



Arklow Bank Wind Park 2

Environmental Impact Assessment Report

Volume III, Appendix 12.18 Offshore Ornithology Technical Report -
Kittiwake Tracking Report (RFI March 2026)



Biotelemetry and diet analysis of Black-legged kittiwake distribution in the Irish Sea

Emma Murphy & Mark Jessopp
University College Cork

Contents

Background	1
Methods	1
Results	3
Discussion	9
References	10

Table of Figures

Figure 1: All tracking data recorded for black-legged kittiwake at Wicklow Head, July 2024	4
Figure 2: Examples of kittiwake foraging trips recorded from Wicklow Head colony, July 2024	6
Figure 3: Kittiwake projected distribution for over 3-hour foraging trips at Wicklow Head compared to the average maximum distance travelled by tracked birds from Wicklow Head Colony, July 2024	7
Figure 4: 50% utilization distribution illustrating kittiwake foraging hotspot based on tracking data at Wicklow Head colony, July 2024	8

Background

University College Cork was commissioned by Sure Partners Ltd to conduct a tracking and diet analysis of black-legged kittiwake (*Rissa tridactyla*), hereafter kittiwake, in the Irish Sea. This is a species of high conservation concern in Ireland (Gilbert *et al.*, 2021; IUCN 2022), and without appropriate baseline data and well-informed conservation protocols, have the potential to face negative impacts from the expansion of offshore wind developments. The kittiwake colony at Wicklow Head, comprising an estimated 773 breeding pairs (Daunt, 2023), is a key site for this study due to its proximity to planned offshore wind energy infrastructure in the coming years.

Methods

Tracking Data

A total of 20 breeding adult kittiwakes were equipped with Pathtrack NanoFix Geo+RF (GPS) and Lotek MK4083 Geolocators (GLS) from a sub colony at the concrete pier below Wicklow Head Lighthouse (52.965, -5.999), from the 7th to the 10th of July 2024. All capture, handling and tagging was completed under license from the National Parks and Wildlife Service (C114/2023) and the British Trust for Ornithology (C/6143).

GPS tags were attached on the centre of the birds back using Tesa 4651 waterproof tape, and GLS devices were attached to the tarsus (leg) using a coloured plastic leg ring. The total weight of both devices weighed 1.75% the average weight of the bird, limiting potential negative impacts due to weight and hydrodynamic drag for the duration of the deployment. GLS devices will remain on the bird, recording non-breeding distribution, until recovered in summer 2025. Two GPS sampling schedules were used to prolong battery life as kittiwakes are visual foragers with typically little to no foraging activity at night (Daunt *et al.*, 2002). 10 tags were programmed to record a location fix every

4 minutes between the hours of 3am and 11pm, and 10 tags were programmed with 4-minute intervals across the full 24 hours.

The use of GPS devices with remote download capabilities meant there was no need to recapture birds to recover devices, with all data downloaded to an on-site base station. Data were successfully collected from deployment birds until the 15th of July after which tags had either dropped off the birds or the batteries had depleted. Premature cessation of recording (i.e., up to 48 hours post-deployment) is likely a result of the birds preening the tag off either at sea or at the colony.

Diet Analysis

On handling, kittiwakes often spontaneously regurgitate. A total of 5 regurgitate samples were collected from deployment birds to conduct diet analysis for this colony. Samples collected were partially digested, preventing prey species identification through identification of whole regurgitated fish. The regurgitates were therefore examined using Next-Generation DNA Sequencing and metabarcoding to identify potentially important prey for kittiwakes at this colony during the breeding season. Two DNA samples per individual were extracted and sequenced, and these sequences were matched to a species using the Basic Local Alignment Search Tool (BLAST) online database.

Tracking Data Analysis

All tracking data were plotted. Tracks for each bird were then divided into individual foraging trips, with trip duration based on the first point beyond a 1km buffer from the colony and the first subsequent point to pass back through this buffer. Any incomplete trips or trips with a duration less than 10 minutes were disregarded from the data set. Following this, the number of foraging trips per individual was determined, and the mean maximum distance and average length of foraging trips were calculated. Maximum foraging trip distance and duration was compared with the foraging radius model reported previously. Finally, we highlight core foraging areas for tracked kittiwakes mapping 50% kernel density utilization distribution at 1km² resolution to describe the areas where individuals were found most regularly at sea while on a foraging trip.

