern species. Like many tern species, Little Terns are long distance migrants, wintering in West Africa and returning to Irish coasts to breed in late April and early May and departing again in late July or August. Unlike the other four Irish tern species, which primarily nest on islands, the majority of the Irish Little Tern population nests on mainland sand or shingle beaches. Nests are composed of a shallow dip scraped in the beach substrate above the high tide line, and the eggs and chicks are well camouflaged in the sand and shingle. Due to their nesting habitat, Little Terns are very vulnerable to recreational human disturbance, sea level rise and predation. Unlike the Ringed Plover they share that ecosystem with, they prefer open spaces in order to be able to see potential predators but like having patches of plants and marram grass nearby in order to provide shelter for their chicks.

Little Terns are classed as an Annex 1 species under the EU birds Directive (79/409/EEC), requiring member states to take special conservation measures to ensure their survival and breeding success. In Ireland and the United Kingdom, the species is amber listed by Birdwatch Ireland and the RSPB (Royal Society for the Protection of Birds), indicating that this species is of medium conservation concern. The Little Tern is fully protected under the Wildlife Act (1976, Amended 2000).

1.2 Little Tern colonies in Ireland

Little Terns form relatively small colonies along the west and east coasts of Ireland, with 14 of the 24 colonies found in 1995 on coastal islands and ten colonies on the mainland. On the east coast there are colonies from Wexford to Louth, and on the west coast from Kerry [the map shows a site in Cork] to Donegal (Hannon *et al.*, 1997). The number of breeding pairs of Little Terns on the west coast is less well known than that on the east, but in 2016 a minimum of 100 pairs was reported in the NPWS Seabird Survey in Kerry, Galway, Mayo and Donegal (Newton *et al.*, 2016). Primary sites on the east coast are better known. Those that have recently supported colonies of breeding Little Tern are Kilcoole (Co. Wicklow), Baltray (Co. Louth, as covered in this report), Wexford Harbour and Tacumshin (Co. Wexford), and Portrane/Rogerstown (Co. Dublin).

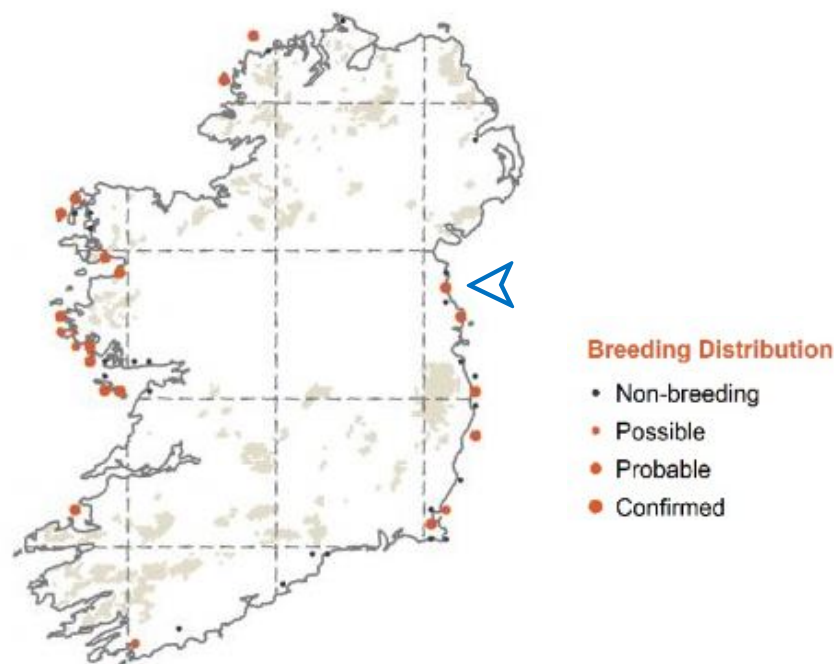


Figure 2: Breeding distribution of Little Terns in Ireland. Blue arrow indicates Baltray. (birdwatchireland.ie/birds/little-tern/)

North Bull Island (Co. Dublin) and Buckroney (Co. Wicklow) historically supported Little Tern colonies but are no longer used due to high levels of recreational disturbance. At Portrane, just a single pair successfully bred in the years 2009 to 2012. From 2013 to 2015, one or more pairs may have nested successfully but in 2016 a hot and sunny spell in early summer brought large crowds on to North Dublin beaches, including Portrane and this probably deterred Little Terns from settling. The establishment of a wardening scheme at Portrane in 2018 resulted in eleven breeding pairs producing fourteen fledged chicks that year. Breeding success in 2019 was hampered due to predation by Red Fox, resulting in just one pair out of fifteen fledging three young. Unfortunately and due the same high tide in June and to constant predation (mostly Red Fox) the Portrane Colony only had a handful of fledglings this year.

In County Wexford Little Terns have been recorded nesting in new breeding locations at Raven Point and a site known as "New Tern Island" off the Rosslare Backstrand in Wexford Harbour since 2009. Elsewhere in Co. Wexford, there are reports of nesting at Cahore in recent years. In 2017, an attempt was made to monitor the colony in Wexford Harbour (details extracted from the

Irish Sea Tern Colony Network Facebook Page); the first visit on 9th June yielded a total of approximately 150 pairs and 64 nests were located of which more than 20 contained only a single egg. On the 22nd June, the same number of adults was present, and a few chicks had hatched. No obvious change in colony status was detected on 5th July but the site was deserted by the 13th July and the colony was judged to have failed. Elsewhere in Wexford during 2017, two Little Terns were seen at Tacumshin Lake on 9th April, and a Little Tern nest with three eggs was located by Oran O'Sullivan at the 'cut' on 18th May, though its fate was not followed up. Only two birds were seen at Cahore on the 8th May (<http://www.irishbirding.com>).

Despite the success at sites such as Baltray (up to 2014) and the apparent expansion to former breeding locations, Kilcoole is most likely the only site on the east coast to have attracted nesting Little Terns every year since 1984. At Kilcoole in 2013, 45 pairs fledged 75 chicks (Keogh *et al.*, 2013). The relatively low number of pairs in 2013 may have been a result of the record breeding year here at Baltray, Co. Louth (Doyle *et al.*, 2013). The most successful breeding year to date, at Kilcoole, was in 2015, with 155 pairs producing 301 chicks, 289 of which were presumed successfully fledged (Doyle *et al.*, 2015). A poorer year was experienced in 2016 with starvation and significant fox predation of chicks the most significant factors behind poor productivity (Manley *et al.*, 2016). The 2017 season saw a significant improvement, with 141 pairs laying clutches and an overall productivity of 1.81 fledged young per pair (Johnson *et al.*, 2017). Kilcoole was the only fully wardened active Little Tern colony in 2018. This year, there was an estimated 250 active nests in Kilcoole with over 500 chicks hatched (info by Brian Burke, Birdwatch Ireland). Unfortunately, it seems that later in the season the colony lost a lot of chicks due to an apparent lack of food, full broods dying in the nests and poor-quality food items were witnessed being brought by adults which would indicate a lack of food in the vicinity (little terns can't travel more than 10-15 kilometres for food due to obvious reasons). This year food supplies of sand eels and sprats were plentiful around Baltray which could explain the success of this year's colony.

1.3 Little Tern Colony in Baltray

1.3.1 *The nineteenth and early twentieth centuries*

Little Terns were first definitively reported breeding in county Louth in 1900 by RJ Ussher: "Little Terns have laid on the coasts of Louth..." and this refers to records collected from 1866 (Ussher & Warren, 1900); unfortunately, Ussher does not mention the location in county Louth. Kennedy refers to a possible decline in Little Tern numbers since Ussher's report but reports one unidentified area in county Louth with up to ten nests in 1946 (Kennedy, 1953). Subsequently Kennedy (1954) reported a possible decline of Little Terns, however Hutchinson (Hutchinson, 1994) thought that this may have more accurately reflected changes to their nesting site, a phenomenon well known in the ecology of Little Terns (Cabot & Nisbet, 2013).

1.3.2 *The late twentieth century (1960s and 1970s onwards)*

There are no detailed records of the site during the 1960s and 1970s, but reliable observers noted Little Terns flying up and down the estuary, apparently nesting on both the beach and on sandbanks/mud banks farther up the estuary than the present-day site (Dominic Hartigan, pers. comm. 2013).

During the 1960s and 1970s, Irish people started to frequent beach areas in unprecedented numbers. Oscar J. Merne reported Little Terns at Clogherhead in 1967. The site at Baltray is relatively inaccessible with 2km of dunes to cross, but nevertheless An Foras Forbartha reported that this was starting to become a significant issue by 1970 (NPWS). The 1968–72 Breeding Atlas (Gibbons, 1973) recorded a small colony at Baltray and this was apparently unchanged when the 1988-91 survey (Chapman, 1992) was undertaken, even though many of the other colonies on the east coast had clearly declined. Several surveys since then, notably Operation Seafarer covering 1969-70, the All Ireland Tern Survey in 1984 and 1995, as well as Seabird 2000 covering 1998 – 2002, have provided more solid information on Little Tern numbers and trends.

