

National Urban Gull Survey 2021

Technical Report



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1. SUMMARY

This technical report outlines the first ever national survey for urban nesting gulls undertaken in Ireland, commissioned and funded by National Parks & Wildlife Service (NPWS) in collaboration with the Joint Nature Conservation Committee (JNCC). The survey was carried out as part of Seabirds Count, an international breeding seabird monitoring project across Ireland and Britain.

Ground-based counts were used for the first time, at a national scale. The surveys were conducted within 1km squares, allocated randomly, in a stratified sample of various industrial, urban and suburban habitats. A single visit was made by a surveyor to each survey square between 1st May and 15th June 2021 and data collected via online data capture.

The surveys focused on Herring Gull *Larus argentatus* and Lesser Black-backed Gull *Larus fuscus* but other gull species were also recorded if seen. Sightings of adult gulls interacting with suitable urban nesting habitat were recorded in three counts units; Apparently Occupied Nest (AON), Apparently Occupied Territory (AOT) and Individuals (IND). Each count unit relates to confirmed, probable and possible breeding respectively. The methods follow those used in England, Scotland and Wales during in 2020-2021 as part of Seabirds Count. This allows for comparable analysis across the biogeographic region. These data will inform population modelling, to be carried out by JNCC, to derive national population estimates in the publication of Seabirds Count, in approximately 2023.

The 594 priority 1km survey squares allocated across Ireland representing over 15% of the estimated national resource were supplemented by an additional 136 1-km survey squares. These additional squares were identified by ALCnature staff (in discussion with NPWS) in order to provide sufficient coverage of particular towns that would allow the sizes of the relevant urban gull populations to be estimated. These were selected on the basis of having known high numbers of nesting gulls, where gull-human conflict is well documented and, in some cases, to provide a comparison of inland versus coastal sites.

Detailed survey results for all count units, at a county level and for each of the seven target areas, is presented.

Confirmed or probable breeding by gulls in urban habitats were recorded across twelve counties for Herring Gull and thirteen counties for Lesser Black-backed Gull. Herring Gull was the most numerous, with totals of 204 AON, 495 AOT and 1227 IND recorded nationally in randomised priority squares compared with 23 AON, 74 AOT and 268 IND for Lesser Black-backed Gulls. The largest concentrations of both species were found in Dublin, followed by Louth, Galway and Waterford. Based on data from the stratified random samples in combination with the supplementary survey data allowed for statistical modelling to produce preliminary Herring Gull breeding population estimates ranging from little to no breeding pairs for the towns of Athlone and Mullingar to approximately 1,485 nesting pairs in Balbriggan.

Insights from surveyor experience are also presented including notes on apparent efficacy of deterrent measures aimed at roof nesting gulls. Observations from the surveys also identify mixed views by members of the public on gulls in the urban environment. Recommendations made include refining current survey methods to provide complete coverage (i.e. extra squares) at urban gull “hotspots” which will allow for accurate population trend analysis, developing hybrid survey methods (e.g. ground-based counts alongside drones) and research into recruitment, survival rates, nest site selection and movement between urban and natural colonies.

2. INTRODUCTION

The current seabird census effort across Ireland and Britain (known as *Seabirds Count*) follows previous periodic breeding seabird censuses (*Operation Seafarer* 1969-70; *Seabird Colony Register* 1985-88; *Seabird 2000* 1998-2002) which have gathered information on all of the seabird species that regularly breed in Ireland and Britain. This current fieldwork programme for *Seabirds Count* is now complete and follows on from these historical surveys. *Seabirds Count* will form the basis for:

- A *Seabird 2000* update (i.e. a *Seabirds Count* publication).
- Reporting under Article 12 of the Birds Directive (Directive 2009/147/EC).
- The production of site-specific conservation objectives for Ireland's breeding seabird Special Protection Area (SPA) network.
- Input to the National Parks and Wildlife Service (NPWS) own National Seabird Monitoring Programme and onward input to the Joint Nature Conservation Committee (JNCC) 'Seabird Monitoring Programme' (SMP).

Ireland supports a total of seven species of breeding gulls (Black-headed Gull, Mediterranean Gull, Common Gull, Lesser Black-backed Gull, Herring Gull and Great Black-backed Gull and Kittiwake). Of these six species, Herring Gull and Lesser Black-backed Gull have been breeding in urban habitats with increased frequency for several decades. Herring Gull was noted as breeding on rooftops as far back as 1945 at Dunmore East, Co. Waterford. More frequent roof nesting, albeit in small numbers, was noted largely in Co. Dublin from 1972 and through the 1980s but also at sites in Co. Waterford again from 1962 and Co. Galway in 1982¹. To date, population information available for these urban nesting gulls has been limited to collating of anecdotal evidence, public appeals for records and small-scale surveys focusing on towns and smaller cities²³⁴⁵⁶. A summary table detailing previous urban nesting gull surveys in Ireland is presented in Appendix 1. A national assessment of nesting urban gulls in Ireland has not been attempted prior to this survey.

A recent Irish Wildlife Manual⁷ examining the status of Ireland's breeding seabirds between 2013 and 2018 incorporated data from a targeted survey of urban nesting gulls in north Co. Dublin during 2018⁸ as well as *ad hoc* counts from other sites such as Navan, Drogheda and Dunmore East. This publication noted the data deficiency with regard to urban nesting gulls. Total population estimates provided in that report, surveyed between 2015 and 2018, were 7,112 pairs of Lesser Black-backed Gull and 10,333 pairs of Herring Gull. The survey noted short-term population increases of 148% and 87% respectively between 1998 and 2018.

¹ Hutchinson, C.D. (1989) *Birds in Ireland*. T&AD Poyser. Page 126.

² Harford, P. (1990) Herring Gulls Nesting on Buildings at Howth and Coolock, County Dublin. Irish East Coast Bird Report 1989. Irish Wildbird Conservancy. Pages 70-74.

³ Dalton, A.J. (1992) Roof Nesting Lesser Black-backed Gulls at Islandbridge, Co. Dublin. Irish East Coast Bird Report 1991. Irish Wildbird Conservancy. Pages 86-87.

⁴ Madden, B. (1994) Roof nesting by Herring Gulls in Dublin City. Irish East Coast Bird Report 1993. Irish Wildbird Conservancy. Pages 69-72.

⁵ Lenahan, L.J. (1997) Herring Gulls nesting on buildings in Balbriggan, Co. Dublin. Irish East Coast Bird Report 1996. BirdWatch Ireland. Pages 77-79.

⁶ Lenahan, L.J. (2009) Herring Gulls nesting on buildings in Balbriggan, Co. Dublin. Irish East Coast Bird Report 2003. BirdWatch Ireland. Pages 101-102.

⁷ Cummins, S., Lauder, C., Lauder, A. & Tierney, T. D. (2019) The Status of Ireland's Breeding Seabirds: Birds Directive Article 12 Reporting 2013 – 2018. Irish Wildlife Manuals, No. 114. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland

⁸ Roughan & O'Donovan Consulting Engineers (2018) Nesting Gulls Populations in Balbriggan, Skerries and Howth, Co Dublin. Final Report to Fingal County Council.



Figure 1 Herring Gulls scavenging from rubbish bins (left) and chicks at rooftop nest sites (right) are now a familiar sight in Irish towns and cities such as Dublin where these images were taken

Both Herring and Lesser Black-backed Gull are Amber listed on the most recent assessment of Birds of Conservation Concern in Ireland⁹, with Herring Gull having moved off the Red List on account of long-term breeding population decline having reduced from severe to moderate.

Despite excellent coverage of cliff, island and colony nesting seabirds during previous national surveys, it is clear that information gaps regarding nesting urban gulls in Ireland are still apparent. This includes knowledge of the range, overall population size and regional patterns of occupancy. With gull-human conflict in certain areas now widely reported on by local community groups, politicians and the media (e.g.¹⁰), the need for more complete information on nesting gulls in all habitats has become a priority. This survey forms part of the response to filling those information gaps. It follows the methods laid out by JNCC¹¹ for concurrent urban nesting gull surveys being carried out across England, Scotland and Wales in 2020 and 2021. The results of these surveys will provide the most complete population estimates to date for urban nesting gulls across Ireland and Britain, due to be presented in the final *Seabirds Count* publication in approximately 2023.

2.1 Purpose of this report

This technical report details a national survey of urban nesting gulls implemented across Ireland in 2021, during which:

1. Primary data was collected using a stratified random sample of 1km squares across the range of urban habitats in order to inform national level population modelling to be carried out by JNCC at a later date as part of the *Seabirds Count* analysis and final publication.
2. Additional data was collected for specially selected towns in order to derive population estimates of nesting gulls for those areas.

⁹ Gilbert, G., Stanbury, A. & Lewis, L. (2021) Birds of Conservation Concern in Ireland 4: 2020–2026. *Irish Birds* 43: 1–22

¹⁰ Bradley, D. (2021) 'Cull the gulls'. *Connaught Tribune* <https://connachttribune.ie/cull-the-gulls/>. Accessed: 14/09/2021

¹¹ UK Joint Nature Conservation Committee is a partner in the *Seabirds Count* programme for Ireland and Britain

3. METHODS

3.1 Selection of survey method selection

In light of the apparent expansion in the distribution of urban nesting gulls in recent decades a simple, rapid and effective method for large scale surveys was required. A method using ground-based survey, developed for large scale survey in the UK, was used. This approach enables population estimates to be calculated and is underpinned by extensive reviews of urban gull census methods^{12,13}.

Various methods have been used and tested in the past for urban gull surveys. Land-based methods include transect counts, sample quadrat counts, flush counts of adults and vantage point counts. Aerial surveys have utilised an ingenious array of methods including both digital and visual methods from unmanned aerial vehicles (UAVs), helicopters, planes and microlights as well as thermal imagery and satellite imagery.

Both vantage point and ground based methods have been shown to underestimate the number of breeding gulls present in an urban area. However, for a large scale survey, such as that being conducted across Ireland and Britain during *Seabirds Count* and in the case of this particular survey, ground-based methods have been chosen due to the relatively efficient, simple and repeatable nature of the survey approach for covering a large number of survey squares during a relatively short window in the breeding season. Despite their accuracy, the use of UAVs or other aerial methods were not chosen for these national gull surveys due to various limitations, namely time constraints for deploying during field work, length of time needed for analysis of images, available budget plus potential GDPR and access issues relating to privacy, private land, buildings and limitations on flying around areas of aviation activity.

A recent report by JNCC, commissioned by Natural England, devised species-specific correction models for ground-based surveys using digital aerial surveys¹⁴ in order to find suitable conversion factors to account for detectability issues with the ground-based method¹⁵.

3.2 Survey square allocation

In order to carry out the ground-based method, a random sample of 1km squares were assigned within all relevant urban habitat types, within each of the Seabird Monitoring Programme administrative areas in Ireland. The sample is a stratified random sample based on the number of urban squares, and the ratio of strata, found within each area. As with all random sample-based surveys a significant proportion of sample squares may not contain the target species but require surveying, nonetheless.