Results

Of the 20 birds equipped, tracking data for 17 individuals was collected. Based on the trip defining criteria used, a total of 60 foraging trips were recorded across 15 individuals. The remaining two individuals did not provide sufficient data points beyond the 1km buffer to identify any complete foraging trips, with tags likely prematurely preened off. The average weight of the deployment birds was 345g.

Table 1: Kittiwake Tracking Data Summary from Wicklow Head, July 2024

Total number of birds tracked	17
Total number location points recorded	11,037
Total number of foraging trips recorded	60
Maximum distance travelled from colony (km)	62.95
Mean maximum distance from colony (km) \pm SD	31.9 \pm 14.86
Minimum trip duration recorded (mins)	48
Maximum trip length recorded (hrs)	25.6
Mean foraging trip duration (hrs) \pm SD	8.4 \pm 6.26

Table 2: Tracking summary per individual tracked at Wicklow Head, July 2024

<i>Individual ID</i>	Data Points Recorded	Recording Period (h)	Trips Taken	Max Distance (km)	Max Trip Time (h)
46262	1422	109.4	6	52.11	23.7
46265	328	25.1	2	47.34	15
46268	330	41.9	3	35.84	11.1
46269	1476	120.5	10	62.95	21.7
46270	401	41.8	2	46.36	17.8
46282	394	30.4	1	37.47	16.1
46291	1058	82.4	6	58.94	22.3
46292	1135	91.4	7	54.95	13.6
46293	262	25	1	11.38	1.9
46294	334	29	2	35.18	17.9
46304	920	106.9	7	47.55	16.7
46305	523	51.1	5	38.50	25.6
46312	1190	108.4	0	NA	NA
46313	159	12.3	1	33.09	4.3
46317	124	12.5	0	NA	NA
46323	719	52.7	5	30.71	8.4
47533	262	24.5	2	31.37	6.5

Below is a plot of all tracking data recorded per individual at the Wicklow Head colony, between the 7th and 15th of July 2024.