Following the results of the 1984 tern survey (Whilde, 1985), the need for conservation of Little Terns was identified due to declining numbers and contraction into fewer colonies (Herbert, 1986). This effort was spearheaded by the Irish Wildbird Conservancy (now BirdWatch Ireland) in 1986 by John Coveney, Ian Herbert and Larry Lenehan with fencing, wardening and detailed surveillance and reporting. Thereafter, sporadic efforts were made at fencing and wardening but as this was largely volunteer-dependent it had mixed success (L. Lenehan, pers. comm. 2014). Historically the Little Terns at Baltray have undergone a series of extremely poor breeding seasons and occasional rearing of a small number of young but with productivity hovering just above zero. Attempts were made to monitor the site from 1984 onwards, with observers noting that Little Terns continued to attempt to breed at Baltray, but that breeding success was very low (Larry Lenehan, pers. comm.). Principally, breeding productivity of the colony was hampered by a combination of disturbance and predation by a range of nest predators.

1.3.3 Intensive wardening at Baltray, in the twenty-first century

It is from this point that the project at Baltray began in 2007, initially run by a team of volunteers coordinated by Sandra McKeever and Margaret Reilly; this effort resulted in their foundation of the Louth Nature Trust, with others, a factor which permitted the funding from the Heritage Council, Louth County Council and the NPWS.

The implementation of wardening by dedicated volunteers, in conjunction with fencing to protect the colony, led to a dramatic improvement in the breeding success of the Little Terns at Baltray. In 2007, 21 pairs fledged 41 chicks (McKeever and Reilly, 2007) and in 2008, 25 pairs fledged 29 chicks (Reilly, 2008). In 2007 and 2008 the project did not have sufficient funding for paid night wardens and suffered heavily from predation by Hooded Crows (*Corvus cornix*) (2007) and gull spp. (*Larus* spp.) (2008). The project reached its peak success in 2009 and 2010 when funding from both the NPWS and Heritage Council helped pay for wardens to cover the entire night, providing the colony with 24-hour protection. In both 2009 and 2010, 43 pairs bred, fledging 94 and 96 chicks respectively (Reilly, 2009; 2010). In 2011 withdrawal of NPWS funding meant that 24-hour wardening could not be provided, leading to the predation of 37 eggs, mostly between 11pm and 4am when wardens were absent. However, 2011 was still very successful with 49 pairs fledging 84 chicks (Reilly, 2011). The following year, 2012, proved to be a difficult year as extremely inclement weather led to the loss of 41 eggs to spring tides and 45 eggs were predated by a fox in the early hours of 17 June before the night warden arrived. Therefore 33 pairs fledged only 24 chicks (Reilly, 2012). This was the poorest breeding year experienced by the project so far, however given the very poor conditions for breeding in 2012, even 24 fledged chicks was a significant achievement, and a testament to the hard work of the project wardens. This is especially true considering that Kilcoole experienced zero breeding success in 2012 due to similar circumstances (Keogh *et al.*, 2012).

The 2012 breeding season illustrates the importance of the Little Tern protection scheme at Baltray. Since the Little Tern protection scheme at Kilcoole was set up in 1985, the breeding success of Little Terns on the east coast has been largely dependent on this one site. Such heavy dependence on one site would leave the east coast population very vulnerable if Kilcoole were to suffer a number of disastrous washout years such as was experienced in 2012. The upturn in fortunes in the Little Terns breeding in the vicinity of Wexford Harbour has helped to alleviate this problem, however this site does not enjoy the intensive protection enjoyed at Kilcoole and breeding success has been more intermittent. Therefore, the setting up of a second, intensively-wardened Little Tern protection scheme at Baltray has been vitally important. It is helping the Irish Little Tern population to grow as well, as reducing the dependence on a single breeding site. From 2013 scientific reports were produced following the contracting of the ecological aspects of the project to Birdwatch Ireland.

The 2013 and 2014 seasons were very successful years with 102 breeding pairs, 203 hatched chicks and 193 fledglings in 2013, and 150 nesting attempts, 170 hatched chicks and 91 successfully fledged Little Tern chicks in 2014.

Due to a reduction of funding only one day time warden was in place in 2015 and this had a severe negative impact on the project's ability to mitigate corvid predation (crows). A total of 66 nesting attempts were made by 25 breeding pairs, the lowest total of pairs recorded since the project began in 2007. Of the 66 nests, 20 chicks are known to have hatched successfully, and due to the hard work of the wardens no predation of chicks was observed and all 20 chicks successfully fledged. The project was funded, indirectly, by the Heritage Council in 2013, through the Heritage Office of Louth County Council, which dedicated the whole of its annual project funding from the HC to the Baltray project.



Figure 3: Little Tern flying over Baltray Beach, 2020.

The 2016 season was not a successful year for the Little Tern colony at Baltray, especially in comparison with the previous three years. Bird numbers were low (typically max counts of 20 with only 8-16 birds regularly recorded; there was some evidence of courtship and nest scraping but no

chicks were produced). Later in the season a peak of 89 adults and at least three colour ringed fledglings (ringed in Kilcoole) were observed. Possible reasons for this poor breeding season in 2016 relate to a late start in wardening, a large corvid presence, and sustained easterly winds early in the season. During the Little Tern migration from West Africa towards Europe there were some continuous days of very strong easterly winds and it is possible that some birds got blown off course and did not make it to Ireland (B. Martin, pers. comm.). This bad weather seems to have affected all of the Little Tern colonies throughout Ireland and the United Kingdom with the exception of the Gronant colony in Wales (P. Manley, pers. comm.), which has a westerly exposure rather than easterly, and could explain the low numbers of birds seen in the Baltray area. The Gronant colony recorded two adult Little Terns that had been ringed in Baltray, indicating that the species will move between sites and is not necessarily loyal to just one breeding site. This reinforces the idea that the terns just nested elsewhere in 2016. Another possible explanation for the lack of Little Terns at Baltray in 2016 may have been a food shortage. Food shortages have been reported as causing major mortality at both the Kilcoole nesting site and for the Common and Roseate Terns on Rockabill in 2016 (S. Newton & P. Manley, pers. comm.). Multiple dead chicks, with no external physical damage, were found along the foreshore in Kilcoole, some near fledgling age, indicating that they had probably died of starvation. On discussing this issue with the local anglers in the Baltray area, we were informed that a possible cause of this problem was that the mackerel had not begun to move in close to the coast yet (R. McElhinney, pers. comm.). As the mackerel move in, they push the sandeels and sprats closer to the coast, with Sprats going up the estuary, moving into the shallower water in which the Little Terns prefer to hunt.

Overall, the low tern numbers in the area in 2016 were likely down to a combination of reasons, including adverse weather during the migration, food shortage and heavy corvid disturbance suffered by the birds that did arrive. As the Little Terns arrived in such small numbers, they were unable to effectively mob the Hooded Crows and Rooks that were feeding in the nesting area and, although the wardens chased the corvids out as quickly as they were coming in, the large size of the nesting area (between 800 and 900m long) and the sheer number of corvids made this difficult. Corvids were observed to move in at several points simultaneously, therefore it was not possible to protect the entire area all of the time, even with both wardens working together.

The 2017 season was the worst breeding season seen at the Baltray site since the inception of the organised wardening and protection scheme in 2007, marked by the almost complete absence of courtship display. An exhaustive analysis of the possible causes of this eliminated factors such as weather, disturbance, predation etc and suggests that an increased dredging regimen both in time and in volume in late 2016 and through the breeding season in 2017 is a likely cause. The Little Tern conservation project in Baltray was not carried out in 2018 following the failure of Little Terns to breed in Baltray in the two years previously. A grant was not applied for due to the severe deleterious effects of the dredging (Breffni Martin, pers comm.)

Breeding success improved markedly in 2019, with over 36 pairs fledging an estimated 50 chicks. The project in 2019 was carried out with funding from the National Biodiversity Action Plan obtained through and supplemented by the Heritage Office of Louth County Council.

1.4 Project Aims

The principal aim of the Baltray Little Tern Protection Scheme is:

“To ensure the survival and breeding success of Little Terns at Baltray by minimising disturbance by humans and predators, in order to help fulfil Ireland’s legal obligations under the EU Birds Directive”.

Strategies employed by the Louth Nature Trust/Birwatch Ireland partnership to achieve this aim are:

- To promote awareness amongst the visiting public, in order to seek their co-operation in minimising human disturbance.
- To create physical barriers to prevent terrestrial predators accessing nest sites, where possible.
- To maintain colony surveillance for the early detection of both avian and terrestrial predators, and take appropriate steps to prevent loss of eggs, chicks and adults to predators.
- To monitor the breeding performance of the colony, in order to measure the success of the project and increase our knowledge of Little Tern ecology.
- To survey and monitor other species and habitats at the mouth of the Boyne estuary

2. Methods

2.1 Study Site

Little Terns at Baltray breed in an area known as the Haven. The colony is situated within the boundary of the Boyne Coast and Estuary Special Area of Conservation (SAC) and the Boyne Estuary Special Protection Area (SPA). Little Terns have very specific requirements for nesting and this area is suitable because of the presence of a ridge of shingle and its proximity to the river Boyne. As a consequence of winter storms, the beach configuration at the Haven changes dramatically year on year; a combination of embryonic dune formation, vegetation encroachment and wave dynamics act together to shape the topography of the area. In 2020 the potential nesting area extended from the training wall next to the Boyne river ca. 900m northwards to the shingle area adjacent to the pump house. This area is constantly changing due to the effects of weather, primarily the direction of the wind, which redistributes the sand along the beach.

