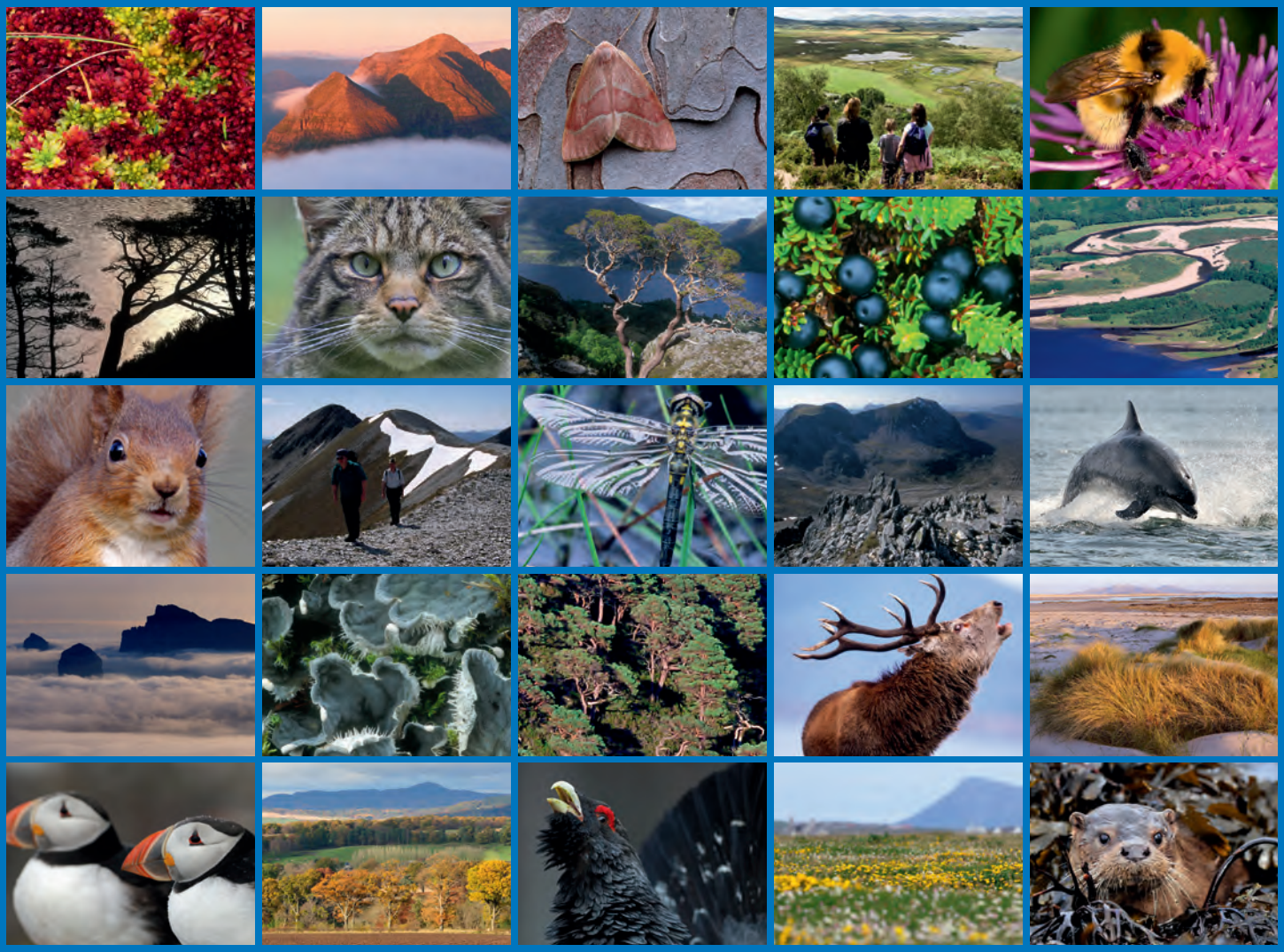
Scottish Natural Heritage
Commissioned Report No. 903

Black guillemot (*Cepphus grylle*) tracking in Orkney, 2013 and 2014



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Black guillemot (*Cepphus grylle*) tracking in Orkney, 2013 and 2014

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This report should be quoted as:

Owen, E. 2015. Black guillemot (*Cepphus grylle*) tracking in Orkney, 2013 and 2014. *Scottish Natural Heritage Commissioned Report No. 903.*

COMMISSIONED REPORT

Summary

Black guillemot (*Cepphus grylle*) tracking in Orkney, 2013 and 2014

Commissioned Report No. 903
Project No: 15097
Contractor: Ellie Owen, RSPB
Year of publication: 2015

Keywords

Black guillemot; *Cepphus grylle*; Orkney; Shapinsay; foraging; tagging; tracking; MPA.

Background

Both Scottish Natural Heritage (SNH) and Royal Society for the Protection of Birds (RSPB) recognise the gaps in current knowledge of at-sea movements of black guillemot (*Cepphus grylle*). The need to fill this gap is recognised in light of the black guillemot being the only seabird species which can qualify as a protected feature of a Scottish Nature Conservation Marine Protected Area (NCMPA). GPS tracking, to describe black guillemot foraging behaviour and deduce foraging areas, had, until now, not been carried out successfully for this species, despite this technique being extremely informative for other species (e.g. the FAME www.FAMEproject.eu and STAR http://www.rspb.org.uk/ourwork projects). This study tracked black guillemots in Orkney in 2013 and 2014.

RSPB carried out a pilot tracking study on the black guillemot in Orkney during the breeding seasons of 2013 and 2014. The project was successful in developing acceptable methods for tagging this species and gaining high resolution tracking data from 19 birds. This study has considerably increased the amount of tracking data available for a species known to be particularly challenging to track and has allowed an initial assessment of the variation between years.

Main findings

- Catching birds using mist nests and deploying remote download tags was found to be a reliable way to track black guillemot. Ecotone tags were used and performed fairly well.
- Nineteen birds were tracked over one to 17 days. The longest foraging trip was 7.45km (10.1km avoiding land).
- Typically black guillemots were feeding in shallow areas with kelp and individual birds used a small number of feeding sites repeatedly.
- Black guillemots use manmade and natural objects in the environment for resting between foraging bouts.