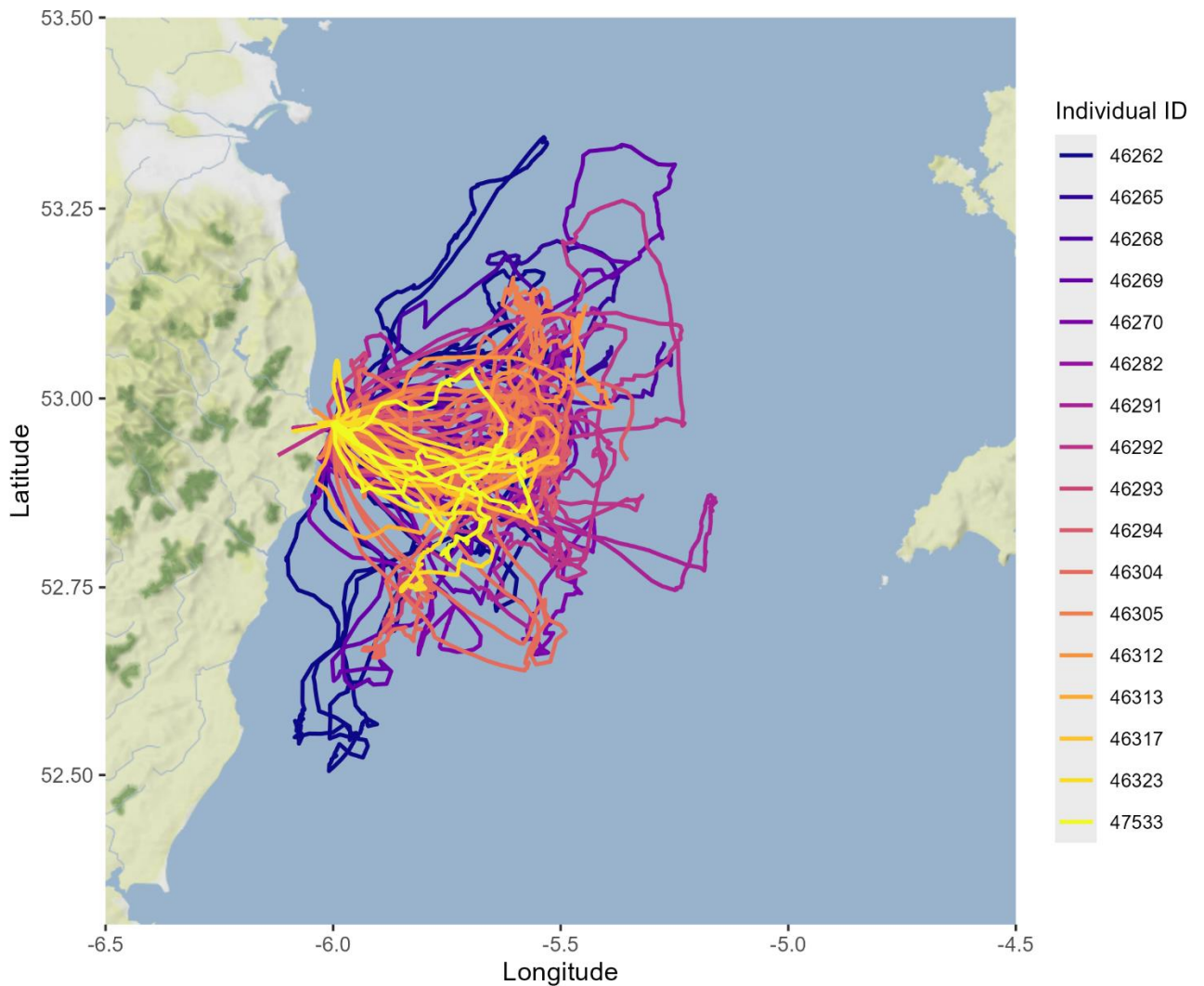
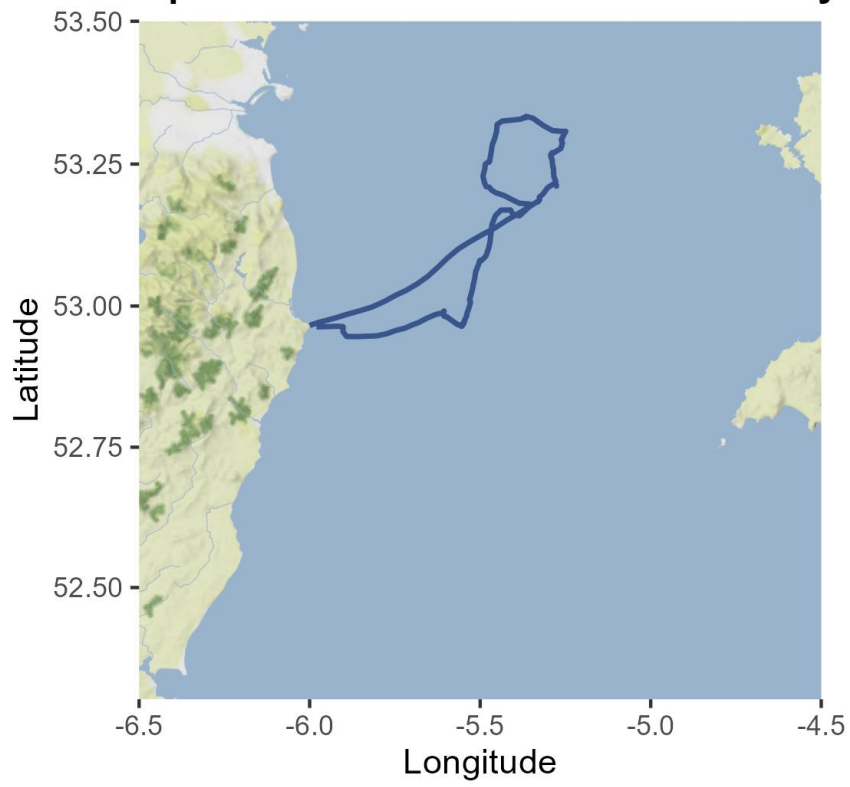