The Baltray site is subject to very large tides, with the horizontal width of the intertidal area measuring approximately 300m between the Mean High Water (MHW) and Mean Low Water (MLW) mark. The nesting area stretched from the MHW mark c.50m inland, though much less in certain areas. From the MHW there was c.20m gently sloped sand/small shingle followed by a c.10m transitional zone of mixed sand/medium shingle straddling a ridge which marked the beginning of the vegetation line and embryonic dune formation dominated by Marram Grass (*Ammophila arenaria*) and Sea Lyme Grass (*Elymus arenarius*)(Figure 4). In some sections the nesting area extended another c.20m into an area of large shingle mixed with patches of vegetation, though in much of the potential colony the vegetation was too dense for the terns to breed.



Embryonic dunes, Marram grass. Shingle beach and nesting site.

A track runs along behind the breeding area, separating it from the dunes, and is used to service the colony during the setting up and taking down of the fence. To facilitate the wardens and volunteers' presence on site, a portaloo was hired in each year from 2013 and two caravans are on site providing shelter to both wardens and volunteers. These facilities are vital to the running of this project.



Track and caravans

2.2. Monitoring

Monitoring of the nesting site in Baltray began in mid-May, and a full time day warden was employed present from May 16th, followed the week after by two student wardens from Dundalk Institute of Technology (studying Environmental Bio Sciences). The shift covered by the main warden was Sunday to Friday from 8 am until 5pm, one of the students would come on Saturday each covering six hours four days a week; outside this period it was covered by volunteers. Monitoring between 22:00-05:00 was undertaken by Maurice Conaghy, Dominic Hartigan, Gerard Murray and other volunteers after June onsite 24 hours a day as soon as the first chicks had hatched.

The warden's daily routine consisted of locating new nests and monitoring existing nests for the presence or absence of incubating birds. Nest visits were made carefully and thoroughly once a week to avoid unnecessary disturbance to check the number of eggs and/or chicks present. This operation consisted in covering every square metres of the 900 m long sanctuary and it took about six hours to do. As well as Little Terns, Ringed Plovers (*Charadrius hiaticula*) which nested within the

colony were monitored in the same way. A daily log was kept, where details of personnel present, weather, tides, work done, tern activity, nest status, disturbances, visitors and all wildlife observations were recorded. Nest data tables were kept outlining the progress and due hatching dates for each nest. However, as entering the colony (beyond the electric fence) causes disturbance which may result in nests being abandoned, every effort was made to minimise visits into the colony. The colony was never entered in adverse weather conditions (during rainfall, high winds or fog). In addition to these duties, the wardens were responsible for erecting and maintaining the colony fence. This year, weather was also recorded daily, such as wind direction, atmospheric pressure, temperatures and precipitations. Tides were also recorded and monitored as well as their strength (height) which gave us extra preparation in case of a combination tide and weather event combined. This helped us to be prepared to moving nests and only on the last minutes; an operation that had to be done a couple of times and with great care during the high tides of mid-June and with success every time (no abandonment or distress as a result).

2.2.1. Little Tern Numbers

The number of adult Little Terns present at the colony was recorded by the wardens as often as possible, and at the end of each day the maximum number was entered into the daily log. Counts were conducted during full dreads, when the birds were flushed, or when they were counted, roosting at high tide along sandbars on the seaward side of the colony, using a telescope (during good weather); this was noted separately when it occurred. The presence of any colour ringed terns was also noted, and inscriptions read when conditions allowed.

Once chicks start to fledge, separate counts are made of fledglings to give an idea of productivity. This estimate decreases in accuracy after the first two weeks however, as fledglings begin to leave the colony around two weeks after fledging (Keogh *et al.*, 2011). Therefore, fledgling counts are not used to estimate the total number of fledglings produced in a breeding season. However, they are a useful monitoring technique, as very low fledgling counts may indicate that chicks are being heavily predated. Survey methods for fledglings consisted of counts at high tide when the majority of the Little Terns roost together along sandbars in front of the colony. These counts were undertaken during calm and clear weather when fledglings can easily be distinguished in amongst a flock of adults.

2.2.2. Nest Locations and Observations

Binoculars and telescopes were used to monitor tern activity and locate nests within the colony. Note was taken of the following behaviours: courtship feeding, courtship displaying, aerial displaying, mating, making nest scrapes, incubating but also distress, feeding frequencies etc. When it became apparent that a bird was incubating, an exploratory visit was made to locate the nest. Nest contents (i.e. number of eggs), nest substrate and approximate position in the colony were noted. The nest was marked by placing an upright razor clam shell and a black plastic marker in the vicinity of the nest. Nests were recorded from a distance and coded from location first – as in the pen number 1 to 8 south to north- number of the nest, number of eggs of chicks; so e.g. Pen 2 LT2 – 3e.

Observation and counting were done daily from a distance to monitor the recorded nests and once hatched to monitor potential predation which thankfully didn't seem to have happened

this year. We also noticed that there were very little three clutch nests this year. Interestingly all the four nests in the buffer zone contained three eggs (all but one taken by mid June tide) as 10 others around the site. Most of the nests contained two eggs. It could explain the success of this year's colony as well as the abundance of food of course. After a couple of days, and once hatched, the chicks were able to move around so it was much harder to track and we had to rely on our data and observe the adults with fish in order to find the chicks hidden in different locations. They would also cross to another pen or to the buffer zone but since they didn't hatched at the same time, it took a little longer but it was successfully done and reported daily.

Ringed Plover's were also monitored even if much harder to find has they could be hidden in the grass in and outside the pens but we were able to established that the average clutch was of three eggs and even if we had a record of 50 chicks hatched, it could be indeed a good bit more, between 16 and 20 nests to stay conservative. Ringed Plover's chicks are incredibly mobile and independent as nearly as soon as they hatched covering great distances in a short period of time. If one was to get too close to a chick or a nest, we have witnessed several time the famous "broken wing" display of the adult, leading you away from the sensitive area or indeed to the chick itself.

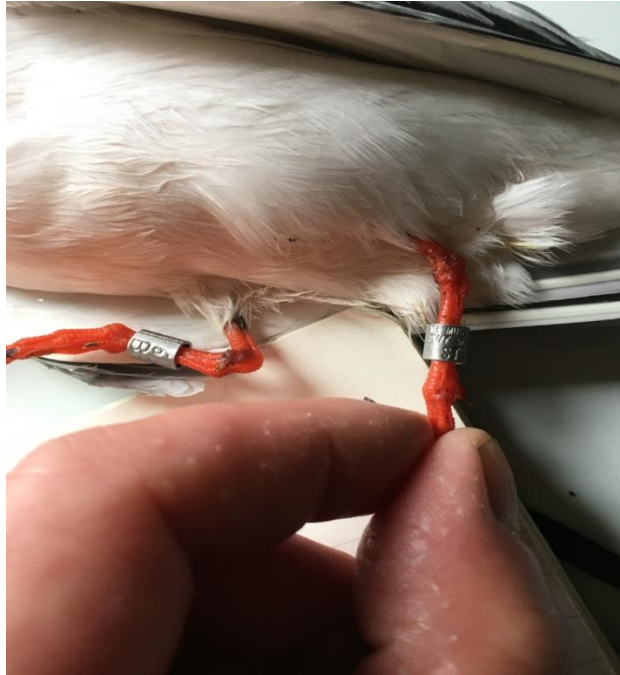


Little Ringed Plover – Picture Franck Le Moënner

2.2.3. Biometrics and Ringing

Unfortunately and due to the increasing numbers of avian flu in Scotland and England and soon to be followed by Wales and Brittany the decision has been taken not to handle and/or ring birds this year to avoid any potential cross contamination. That decision was effective not only in Baltray, but to all other colonies of terns and seabirds that would normally get ringed this time of year.

Ringing offers data when observed from a distance (Darvic rings, colour coded depending on the country of origin) by re-capture or simply found on a deceased bird (aluminium ring, with country or origin, reference code of the ringer and reference code of the recording of the data such as age, sex, measurements, location etc.). It helps understanding migrations, age and ecology of the bird but since we already have a good bit of data on terns, losing a year carries very little negative consequences.



Ringed Roseate Tern found in the dunes.

2.3. Conservation Measures

2.3.1. Use of Fences

Initial work on erecting fencing and signs began in mid-May thanks to Dominic Hartigan and a team of volunteers. Fencing from previous years was reused again in 2022 as well as the purchase of new ones. The area of shingle enclosed stretched from approximately 500 metres north of the Boyne wall northwards towards the pump house. The fence is used to reduce the probability of breeding failure caused by mammalian predators and to protect the area from human disturbance. Green plastic mesh was used on all but the east (seaward) side of the site (Figure 5). This made repair of storm damage easier and allowed chicks to leave the fenced area. A section of approximately 20 metres of dunes to the west of the beach was also enclosed, and the green mesh fence also went further north than the actual nesting enclosure. This was very useful as it acted as a buffer zone so that people and dogs were kept well away from the nesting terns when they approached from the north side of the beach.

We also created a buffer zone shy of 10 m wide and running all along the actual fencing in order to deter people from coming too close to the pens and give extra safety to the chicks once hatched. It has appeared to be well respected and successful in terms of preservation.



Figure 5: Green mesh outer fence, with motion-activated solar powered lamp. Buffer zone east

This year, the nesting area was divided into eight pens and each pen was enclosed separately (Figure 6). These pens were created using posts and one metre high electric mesh fence.

A line of posts was erected along the HWM to the seaward side of the fence, to remind people to keep away from the fence.

