Atlantic puffin & Black-legged kittiwake

Tracking Report 2025, Skellig Michael

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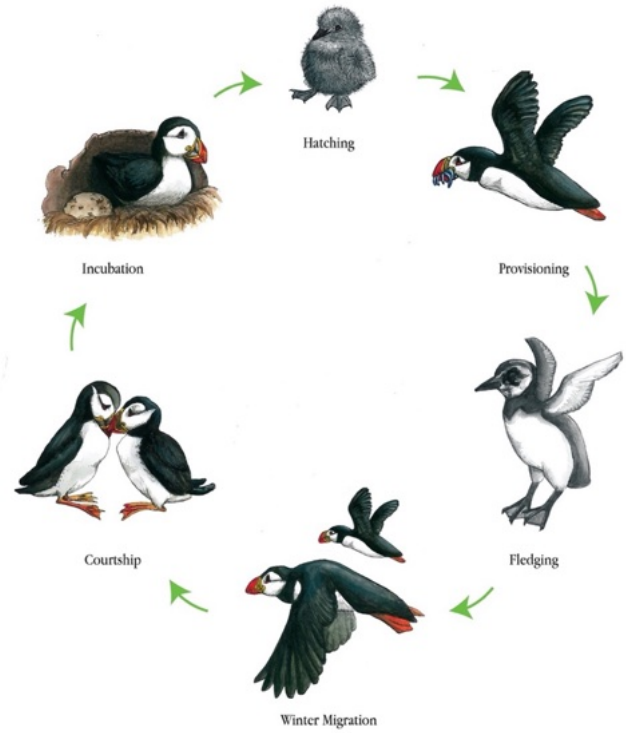
Background

Atlantic Puffin

The Atlantic puffin (*Fratercula arctica*) is a seabird species found on several islands and high cliffs around the coast of Ireland. Puffins are typically monogamous and long-lived, with breeding delayed until 5 or 6 years old. A single egg is laid in early summer, which parents take turns incubating until it hatches, then taking turn provisioning the chick until it fledges in late July/early August. Once the breeding season is over, puffins migrate offshore until the next breeding attempt. Because of their low reproductive output, puffin populations are sensitive to impacts such as severe storms or oil pollution at sea, or invasive predatory species at the colony. In the 2000s, population declines led to the species being classified as Endangered in Europe by the IUCN. Despite the emblematic status of the puffin, our knowledge of their ecology in Ireland is limited, especially concerning their behaviour and distribution at sea.



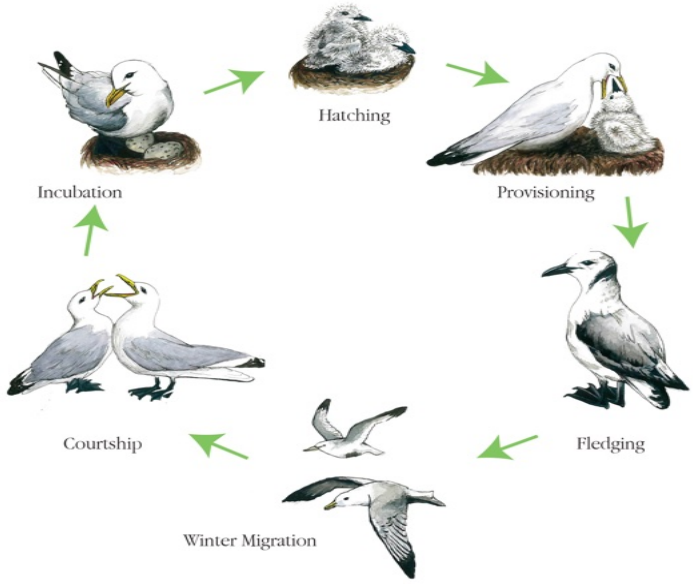
Simplified life cycle of the puffin (credit: Terra Dawson)

Black-Legged Kittiwake

The Black-legged Kittiwake (Rissa tridactyla) is a gull species commonly found along Ireland's coastline and offshore islands. This monogamous species typically nests on

steep cliff faces from early May through mid-July, with both parents sharing incubation and chick-rearing duties. During this period, adults undertake short to medium length foraging trips, ranging from a few minutes to several hours, to provision their chicks.