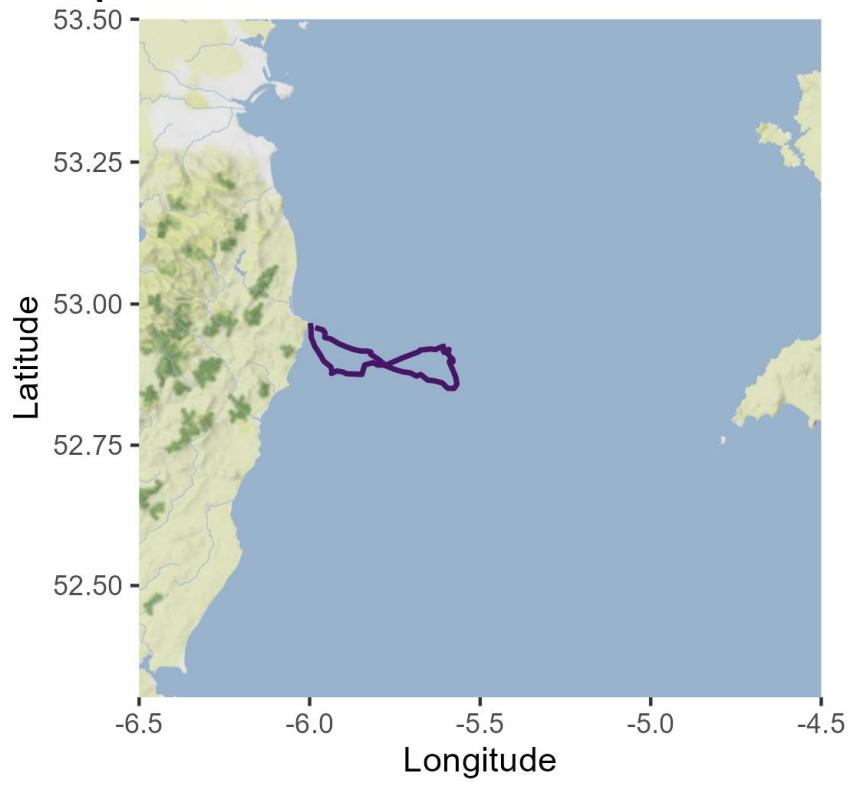
Figure 1: All tracking data recorded for black-legged kittiwake at Wicklow Head, July 2024

Examples of kittiwake foraging trips for the Wicklow Head are shown in Figure 2 (a – d). These maps illustrate the furthest distance travelled for a foraging trip (62.95km), a trip of similar distance to the mean distance travelled by tracked birds (31.4km), the longest duration spent on one trip with no overnight resting period (11.5hrs), and the longest duration with an overnight period spent at sea (25.6hrs).