There were 597 priority survey squares identified by JNCC and assigned to one of four strata based on urban habitat type as identified by the CORINE¹⁶ land classification system:

- Stratum 1: Primarily Industrial and Suburban
- Stratum 2: Urban, Industrial and Suburban
- Stratum 3: Essentially Suburban

¹² Coulson, J.C. & Coulson, B.A. (2015) The accuracy of urban nesting gull censuses. *Bird Study* (2015) 62, 170–176

¹³ Ross, K.E, Burton, N.H.K., Balmer, D.E., Humphreys, E.M., Austin, G.E., Goddard, B., Schindler-Dite, H. & Rehfish, M.M. (2016) *Urban Breeding Gull Surveys: A Review of Methods and Options for Survey Design*. BTO Research Report No. 680

¹⁴ Ground-based survey

¹⁵ Burnell, D (2021). Urban nesting Herring Gull *Larus argentatus* and Lesser Black-backed Gull *Larus fuscus* population estimates: devising species-specific correction models for ground-based survey data. Natural England publication ref: JNCC21_01

¹⁶ Corine Land Cover is the COPERNICUS pan-European landcover data series. The dataset is based on interpretation of satellite imagery and national in-situ vector data. It is mapped to the standard CORINE classification system (link) and data specifications - minimum mapping unit (mmu) of 25ha and the minimum feature width of 100m.

- Stratum 4: Essentially Industrial

Data collected in these 597 priority squares will be used for national level population modelling by JNCC for the *Seabirds Count* publication. In addition to the priority survey squares, a further 136 extra squares were allocated by ALCnature staff in discussion with NPWS Birds Unit staff, to areas deemed of priority for increased coverage due to likelihood of large numbers of urban nesting gulls present or where negative gull-human interactions are known to arise during the breeding season.

The allocation of extra squares in these target areas was done in order to achieve as close to full coverage of particular urban areas as possible, to provide more accurate population assessments for a number of towns in Ireland. The majority of these extra squares were allocated in areas along the east coast (Louth, Dublin and Wicklow) but two inland sites (Mullingar and Athlone) were chosen to investigate the potential of roof nesting colonisation of areas close to large inland bodies of freshwater (notably Lough Ree) and of particular relevance to Lesser Black-backed Gulls.

The distribution of squares covered relative to all classified urban squares is shown in Figure 2.

3.4 Field Survey Methodology and Count Units

A single visit was made to each survey square during the survey period (1st May to 15th June). Surveyors were encouraged to use their own judgement and local knowledge to coincide these surveys with peak gull nest occupancy. The protracted survey period aimed to allow for surveys to be carried out at different times due to latitudinal differences in breeding phenology between sites in the south and north. The average peak occupancy was expected to be between 15th May and 5th June, with the third week of May often cited as the optimum time for surveys if possible¹⁷.

Survey squares were presented on a Google Maps link¹⁸ where square number, location, boundaries and habitat type could be viewed in the field on a smartphone or at home on a computer. Surveyors were encouraged to take screenshots of these prior to surveying for use on the day if phone signal was expected to be poor in their area. The squares presented in the Google Maps link were indicative only. Due to map projection variances in online mapping, surveyors were asked to ensure the accuracy of survey by use of the relevant OSI Discovery Series or other definitive OSI map for the relevant square.

Where possible, clusters of squares or squares adjacent to each other were surveyed on the same or subsequent days, in order to reduce the potential for double counting of relocating or re-laying birds in that area.

A ground-based count method was employed throughout. This involved walking or driving each street and road within the urban habitats within the 1km survey square in order to gain as clear a view of rooftop areas as possible. Vantage point counts were not necessary for this method but it was suggested that if a clear sight of several roofs could be gained, e.g. from the top of street or at a junction, there was no need to walk the entirety of the street, which would save time and maintain a high level of count accuracy.

¹⁷ Walsh, P.M., Halley, D.J., Harris, M.P., del Nevo, A., Sim, I.M.W., & Tasker, M.L. 1995. Seabird monitoring handbook for Britain and Ireland. JNCC / RSPB / ITE / Seabird Group, Peterborough

¹⁸ <http://bit.ly/UrbanGullsMap>

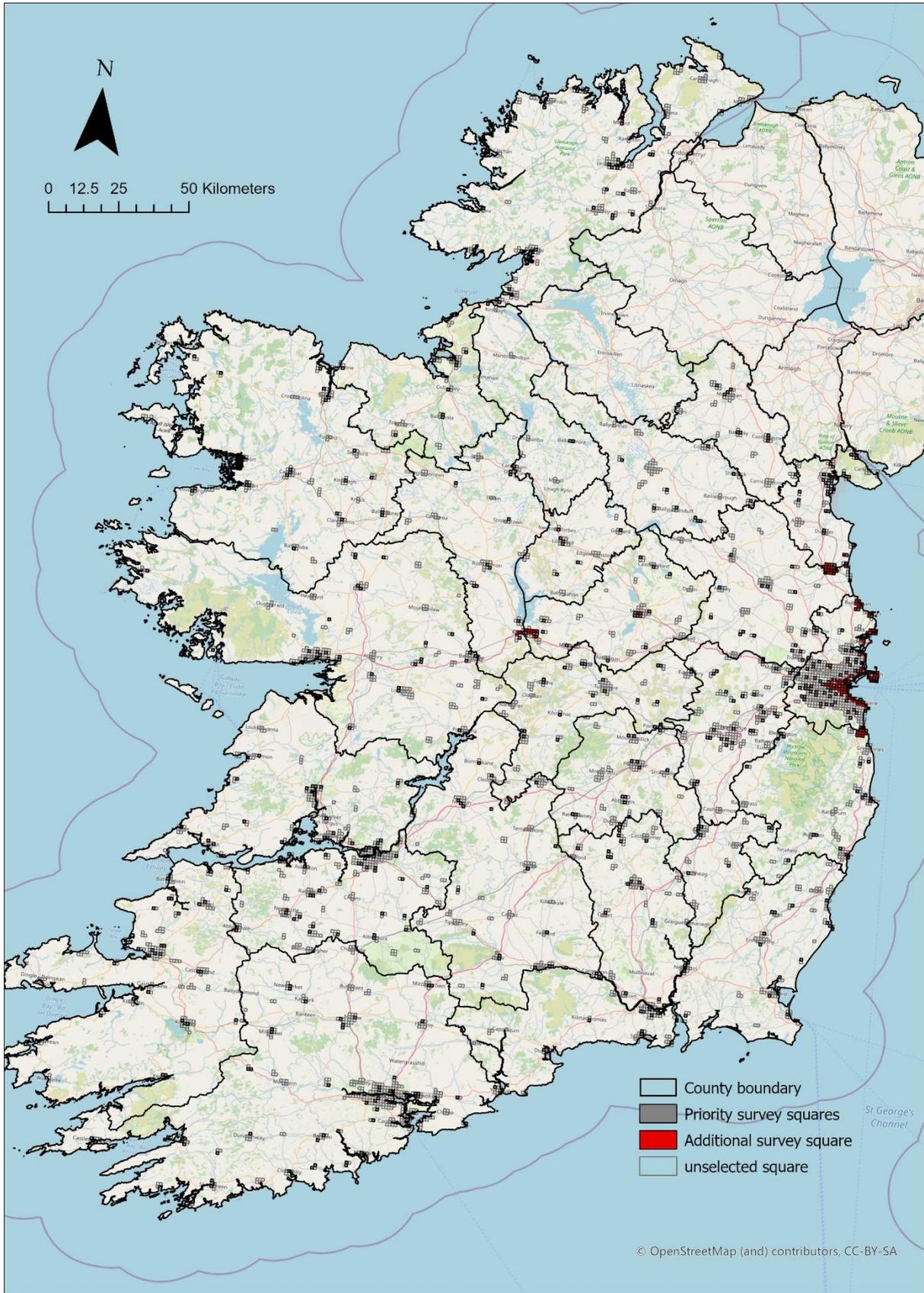


Figure 2 Survey square allocations

The focal species for this survey were Herring Gull and Lesser Black-backed Gull, with counts to be made for other species of note such as Great Black-backed Gull, Black-headed Gull, Common Gull, Kittiwake and Common Tern should be they encountered. Counts for each species were reported separately, for each 1km square. A count for all three units below was to be given for each species:

Count unit	Description
AON apparently occupied nest	Obvious nest sites with built structures, eggs and/or chicks. Empty nests could also count: <ul style="list-style-type: none"> • Well-constructed nest or scrape nest (even if empty but attended by an adult). • Nest containing eggs or young. • Nest with an apparently incubating adult. • Unfledged young still dependant on adults (even if away from the nest, so long as they were within reach of the nest and not separated by any great distance).
AOT apparently occupied territory	Estimated by the spacing of birds or pairs on different rooftops or suitable nesting habitat and observations of apparent territorial behaviour, when actual nests cannot be discerned. Territorial behaviour can include displaying (e.g. 'long calls'), aggressive behaviour between birds and pairs, mobbing of surveyor, other humans, animals etc. The count given for AOT is in relation to the number of apparent territories and not the number of birds so one gull standing, displaying or defending at a suitable nest site was equal to 1 AOT and similarly, a pair of birds standing together at a suitable nest site was also equal to 1 AOT. Any AONs were also considered a territory, so the final number of AOTs recorded for a square included territories and nest sites (i.e. the number of AOTs would always be equal to or greater than the number of AONs).
IND individual adults	The individual count is a count of the total number of birds in full adult plumage that were associating with suitable breeding habitat. Individual birds were only counted once. Gulls (including adults) seen at other roosting or foraging habitats (on water, wetlands, parks, pitches, farmland etc.) were not counted and included in this total of individuals seen. Birds in flight could be counted if it was clear they were engaging with suitable nesting habitat in the square (e.g. circling low over rooftops in a territorial manner or calling to a bird below). Birds observed flying in a determined direction (e.g. a foraging movement) or commuting over the square were not counted.



Figure 3 Adult Herring Gull incubating on a built nest structure. A classic example of an Apparently Occupied Nest (AON)

The counts are cumulative, so the final count of AOTs would be the number of AONs observed plus any extra AOTs seen. The final number of individuals was given as all adult birds seen associating with suitable nesting habitat (i.e. those involved in AONs, AOTs and singles standing on rooftops etc) – this is illustrated in Box 1.

Additional data that was also routinely recorded included:

- The survey square number, date of survey, time of survey and weather.
- A note of any use of gull deterrents or control measures (e.g. netting on roofs, bird spikes, kites).
- An approximate estimate of the overall percentage of potential suitable urban breeding habitat that could not be accessed for survey (e.g. private land where access or views across it were not possible).
- Other gull/tern species recorded in the square (e.g. Great Black-backed Gull, Black-headed Gull, Common Tern). Basic counts of individuals with notes on breeding behaviour.
- Finally, any other observations of note made.

3.5 Data Submission

Count units and additional information was submitted using an online recording form¹⁹. Surveyors were encouraged to enter data immediately after completing a survey in a square (using a smartphone) or by the end of the day (on computer).

3.6 Survey Workshops

A series of workshops were held in advance of the main survey period, with the main aim of ensuring consistency of understanding of the methods by all surveyors. The workshops set out: the background to and aims of the survey; the methods and count units; general survey tips; and provided a forum for questions to be immediately addressed. These were delivered via online video conferencing platforms on Friday 30th April (two sessions) and Tuesday 4th May (one session), which allowed the maximum number of surveyors to participate prior to going out on fieldwork. Each workshop session lasted up to one hour.

Back up short sessions were held with other surveyors unable to attend the main sessions on an “as needed” basis.