- Some colonies, where black guillemot numbers are low and birds nest are in inaccessible areas, would not be suitable to catching black guillemots.

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Acknowledgements

For the 2013 survey SNH provided the funding for tags and RSPB provided the funding for the fieldwork costs, in 2014 the funding for the tags was provided by Marine Scotland with funding for fieldwork costs provided by SNH, RSPB provided the funding for staff carrying out the tracking work. This project was undertaken under BTO licence with an approved special methods endorsement.

Paul Hollinrake initiated the study monitoring black guillemots off Shapinsay and building artificial nesting cairns. He also monitored the colony in 2013 and along with Alan Leitch provided extensive assistance in tagging fieldwork.

1. INTRODUCTION

Both Scottish Natural Heritage (SNH) and Royal Society for the Protection of Birds (RSPB) recognise the gaps in current knowledge of at-sea movements of black guillemot (*Cepphus grille*). The need to fill these gaps is recognised in light of the black guillemot being the only seabird species which can qualify as a protected feature of a Scottish Nature Conservation Marine Protected Area (NCMPA). GPS tracking, to describe black guillemot foraging behaviour and deduce foraging areas, has so far not been carried out successfully for this species, despite this technique being extremely informative for other species (e.g. the FAME www.FAMEproject.eu and STAR http://www.rspb.org.uk/ourwork projects). This study tracked black guillemots in Orkney in 2013 and 2014.

Black guillemots are a diving species and are therefore considered potentially vulnerable to effects of tidal energy developments. Furness *et al*. (2012) identify black guillemot, razorbill, European shag, common guillemot, great cormorant, divers and Atlantic puffin as the species most vulnerable to adverse effects from tidal turbines in Scottish waters. The present study is situated in Orkney where investment is currently being made into tidal energy generation. Therefore, this work is highly relevant to MPA design and planning our offshore marine energy industries.

Black guillemots were tracked at a small colony off the west coast of Shapinsay, Orkney. This colony was chosen because of an existing study whereby nesting cairns were constructed to facilitate monitoring of breeding success over the season and monitoring is conducted throughout the breeding season. This was important to allow the assessment of the effects of the study on Black guillemots. Black guillemots, like puffins, are known to be sensitive to handling in the burrow (Cairns, 1980; Rodway *et al*., 1996) and birds have been known to abandon the burrow after being caught from their nest.

Initial plans were for the 2014 tracking to take place at Sanda, Argyll, due to its interest as part of the Clyde Sea Sill NCMPA for this species, however this was unsuccessful. A team of two experienced seabird tracking staff were deployed to Sanda to attempt 10 days tracking here. Within a few days of working on the island it became clear that catching adult black guillemots was not feasible at this colony in 2014. This was because only a very small number of birds were breeding and these were in inaccessible areas of cliff. Black guillemots have successfully been found here in accessible locations in the past (by the Sanda Island Ringing Group). It was found that the breeding population on the island this year was smaller than in the past possibly due to predation pressure, allowing birds only to breed in less accessible places on the island. This is in agreement with population counts conducted by SNH in 2014 (Swann, 2014) which recorded a steep drop in the number of adults breeding black guillemots at this colony in 2014. In agreement with SNH, RSPB returned to the Island of Shapinsay, Orkney, where tagging had taken place in 2013. This was to increase the sample size for that colony and to allow an assessment of variation in foraging behaviour between two consecutive years.

2. METHODS

Tagging took place between 16th June – 27th July 2013 and 18 July – 10th August 2014. The colony was accessed by boat during calm weather. Due to the sensitivity of the black guillemot to handling, remote download tags were used which are of a higher specification, than archival GPS tags that RSPB commonly use on other seabird species. The higher specification tags are able to relay the data to a base station, thus removing the need to re-catch a bird, and removing the need to catch the bird on its nest in the first place. The majority of the birds were caught away from the nest by erecting mist-nets in the proximity of a cluster of nests in order to capture adult birds as they returned to the nest. During 2013

two birds which stayed with their nests when approached were caught on their nest, one of these failed to fledge any chicks and the other fledged one chick.

Upon capture birds were ringed and weighed to check that they were within the acceptable weight limit for attaching a tag. An ECOTONE Uria 240 (11.5g) VHF remote download GPS tag was fitted to the plumage on the lower back of the bird using four strips of waterproof tape. The bird was released and stored GPS positional data were automatically downloaded whenever the bird was in range of a VHF antenna and base station which were installed at the colony. The tag attachment method is temporary and tags fall off after less than two weeks which further reduces the potential impact of the research. Birds were tracked during the chick rearing period and although the nesting status of each bird could not be verified, birds were checked for the presence of brood patches, if present it was assumed that these were breeding adults.

Breeding success data was also collected in 2013 by inspecting individual nests at incubation, chick rearing and just prior to fledging by Paul Hollinrake (Paul Hollinrake, unpublished data). No breeding success data was collected in 2014.

3. RESULTS

3.1 Numbers of birds tracked, duration of tracking and breeding status

Over the two years deployments were made on 23 birds with tags successfully providing data from 19 of these for a period of 24 hours to 17 days (Table 1). In 2013 these included three incubating adults, three chick-rearing adults and two immature birds.

Table 1: The number of birds tracked each year, duration of tracking, breeding status and foraging range.