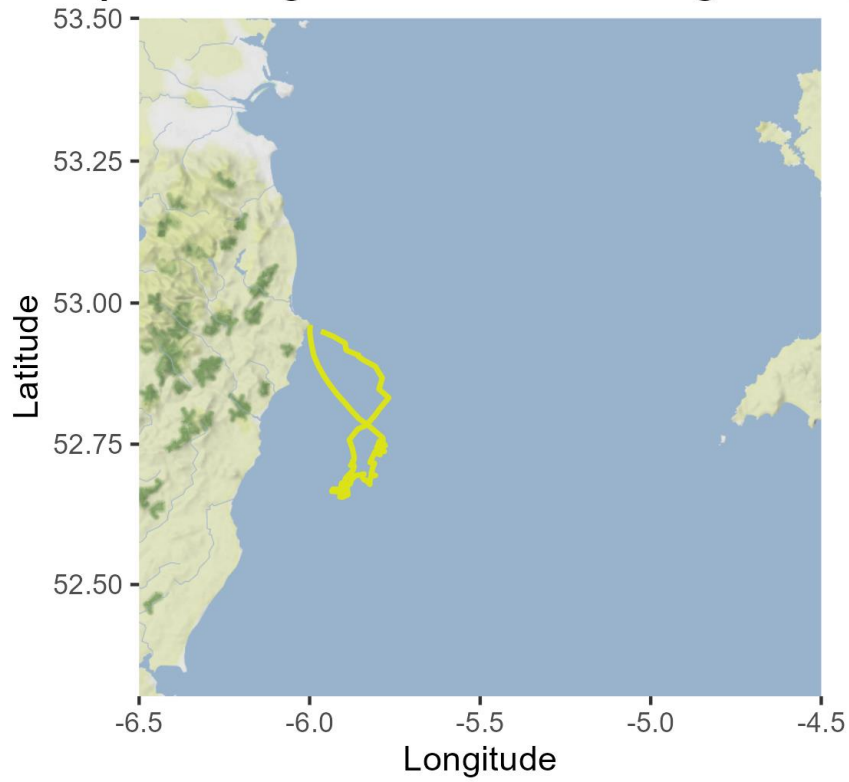
Trip 14 - Furthest Distance from Colony



Trip 59 - Similar to mean max distance travelled



Trip 46 - Longest Duration excluding Overnight



Trip 51 - Longest Duration including Overnight

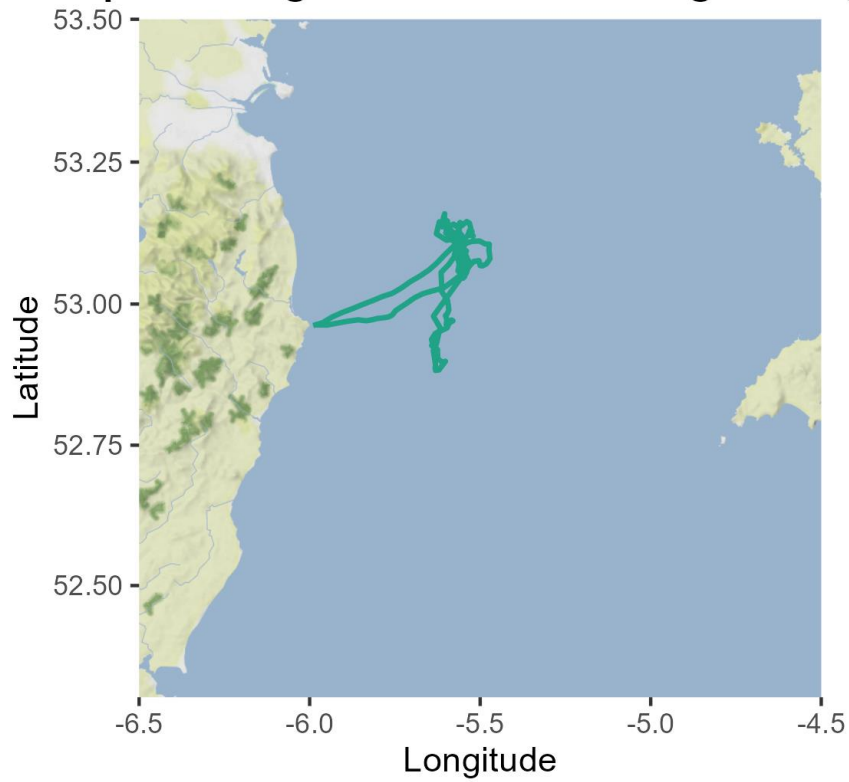


Figure 2: Examples of kittiwake foraging trips recorded from Wicklow Head colony, July 2024

There is good agreement between the mean maximum distance travelled by birds in this study, and the previously modelled foraging distribution based on a 3-hour trip length assumed from monitoring in 2023 (Figure 3). The 50% utilization distribution highlights the core area for foraging for birds from this colony (Figure 4). A hotspot surrounding the colony area is to be expected, however a core foraging area was also identified between 25 to 35km offshore from to Wicklow Head colony.