3.7 Analysis and Presentation of Data

Detailed analysis of the survey data will be carried out by JNCC and will apply suitable statistical modelling and devised correction factors to calculate population estimates for the urban nesting gull population of Ireland and Britain.

In this report, un-extrapolated or minimum population estimates will be presented using uncorrected totals derived from the randomly selected survey squares and presented as Apparently Occupied Nests (AONs), Apparently Occupied Territories (AOTs) and Individuals (IND) for each species recorded. These results will be presented at a county level and for a selection of target areas of interest where full or near full coverage was attained. Additionally, for the target areas, preliminary estimates of local

¹⁹ <http://bit.ly/IrishUrbanGullsData>

population sizes were modelled by Daisy Burnell (JNCC), following the method set out in Burnell (2021)²⁰.

This model attempts to account for the variable detection obtained from surveying from the ground. To do this it uses data collected from both ground and aerial surveys previously conducted in England and Wales (exact squares for comparability) and quantifies the correlation between the two methods for each species whilst also factoring in other variables such as:

- The amount of urban habitat in the square (potential nesting opportunity)
- The type of urban habitat it is (i.e. the four types of strata)

Data from the target squares in this survey are entered into the model which then produces a predicted mean AON value for each square and the corresponding 95% Confidence Limits. The general caveats, limitations and how these models were produced are found in the aforementioned methods paper. It should be noted that this model was derived using data gathered from England and Wales. As such the estimates reported here are to be viewed as preliminary in nature as it is envisaged that a refined model will be produced for Ireland at a later date incorporating the 2021 Irish survey data.

²⁰ Burnell, D (2021). Urban nesting Herring Gull *Larus argentatus* and Lesser Black-backed Gull *Larus fuscus* population estimates: devising species-specific correction models for ground-based survey data. Natural England publication ref: JNCC21_01 available from: <http://publications.naturalengland.org.uk/file/5392991402590208> last accessed 15 Sep 2021

4. RESULTS

4.1 Coverage

Of the 597 original priority 1km survey squares allocated, 594 received survey coverage and data were received. As such, 99.5% of priority survey squares received coverage.

A further 136 supplementary squares relating to the list of targeted towns were successfully covered. Furthermore, an additional three squares of interest were covered by NPWS staff (two in Donegal and one in Clare). As such, 736 squares in total were allocated for this survey, with coverage and data received for 733 of these (99.6%).

The distribution of survey squares is shown in Figure 2. A detailed view of additional squares is shown in Figure 4.

Surveys were carried out by a total of 52 observers (18 contracted surveyors and 34 NPWS staff) between 5th May and 17th June with 478 of the 733 survey squares (65.2%) receiving coverage between 15th May and 5th June which traditionally represents the core survey period for nesting gulls.

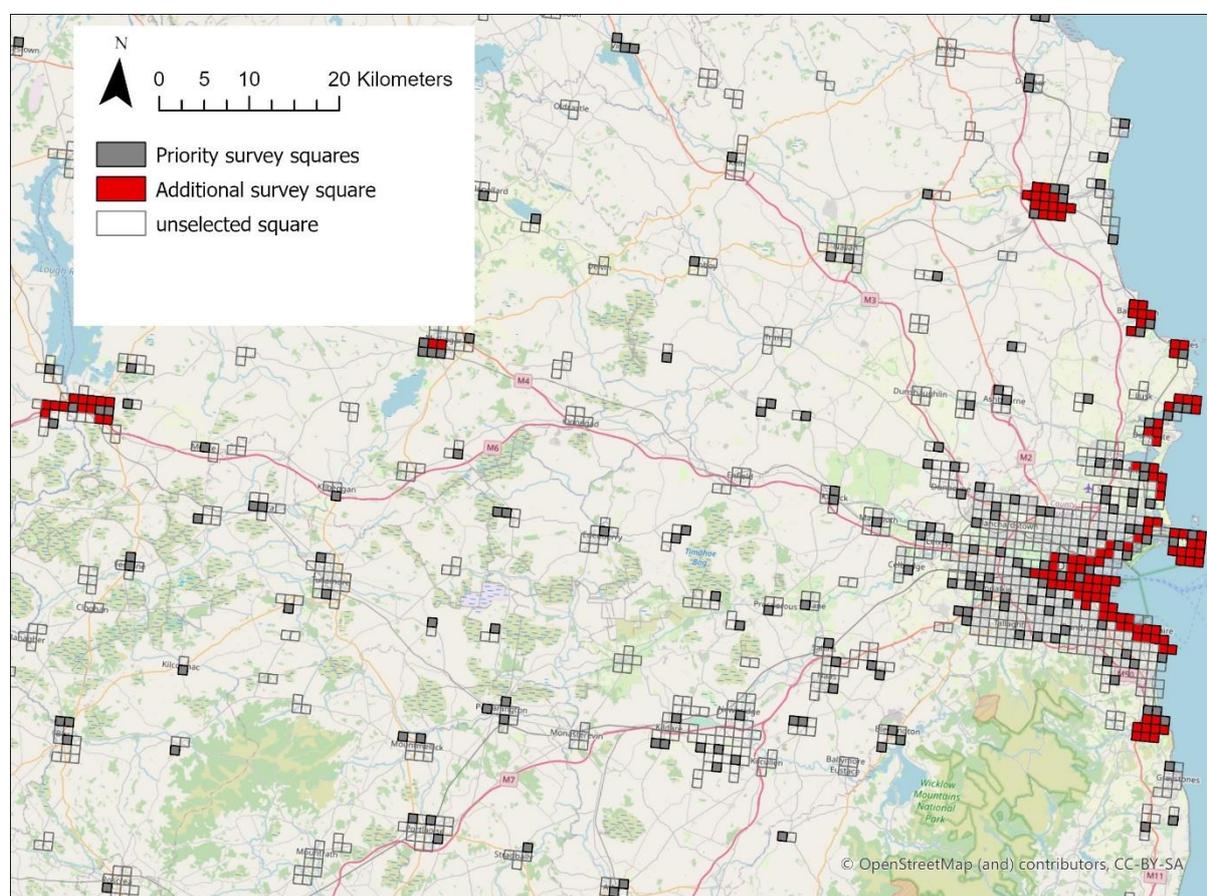


Figure 4 additional selected squares (red) were selected to increase coverage and provide enhanced population estimates for high priority areas

4.2 County Level Population Counts

The observed counts of AON, AOT and IND for Herring Gull and Lesser Black-backed Gull in each county are presented in full in Appendix 4. The results are mapped showing total minimum counts of AOT (confirmed or likely breeding birds) and IND (total count of individuals in breeding habitat) in Figures

5-8, for Herring Gull and Lesser Black-backed Gull on a county basis. These illustrate observed totals only and do not indicate the population size derived from a population model.

Presenting the results as AON would provide numbers based on the highest level of breeding evidence. However, these counts would be an underestimate due to the likelihood of a number of nests sites not being visible using the ground-based count method. Using AOT as the preferred metric for presenting results includes all confirmed AON and additionally any probable breeding pairs on territorial sites. Results presented as AOT will likely be an overestimate of the observed confirmed breeding pairs in an area but takes into account both confirmed nests and territorial pairs and as such, is a more functional representation of the status of breeding gulls in a given area. The figures presented for IND are useful as they highlight areas where potential expansion of breeding gulls might occur in the future, outside of the core areas with confirmed AON and high numbers of AOT.

Dublin coverage was relatively high with the additional non-random squares targeted at high density areas and thus is likely to show a more complete picture than in most other counties. The absence of gulls in many inland counties is not unexpected given the observed paucity of gulls both within survey squares and while travelling between squares.

The maps show the high densities observed of Herring Gulls in Dublin (1171 AOT) and the east coast in general, notably Louth (256 AOT), Meath (23 AOT) and Wicklow (19 AOT) with a second, lower tier, density in other coastal counties such as Waterford (46 AOT), Cork (18 AOT), Galway (46 AOT) and Sligo (13 AOT). Potential or early stage expansion into counties Kerry (3 AOT), Limerick (2 AOT), Clare (1 AOT) and Mayo (8 AOT) are also highlighted here. Surprisingly, no Herring Gull nests or pairs constituting AOTs were recorded in counties Wexford and Donegal, both of which have sizeable towns adjacent to active fishing harbours. This may be a factor of the sampling strategy employed whereby small populations may be missed by chance.

Lesser Black-backed Gulls show a similar picture albeit with counts an order of magnitude lower. Breeding populations are most prevalent in Dublin (97 AOT), followed by Louth (13 AOT) and Limerick (12 AOT). Hints of early stage colonisation or low levels of breeding were recorded in Meath (2 AOT), Westmeath (1 AOT), Longford (1 AOT), Waterford (8 AOT), Cork (1 AOT), Kerry (2 AOT), Galway (6 AOT), Mayo (6 AOT), Sligo (4 AOT) and Donegal (4 AOT). The presence of individuals at inland counties such as Roscommon and Tipperary warrants further investigation during future surveys.

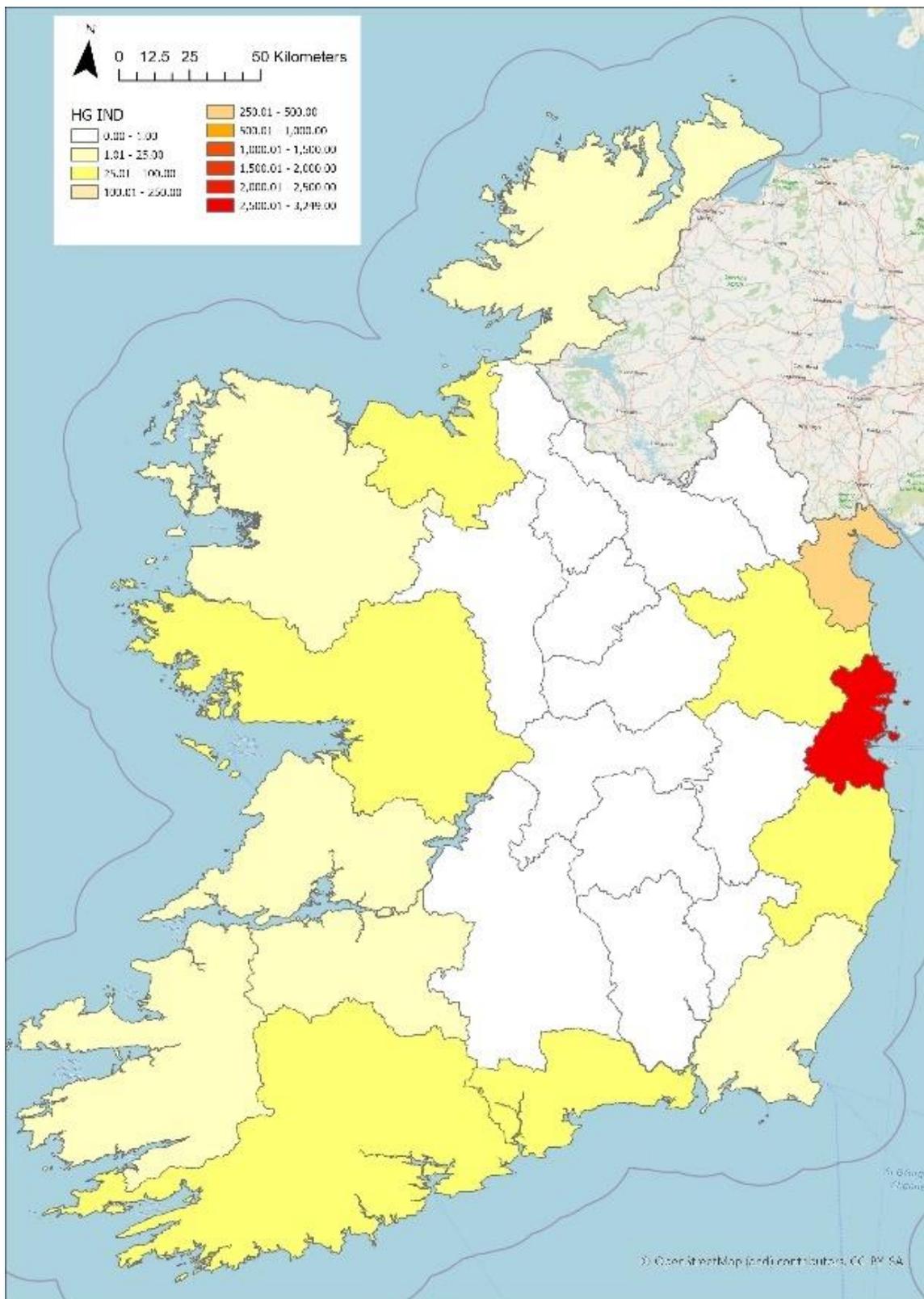


Figure 5 Herring Gull – observed individuals in urban breeding habitat (by county)