Year	Bird ID (logger number in brackets)	Breeding status	Days of deploy-ment	Max Foraging range (km)	Capture method	Nest success at end of season
2013	AA (6)	Incubating adult	6	4.38	On nest	1 chick (cairn 22)
2013	AB (13)	Incubating adult	4	3.40	Mist net	Unknown
2013	AC (5)	Incubating adult	0	No data	Mist net	2 chicks (cairn 9)
2013	AD (4)	Immature	8	3.38	Mist net	Not a breeding adult
2013	AI (7)	Incubating adult	5	7.45	On nest	Failed (cairn 4)
2013	BV (25)	Chick-rearing adult	5	4.62	Mist net	2 Chicks (cairn 42)
2013	BX (18)	Chick-rearing adult	1	1.88	Mist net	Unknown
2013	BZ (21)	Chick-rearing adult	-	No data	Mist net	Unknown
2013	CA (17)	Chick-rearing adult	1	3.94	Mist net	Unknown
2013	CB (23)	Immature	8	6.99	Mist net	Not a breeding adult
2014	DJ (2)	Chick-rearing adult	10	7.27	Mist net	Unknown
2014	DK (3)	Chick-rearing adult	-	No data	Mist net	Unknown
2014	DL (4)	Chick-rearing adult	8	3.88	Mist net	Unknown
2014	DN (5)	Chick-rearing adult	8	5.12	Mist net	Unknown
2014	AI (6)	Chick-rearing adult	-	No data	Mist net	Unknown
2014	DX (7)	Chick-rearing adult	2	4.01	Mist net	Unknown
2014	DZ (8)	Chick-rearing adult	3	2.88	Mist net	Unknown
2014	FA (9)	Chick-rearing adult	9	3.39	Mist net	Unknown
2014	FB (10)	Chick-rearing adult	3	4.48	Mist net	Unknown
2014	FC (11)	Chick-rearing adult	10	5.29	Mist net	Unknown
2014	FD (12)	Chick-rearing adult	10	6.47	Mist net	Unknown
2014	FF (14)	Chick-rearing adult	7	8.04	Mist net	Unknown
2014	FH (18)	Chick-rearing adult	17	3.80	Mist net	Unknown

3.2 Movements of tracked black guillemots

Maps in figures 1-19 show the movements of each of the tracked birds in 2013 (figures 1-8) and 2014 (figures 9-19). Track data from all the birds tagged are shown in figure 20 (2013) and figure 21 (2014).