The kittiwake's diet is dominated by small shoaling fish, particularly sandeel, sprat, and herring, though invertebrates can also form part of their prey through fisheries. These prey species are highly dependent on marine conditions, making kittiwakes sensitive indicators of ocean health. Kittiwake populations are of serious conservation concern; they are currently listed as Vulnerable on the IUCN Red List and have suffered steep declines across much of their range, including Ireland. Drivers of this decline include reduced prey availability due to overfishing and climate change, bycatch in fisheries, and the impacts of offshore development. These pressures place kittiwakes at risk year-round, with consequences not only for breeding success but also for adult survival.



Simplified life cycle of the kittiwake (credit: Terra Dawson)

Skellig Michael

Skellig Michael supports a large population of breeding seabirds, including Atlantic puffin, Manx shearwaters, European storm petrels, northern fulmars, black-legged kittiwakes, razorbills and common guillemots. Skellig Michael's sister island, Little

Skellig, hosts the largest gannet colony in Ireland with an estimated 35,000 breeding pairs (Newton et al 2015). Skellig Michael can support such numbers of seabirds due to its location on a productive expanse of continental shelf that benefits from shelf-edge upwellings from the nearby Porcupine Basin. Complex currents passing the peninsulas and islands of County Kerry act to congregate fish and plankton, further enriching the nearby habitat and increasing the availability of seabird prey.

The cultural and natural heritage of Skellig Michael is deeply interconnected. Puffins, storm petrels, and shearwaters frequently nest within crevices in the ancient stone walls, stairways, and monastic buildings. Strict visitor regulations limit foot traffic to defined paths, protecting fragile burrows from collapse and ensuring that the island remains free of invasive predators such as rats—species that elsewhere have devastated seabird colonies (Jones et al. 2008).

Puffin burrows away from the stone steps are often quite shallow and would be liable to collapse were visitors given free reign of the island. Puffins also make use of stone walls and crevices for shelter.

Ireland is required to expand its network of Marine Protected Areas (MPAs), with a process underway to identify, designate and manage new MPAs within the Irish Exclusive Economic Zone (EEZ). Ireland's marine area is expansive, varied and economically important. The allocation of MPAs must therefore be carefully thought out, and information on the at-sea distribution of seabirds is vital to ensuring newly designated MPAs are effective at meeting their conservation goals.

Seabird tracking

Aims and Methods

Having a better understanding of seabird spatial ecology during both the breeding and non-breeding periods is a key step towards improving conservation efforts for these key species. As part of UCC research on seabird distributions, movement, and behaviour, we undertook fieldwork on Skellig Michael from 20th to 25th June 2025 with three major aims:

- To study the movements and fine-scale foraging behaviours of breeding adult puffins & kittiwakes during the chick rearing period.
- To describe the migratory behaviours and the areas used by puffins & kittiwakes outside the breeding season.
- To determine the potential effectiveness of drone imagery in conducting a puffin census.

To study the fine-scale movements and behaviour of puffins during chick rearing we deployed 10 GPS tags (3.6 g, Nanofix, PathTrack) on breeding adults captured at burrow entrances. Of these, five were recovered, with four containing data. There were two individuals recaptured with missing tags and two possibly abandoned burrows. Based on observations by the NPWS ranger and OPW guides on the colony, productivity was lower than previous years. A high number of dead chicks were recorded, and provisioning adults were delivering fish and immediately leaving the colony to continue foraging. There were very few adults seen with fish in their bills standing outside burrows.

The study of puffins' movements outside the breeding season requires tags with a long battery life combined with a low weight. We used Global Location Sensors, or geolocators (1.5g, Lotek mk4083) that we attached to the legs of study puffins using a darvic leg ring. We successfully retrieved 12 of the 20 geolocators deployed in 2024, and at least two birds equipped in 2024 were observed in the colony but evaded recapture. A further 18 tags were deployed with plans to recover these and any remaining tags deployed in 2024 during the 2026 breeding season.