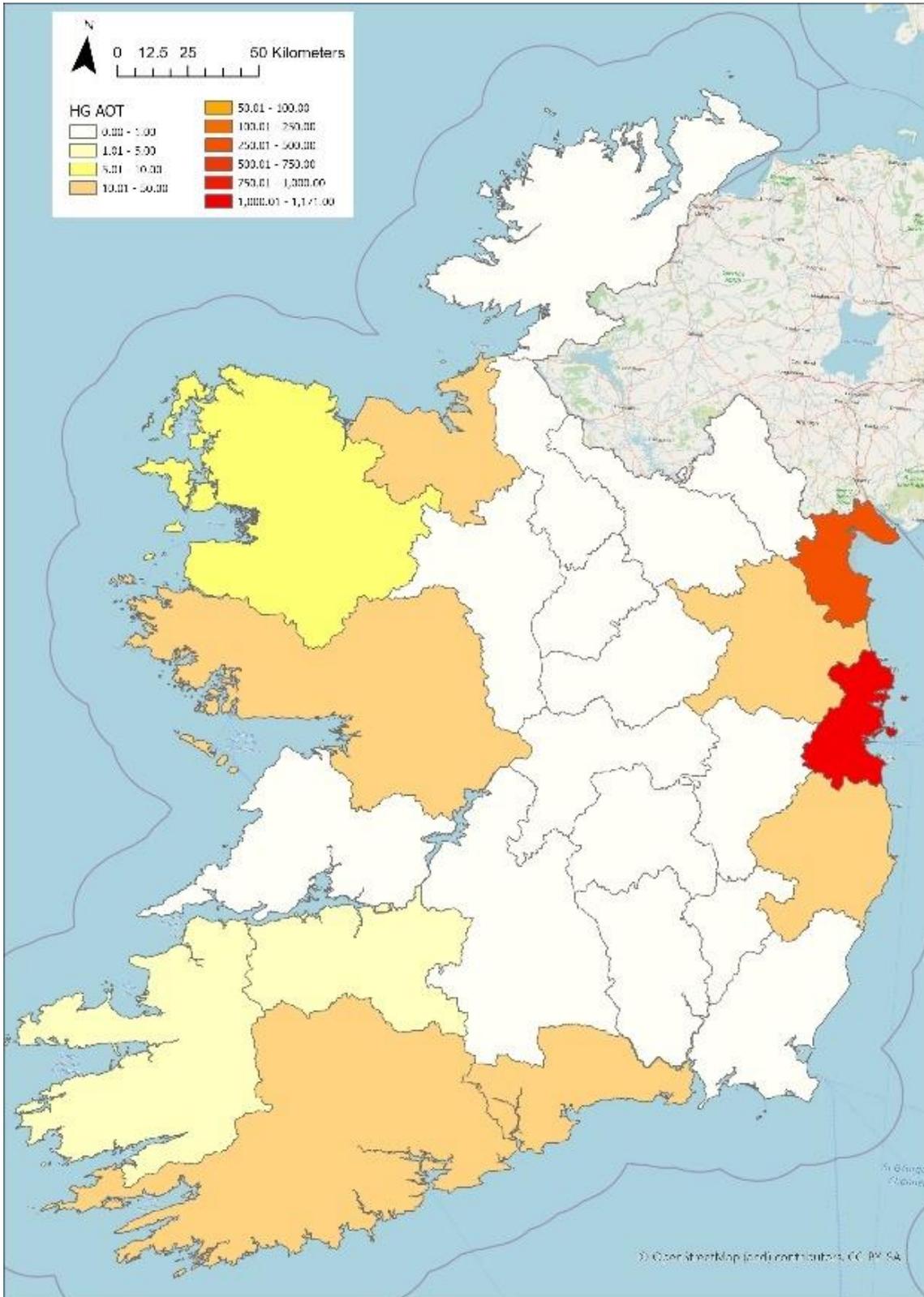


Figure 6 Herring Gull – observed AOT in urban breeding habitat (by county)

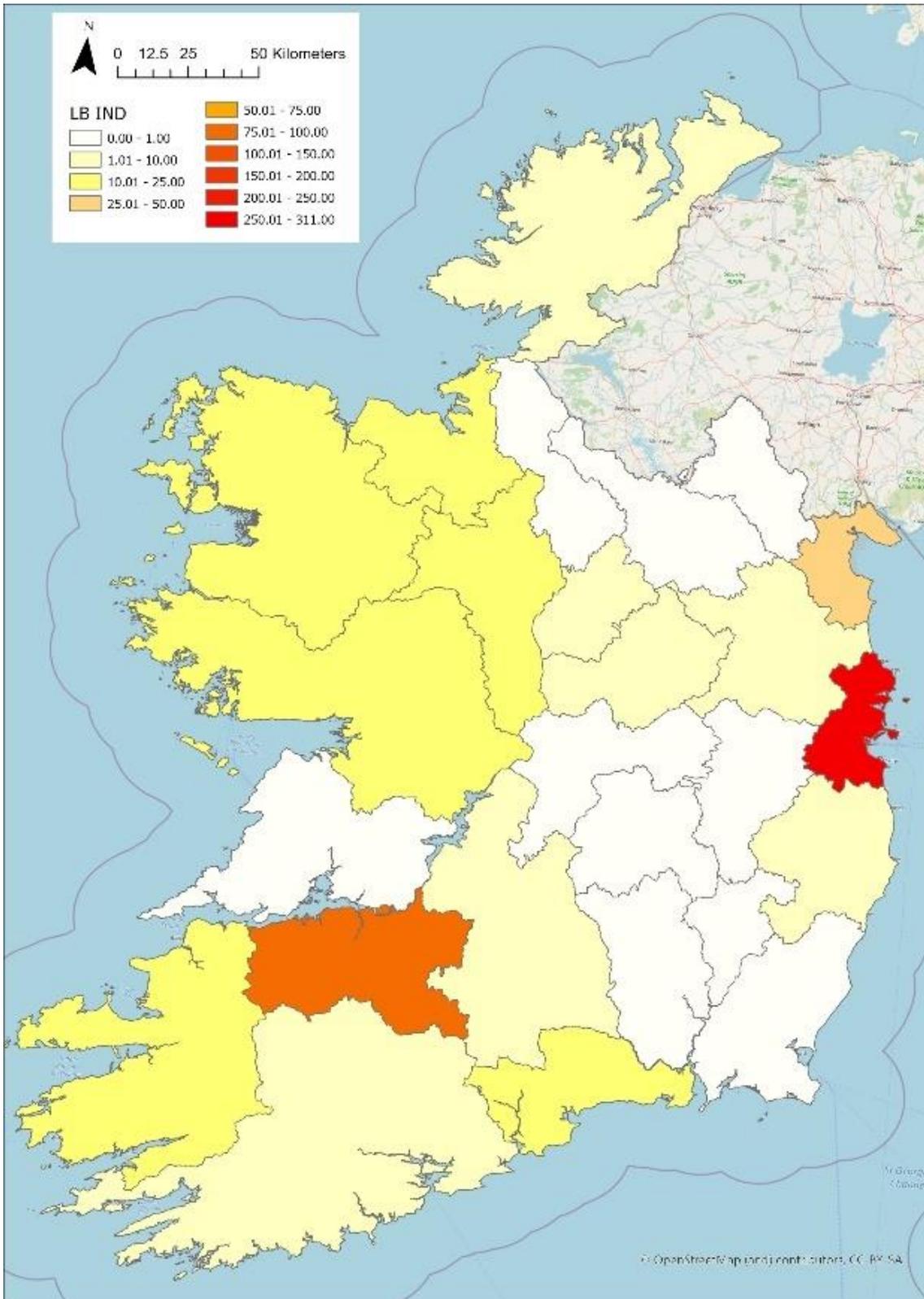


Figure 7 Lesser Black-backed Gull– observed individuals in urban breeding habitat (by county)