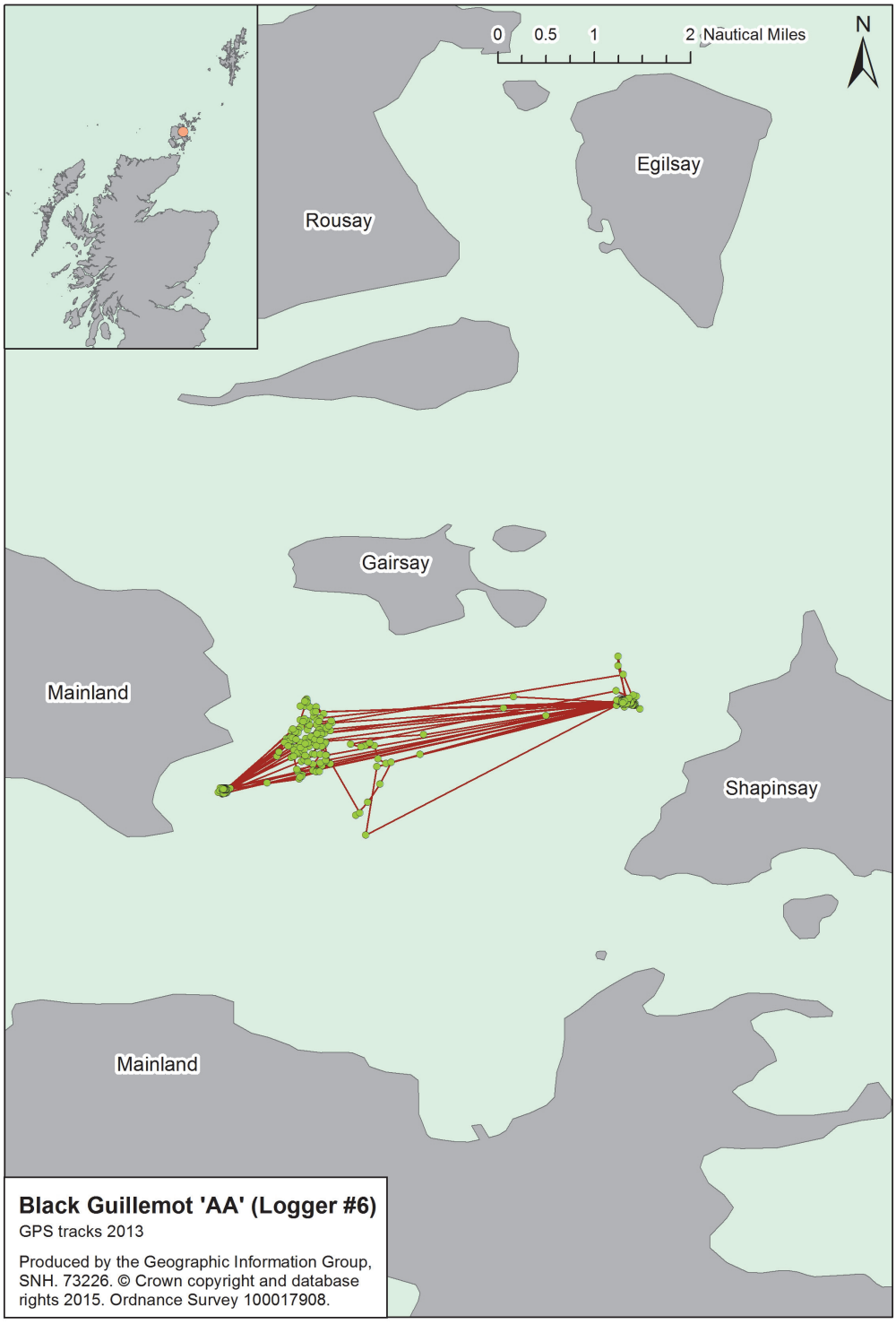

Figure 1: GPS tracks from Bird AA, logger 6 (Incubating Adult), 2013

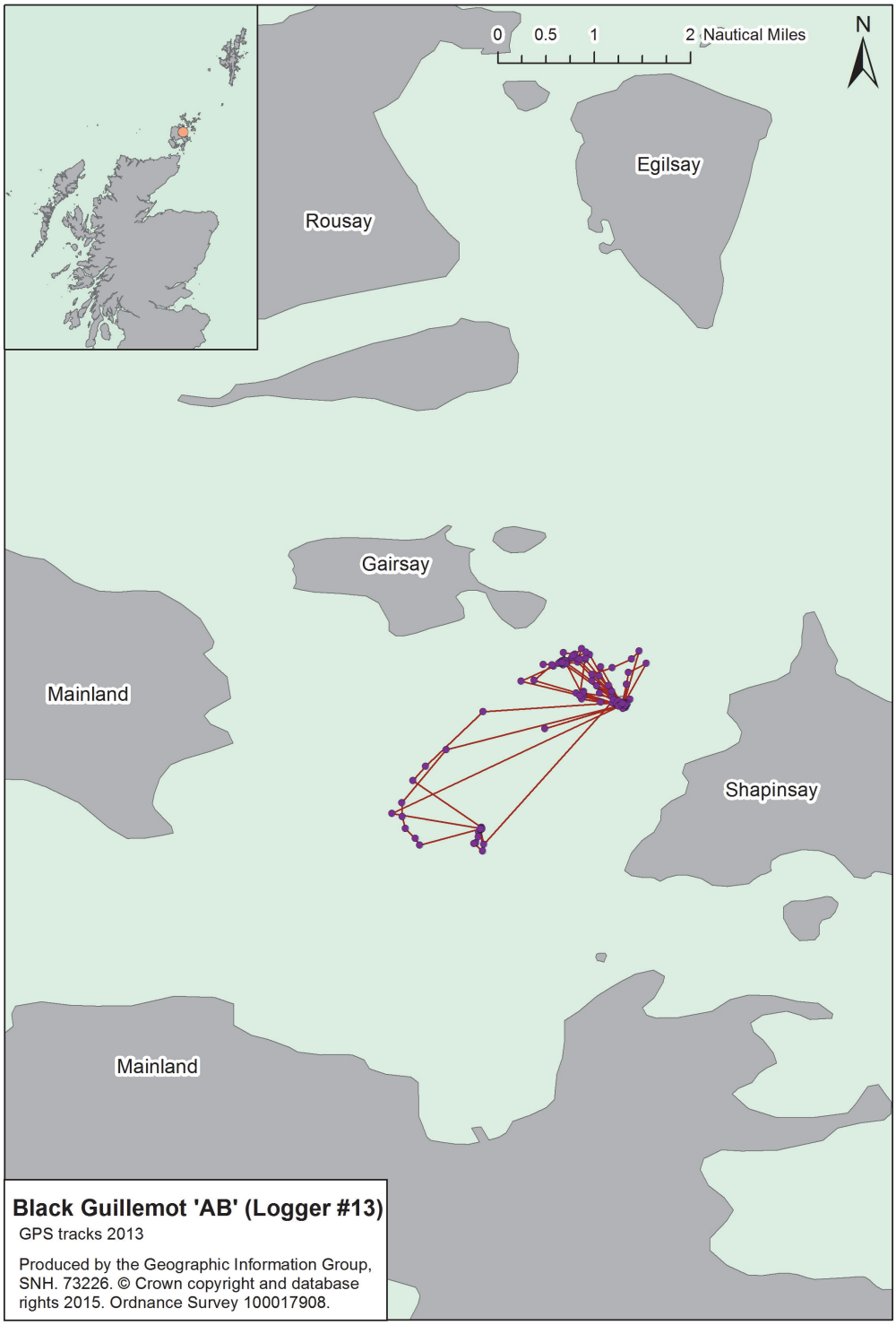

Figure 2: GPS tracks from Bird AB, logger 13 (incubating adult), 2013