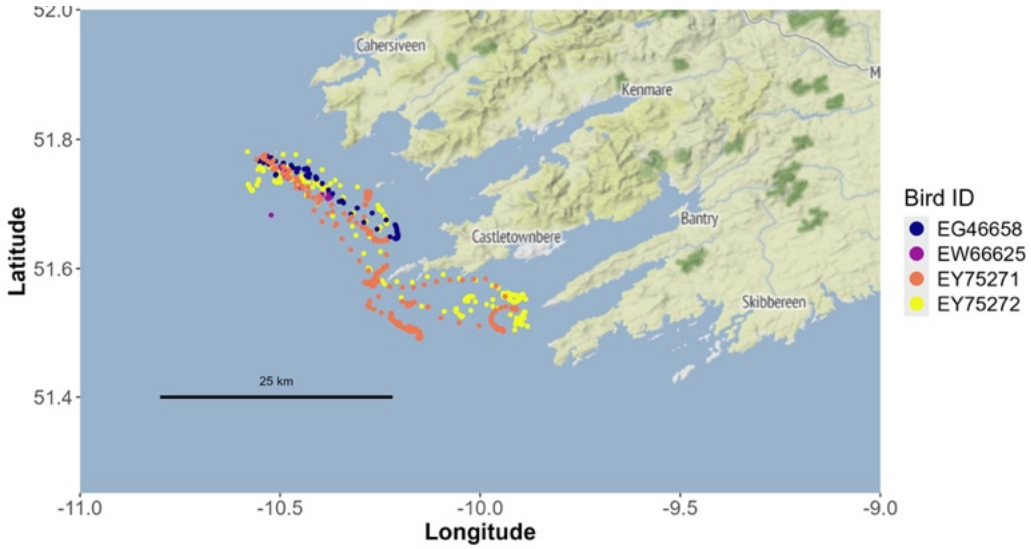
Thirteen black-legged kittiwakes were tagged from the colony below the old lighthouse (51.7693, -10.5414) during the early chick rearing period. Birds were caught by a noose-pole, a standard method utilized for catching this species. Pathtrack NanoFix Geo +RF (2.4 g) GPS trackers were deployed on the upper back of the birds using Tessa 4651 waterproof tape, with tags programmed to record locations every 4 minutes. 16 kittiwakes were also equipped with Lotek MK4083 geolocators to examine non-breeding distribution and will be recovered in 2026.

All bird capture, handling, ringing and tagging was approved by the UCC Animal Ethics Committee and conducted under licences issued by the British Trust for Ornithology and the Irish National Parks and Wildlife Service, with permission from the Office of Public Works who have responsibility for managing the site.