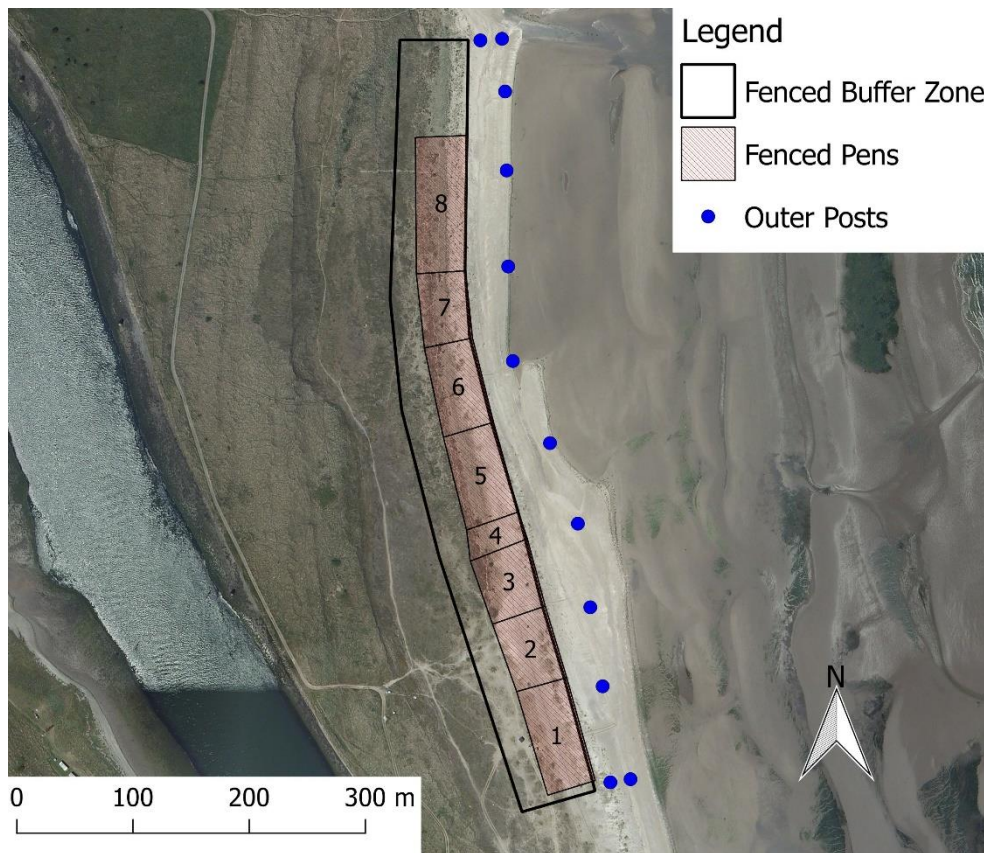


Figure 6: Map of the Little Tern nesting area showing total fenced area, fenced pens (1-8) and line of outer posts on seaward side of the colony.

To prevent avian predators using the wooden posts as perches, cut plastic bottles were attached on top of each post. Consequently, if a bird attempted to land, the cut bottles would not support their weight. This worked well as a deterrent. Motion-activated solar powered lamps were positioned at strategic points around the north, west and south ends of the main colony perimeter mesh fence. These lamps charge during the day and are activated at night when something crosses the sensor within a metre in front of the lamp. This served as a deterrent to nocturnal predators and a warning system for night wardens.

2.3.2. Use of Signs

Several types of signs were erected around the conservation site (Figure 7). These included basic information signs regarding the Little Terns, protected area signs, warning signs for the electric fence and chicks on the foreshore signs. To cater for non-English speaking visitors, some were designed using symbols and pictures. These were erected at all entrances to the area, on the northern end of the beach and all around the nesting enclosure. Two large 1m² signs were erected at the entrances to the beach North and South of the site. These were full colour interpretive signs, outlining the project and providing information about the Little Tern.

Signs were erected along the walkway from Baltray to the beach as well as along the fence

at either end, asking people to keep dogs on leads to protect ground-nesting birds. Signs were placed along the stakes of the buffer zone around the entire north and south ends of the colony and at a stile by which many people access the beach. This proved very successful at cutting down on the number of people who attempted to cross over. We have also added hand written signs to inform and communicate with the general public.



Figure 7: A selection of signs erected around the Little Tern conservation site.

2.3.3. Chick Shelters

Around 15 lengths plastic pipe were placed on the beach as chick shelters. A variety of pipes were used, the diameters ranged from 6cm to 10cm, and the length was typically 20cm. These were half-buried in the shingle and sand to provide chicks with shelter from the elements and from predators. Shelters were placed beside newly hatched nests, and on the foreshore on the seaward side of the fence. They were redistributed to areas with a lot of chick activity as necessary. Several

young chicks were observed sheltering in and beside the pipes throughout June and July. A variety of natural and man-made debris present on the shore was also utilised by chicks for shelter – pieces of driftwood, large rocks and large plastic rubbish provided shelter to chicks on occasion.

2.3.4. Predator Management

As a ground-nesting species, Little Terns are very vulnerable to predators during the breeding season. In addition to the protection afforded by the fencing, wardens and volunteers were present 24 hours a day between 12th June and 15th August and attempted to scare away any potential predator spotted. The presence of people on site was a deterrent to most predators, the focus of predator management this year were Red Foxes (*Vulpes vulpes*), Sparrowhawks (*Accipiter nisus*) and corvids (Hooded Crows (*Corvus cornex*) and Rooks (*Corvus frugilegus*)).

Motion activated solar lights were placed at intervals along the fence, to disturb predators and alert wardens to their presence. During nocturnal disturbances, a searchlight was used to locate and scare foxes, and a radio was used as a noise deterrent. Cage traps of various sizes and designs were set in the vicinity of the site to capture potential predators so they could be relocated to a more suitable area.

2.4. Public Awareness

2.4.1 Interaction with beach users

A daily effort was made to increase public awareness and appreciation of the Little Tern. This was carried out by talking to interested walkers and, when possible, showing them an incubating adult or chick through a telescope or on a leaflet. When beach users were seen to be walking along the foreshore on the seaward side of the colony, or were in danger of entering the colony, they were approached by wardens, informed about the Little Tern colony and politely redirected. When people were unaware of the project it was explained, nests were pointed out when possible and alternative routes were suggested. When loose dogs came too close to the colony, wardens asked owners to place them on leads or take them away from the nesting site.

A blackboard was placed at the north end of the conservation site near the access pathway from Baltray. This was updated daily with counts of nests and eggs, and any news on the colony. This was well received, and many regular beach users enjoyed keeping updated on the colony.

From mid July and during high tide ours, the team would post themselves on the North side of the beach as it offered the best vantage point to interact with the public, locals, visitors and people holidaying in the locality. It was so well received that some came back with family and friends on a regular basis some for a chat, others to take news on how the terns were doing. Since we had two telescopes available, it was a great tool to show the birds of the strand. The reason why we choose high tide hours is the fact that those hours are preferred for the birds to rest offering a concentration of Little Terns of course but also Common, Sandwich, Arctic and Roseate as well as great numbers of Sanderlings and Dunlins (small waders) as well as Ringed Plovers, Cormorants, Herring and Great Black Backed Gulls, Oystercatchers etc.

2.4.2 Group Talks & Outings

We had the visit of 30 children from the local school in Termonfeckin after going to the school itself a couple of days prior to that. We were able to show them terns and plovers with the help of our telescopes as well as sharing fun facts that kids love and we recreated a tern's nest with abandoned eggs from the previous month.

We received the visit of birders and nature lovers from Dublin, Meath, Louth and Armagh to just name a few but the focus this year was to spend a few hours with the telescope and during high tide hours to invite people to talk about the conservation project and the ecology of the birds. It was an opportunity to explain when a bird is alarmed or distressed visually of course but also inviting visitors to listen to their calls, be respectful of the birds' resting times at high tide as the strand is shared by waders such as Sanderlings, Dunlins, Curlews and Godwits just to name a few as well as other terns, Sandwich, Common, Arctic and Roseate and of course Herring, Great Black Backed, Common and Black Headed Gulls, not forgetting the Oystercatchers (up to 200) and Cormorants (under 100 daily).



Dunlin and Sanderling -Show and tell.