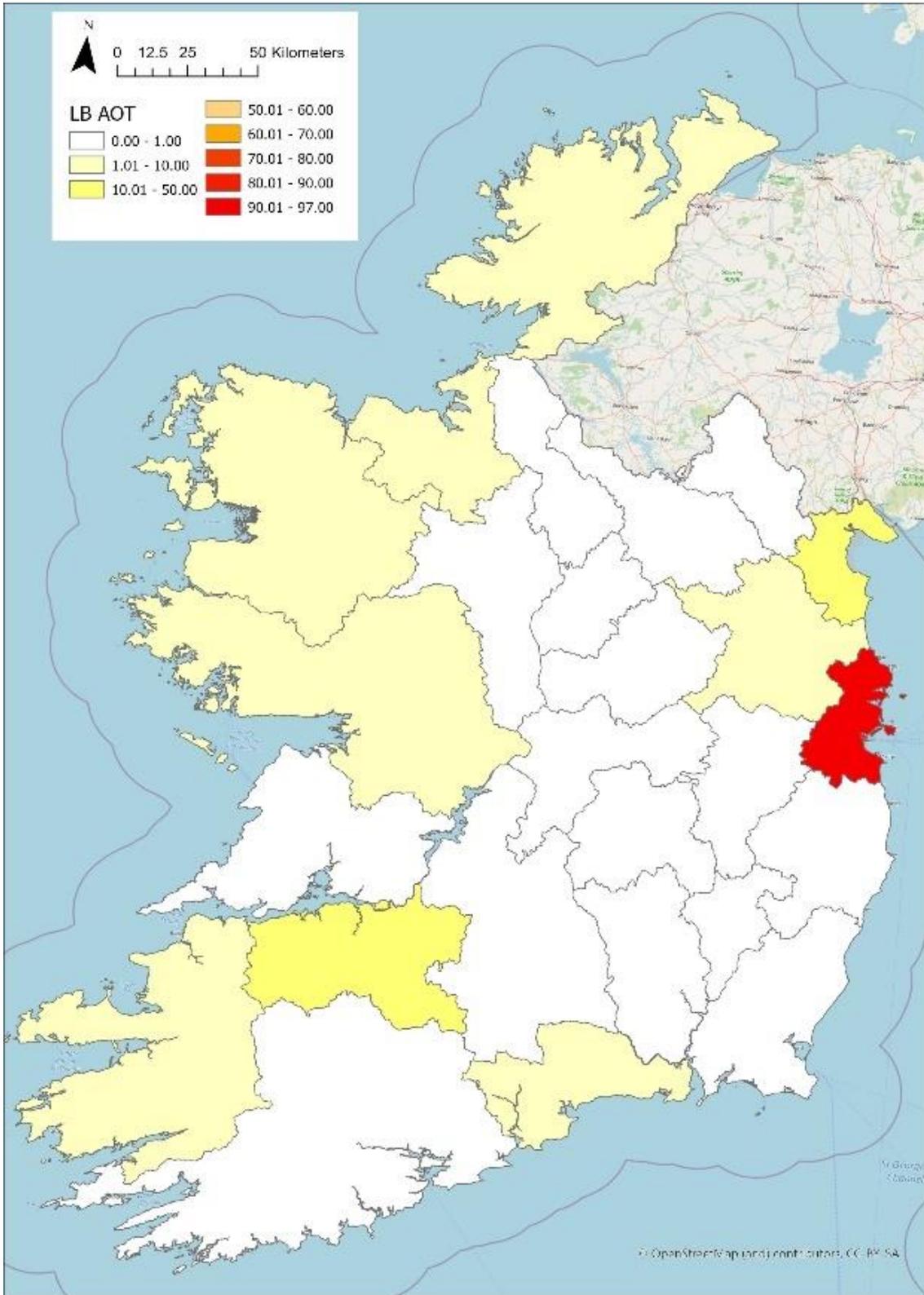


Figure 8 Lesser Black-backed Gulls – observed AOT in urban breeding habitat (by county)

4.3 Target Area Population Counts

Of the 136 extra squares surveyed, 63 were allocated alongside 20 priority survey squares located in seven target areas. In these target areas coverage was maximised in order to cover all, or close to all, available urban habitat (Figure 4). This provided more complete data upon which population modelling could be applied. The seven target areas were (1) Bray, (2) Howth, (3) Skerries, (4) Balbriggan, (5) Drogheda, (6) Mullingar and (7) Athlone. Howth, Skerries and Balbriggan are well known urban gull nesting areas where gull-human conflict has been widely reported. Bray and Drogheda are sizeable towns near Dublin with a known, but previously under-surveyed, urban gull nesting population and with the potential to become future conflict sites. Athlone and Mullingar are sizeable inland towns in close proximity to large freshwater bodies, one of which (Lough Ree near Athlone) is known to host a significant Lesser Black-backed Gull breeding population.

Dublin City Centre and adjacent coastal suburbs also received extra square coverage in order to provide additional data for population modelling there. These data are not modelled and presented here in the same manner as for the seven target areas due to survey constraints (available time, budget, personnel etc) not allowing for the full area to be covered. The seven target areas being smaller and more defined geographically allow for small scale, detailed reporting compared to the less well defined and sprawling nature of the inner city and adjacent areas.

Modelled population estimates for both Herring and Lesser Black-backed Gulls are presented for these target areas in Appendix 6. Note that the modelled populations for Balbriggan includes three squares (IO1864, IO1864 and IO1962) which, due to relatively new building developments, were not classed as urban in the available CORINE dataset which excludes them from national modelled population analysis but they are included here in minimum counts. A summary of each area is given below.

Bray, Co. Wicklow

An observed total of four AONs and 17 AOTs for Herring Gull recorded along the coastal section of the town. Preliminary modelling indicates that the town's Herring Gull population to be approximately 62 AONs. Extensive coverage of the inland housing estates revealed little to no territorial gull presence in those areas. Just two individual Lesser Black-backed Gulls were noted engaging with suitable urban nesting habitat. Bray appears to host the largest number of breeding Herring Gulls in Wicklow, with just small numbers of birds observed in Greystones, Wicklow Town and Arklow (although coverage in Bray was more complete). It would appear that the Herring Gulls breeding in Bray are a spill over from nearby Dublin, and as such are occupying the prime nesting locations along the coast, or perhaps is a small breeding population which has yet to expand into housing estates.

Howth, Co. Dublin

A busy location for breeding Herring Gulls with 110 AONs and 153 AOTs observed during these surveys. These counts compare favourably with those presented in the survey conducted by Roughan & O'Donovan here in 2018, during which 147 nests were found using a mix of methods: media appeal, walking survey and drone survey. Both surveys identified centres of breeding around the Evora, Grace O'Malley and Balkill housing estates. Preliminary modelling indicates that the town's Herring Gull population to be approximately 460 AONs.

Skerries, Co. Dublin

Another site with high breeding abundance of Herring Gulls with 71 AONs and 101 AOTs observed during these surveys. Again, these counts compare favourably with those presented in the survey conducted by Roughan & O'Donovan here in 2018, during which 72 nests were found using a mix of methods (media appeal, walking survey and drone survey). The 2021 survey found that the

distribution of nests around Skerries was quite evenly spread but with some clusters closer to the coast (e.g. Mourne View estate). Preliminary modelling indicates that the town's Herring Gull population to be approximately 249 AONs.

Balbriggan, Co. Dublin

A well-known area for urban breeding gulls with records showing as many as 57 nests as far back as 1996 (see Appendix 1). Survey coverage of all urban habitats in this area in 2021 using the ground-based method revealed impressive totals of 267 AONs, 328 AOTs and 800 IND for Herring Gull plus four AONs, six AOTs and 16 IND for Lesser Black-backed Gull. These counts are higher than those presented in the survey conducted by Roughan & O'Donovan here in 2018, during which 232 nests were found using a mix of methods (media appeal, walking survey and drone survey). The 2021 survey allowed for more complete coverage of the housing estate areas around Balbriggan whereas the 2018 survey was able to obtain a better count of nests found on industrial and school rooftops using drones. As such, both survey methods work towards filling gaps of the other and suggest that a combined survey approach could be utilised for future surveys in this area. Preliminary modelling indicates that this town's Herring Gull population to be 1,485 AONs and 10 AONs for the Lesser Black-backed Gull breeding population.

Both surveys identified similar centres of breeding activity in Balbriggan such as the Wavin factory compound, Ardgillan Community College/Bracken Educate Together site and the Hampton Cove/Fancourt estates. The 2021 survey also identified other sites such as the Lambeecher, Moylaragh, Westbrook and Chapel estates as hosting high numbers of breeding Herring Gulls. Some of the more recently developed areas at the west side of the town contained small colonies, such as the Balbriggan Educate Together National School and Flemington Community College (where some of the few Lesser Black-backed Gull nests were observed). In general, however, these more recently constructed estates on the inland side of the town supported fewer gull nests compared to the older, more coastal estates. Some element of differing roof and chimney design could be at play here and/or early stages of recruitment into these areas. In addition it is possible that efforts to control gulls at specific sites in the current or in previous years may be affecting population size and distribution within the town.

Drogheda, Co. Louth and Co. Meath

Complete survey coverage of the Drogheda area in 2021 has revealed a potentially significant number of breeding gulls in this area. Drogheda is different to areas of Dublin with similar levels of breeding gull activity in such that it is not connected directly to the coast by an unbroken extent of urban habitat. The town centre is some 6.5km from the open sea, yet the mix of active shipping along a large tidal river, extensive urban waterfront and adjacent housing estates has seemingly created an attractive breeding habitat. Totals of 129 AONs and 246 AOTs for Herring Gull and eight AONs and 11 AOTs for Lesser Black-backed Gull suggest this is the strongest centre for urban nesting gulls outside of Dublin known so far.

Preliminary modelling indicates that this town's Herring Gull population to be approximately 360 AONs and 24 AONs for the Lesser Black-backed Gull breeding population.

Mullingar, Co. Westmeath

Situated close to Lough Owel and Lough Ennell, Mullingar was selected as an inland site to survey for urban nesting gulls on account of its size and presence of residential and industrial estates. Lesser Black-backed Gulls occur around the adjacent lakes in the breeding season but are not known to breed in any significant number on account of a lack of suitable nesting islands. As such, an urban area in

close proximity to lakes where birds gather in summer may provide an alternative breeding location. The 2021 surveys found no Lesser Black-backed Gulls engaging with suitable urban nesting habitat around Mullingar. Herring Gull is an uncommon visitor to this area and no adult birds were observed engaging with suitable urban nesting habitat.

Athlone, Co. Westmeath and Co. Roscommon

With its relatively large size and mix of housing estates plus industrial buildings, Athlone would appear to be a likely site for inland urban nesting gulls, particularly Lesser Black-backed Gull which is known to breed in significant numbers at inland sites like this in the UK. Its proximity to Lough Ree where large numbers of Lesser Black-backed Gulls breed may also suggest this. However, the 2021 survey found just a handful of individual Lesser Black-backed Gulls present around the town and just 1 AOT observed. It would appear that the island nesting sites of nearby Lough Ree may cancel out the need for urban nesting by Lesser Black-backed Gulls in the Athlone area at present. Herring Gull is an uncommon visitor to this area and no adult birds were observed engaging with suitable urban nesting habitat.

4.4 Additional Species

Black-headed Gull was recorded in one square near Dunfanaghy, Co. Donegal, as a single breeding plumage adult standing on suitable rooftop nesting habitat. This most likely refers to a loafing, non-breeding bird although suitable wetland nesting habitat occurs nearby at Dunfanaghy New Lake.

Common Gull was also recorded in one square in Castlebar, Co. Mayo, again as a single breeding plumage adult standing on suitable rooftop nesting habitat. While this also most likely refers to a loafing, non-breeding bird, it should be noted that the square is near Lough Lannagh and other lakes with suitable island and shoreline nesting habitat.

Great Black-backed Gull was recorded in 13 survey squares, totalling 24 individual adult birds seen engaging with potential urban nesting habitat. No suspected AONs or AOTs were recorded, however. These records refer to: a count of six birds in one square in Killybegs Co Donegal; two single birds in two separate squares in Westport, Co Mayo; a single bird in one square in Ashbourne Co Meath; and two birds in a single square in Wicklow Town. The remaining thirteen birds were found across eight squares in Dublin, with six at a square in Howth and the final seven as singles at squares in Balbriggan (n = 3), Ballyogan, Finglas, Blanchardstown and Clondalkin. It was noted in each of these areas that the Great Black-backed Gulls recorded on rooftops were at or near fishing harbours or industrial estates so likely refer to loafing, non-breeding birds rather than true breeding birds.

No records were received of Common Terns or Kittiwakes engaging with potential urban nesting habitat in the survey squares.

5. DISCUSSION

Insights into urban gull breeding biology and interactions with humans discussed here, are largely based on anecdotal evidence and general impressions from observations in the field during the extent of this survey. Some of the ideas and issues have been presented previously in a British context²¹ in relation to urban nesting gulls.