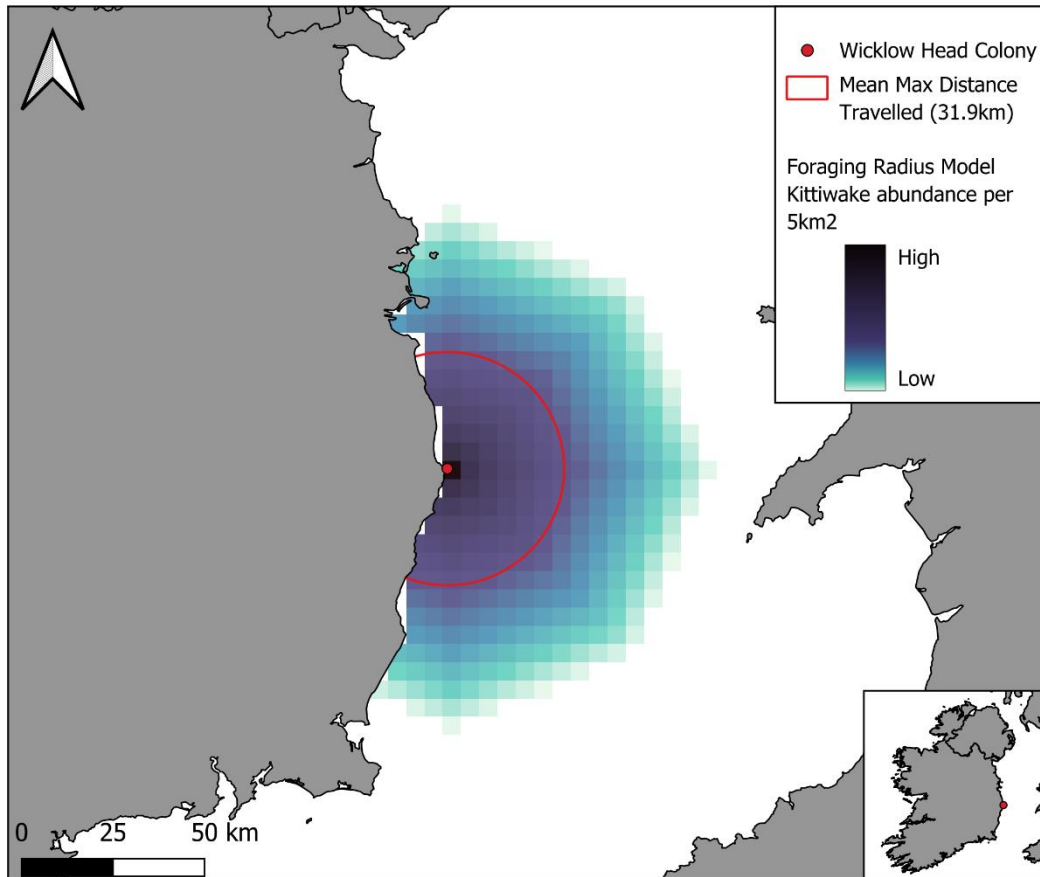


Figure 3: Kittiwake projected distribution for over 3-hour foraging trips at Wicklow Head compared to the average maximum distance travelled by tracked birds from Wicklow Head Colony, July 2024



Figure 4: 50% utilization distribution illustrating kittiwake foraging hotspot based on tracking data at Wicklow Head colony, July 2024

Based on the five diet samples collected, the primary prey species identified for kittiwakes at Wicklow Head were sprat, sandeel, and herring (Table 3). Sprat occurred in the diet of kittiwakes from all 5 samples, while sandeel was only detected in 3 of the 5 samples. The detection of lesser spotted catshark and northern rockling is likely attributable to larvae consumed by the prey fish ingested by the kittiwakes, rather than direct predation. The sequences attributed to sandeel could not be definitively distinguished between lesser and greater sandeel, as they shared a common genetic marker. Similarly, some sequences overlapped between sprat and herring, making it challenging to differentiate between the two in certain cases; as a result, these were combined into a single category.

Table 3: Summary of Diet Analysis for kittiwake at Wicklow Head, July 2024

	KW1	KW2	KW3	KW4	KW5
<i>Sprattus sprattus</i> European sprat	✓	✓	✓	✓	✓
<i>Hyperoplus lanceolatus</i> / <i>Ammodytes tobianus</i> Greater / lesser sandeel		✓		✓	✓
<i>Clupea harengus</i> Atlantic herring	✓		✓		✓
<i>Clupea harengus</i> / <i>sprattus sprattus</i> Atlantic herring / European sprat	✓	✓	✓		✓
<i>Sardina pilchardus</i> European pilchard					✓
<i>Scyliorhinus canicula</i> Small-spotted catshark			✓		
<i>Ciliata septentrionalis</i> Northen rockling					✓

Discussion

Using colony specific tracking data has revealed key foraging areas for chick provisioning kittiwakes at Wicklow Head during the breeding season. Previous visual monitoring of this colony recorded an average foraging trip duration of 45 minutes, based on parental changeovers at the nest. Results from this tracking study however found no trips shorter than 45 minutes and only four trips with a duration less than one hour. This significant increase in trip duration is unlikely to be influenced by the 1 km boundary used to define the start and end of trips, as kittiwakes, with an average flight speed of 13.1 m/s, would take only 1.5 minutes to travel this distance. Instead, the shorter trips observed at the nest may represent self-provisioning or social interactions by the parent birds. The maximum distance travelled from the colony was 60km, over an 11-hour period from departure to the farthest point. However, this included two rest periods on the sea surface overnight. Therefore, birds are travelling slightly shorter maximum distances than previously proposed (70km) but are spending substantially longer at sea when on these foraging trips.