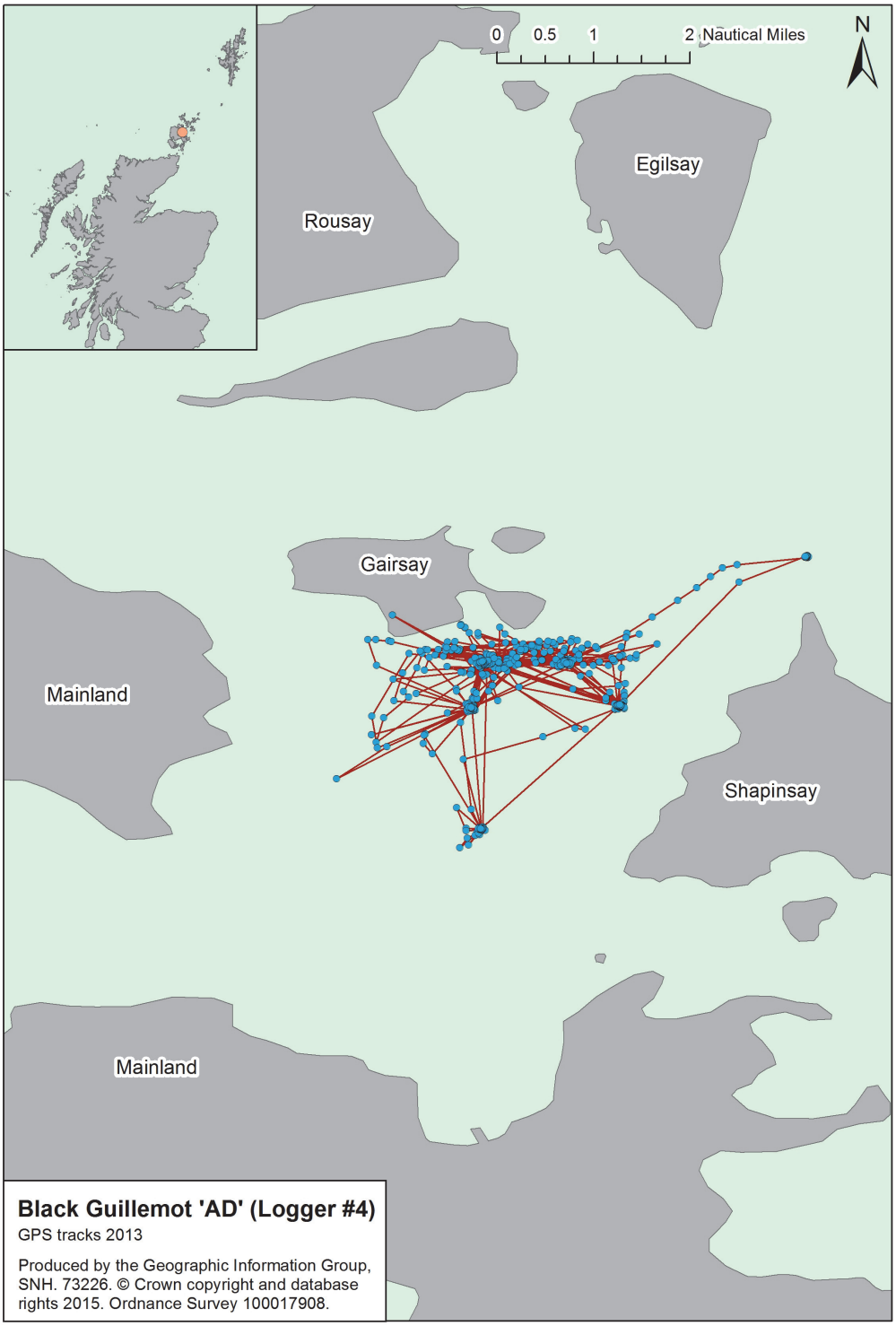

Figure 3: GPS tracks from Bird AD, logger 4 (immature), 2013

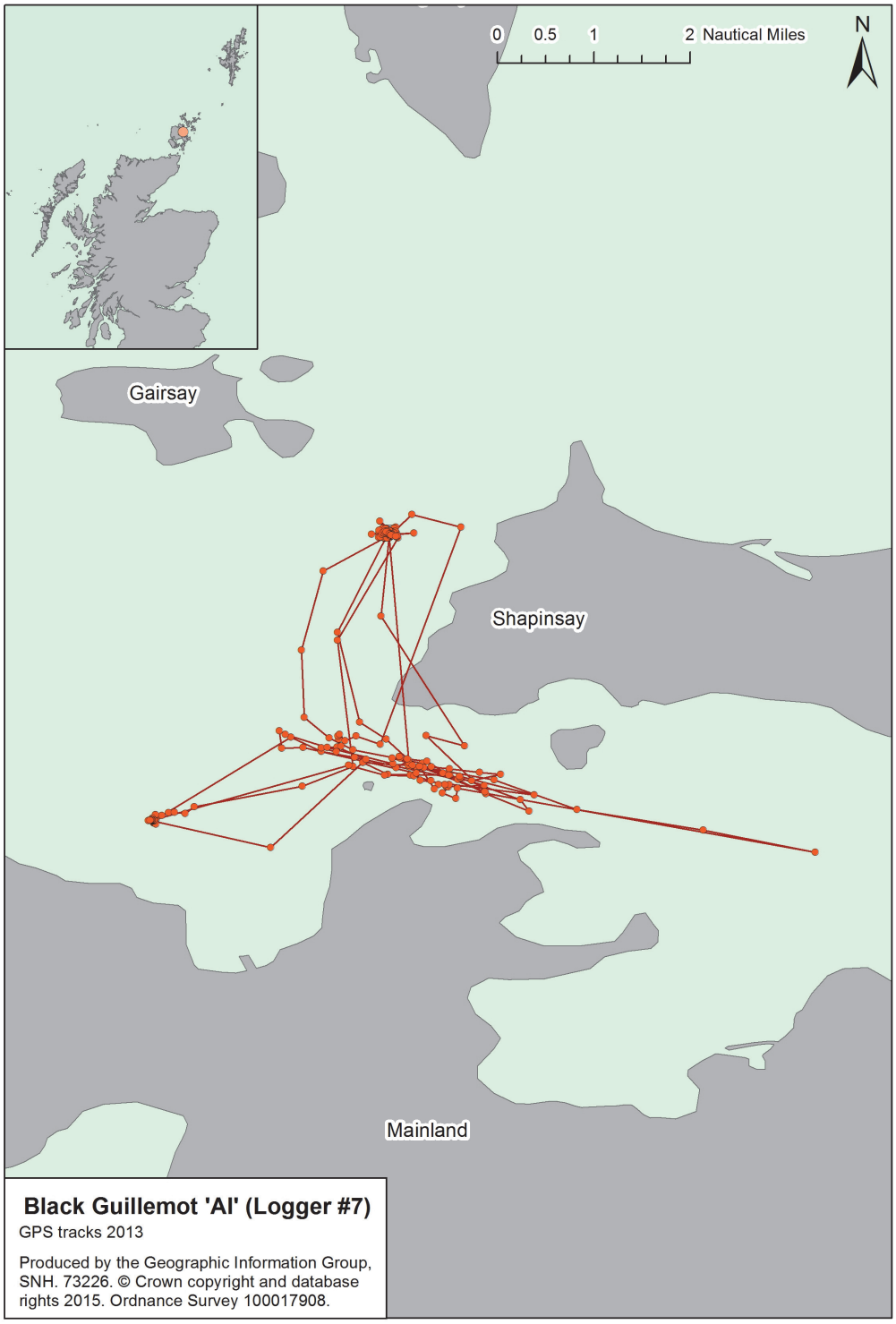

Figure 4: GPS tracks from Bird AI, logger 7 (Incubating adult), 2013