It appears that a range of variables may determine the presence or absence of urban nesting gulls in a given town or city in Ireland. Factors such as distance from the sea, proximity to a known or historical natural breeding site (natal philopatry²²), or to a river or water body, the age of housing estates and buildings, extent of industrial areas and history of roof nesting in an area likely all play a role here. In addition, the extent of gull deterrents used, or scale of nest removal and control is more prevalent in recent years, particularly in well-known gull-human conflict areas. Recording fine scale data such as nest location, distance from water body, number of deterrents used etc was outside the remit of this survey. Further research into all aspects of urban gull breeding biology, causes for conflict with humans and deterrent methods is strongly recommended.

5.1 Aspects of breeding biology and nest site location

Throughout the survey it was clear that a wide range of nest sites and building types are utilised by urban nesting gulls. Building types ranged from inner city terraced houses or semidetached housing in suburban estates where nest sites would be relatively low to the ground (<10m), to rows of tall Georgian townhouses, high rise apartment blocks, commercial buildings and hospitals where nests could be found on flat surfaces or nestled next to and even in, chimney pots.

Nests in housing estates were usually found on or around chimney stacks, either positioned in between groups of four or two chimney pots or supported in the space between where the stack comes out of the slanted roof. Less frequently were nests found out on an open slanted roof where it might be more prone to slipping or damage caused by rain and wind. Density of nests in these housing estates could range from one pair per street to a nest on every second or so building resulting in small colonies of 5 – 10 pairs on a single street (e.g. as observed in some areas of Balbriggan, Co. Dublin).

²¹ Rock, P. (2005) Urban gulls: problems and solutions. *British Birds* 98: 338-355

²² Harris, M.P. (2008). Aspects of the breeding biology of the gulls *Larus argentatus*, *L. fuscus* and *L. marinus*. *Ibis*. **106**. 432 - 456. DOI: 10.1111/j.1474-919X.1964.tb03725.x.



Figure 9 Examples of typical urban roof nest sites encountered during surveys around Dublin. Herring Gull nest, occupying the space between a slanted roof and protruding chimney (left); Herring Gull nest located on an open slanted roof (top right); Lesser Black-backed Gull nest inside a chimney pot (bottom right).

Nests found on taller buildings such as in urban centres, hospitals or industrial estates were generally flat in aspect or making use of shallower slanted roof types compared to those found in residential housing estates. In many of these scenarios, nests were often less visible compared to those of housing estates and presence of breeding birds was often inferred by calling individuals or obvious territorial behaviour noted between pairs. Colonies of gulls with numbers of birds and spacing between nests more similar to those found on coastal headlands and islands could be encountered on occasion at taller, open and flat rooftop sites. In such scenarios, mixed breeding groups of Herring Gull and Lesser Black-backed Gull pairs near each other could be found (e.g. the Guinness Storehouse and Heuston Train Station depot in Dublin City).

One curious observation of Herring Gulls and Lesser Black-backed Gulls nesting close together included an occupied nest of each utilising the same chimney stack (with four pairs of pots) on a Georgian townhouse in Dublin City Centre. The nests were less than a metre apart with little or no aggression noted between incubating and attending birds present there.

Proximity to the sea or water courses such as lakes and rivers is a variable worth investigating but with no clear or obvious relationship based on observations in the field during this survey. It was apparent that that coastal towns where good numbers of nesting gulls could be found such as Howth and Skerries with obvious connections to maritime and/or fishing activities could be well occupied by gulls and in contrast seemingly similar areas such as Rush, Wicklow Town, Arklow and Wexford town had very few nesting gulls. In some scenarios, concentrations of nesting gulls could be found well away



Figure 10 A typical Herring Gull nest (centre) near ground level in a flower bed at Balbriggan Garda Station. Note the nest has been marked with a traffic cone. (image courtesy: João de Brito)

from the coast or direct open sea, such as at Drogheda and Waterford, but both have strong estuarine river influences and active ports. In these cases, nesting gulls were found 7 - 10km away from the open coast.

Apart from sites up to 10km from the coast around Dublin City, inland nesting of Herring Gulls did not occur in any noticeable numbers, with sporadic individuals or territories at best often the case. Territorial Lesser Black-backed Gulls occurred at inland sites such as Athlone and Longford town, as was expected but the lack of any confirmed breeding birds at such locations, especially near large water bodies and where industrial estates occur, was surprising. It seems that Lesser Black-backed Gulls have not yet taken advantage of urban nesting opportunities in Ireland in the same way they have in Britain. Relatively low numbers of pairs were found in Galway, Limerick, Waterford and Drogheda (sites influenced by the coast or estuarine rivers). Dublin also hosted this species but generally in discrete colonies or loose aggregations as opposed to a more even distribution across the surveyed sites.

These discrepancies between breeding sites relating to proximity to coast and other waterbodies suggests that other factors are likely at play when it comes to determining nesting areas for urban gulls. Accessibility to food resources (natural, refuse or feeding by humans) may play a part but also the type of building, levels of urbanisation and previous history of nesting gulls in those areas.

Of interest was a successful breeding of a pair of Herring Gulls at Thomas Street, Dublin City Centre which was comprised of an immature female (4th calendar year/3rd summer) and an adult male. The female was aged by the near adult like plumage but with brown feathering in the wing coverts, tertials and tail along with a small amount of black in the bill and faded, dark brown primaries, lacking obvious white tips. Both birds were assigned sex based on behaviour and size. Their nest site was unusual, located in a large plant pot on the ground in the communal courtyard of an apartment building located several floors up. The pair laid one egg on or before 22nd May, which then hatched on or before 22nd June, and the chick later successfully fledged (N. Keogh pers. obs.). The pair accepted the presence of most human activity in the courtyard area and were noted as more approachable than most roof nesting gulls but alarm calls and defence tactics (swooping flight) were initiated when a human came within a couple of metres of the nest. The incubation period of c.30 days falls in line with that known for Herring Gull²³ but the unusual location of the nest and small clutch size (usually three eggs) may be explained by the inexperienced nature of the pair. This was the only immature-adult breeding pair of gulls noted during the survey.



Figure 11 Herring Gull nest site in large plant pot at ground level in courtyard (top left); immature female (4th calendar year/3rd summer) of the breeding pair (bottom left); adult male with a young chick in the plant pot nest site (right)

²³ BTO Bird Facts – Herring Gull *Larus argentatus* <https://app.bto.org/birdfacts/results/bob5921.htm> (Accessed 14/09/2021)

5.2 Deterrents

Various types of gull deterrents were recorded on rooftops of both residential and commercial buildings. It was noted that the presence, amount and diversity of deterrent type was highest in areas with larger numbers of roof nesting gulls and in areas where gulls are often considered to be problematic (i.e. Balbriggan, Howth, Skerries and Dublin City Centre).

Bird spikes

Those seemingly targeting nesting gulls were found surrounding the tops of chimney stacks or in the space between chimney stacks which protrude from slanted rooftops. Spikes could also be regularly found positioned along the apex of residential roofs. They were also noted along the edges of commercial or private buildings but in some cases, it was clear that the intended species to deter here was Feral Pigeon. Though spikes appeared to be successful in deterring gulls in most cases, a small number of active nest sites were noted where Herring Gulls nested directly on top of spikes positioned on a chimney top. It appears that enough nesting material was used in these cases to negate the effectiveness of the spikes in acting as a deterrent.



Figure 12 Herring Gull incubating on a nest built on top of bird spikes erected on a chimney at Beggars Bush, Co. Dublin.

Razor wire

Most frequently noted on residential buildings as loose coils or bundles in the space between chimney stacks protruding out of the slanted roof, particularly in the Balbriggan, Skerries and Howth areas. This method appears to be successful at deterring gulls from most sites where it is installed. In some cases, where the coils or bundles were loose, Herring Gulls could gain access to the space in between the chimney and roof under the razor wire and continue nesting with what was, in effect, a protective cage over the nest site.

Wire cages

Usually noted as caged over the top of chimney stacks or over the space between a chimney stack protruding out of the side of a slanted roof on residential buildings. In some cases, the flat nature of the top of the wire cage allowed Herring Gulls to simply build a nest on top of them. Some wire cages were modified and used in conjunction with spikes on the top to discourage nesting there.



Figure 13 Example of a wire cage in conjunction with spikes erected in order to deter Herring Gulls from nesting on a chimney at Beggars Bush, Co. Dublin

Roof netting

A common method used on the wider, open-topped roofs of tall commercial buildings and hospitals where chimneys are often not found. Usually the netting is propped up by poles to give structure and support but in some cases the netting was found to be slack. In scenarios such as this, there is the potential for gulls to land on the netting and get their legs tangled, resulting in injury, immobilisation and in some cases, death. The carcasses of two adult Herring Gulls were observed hanging from such netting in Dublin City Centre along Eden Quay.



Figure 14 Example of roof netting erected over tall townhouse buildings in Dublin City Centre to deter gulls from nesting on the roof. Note that the netting does not cover over the top of the chimney pots which might allow gulls to nest between them and potentially tangle themselves in the adjacent net

Bird scarers / flying kites

This method was noted most often on the wider, open topped roofs of tall commercial buildings and hospitals where chimneys are often not found and seemed to be less popular in residential areas but a small number of gardens in Balbriggan opted for this method. Seemingly an effective measure for deterring gulls from nesting in the immediate vicinity due to the erratic nature of the kite moving around in the wind.



Figure 15 Example of a bird of prey shaped kite used as a bird scarer on top of a tall commercial building in Dublin City Centre

Model birds of prey

Models of owls and falcons were usually seen on the wider, open topped roofs of tall commercial buildings and hospitals where chimneys are often not found but a small number were observed on lower residential buildings. The efficacy of these is questioned as the motionless nature of the object most likely allows for gulls to become used to them over time. In some cases, the models were observed to be covered in droppings and Herring Gulls were observed standing on or near them, seemingly unperturbed by their presence.

Alarm or predator calls

This method was noted at two locations in Dublin City Centre at commercial and non-residential sites and involved playing sound recordings of gull agitation noises and alarm calls on a loop. Whilst this method was only noted at two sites, both areas did not host any nesting or loafing gulls. This non-invasive method could prove useful and may be worthy of more rigorous field testing. However, for locations where existing noise from calling territorial gulls is perceived to cause a negative impact, such as residential areas, this method may not be appropriate.

5.3 Interactions with humans, litter and rehabilitation

During survey work, several curious interactions between humans and gulls were noted, both objectively positive and negative.

An abundance of food in urban areas is thought to be a major contributing factor to the rise of some species of gull nesting in towns and cities²⁴. A large part of this is derived from scavenging on poorly maintained refuse sacks, bins and discarded food items. Plastic bin bags left out on the side of the road or in front of premises are easily accessed by gulls, especially in the early hours of the morning when city streets are relatively quiet. After tackling a bag of rubbish, foraging gulls often leave a trail of litter in their wake, which has the potential to further attract Feral Pigeons, corvids and Foxes. This behaviour is one of the many reasons why some people consider them a pest.

Some other people can and do hold gulls in higher regard. Many urban gulls avail of supplementary feeding opportunities provided by humans directly feeding them. This is most frequently observed as the feeding of bread to wildfowl at ponds in urban parks, which gulls are adept at acquiring and throwing discarded food to gulls at the seaside or on piers and harbours. Other examples observed during survey work in 2021 included throwing of bread and other foodstuffs out onto amenity grasslands in housing estates and on a few occasions (presumably as a convenient means of waste disposal), deliberate feeding of birds (gulls and pigeons) on the street outside people's houses. In both cases, the people involved were asked by a surveyor if they were consciously feeding the gulls (as opposed to inadvertently doing so, perhaps intending to feed another species), and the response was yes, an activity which they got great enjoyment out of. So, it would appear that the attitudes towards gulls in the urban environment are not entirely negative.