3. Results

3.1 Weather

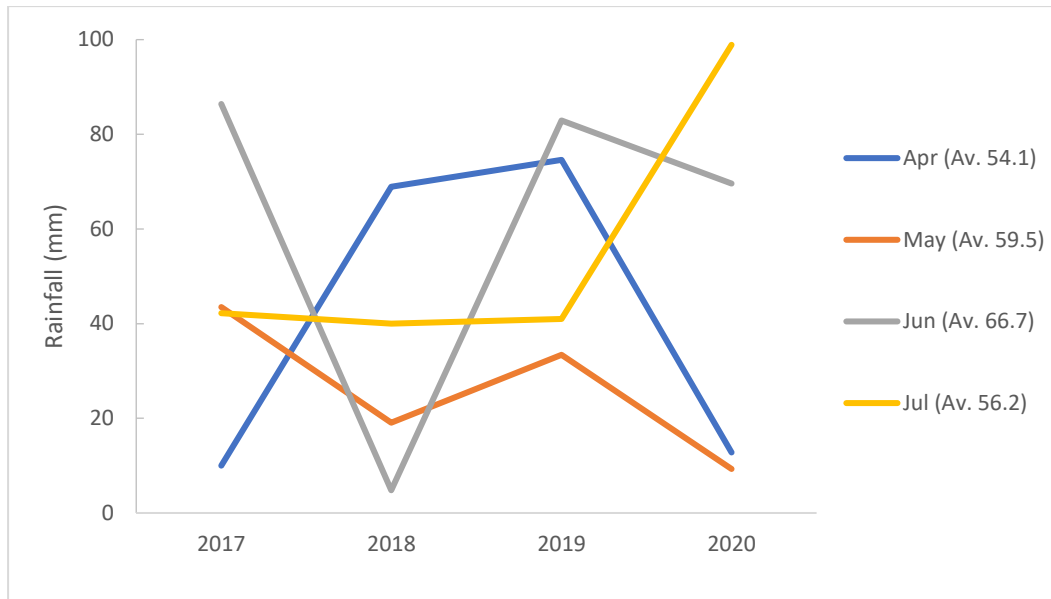


Figure 8: Average monthly rainfall (April-blue, May-red, June-grey and July-yellow) at Dublin Airport weather station between 2017 and 2020. Average given in brackets represents the mean rainfall (mm) for the period 1981-2010. (www.met.ie/climate/available-data/monthly-data)

The weather this season started quite cool for this time of year and until most of June but thankfully, there was little precipitations on the beach; it's seems that the area is spared due to different factors and clouds tend to break south and north which is not an unknown phenomenon. August saw a couple of small but intense heat waves but there was always a nice breeze on the strand and it didn't seem to have affected the chicks which at that stage of the summer had either flown away or about too, what was more noticeable this year was the more regular Eastern winds.

3.2 Little Tern Numbers

An average count of approximately 60 to 75 adult Little Terns was recorded daily in the colony. The main method of counting was dread counts. Dreads typically consisted of 30 to 70 Terns. These numbers are considerably lower than what would have been expected given the number of breeding pairs present. A peak count of 73 adult Little Terns roosting on a sandbar occurred on 10th July. The number of adult Terns increased throughout May, with numbers dropping in early June after a predation event resulting in the loss of 20 nests (Figure 9).

The first egg was discovered on May 19th and the number of active nests continued to increase for the rest of May, dropping in early June following predation by a fox (Figure 9). The first nest hatched on June 13th. As chicks fledged, there was a drop in Little Tern numbers as some of the population began to move around the eastern coastline. In July, the population increased once again as large numbers of adult Little Terns began to gather in loafing flocks before migration. In mid-July, numbers decreased as Terns began migration.

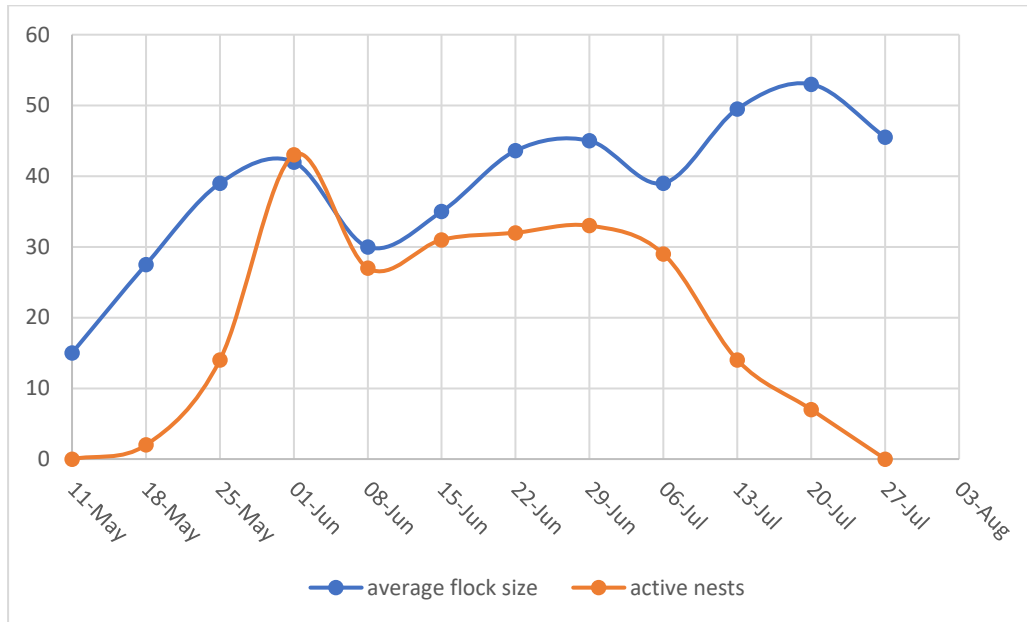


Figure 9: Average Little Tern flock size and the number of active nests per week at the Baltray colony from 11th May to 27th July 2020.

3.3 Nesting

3.3.1 Number of Breeding Pairs

With prolonged periods of nest loss and re-laying it can be hard to ascertain the exact number of pairs involved. The maximum number of clutches (both hatched and incubating) occurred on the 3rd of July with 59 clutches present. This means at least 59 pairs were active in Baltray, however it is likely that the number of pairs that attempted to breed is higher. Fox predation early in the season may have caused some pairs to desert the colony, but, due to the number of new nests found later in the season, many of these seem to have re-nested in Baltray.

3.3.2 Pattern of Nesting

Of the 90 nesting attempts, 64 were made inside the fenced area. Three attempts occurred in the buffer zone to the north of the site, with another outside the fence to the north and three more outside the fence to the south. Nineteen nesting attempts were made between the electric fence and the HWM on a sand bank on the seaward side of the colony. Due to the layout of the beach this year it would not have been practical to extend the fence any farther out as it would be at risk of damage by high tides. Of the nests outside the fence and in the buffer zone, 73% were lost prior to hatching and of the 64 nests inside the fence, 37.5% were lost before hatching. This highlights the importance of the fence in protecting the nesting site.

The first nest was discovered on 19th May, and numbers increased until 8th June, when predation by a red fox resulted in the loss of 20 nests. Active nest numbers increased again until the 18th June when a large number of eggs hatched. A third round of nesting peaked on the 30th June (Figure 10).

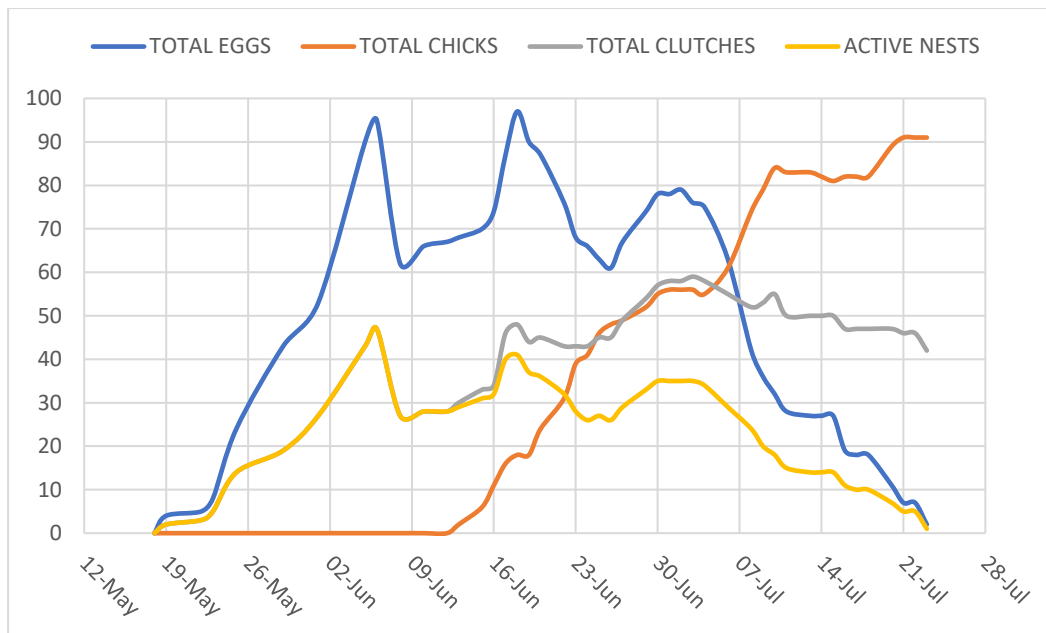


Figure 10: Trend of a) total egg numbers b) total chick numbers c) total clutches (active nests and hatched nests) d) active nests for the Little Terns over the whole nesting season (9th May – 23rd July)

3.3.3 Catch Size and Incubation Period

Of the 90 nesting attempts, four clutches contained one egg, 51 clutches contained two eggs and 35 clutches contained three eggs. The average clutch size was 2.34 eggs. The exact incubation period is known for 23 nests (Table 1). The mean incubation period was 20.43 days. The shortest incubation period was 18 days, and the longest was 23 days.

3.3.4 Hatching Success

In total 211 eggs were laid throughout the season in 90 nests. Of these eggs 104 did not hatch due to the following causes (Figure 11): fox predation (59 eggs), corvid predation (20 eggs), washed away by spring tides (8 eggs), covered by sand in strong wind (2 eggs), infertility or abandonment (13 eggs) and walked on by human (2 eggs). The remaining 106 chicks successfully hatched from 45 nests. The overall hatching success was 50.2% of eggs laid. Hatching commenced on 13th June and continued until 21st July.