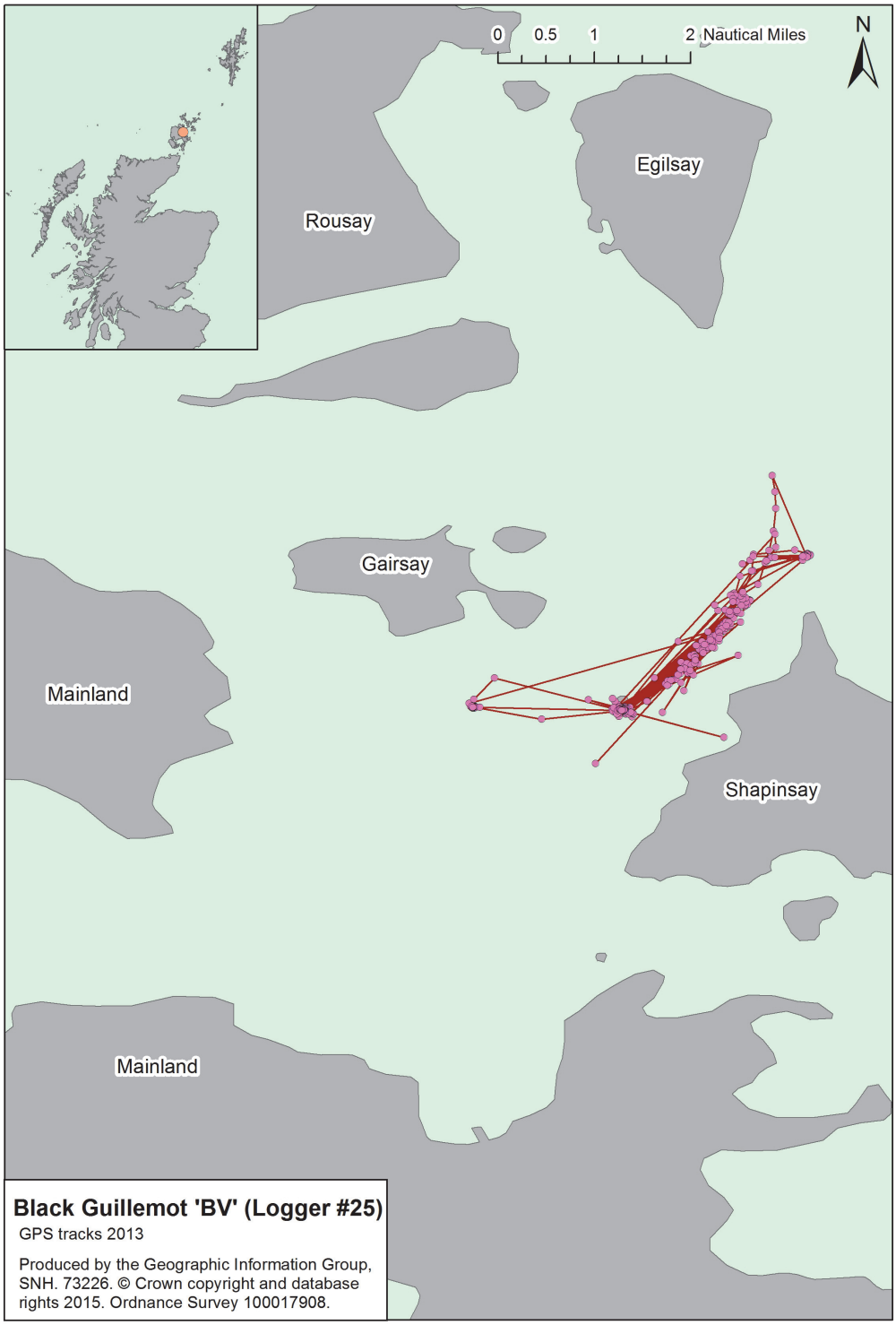

Figure 5: GPS tracks from Bird BV, logger 25 (chick rearing adult), 2013

Figure 6: GPS tracks from Bird BX, logger 18 (Chick-rearing adult), 2013