Negative interactions with roof nesting gulls were encountered by surveyors during the course of fieldwork, particularly at sites in north Co. Dublin (Balbriggan, Howth and Skerries) where agitated adult gulls (usually with recently hatched chicks as opposed to a nest with eggs) would swoop at the surveyor (and nearby dogs) while they were walking nearby. In these cases, no physical contact was

²⁴ Ouled-Cheikh, J., Morera-Pujol, V., Bahillo, Á., Ramírez, F., Cerdà-Cuellar, M., Ramos, R. (2021) Foraging in the Anthropocene: Feeding plasticity of an opportunistic predator revealed by long term monitoring. *Ecological Indicators*, Vol 129 <https://doi.org/10.1016/j.ecolind.2021.107943>

made by the gull, but swooping behaviour was initiated even when 20m or more away from the nest. In these instances, it was noted that the nest sites were located on the roof of houses quite close to the ground (<10m). It is likely that the regular presence of humans to the nest in these situations has driven aggressive behaviour²⁵. Lower levels of aggression were observed in some areas also and this appeared to be in situations where greater separation distances between people and nests occurred often with higher buildings. Perhaps the separation distance gives a perception of lower threat levels?

Nesting in open urban rooftop habitats has its downsides. Chicks regularly fall off and can be found wandering around on the street or trapped in spaces between buildings by June and July. Adults often also come into contact with wire, string, plastics etc. This can entangle them or can be ingested and cause injury or mortality. A number of wildlife rescue organisations and individuals take it upon themselves to rescue, raise and release gull chicks each year. The extent of this work and the number of birds involved is currently not fully accounted for, but in 2021, Wildlife Rehabilitation Ireland alone rescued and released over 80 young gulls²⁶. Other smaller scale efforts are undertaken by private individuals or organisations and such rehabilitation and release events were witnessed by surveyors this year at Bullock Harbour, Co. Dublin (S. Quinn pers. comm.) and Galway City, Co. Galway (N. Keogh pers. obs.).

5.4 Ringing

At present there is one active colour-ringing project on urban nesting gulls being carried out in Ireland, initiated by the Irish Midlands Ringing Group (IMRG) in 2017²⁷. This effort is focused on a mix of roof nesting gulls and those nesting on islands close to the coast (Ireland's Eye and Dalkey Island) and uses red coloured rings. Since 2017, IMRG have colour ringed over 1,000 Herring Gulls, Lesser Black-backed Gulls and Great Black-backed Gulls at both urban and island nesting sites around Dublin. It is envisaged that re-sightings data from this project could be used to assess survival, site fidelity, site usage, population and behaviour of individual urban and Island gulls in Dublin.

It was interesting to note that no colour-ringed adult gulls were noticed by fieldworkers during the course of the current urban gull nesting survey, particularly around Dublin. This may simply be explained by the fact that the IMRG project started in 2017 and many of the original colour birds many only just be now of breeding age or only recently recruiting back into the breeding population and occupying nest sites.

Colour-ringing projects such as these have the potential to answer questions in relation to the management and conservation of urban nesting gull populations. Information on recruitment, nest site and natal site fidelity and movement between breeding sites (specifically between urban breeding areas and cliff/island breeding areas) would potentially be beneficial. The ringing should, however, be balanced with a commensurate effort in encouraging and managing re-sightings and support for, reporting and analysis.

²⁵ Burger, J. (1981) Effects of Human Disturbance on Colonial Species, Particularly Gulls. *Colonial Waterbirds* 4: 28-31

²⁶ Irish Wildlife Rehabilitation tweet 1st August 2021

<https://twitter.com/WildlifeRI/status/1421932249856057351> (Accessed 14/09/2021)

²⁷ O'Halloran, J., Kelly, T. C., Quinn, J. L., Irwin, S., Fernández-Bellon, D., Caravaggi, A. and Smiddy, P. (2017) Current ornithological research in Ireland: seventh Ornithological Research Conference, UCC, November 2017. *Irish Birds* 10: 598-638

5.5 Additional recommendations for future surveys

Since an amendment in April 2017 the Wild Bird Declaration has allowed for the removal of nests and eggs of Herring, Great Black-backed and Lesser Black-backed Gulls in the Balbriggan area. This declaration has seen pest control/removal companies and contractors undertaking such works in the area. The extent of which this nest removal has had an effect on the observed numbers of roof nesting gulls during the 2021 survey was not quantified, as no active removal was noted on survey dates in Balbriggan. Future surveys in this area should incorporate an assessment of the scale of nest removal during a survey season in order to account for any likely effects on the total number of breeding birds present.

The allocation of extra squares to fill out coverage in target areas and gather supplementary counts at key sites was shown to be an effective way at estimating minimum population data for those locations. The number of these extra squares that could be allocated in 2021 was resource limited, but it is recommended that this method be encouraged during future surveys in order to collect more complete data for towns and cities that have established urban nesting gulls. For example, a vantage point survey for roof nesting gulls in Galway City conducted by staff from the Marine and Freshwater Research Centre at Galway-Mayo Institute of Technology during early June 2019 recorded a minimum of 70 Herring Gull AONs and 2 Lesser Black-backed Gull AONs (I. O'Connor pers. comm.). In comparison, the 3 priority squares allocated for Galway City during the 2021 survey (which were present in the same area surveyed by vantage point in 2019) recorded 14 Herring Gull AONs and 0 Lesser Black-backed Gull AONs using the ground-based method. While this underestimate will be managed by the application of modelling the use of combined methods where possible can enhance accuracy where complete counts are possible.

APPENDICES

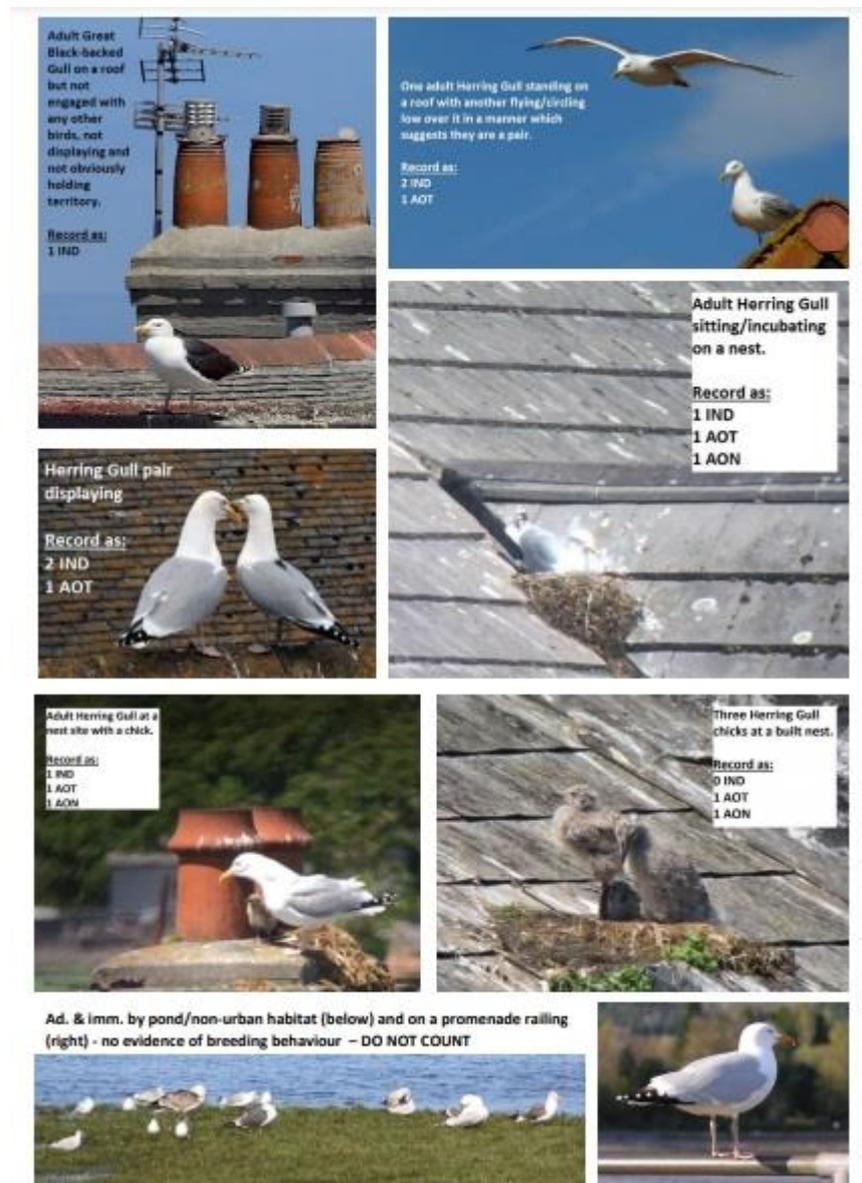
Appendix 1 Previous urban nesting gull surveys and records in Ireland

Summary table detailing previous urban nesting gull surveys and records in Ireland (this list is to be considered non-exhaustive). Species codes: HG = Herring Gull; LB = Lesser Black-backed Gull; KI = Kittiwake.