3.3.5 Fledgling Success

Of 106 chicks hatched, 16 are known to have died before fledging. 14 chicks were found dead, probably due to exposure and starvation – 12 of these were found near the nest scrape at less than four days old, often after periods of poor weather. The other two chicks were found on the beach and were estimated to be a week old and three weeks old, respectively. A Sparrowhawk hunted in the colony regularly between 9th and 14th July, resulting in the loss of two fledglings. The number of chicks taken by the Sparrowhawk was estimated through the number of piles of plucked feathers found in the surrounding sand dunes. These piles of feathers were used to identify the birds which were taken as fledged chicks, as they lacked full adult colouration (Figure 12) (Baker, 1993). No rings were found in the piles of plucked feathers.



Figure 12: Little Tern Fledgling with characteristic juvenile plumage.

Any chick not known to have died is assumed alive. Ninety chicks (85% of the total hatched) are assumed alive and fledged (Figure 13). This is likely an overestimate, but as the colony was observed on a 24-hour basis, and frequent searches were undertaken within the colony for chicks, it is thought that the majority of predations events and other chick deaths were accounted for, so this should be close to the true figure.

3.3.6 Productivity

The productivity for this season is based on chicks assumed alive. As outlined above this is likely an overestimate but is thought to be the closest to the real figure. Fifty-nine pairs produced 90 fledglings, giving a productivity of 1.52 fledglings per pair.

3.7 Predators and Disturbance

3.7.1 Terrestrial Predators

Predation by Red Foxes was the largest cause of egg loss for the Little Terns this year, with a total of 59 eggs taken by foxes. The largest predation event occurred between 22:00 on 7th June and 5:30 on 8th June, when 45 eggs were lost from 18 nests. After this event, night wardening was implemented. A fox was seen inside the fence again on 10th and 11th June, and one further nest with two eggs was lost. On 22nd June, a vixen and three cubs were seen in the dunes behind the colony. A single fox was seen on June 27th, 29th, July 2nd, and July 3rd, and two nests with three eggs each were lost. Foxes were seen on seven nights between 7th and 20th July, with two seen on the 14th and 15th. Three nests with a total of six eggs were lost on 16th July. No foxes were seen in the vicinity of the colony after 20th July. A rat (*Rattus norvegicus*) was seen on the track behind the colony on 16th July.

3.7.2 Avian Predators

Several potential avian predators posing a danger to fledged Little Terns and adults were observed in the area. As Kestrels (*Falco tinnunculus*) and Sparrowhawks (*Accipiter nisus*) have been major predators of Little Tern fledglings in Baltray in the past, the site was closely monitored for their presence. A Sparrowhawk was seen flying over the colony on 15th June, and a kestrel was spotted at the outer gate to the beach on 30th June. A Sparrowhawk hunted in the colony regularly between 9th and 14th July, resulting in the loss of two fledglings. A Knot (*Calidris canutus*) was also taken by the Sparrowhawk on one occasion. In an attempt to deter the Sparrowhawk, wardens would shout and chase the bird, with some success - on 13th July it made five visits to the beach, but due to disturbance by wardens it did not appear to catch anything (empty claws were seen as it flew away).

Several seabirds which presented potential threats to Little Tern chicks and eggs were present throughout the season; the Lesser Black-backed Gull (*Larus fuscus*), Great Black-backed Gull (*Larus marinus*), Herring Gull (*Larus argentatus*), Black-headed Gull (*Chroicocephalus ridibundus*),

and Grey Heron (*Ardea cinerea*). Gulls were thought to have been responsible for heavy predation of Little Tern eggs in 2008 (Reilly, 2008) and any gull species flying over the colony was relentlessly mobbed by the Little Terns. However, no predation by any seabirds was observed. Flocks of up to 100 Starlings (*Sturnus vulgaris*) were observed throughout the season. They were considered a potential threat to the Little Tern eggs as they are thought to have predated two nests in 2011 (Reilly, 2011). They were chased away whenever they entered the enclosure.

3.7.3 Human Disturbance

3.7.4 Dredging

As in previous years, dredging continued at the mouth of the river Boyne in 2020 (a dredger registered under the name of Argus). It was recorded dredging on at least 26 occasions between the 8th June and 31st July. The area of operations was limited, and it did not move greatly north of south of the river mouth. Dredging typically took place at low tide, and an took an average of 3.5 hours. In 2019, observations of foraging terns during dredging operations were carried out in Baltray which found that the terns did not actively forage in the wake or plume of the dredger and seemed to actively avoid it.

Drogheda Port's annual environmental report provides the following information in relation to maintenance dredging by the TSD Sospan Dau and dumped at sea:

24.03.22 to 30.03.22 (1st campaign): 48,364.5 tonnes

11.12.22 to 15.12.22 (2nd campaign): 29,401.5 tonnes

This is a relatively low level of dredging in comparison to previous years, particularly 2017, 2018. The discrepancy between the observed dredging and the reported dredging stems for the fact that the dredging during the summer was likely because the summer material was used for "beneficial reuse", whereby it may be collected from the quay wall for use in the construction industry, for example by Kilsarin. As such it is not classified as waste, however this activity is not regulated by the EPA and no Appropriate Assessment has ever been carried out in relation to beneficial reuse. The DPC Foreshore license provides for the extraction of 60,000m³ of sand for beneficial reuse; this activity is not regulated under the dumping at sea permit and quantities brought onshore are not required to be reported as part of the Annual Environmental Report. For reasons unknown this activity seems to mainly take place during the summer months when terns are breeding.

3.7.5 Avian Influenza

A major worldwide epidemic of Highly Pathogenic Avian Influenza A(H5N1) broke out in 2021 and had devastating impacts on many seabird species in Britain. Over a third of barnacle geese on the Solway Firth, UK, were lost; pink-footed geese were also affected there and may have carried the virus other sites in Scotland. It was confirmed in sandwich terns in South Africa in April 2022 which was followed by multiple outbreaks around Britain in spring and into summer, particularly affecting

gannets, great skuas, auks, various terns and gulls, as well as scavenging species such as corvids and raptors).

There was worry that the little tern colony may be impacted but no sign of disease was seen at Baltray. It is possible that because little terns tend not to mix with other species in nesting colonies, they may have been spared.

At Kilcoole and other sites around the country, much wardening and ringing was suspended due to concerns about bird flu.

[Note we should insert a quick comparison of performance of Baltray vis-à-vis other sites when we get the data].

3.8 Ringed Plover and other species

Up to 30 pairs of ringed plover hatched at least 50 chicks, though probably more over the whole beach area. Skylarks, meadow pipits and linnets bred around the site. No breeding oystercatchers were noted this year.

4. Discussion

4.1 The 2022 Breeding Season in Baltray

4.2 Dredging

Dredging has been ongoing along at the Boyne estuary to a greater or lesser extent for at least a few hundred years. Dredging has probably increased in recent decades in line with increased activity at the port and larger ships. Capital dredging is typically carried out to maintain shipping berths and the estuary channel, where silt builds up over time carried down by the river, and mouth of the river, where sand builds up thanks to the south to north longshore drift in the Irish Sea. This drift causes sand to be conveyed south to north and build up along the south training wall, onto the bar and so on northwards. To prevent the build-up of both silt and sand, dredging is carried out under a Foreshore Licence issued by the Department of the Marine. The licence specifies how much material can be removed, how it can be removed, at what frequency it can be undertaken (in terms of days per year) and where it may be disposed of (dumping at sea or beneficial reuse). During the 2017- 2019 nesting seasons, several wardens and other regular visitors to the site made anecdotal observations that dredging had apparently significantly increased, with plumes of material constantly visible in the water column, and almost daily activity by one or two suction dredgers (Argus and Sospan Dau). In 2019 and 2020 the work was carried out solely by the Argus.

To gain an understanding of this phenomenon the Foreshore Licence was checked. Because the whole area is designated under both the Birds and Habitats Directives, dredging requires an Appropriate Assessment (AA) to be carried out (Habitats Directive Article 4). The AA is the mechanism whereby impact on the Natura 2000 site is assessed; if any likely or uncertain impact is identified an Environmental Impact Assessment must be undertaken. Therefore, from the point of view of the Habitats Directive, the AA is the key permitting document since the dredging permit is dependent on it. An examination of the AA document under the heading Little Terns states as follows:

“3.5 Future Maintenance Dredging Requirements

Dredging at the river mouth and approaches generally takes place twice yearly, although in some years over the previous decade there have been three annual campaigns. The dredging at this location is generally in response to weather events. The time of year for dredging is dictated by the weather and weather events. A typical campaign takes about three weeks, working each tide, twice daily, generally from three hours before the high water to about 1 hour after the highwater.

Over the previous maintenance licence periods the port has accumulated a good deal of data and experience on the performance of the river and bar and the effects of weather. This coupled with mathematical modelling see reports by Kirk McClure Morton and RPS enclosed at Attachments B1 and D6 to this Dumping at Sea Permit application) allow realistic figures of annual maintenance dredging predictions. Monitoring of the bar/river mouth and the most sensitive area of the river in dredging requirement terms is now carried out by the port internal hydrographic unit, thereby maintaining a good check on depths particularly after easterly wind storm events.

The estimated annual quantity of maintenance dredging for the commercial channel, berths & swing basins from Drogheda town quays to the sea at Mornington is 30,000m³ or 48,000 tonnes, for the seaward approaches 90,000m³ or 144, 000 tonnes, with an additional annual contingency of 100,000m³ to allow for the unexpected and unplanned events that may impede the navigation channel. This is to cover an unexpected weather event or where the river retaining walls that created the estuarine polders collapse (as occurred in 2000) and the material contained within a polder flows out into the main navigation channel. This can occur due to a differential in the water pressure between the retained waters in the polder and the river falling tide levels. The river walls were constructed in the 1850s and their construction and current condition leave them susceptible to the effects of ship wash and hydrodynamic action. The contingency also allows for unexpected weather events at the river mouth and seaward approaches.