Results

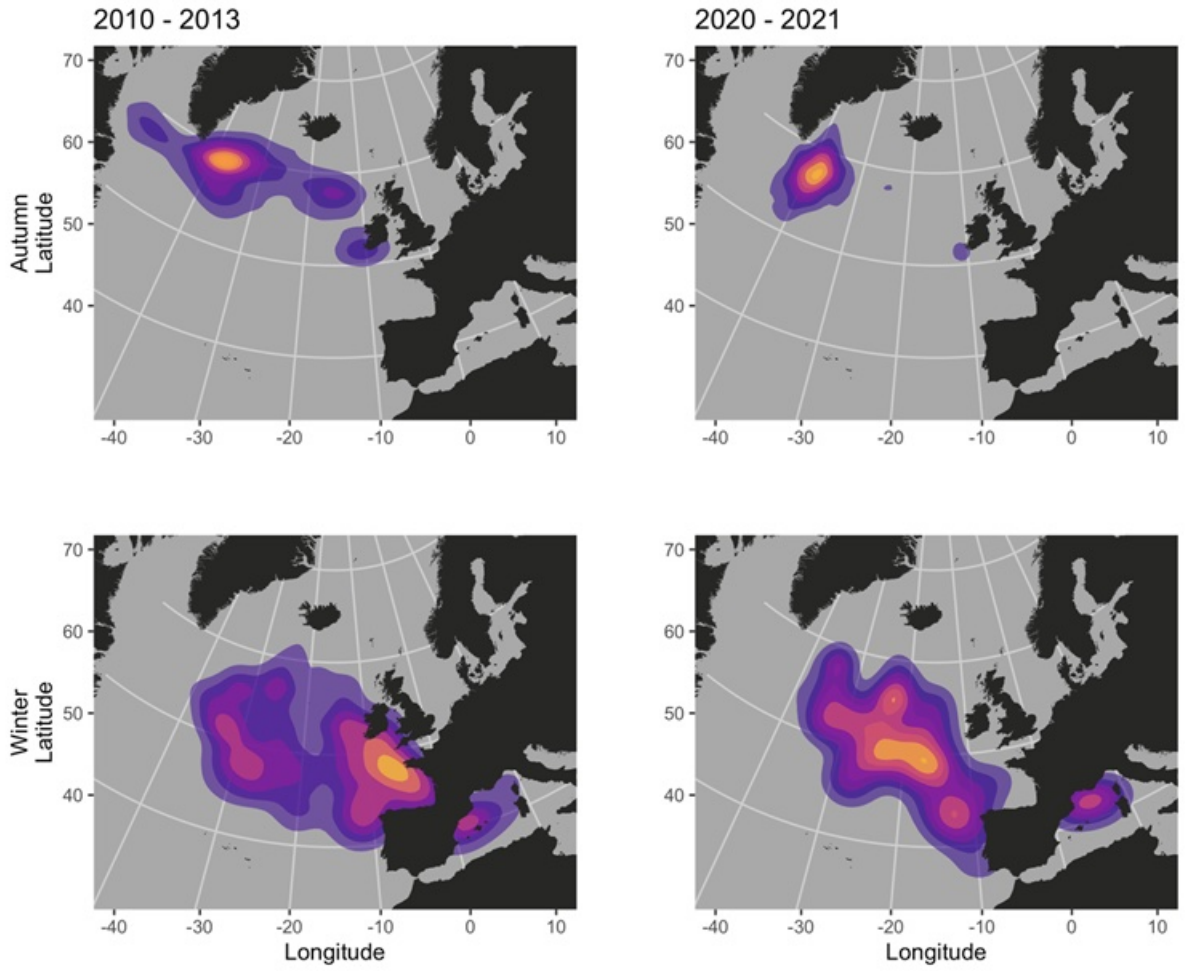
Puffin

We collected fine-scale data on the movements and dive behaviour of four puffins using GPS tags that provide accurate locations (±10m) every 5 minutes. GPS-tagged puffins mostly travelled southeast from Skellig Michael and foraged coastally. Two of the individuals foraged near the Beara peninsula, with the other two continuing further southeast near Mizen Head.



GPS tracks of 4 puffins from Skellig Michael in June 2025.

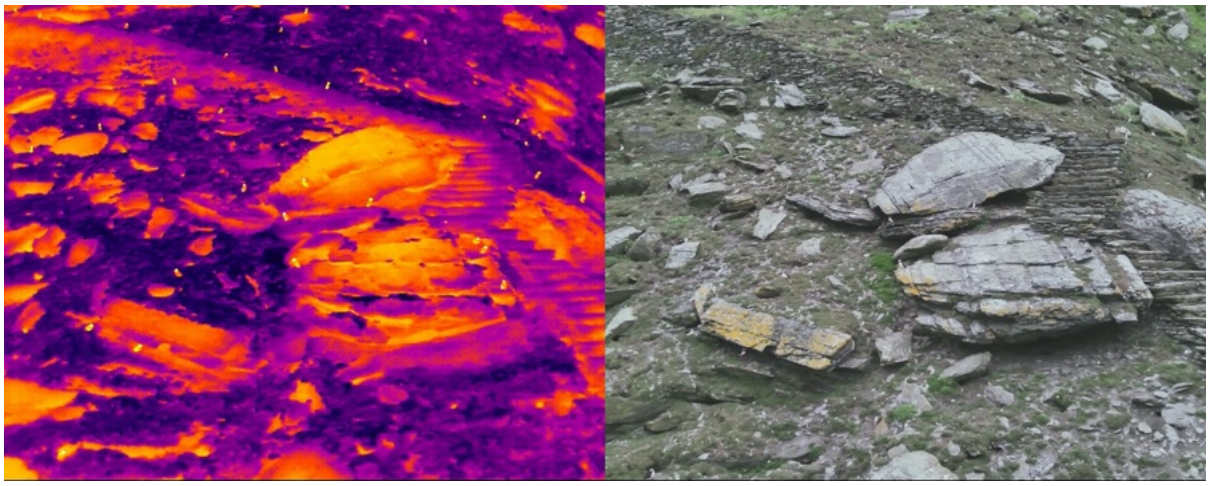
Geolocator tags are only accurate to ±200km, but the year-round data provide broad scale information on migration routes and overwintering distribution. Data from tags successfully recovered in 2025 will be processed to determine overwintering distribution across the north Atlantic between September-February, and compared with previous data collected from the site (see below).



The areas used by puffins from Skellig Michael in Autumn (top) and Winter (bottom). The maps on the left show areas used by puffins in 2010-2013, on the right are the areas used in 2020-2021. Though the overall migration pattern has remained similar, there has been a noticeable shift in areas used between the two periods.