This tracking study provides a more detailed account of the spatial distribution and duration of kittiwake foraging trips in Irish Sea near Wicklow Head. Foraging trips may vary in length depending on the stage of the breeding season, including incubation and early or late chick rearing stages (Robertson *et al.*, 2014). Our results identify key foraging areas near Wicklow Head during the breeding season; areas to the north and south of Wicklow Head were underutilised compared to the projected foraging range based on trip length. The 'core use' area for kittiwake activity is highlighted in the 50% utilization distribution. This area emphasizes concentrated use of specific regions near the colony, likely due to a combination of accessible distance from the colony during chick provisioning, prey availability and suitable habitat for improved foraging success and high prey abundance.

The limited information on the diet obtained from this study suggests that at the time of tracking, herring and sprat were particularly important contributors to the diet. Sandeel also occurred in more

than half of samples. While the sample size is small, these results are consistent with information on kittiwake diet at other colonies in the Irish Sea, with clupeids (including herring/sprat) and sandeel being the predominate prey items identified (Chivers et al., 2012). Fisheries in this core area appear to be for whelks and mussels (Tully, 2017) with the predominant fishing gear being pots (Gerritsen, 2024). However, this is based on the distribution of fishing effort for vessels equipped with Vessel Monitoring System (VMS) equipment, which are restricted to vessels >12m length, so do not include the smaller inshore vessels likely to be operating in the area. Further research into the target species of these small inshore fisheries is certainly warranted to determine whether they are targeting the same prey species as kittiwakes.

This study cannot account for factors such as seasonal or interannual changes in prey distribution, habitat preference, niche partitioning, and anthropogenic pressures that may drive fine-scale variation in distribution and habitat use of kittiwakes. These limitations are particularly relevant when examining a colony that accounts for only 13% of the kittiwake population residing on the east coast of Ireland (Daunt 2023). Despite these constraints, this work enhances our understanding of kittiwake foraging distribution in relation to proposed offshore developments, and highlights where mitigation or compensatory measures may be appropriate.

These findings will be enhanced on the recovery of geolocators that were deployed this year in the following 2025 breeding season. These will provide data on the migration/overwintering distribution of these birds and determine whether Wicklow Head breeding kittiwakes remain in the area or migrate further offshore in the non-breeding season.

References

- Chivers, L. S., Lundy, M. G., Colhoun, K., Newton, S. F., & Reid, N., 2012. Diet of Black-legged Kittiwakes (*Rissa tridactyla*) feeding chicks at two Irish colonies highlights the importance of clupeids. *Bird Study*, 59(3), 363–367. <https://doi.org/10.1080/00063657.2012.707638>
- Daunt, F. Black-legged kittiwake *Rissa tridactyla*. In: Burnell, D., Perkins, A.J., Newton, S.F., Bolton, M., Tierney, T.D., & Dunn, T.E., 2023. *Seabirds Count: a census of breeding seabirds in Britain and Ireland (2015-2021)*. Lynx Nature Books, Barcelona.
- Daunt, F., Benvenuti, S., Harris, M. P., Dall'Antonia, L., Elston, D. A., & Wanless, S., 2002. Foraging strategies of the black-legged kittiwake *Rissa tridactyla* at a North Sea colony: evidence for a maximum foraging range. *Marine Ecology Progress Series*, 245, pp.239–247.
- Gerritsen, H.D. 2024. Atlas of Commercial Fisheries around Ireland, fourth edition. Marine Institute, Ireland. ISBN 978-1-902895-84-0.
- Gilbert, G., Stanbury, A. & Lewis, L., 2021. Birds of conservation concern in Ireland 4: 2020–2026. *Irish Birds*, 43, pp.1-22.
- IUCN. 2022. *The IUCN Red List of Threatened Species. Version 2022-2*. <https://www.iucnredlist.org>. Accessed on 02-10-2023.
- Robertson, G. S., Bolton, M., Grecian, W. J., & Monaghan, P., 2014. Inter- and intra-year variation in foraging areas of breeding kittiwakes (*Rissa tridactyla*). *Marine Biology*, 161(9), pp.1973–1986.
- Tully, O. 2017. Atlas of Commercial Fisheries for Shellfish around Ireland, Marine Institute, March 2017. ISBN 9781902895611 58pp