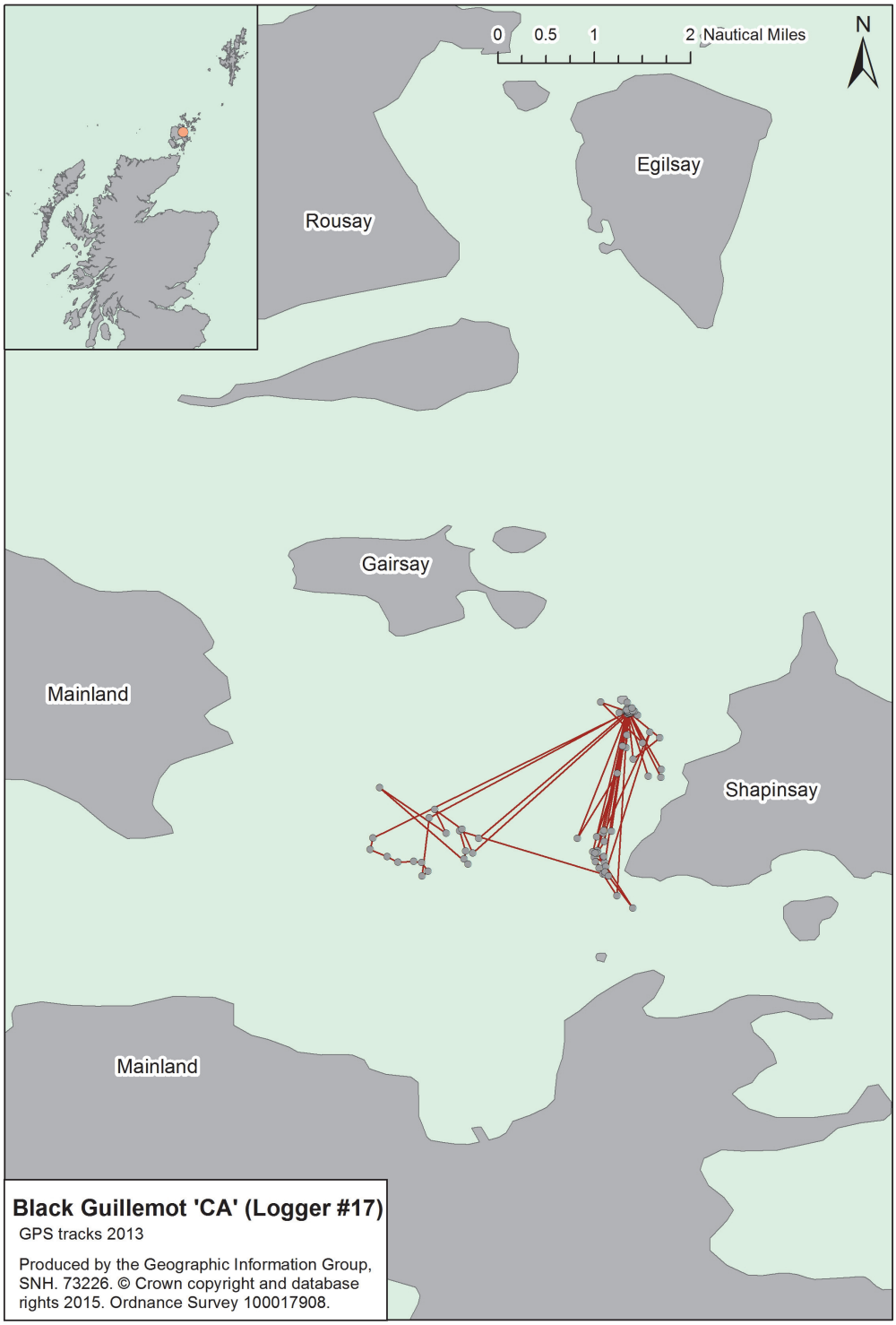

Figure 7: GPS tracks from Bird CA, logger 17 (chick-rearing adult), 2013

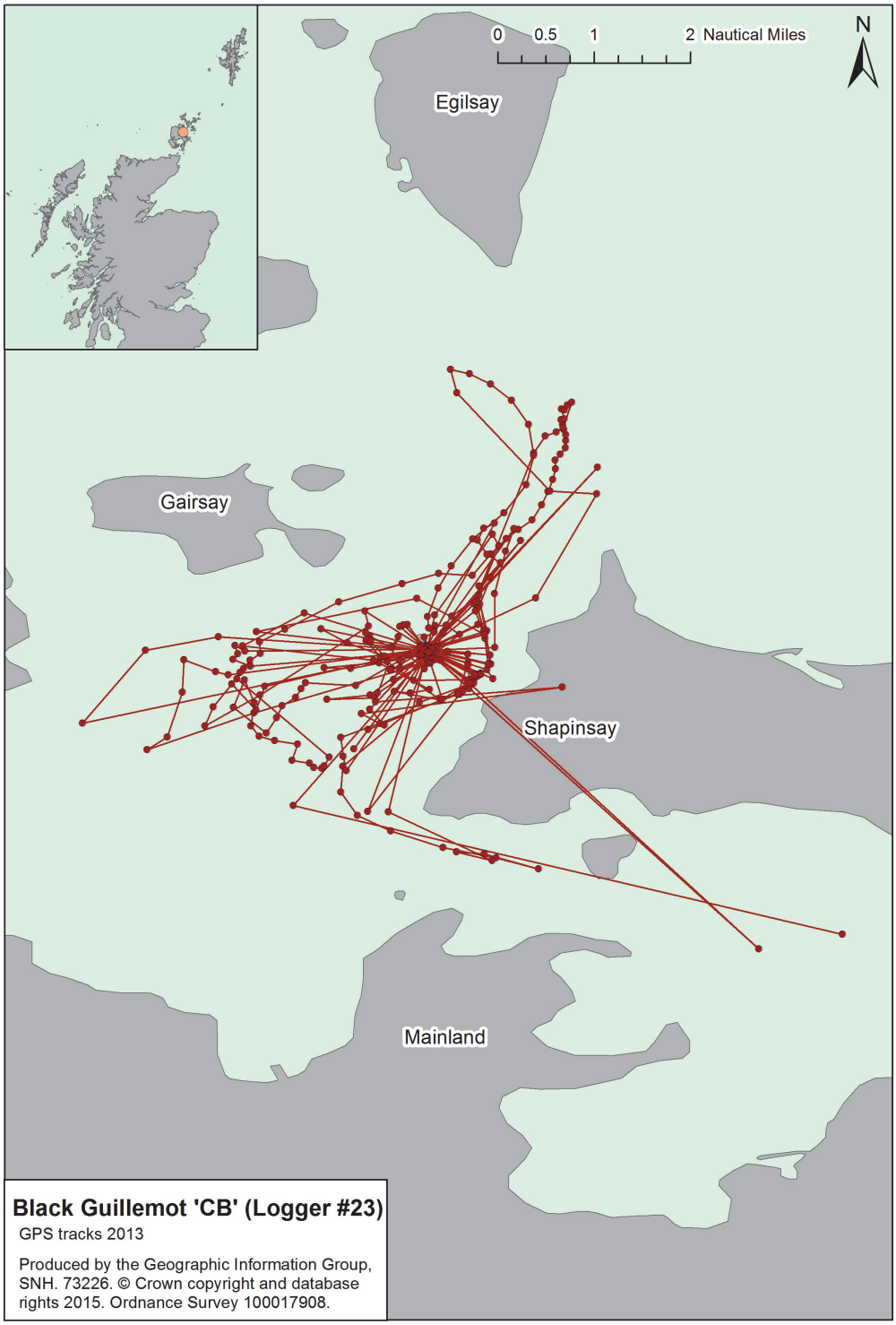

Figure 8: GPS tracks from Bird CB, logger 23 (immature), 2013.