A detailed breakdown of historic figures upon which this annual estimate is based on is provided in the main application. The majority of the material will come from the bar mouth and approach channel with much smaller quantities arising from the channel from the town to sea including all berths and ship turning areas.”

The same document assesses the impact of the above activity on little terns nesting in the area as follows:

“4.3 Boyne Estuary SPA 4080 Disturbance to birds

Little Terns are breeding on the beach at Baltray. The dredging activities will be remote from this location and will have no impact on this species.

The wintering bird populations in this SPA use the polders which are behind the training walls that define the river channel. These polders become exposed at low tide and are used for feeding and roosting by wintering bird species which the SPA is designated for. There will be no dredging activity within the polders and so there will be no direct impact on wintering birds.

Given that the waterfowl populations in the Boyne estuary currently tolerate a high volume of shipping through the SPA, it is considered highly unlikely that the additional barges, which will be in operation for 2 – 3 weeks at a time on a number of occasions during the year, associated with the disposal of the dredged sediments will have any significant impact on waterfowl populations for which the SPA is designated.

Impact Prediction: No significant impact.”

Source: Provision of Information for An Appropriate Assessment For A Maintenance Dredging Plan For The Drogheda Port Company, Co. Louth 2012, Scott-Cawley

The above paragraphs contain a factual error, in that Little Terns breed in an area immediately adjacent to the dredging activity, and their foraging area is directly coincident with it. A review of available literature on the impact of dredging on Little Terns would suggest that the statement that dredging will have no impact is also erroneous:

“4.2.19 Little Tern

As Little Terns tend to feed close to the shore, they are at a low exposure to the disturbance and impacts on the benthos and associated fish species associated with marine aggregate dredging operations. Consequently, their vulnerability to these issues has been assessed as

being low. As they are relatively insensitive to issues related to shipping, their vulnerability to the shipping associated with marine aggregate dredging operations has also been assessed as being low. Little Terns are highly exposed to the turbidity and increased sedimentation associated with marine aggregate dredging operations. Little Terns may be sensitive to increased sedimentation as the deposition of re-suspended sediment may smother the eggs and larvae of key prey species. Consequently, Little Terns have been assessed as being moderately vulnerable to the effects of increased sedimentation. As vision is an important part of Little Tern foraging ability, and Little Terns are highly exposed to changes in turbidity, Little Terns have been assessed as being very highly vulnerable to changes in turbidity associated with marine aggregate dredging.”

Source: A Review of the Potential Impacts of Marine Aggregate Extraction on Seabirds, Cook *et al.* British Trust for Ornithology, 2010.

A review of the actual number of days of dredging (as well as quantities of dredged material recovered or dumped) was undertaken in 2017 (Lynch *et al.*, 2017). This information was provided by Drogheda Port on foot of an Information request under the AIE Directive. Note that in some instances dates appear as duplicates; this represents where operations were undertaken on two tides in the same day. According to Drogheda Port, overall 152 sailings were undertaken over 80 days up to end September in three campaigns, one lasting from 15/02/2017 to 26/02/2017 (10 days; 91,000), the second lasting from 19/04/2017 to 28/07/2017 (99 days) and the third from 30/08/2017 to 31/10/2017 (60 days); the quantity from 19/04/17 is 74,000 m³. The port therefore reports that 165,000m³ were dredged up to September 2017 (against the predicted maximum of 120,000m³ excepting contingency for exceptional events). In addition to this, a further 75,000m³ was removed/dredged from the river mouth in November 2016 so that the amount from November 2016 to September 2017 is a remarkable 240,000m³! Taken together the licence conditions, the actual level of dredging, the appropriate assessment, and the BTO study on the likely impacts, it is clear that there is a possible adverse impact on Little Terns, both as a result of turbidity and as a result of the knock-on impact on the reproduction and availability of a key prey resource, sandeels and sprats.

Sandeels (*Ammodytes* spp. mainly *Ammodytes tobianus*) are a major prey item for Little Terns. The species lives and breeds over sandy and light shingle seabeds close to the shore and are rarely found in water more than twenty metres deep. Harbours, estuaries and sheltered bays often hold large populations where they are depredated by fish and seabirds. They typically spawn twice a year, once in spring and once in autumn. Spawning involves depositing eggs on the substrate (sand or mud) where they hatch into larvae. They typically spend the winter hibernating in up to 20cm of sand (Source: A Students Guide to the Seashore - Fish and Fish 2011). Other less important prey include sprat (*Sprattus sprattus*), young herring (*Clupea* sp.), butterfish (*Pholis* sp.) and others, may also be adversely affected by dredging. Given the timing and reported locations of dredging it may be inferred that the November 2016 campaign likely impacted overwintering sandeels, the spring campaign impacted spawning and eggs, and the extended summer dredging increased turbidity in the water. This may explain the almost complete failure of the Little Tern colony in 2017, hitherto unprecedented.

5. Recommendations

5.1 Dredging

Going forward it would be beneficial to establish an agreement between the various parties (Including Drogheda Port and Louth County Council) for a dredging regimen in the Boyne estuary that will result in compliance with the Habitats Directive and ensure the favourable status of little terns into the future in accordance with the Irish and EU legislation.

It is strongly recommended to encourage the undertaking of a robust appropriate assessment as to the impact of dredging.

5.2 Monitoring

5.2.1 Coloured Darvic Rings

An increased focus on reading coloured Darvic rings would provide more information on the birds breeding and visiting Baltray. This could involve training interested volunteers to read rings and setting go-pro cameras on nesting adults to read rings as they come and go from the nest.

This year only 4 chicks were ringed with coloured Darvic rings but increasing this will give a greater indication of fledging success and survival of juveniles. It would be worthwhile to have trained ringers onsite to ring chicks whenever they are found.

5.2.2 Night Wardening

Employing a full-time night warden during the Little Tern breeding season would reduce the pressure on volunteers. Night wardening should ideally be provided from late May. As earlier clutches typically have three eggs while re-nesting attempts have fewer, focussing on protecting the first clutches will result in higher numbers hatching and hopefully higher numbers fledging.

5.2.3 Nest labelling

Previously the nests in Baltray were labelled with the nest code on a marker at the nest. In the last couple of years this was not done but I would recommend that it is carried out in future. This would make the nests easier to track and reduce any confusion.

5.2.4 Fencing

Separating the fenced area into pens should be repeated next year. The numbered pens made it easy to note locations, and the separation appeared to prevent foxes from continuing through the whole nesting site once they accessed a pen.

5.3 Equipment

5.3.1 Telescopes

On top of the head warden's telescope, we had access this year to a Swarovski powerful zoom telescope lent to us by the NPW of Ireland as well our own Louth Nature Trust, provided from funding. These items are a must have to monitor the colony, especially for hatched chicks. It prevents having to disturb the birds of the colony and collect data from a safe distance.

5.3.2 Binoculars

Two pairs of binoculars were purchased, one 8x42 the other 10x42 of good quality which helps monitoring the colony and very useful in order to locate new nests and fledglings activity.

5.3.3 GPS

A GPS monitor has been purchased, but was received a bit too late in the season. This will be a great tool in the next years to pinpoint all the nests and the area of future colonies.

6.0 Other birds recorded from May to August on the Baltray site:

A minimum of 65 species of birds have been recorded during the summer of 2022 on the Baltray site:

Sternidae

Little Tern (<i>Sternula albifrons</i>)	Main subject to the project
Common Tern (<i>Sterna hirundo</i>)	Observed during the season, especially in July with young.
Roseate Tern (<i>Sterna dougalli</i>)	A bit less common but few individuals (15+) observed during the summer.
Sandwich Tern (<i>Sterna sandvicensis</i>)	Biggest tern on site, nesting on the water treatment plant. A few adults visiting the strand first, over 140 with young in July.
Arctic Tern (<i>Sterna paradisaea</i>)	Up to 30 on the shore at times

General Waders

Ringed Plover (<i>Charadrius hiaticula</i>)	Nesting with the little terns and in the maram grass (15-25 nests) more individuals visiting later in the summer.
Lapwing (<i>Vanellus vanellus</i>)	40 over the north dunes in July
Sanderling (<i>Calidris alba</i>)	Up to 300 on the beach; non breeders
Knot (<i>Calidris canutus</i>)	A few regular visitors, up to 15. Non breeders
Curlew Sandpiper	First record for Baltray quite rare, from Siberia with full chestnut red plumage. A one day visitor in June.
Dunlin (<i>Calidris alpina</i>)	With Sanderlings, up to 150, non breeders
Snipe (<i>Gallinago gallinago</i>)	2 x 2 Flying over in July and August
Black Tailed Godwit (<i>Limosa limosa</i>)	Regular visitors, up to 30, mostly near wreck
Curlew (<i>Numenius phaeopus</i>)	Up to 10 individuals daily
Turnstone (<i>Arenaria interpres</i>)	A few individuals amongst Dunlins and Sanderling flocks

Redshank (<i>Tringa tetanus</i>)	More common on the mud flats, a few on the beach in August
Greenshank (<i>Tringa Nebularia</i>)	One individual on the beach in August
Oystercatcher (<i>Haematopus ostralegus</i>)	Daily visitor; one attempt to nest in pen 5. Up to 200 individuals observed at times.