The thermal drone imagery collected allowed for the identification of potentially occupied puffin burrows, which appeared as small pockets of heat scattered throughout the colony. Drone surveys were undertaken at dawn, when the temperature of the colony was at its lowest, to increase the visibility of potential burrows. The data collected shows that thermal drone surveys could be a suitable method for conducting a puffin census,

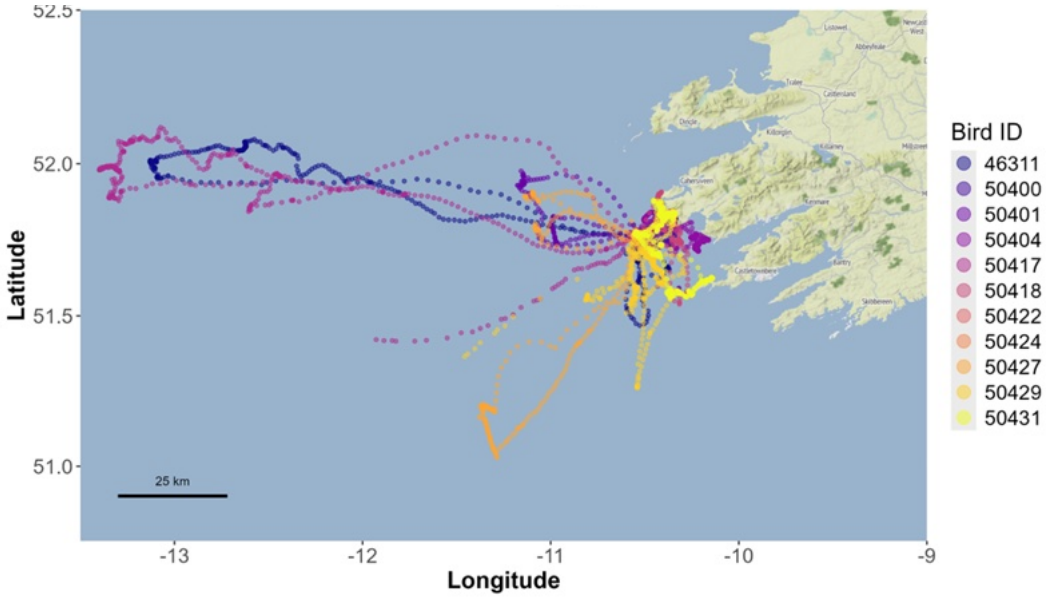
with additional effort required to establish an appropriate data collection and analysis methodology.



A side-by-side comparison of drone imagery collected at Skellig Michael. Potential puffin burrows can be identified, though potential interference from rocky outcroppings is noted.

Kittiwake

Fine scale tracking data was recorded for 11 kittiwakes. Most individuals remained primarily costal, between Valentia Island and Bantry Bay. Two birds carried out an extended foraging trip travelling approximately 200 km to an area of steep gradient in the sea floor depth between the Porcupine Basin and Eastern Porcupine Bank.



GPS tracks from11 black-legged kittiwake from Skellig Michael in June 2025.

Future work

There are currently puffins equipped with geolocators due to return to Skellig Michael next spring for the breeding season. We plan to retrieve these devices in summer 2026, while also continuing to expand our long-term GPS tracking dataset. This will further strengthen our dataset on puffins breeding at Skellig Michael, allowing us to better understand year-to-year variation in foraging ranges and behaviours during the late chick-rearing period. Similarly, 16 kittiwakes were equipped with geolocators this year for the first time at this colony. These will provide valuable new insights into the non-breeding distribution of kittiwakes at one of the most westerly breeding sites in Europe. These tracking studies will inform the Skellig Management Plan and contribute to the designation of Marine Protected Areas, particularly in areas identified as crucial for puffins and kittiwakes.

In recent years, permission for a small team to remain on the island for an additional 5-7 days has greatly improved our success in data collection while also allowing us to broaden our range of study species. This will allow us to create a baseline for the colony to assist in assessing populations, and support efforts in designating Marine Protected Areas in the region.

Acknowledgements

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References

Jones, H., Tershy, B., Zavaleta, E., Croll, D., Keitt, B., Finkelstein, M., & Howald, G. (2008). Severity of the Effects of Invasive Rats on Seabirds: A Global Review. *Conservation Biology : The Journal of the Society for Conservation Biology*, *22*, 16–26. https://doi.org/10.1111/j.1523-1739.2007.00859.x

Newton SF, Harris MP, Murray S (2015) Census of gannet *Morus bassanus* colonies in Ireland in 2013-2014. *Irish Birds* 10:215-220