Species	County	Year	Location	Count Unit	Number	Method/Notes	Reference
HG	Dublin	1992	Balbriggan	Pair	1		Lenehan, L.J. (1997)
HG	Dublin	1996	Balbriggan	Nest	57	Ground based	Lenehan, L.J. (1997)
HG	Dublin	2003	Balbriggan	Nest	47	Ground based	Lenehan, L.J. (2009)
HG	Dublin	1978	Coolock	Nest	6		Harford, P. (1990)
HG	Dublin	1979	Coolock	Nest	4		Harford, P. (1990)
HG	Dublin	1980	Coolock	Nest	5		Harford, P. (1990)
HG	Dublin	1981	Coolock	Nest	4		Harford, P. (1990)
HG	Dublin	1982	Coolock	Nest	5		Harford, P. (1990)
HG	Dublin	1983	Coolock	Nest	0		Harford, P. (1990)
HG	Dublin	1984	Coolock	Nest	0		Harford, P. (1990)
HG	Dublin	1985	Coolock	Nest	1		Harford, P. (1990)
HG	Dublin	1986	Coolock	Nest	0		Harford, P. (1990)
HG	Dublin	1987	Coolock	Nest	0		Harford, P. (1990)
HG	Dublin	1988	Coolock	Nest	1		Harford, P. (1990)
HG	Dublin	1989	Coolock	Nest	1		Harford, P. (1990)
HG	Dublin	1990	Coolock	Nest	1		Harford, P. (1990)
HG	Dublin	1972	Dublin City Centre	Pair	1		Madden, B. (1994)
HG	Dublin	1984	Dublin City Centre	Pair	1		Madden, B. (1994)
HG	Dublin	1985	Dublin City Centre	Pair	2		Madden, B. (1994)
HG	Dublin	1988	Dublin City Centre	Pair	2		Madden, B. (1994)
HG	Dublin	1990	Dublin City Centre	Pair	2		Madden, B. (1994)
HG	Dublin	1991	Dublin City Centre	Pair	1		Madden, B. (1994)
HG	Dublin	1992	Dublin City Centre	Pair	4		Madden, B. (1994)
HG	Dublin	1993	Dublin City Centre	Pair	9		Madden, B. (1994)
HG	Dublin	1994	Dublin City Centre (North)	Pair	7		Madden, B. (1994)
HG	Dublin	1994	Dublin City Centre (South)	Nest	18	Ground based	Madden, B. (1994)
HG	Dublin	1978	Howth	Nest	1		Harford, P. (1990)
HG	Dublin	1979	Howth	Nest	3		Harford, P. (1990)
HG	Dublin	1980	Howth	Nest	3		Harford, P. (1990)
HG	Dublin	1981	Howth	Nest	7		Harford, P. (1990)
HG	Dublin	1982	Howth	Nest	12		Harford, P. (1990)
HG	Dublin	1983	Howth	Nest	12		Harford, P. (1990)
HG	Dublin	1984	Howth	Nest	14		Harford, P. (1990)
HG	Dublin	1985	Howth	Nest	14		Harford, P. (1990)
HG	Dublin	1986	Howth	Nest	14		Harford, P. (1990)
HG	Dublin	1987	Howth	Nest	20		Harford, P. (1990)
HG	Dublin	1988	Howth	Nest	23		Harford, P. (1990)
HG	Dublin	1989	Howth	Nest	31		Harford, P. (1990)
HG	Dublin	1990	Howth	Nest	29		Harford, P. (1990)
HG	Dublin	1981	Skerries	Pair	3		Harford, P. (1990)
HG	Dublin	1985	Skerries	Pair	4 or 5		Harford, P. (1990)
HG	Dublin	1990	Skerries	Pair	17		Harford, P. (1990)
HG	Galway	1982	Galway City	Pair	1		Harford, P. (1990)
HG	Galway	2019	Galway City	AON	70	Vantage Point	O'Connor, I. (2019)
HG	Waterford	1945	Dunmore East		Present	no count given	Harford, P. (1990)
HG	Waterford	1983	Dunmore East	Pair	13		Harford, P. (1990)
HG	Waterford	1985	Dunmore East	Pair	19		Harford, P. (1990)
HG	Waterford	1977	Killea, near Dunmore East	Pair	1		Harford, P. (1990)
HG	Waterford	1975	Kilmacthomas	Pair	1		Harford, P. (1990)
LB	Dublin	1991	Dublin City Centre (Islandbridge)	Pair	1		Dalton, A. (1992)
LB	Galway	2019	Galway City	AON	2	Vantage Point	O'Connor, I. (2019)
KI	Waterford	1978	Dunmore East	Nest	1	Nested on a light standard	O'Meara, M. (1979)

Appendix 2 Count record type – fieldworker examples

Examples of survey count unit types as provided on field sheets and workshop slides for surveyor familiarisation prior to fieldwork commencing.



Appendix 3 Data submission form

Example of one page from the urban gull survey online data submission form, where details such as square number, species and counts could be entered.

**CONTRACTED: Urban Nesting Gull Surveys Ireland** ...

* Required

Urban Gull Survey Data

This section is where you will enter your count data for the two target species, herring and lesser-black-backed gull. A separate section at the end of this survey is provided if you collected information on other species.

4. Survey Square Grid Reference *

Please enter the 4 figure grid reference of the 1km square you surveyed e.g. SS7249

5. Please choose the species you are entering data for first. *

If the square had no birds please enter 0 for all three count units.

HERGU

LBBGU

6. AON Count *

7. AOT Count *

This should be at least be equal to, or more than, your AON count

Appendix 4 County level minimum population estimates for Herring Gull and Lesser Black-backed Gull

Observed, uncorrected counts of AON, AOT and IND for each species. Counts are given for priority squares, extra squares (in target areas) and cumulative for both square types.

County	Square Type	Number	Herring Gull			Lesser Black-backed Gull		
			AON	AOT	IND	AON	AOT	IND
Carlow	Priority	8	0	0	0	0	0	0
	Extra	0	0	0	0	0	0	0
	Total	8	0	0	0	0	0	0
Cavan	Priority	10	0	0	0	0	0	0
	Extra	0	0	0	0	0	0	0
	Total	10	0	0	0	0	0	0
Clare	Priority	26	0	1	14	0	0	0
	Extra	1	0	0	0	0	0	0
	Total	27	0	1	14	0	0	0
Cork	Priority	63	3	18	76	0	1	10
	Extra	0	0	0	0	0	0	0
	Total	63	3	18	76	0	1	10
Donegal	Priority	31	0	0	2	1	4	7
	Extra	2	0	0	6	0	0	0
	Total	33	0	0	8	1	4	7
Dublin	Priority	68	147	254	716	10	26	58
	Extra	95	623	917	2533	23	71	253
	Total	163	770	1171	3249	33	97	311
Galway	Priority	34	14	46	89	6	6	16
	Extra	0	0	0	0	0	0	0
	Total	34	14	46	89	6	6	16
Kerry	Priority	27	0	3	11	0	2	14
	Extra	0	0	0	0	0	0	0
	Total	27	0	3	11	0	2	14
Kildare	Priority	30	0	0	1	0	0	0
	Extra	0	0	0	0	0	0	0
	Total	30	0	0	1	0	0	0
Kilkenny	Priority	17	0	0	0	0	0	0
	Extra	0	0	0	0	0	0	0
	Total	17	0	0	0	0	0	0
Laois	Priority	14	0	0	0	0	0	0
	Extra	0	0	0	0	0	0	0
	Total	14	0	0	0	0	0	0
Leitrim	Priority	3	0	0	0	0	0	0
	Extra	0	0	0	0	0	0	0
	Total	3	0	0	0	0	0	0
Limerick	Priority	38	1	2	11	1	12	81
	Extra	0	0	0	0	0	0	0
	Total	38	1	2	11	1	12	81

County	Square Type	Number	Herring Gull			Lesser Black-backed Gull		
			AON	AOT	IND	AON	AOT	IND
Longford	Priority	7	0	0	0	0	1	2
	Extra	0	0	0	0	0	0	0
	Total	7	0	0	0	0	1	2
Louth	Priority	36	20	77	124	1	2	8
	Extra	10	111	179	357	8	11	27
	Total	46	131	256	481	9	13	35
Mayo	Priority	23	0	8	18	0	6	20
	Extra	0	0	0	0	0	0	0
	Total	23	0	8	18	0	6	20
Meath	Priority	20	0	23	40	0	2	3
	Extra	4	0	0	0	0	0	0
	Total	24	0	23	40	0	2	3
Monaghan	Priority	10	0	0	0	0	0	0
	Extra	0	0	0	0	0	0	0
	Total	10	0	0	0	0	0	0
Offaly	Priority	18	0	0	0	0	0	0
	Extra	0	0	0	0	0	0	0
	Total	18	0	0	0	0	0	0
Roscommon	Priority	11	0	0	0	0	0	14
	Extra	3	0	0	0	0	0	0
	Total	14	0	0	0	0	0	14
Sligo	Priority	11	0	13	33	0	4	16
	Extra	0	0	0	0	0	0	0
	Total	11	0	13	33	0	4	16
Tipperary	Priority	21	0	0	0	0	0	4
	Extra	0	0	0	0	0	0	0
	Total	21	0	0	0	0	0	4
Waterford	Priority	14	19	46	77	4	8	13
	Extra	0	0	0	0	0	0	0
	Total	14	19	46	77	4	8	13
Westmeath	Priority	15	0	0	0	0	0	0
	Extra	12	0	0	0	0	1	2
	Total	27	0	0	0	0	1	2
Wexford	Priority	22	0	0	2	0	0	2
	Extra	0	0	0	0	0	0	0
	Total	22	0	0	2	0	0	2
Wicklow	Priority	17	0	4	13	0	0	0
	Extra	12	4	15	70	0	0	2
	Total	29	4	19	83	0	0	2

			Herring Gull			Lesser Black-backed Gull		
All Counties	Square Type	Number	AON	AOT	IND	AON	AOT	IND
	Priority	594	204	495	1227	23	74	268
	Extra	139	738	1111	2966	31	83	284
	Total	733	942	1606	4193	54	157	552

Appendix 5 Target area minimum population estimates (uncorrected) for Herring Gull and Lesser Black-backed Gull

Presented here are observed counts for AON, AOT and IND for each species. These counts are given for priority squares, extra squares (in target areas) and cumulative for both square types.

Site	Square Type	Number	Herring Gull			Lesser Black-backed Gull		
			AON	AOT	IND	AON	AOT	IND
Bray	Priority	3	0	3	17	0	0	0
	Extra	9	4	14	68	0	0	2
	Total	12	4	17	85	0	0	2
Howth	Priority	2	25	48	137	0	0	0
	Extra	12	85	105	280	0	0	0
	Total	14	110	153	417	0	0	0
Skerries	Priority	1	34	35	69	0	0	0
	Extra	3	37	66	163	0	0	0
	Total	4	71	101	232	0	0	0
Balbriggan	Priority	2	3	4	11	0	0	0
	Extra	10	264	324	789	4	6	16
	Total	12	267	328	800	4	6	16
Drogheda	Priority	4	18	67	113	0	0	4
	Extra	14	111	179	357	8	11	27
	Total	18	129	246	470	8	11	31
Mullingar	Priority	4	0	0	0	0	0	0
	Extra	2	0	0	0	0	0	0
	Total	6	0	0	0	0	0	0
Athlone	Priority	4	0	0	0	0	0	0
	Extra	13	0	0	0	0	1	2
	Total	17	0	0	0	0	1	2

Appendix 6 Target area minimum population estimates (adjusted and modelled) for Herring Gull and Lesser Black-backed Gull

Herring Gull: sum of adjusted units (to account for % square not surveyed)			
Site	AON	AOT	IND
Athlone	0	0	0
Balbriggan	249	307	717
Bray	4	19	101
Drogheda	144	270	515
Howth	110	153	417
Mullingar	0	0	0
Skerries	72	104	240
Grand Total	579	853	1990

Herring Gull: sum of modelled AON (and the 95 % confidence limits)			
Site	Sum of Model (lower confidence limit)	Sum of Model (predicted)	Sum of Model (upper confidence limit)
Athlone	1	3	7
Balbriggan	502	1485	4469
Bray	36	62	112
Drogheda	160	360	842
Howth	186	460	1199
Mullingar	0	2	3
Skerries	121	249	513
Grand Total	1006	2621	7145

Lesser Black-backed Gull: sum of adjusted units (to account for % square not surveyed)			
Site	AON	AOT	IND
Athlone	0	1	2
Balbriggan	4	6	13
Bray	0	0	2
Drogheda	9	12	36
Howth	0	0	0
Mullingar	0	0	0
Skerries	0	0	0
Grand Total	13	19	53

Lesser Black-backed Gull: sum of modelled AON (and the 95% confidence limits)			
Site	Sum of Model (lower confidence limit)	Sum of Model (predicted)	Sum of Model (upper confidence limit)
Athlone	1	3	8
Balbriggan	5	10	17
Bray	2	6	10
Drogheda	13	24	47
Howth	0	2	4
Mullingar	0	2	2
Skerries	0	0	0
Grand Total	21	47	88