Sea Birds

Great Crested Grebe (<i>Podiceps grisegena</i>)	Visible from mid July reaching up to 40 individuals in August
Gannet (<i>Sula bassana</i>)	Visible on a daily basis; up to 30 at times
Manx Shearwater (<i>Puffinus puffinus</i>)	Up to 50 individuals through the summer
Cormorant (<i>Phalacrocorax carbo</i>)	About 85 daily; on southern strand near Boyne

Ardeidae

Grey Heron (<i>Ardea cinerea</i>)	A couple of individual daily
Little Egret (<i>Egretta garzetta</i>)	Up to 4 individual daily

Anatidae

Shelduck (<i>Tadorna tadorna</i>)	Up to 10 mostly behind the dune near Boyne mouth
Mallard (<i>Anas platyrhynchos</i>)	Regular visitor
Eider (<i>Somateria mollissima</i>)	A family of up to 8 on a daily basis on the shore until mid July
Common Scoter (<i>Melanitta nigra</i>)	An ocean duck, up to 10 observed the odd time.

Birds of Prey

Marsh Harrier (<i>Circus aeruginosus</i>)	A rare visitor in July
Sparrowhawk (<i>Accipiter nisus</i>)	Thankfully appearing late in the season; one individual
Kestrel (<i>Falco tinnunculus</i>)	Regular but not a threat from July
Merlin (<i>Falco columbarius</i>)	One observed chasing passerines in dune
Peregrine (<i>Falco peregrinus</i>)	A young female from 2021 visiting daily

Laridae

Black Headed Gull (<i>Larus ribibundus</i>)	Unusual in May and June, more individuals in July and August
Common Gull (<i>Larus Canus</i>)	Few individuals everyday
Herring Gull (<i>Larus argentatus</i>)	Up to 60 at times with young
Lesser Black Backed Gull (<i>Larus fuscus</i>)	Not very common on this site but present
Great Black Backed Gull (<i>Larus marinus</i>)	About 20 individuals daily
Kittiwakes (<i>Rissa triidactyla</i>)	Few observed behind trawlers

Alcidae

Guillemot (<i>Uria aalge</i>)	Up to 50 individuals observed from shore at times
Razorbill (<i>Alca torda</i>)	Up to 10 individuals at times from shore
Puffins (<i>Fraercula arctica</i>)	A couple observed from shore

Columbidae and Cuculidae

Woodpigeon (<i>Columba palumbus</i>)	Regular visitor
Collared Dove (<i>Streptopelia decaocto</i>)	Up to 4 near station
Cuckoo (<i>Cuculus canorus</i>)	Nesting on site, up to 4 calling at times

General Passerines

Skylark (<i>Alauda arvensis</i>)	8-10 couples nesting
Swallow (<i>Hirundo rustica</i>)	A few individuals daily
Sand Martin (<i>Riparia riparia</i>)	Observed daily but in fairly small numbers
Meadow Pipit (<i>Anthus pratensis</i>)	8-10 couples nesting in the vicinity of HQ
Pied Wagtail (<i>Motacilla Alba Yarelli</i>)	Nested on site; chicks playing with tern's chicks
Wren (<i>Troglodytes troglodytes</i>)	Few heard or seen daily. Nesting
Robin (<i>Erithacus rubecula</i>)	Average of 3-4 heard/ seen daily. Nesting
Stonechat (<i>Saxicola torquata</i>)	A bout 4 couples from car park to HQ
Wheatear (<i>Oenanthe oenanthe</i>)	A couple observed weekly
Blackbird (<i>Turdus merula</i>)	5-6 individuals daily
Grasshopper Warbler (<i>Locustella naevia</i>)	Heard twice in June; seen once
Sedge warbler (<i>Acrocephalus schoenobaenus</i>)	Heard and seen a couple of times
Whitethroat (<i>Sylvia communis</i>)	Seen and heard regularly (one couple)
Chiffchaff (<i>Phylloscopus collybiata</i>)	Seen and heard in May
Starling (<i>Sturnus vulgaris</i>)	Flocks of young increasing to 50+ in July
Sparrows (<i>Passer domesticus</i>)	A few near gates
Chaffinch (<i>Fringilla Coelebs</i>)	A few near gates
Goldfinch (<i>Carduelis carduelis</i>)	Up to 20 individuals near track
Linnet (<i>Carduelis cannabina</i>)	8 individuals daily
Reed Bunting (<i>Emberiza schoeniculus</i>)	2-3 couples observed regularly west of track

Corvidae

Magpie (<i>Pica pica</i>)	A couple seen near entrance
Rook (<i>Corvus frugilegus</i>)	40 at times just behind HQ
Hooded Crow (<i>Corvus corvix</i>)	6-8 individuals at times. Hunt often in pairs

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Appendices

Appendix 1: Avian Biodiversity in Baltray

Bird Species observed at the Baltray site from May 17th until August 15th. Species were recorded from the within and the immediate area of beach around the colony (BCH), offshore (OFF), on the river (RIV), in the adjacent sand dunes (DUN) and on the track (TRK) leading to the site.

CHARADRIIFORMES: SHOREBIRDS AND RELATIVES

- Little Tern (*Sternula albifrons*) – present throughout and breeding, BCH
- Common Tern (*Sterna hirundo*) – ~30 present throughout, 200+ present June-July in loafing flocks with juveniles, BCH
- Roseate Tern (*Sterna dougallii*) – 1-2 seen occasionally throughout, 10+ present late-June to July, present with juveniles in loafing flocks in late July and July BCH
- Sandwich Tern (*Thalass sandvichenis*) – 40+ present June-July in loafing flocks with juveniles, BCH
- Arctic Tern (*Sterna paradisaea*) – 20+ present June-July in loafing flocks with juveniles, BCH
- Ringed Plover (*Charadrius hiaticula*) – breeding throughout, BCH
- Oystercatcher (*Haematopus ostralegus*) – ~50 present throughout, BCH, RIV
- Turnstone (*Arenaria interpres*) – 7-30 present June to July, BCH, RIV
- Sanderling (*Calidris alba*) – present throughout, BCH
- Dunlin (*Calidris alpina*) – present throughout, BCH
- Redshank (*Tringa totanus*) - present occasionally, one predated on by peregrine, BCH
- Knot (*Calidris canutus*) – up to 8000 present throughout, BCH
- Curlew (*Numenius arquata*) – 1 to 3 present throughout, BCH
- Lesser Black-backed Gull (*Larus fuscus*) – up to 20 regularly present throughout, BCH
- Great Black-backed Gull (*Larus marinus*) – up to 50 present throughout, BCH
- Herring Gull (*Larus argentatus*) – 100-300 present throughout with juveniles, BCH
- Black-headed Gull (*Chroicocephalus ridibundus*) – up to 10 present throughout, BCH
- Common Gull – (*Larus canus*) – on occasion, BCH

PELECANIFORMES: CORMORANTS AND RELATIVES

- Comorant (*Phalacrocorax carbo*) – 20-150 present throughout, BCH, RIV
- Gannet (*Morus bassanus*) – occasionally present throughout, OFF

CICONIIFORMES: HERONS AND RELATIVES

- Grey heron (*Ardea cinerea*) – 1 to 2 present throughout, BCH
- Little Egret (*Egretta garzetta*) – 1-2 frequently seen throughout, BCH, RIV

PASSERIFORMES: PERCHING BIRDS

- European Starling (*Sturnus vulgaris*) – juvenile flocks of several hundred present throughout, DUN, BCH
- Meadow Pipit (*Anthus pratensis*) – present throughout, DUN, BCH
- Skylark (*Alauda arvensis*) – present throughout and breeding DUN, BCH

Blackbird (*Turdus merula*) – occasionally seen throughout, TRK
Reed Bunting (*Emberiza schoeniclus*) – occasionally seen throughout, DUN
Stonechat (*Saxicola torquata*) – present throughout and breeding, DUN
Pied Wagtail (*Motacilla alba yarrellii*) – present throughout, BCH, DUN
Linnet (*Carduelis cannabina*) – present throughout, DUN
Goldfinch (*Carduelis carduelis*) – 2-6 present throughout June & July
Wheatear (*Oenanthe oenanthe*) – occasionally seen in late-July, TRK
Barn Swallow (*Hirundo rustica*) – occasionally seen throughout, DUN
Sand Martin (*Riparia riparia*) – occasionally seen throughout, DUN
Hooded Crow (*Corvus cornix*) – 2 to 10 present throughout. RIV, DUN
Rook (*Corvus frugilegus*) – 30 present throughout RIV, DUN
Jackdaw (*Corvus monedula*) – 3 present 24th and 25th May, DUN

APODIFORMES: SWIFTS AND RELATIVES

Swift (*Apus apus*) – 2/3 present on occasion

COLUMBIFORMES: DOVES AND PIGEONS

Woodpigeon (*Columba palumbus*) – occasionally seen throughout, DUN, TRK

CUCULIFORMES: CUCKOOS AND RELATIVES

Cuckoo (*Cuculus canorus*) – audible May, juvenile seen July 25-30th

FALCONIFORMES: BIRDS OF PREY (

Sparrowhawk (*Accipiter nisus*) – 1 hunting in colony between the 9th and 14th July, BCH, DUN
Kestrel (*Falco tinnunculus*) – 1 seen over colony 20th July, BCH, DUN
Peregrine Falcon (*Falco peregrinus*) – hunting in colony 22nd and 26th May, BCH, DUN