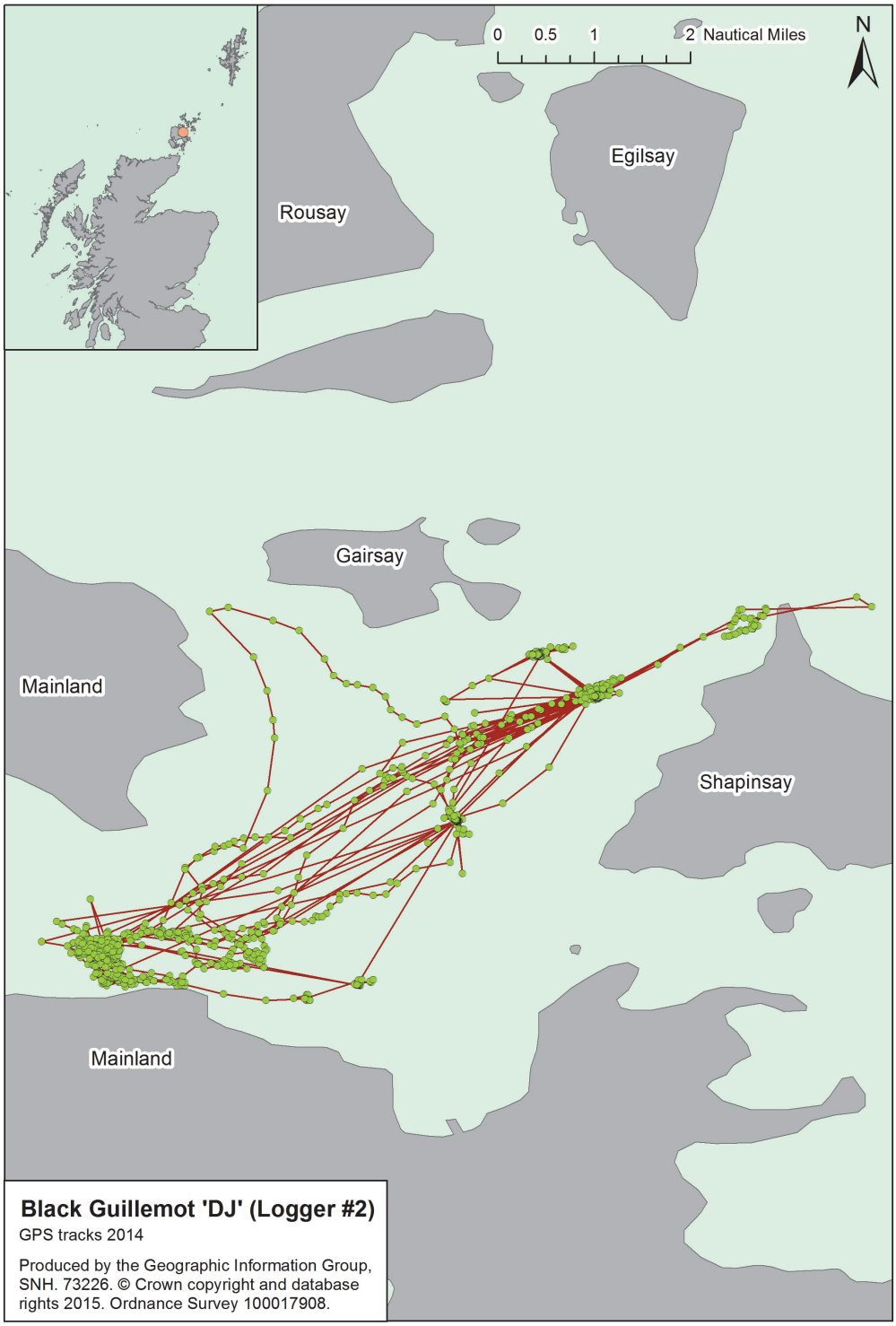

Figure 9: GPS tracks from Bird DJ, logger 2, 2014.

Figure 10: GPS tracks from Bird DL, logger 4, 2014

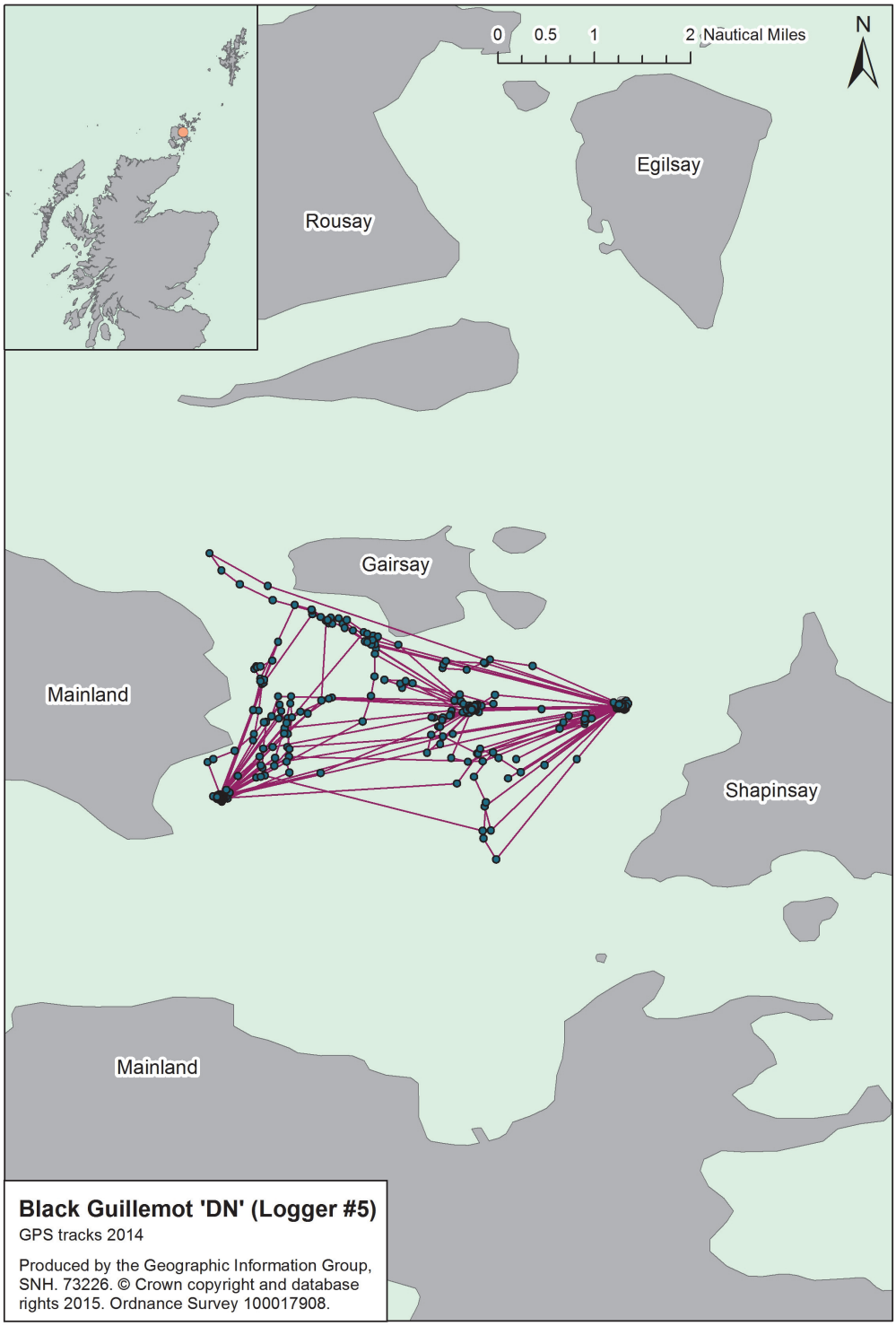

Figure 11: GPS tracks from Bird DN, logger 5, 2014.

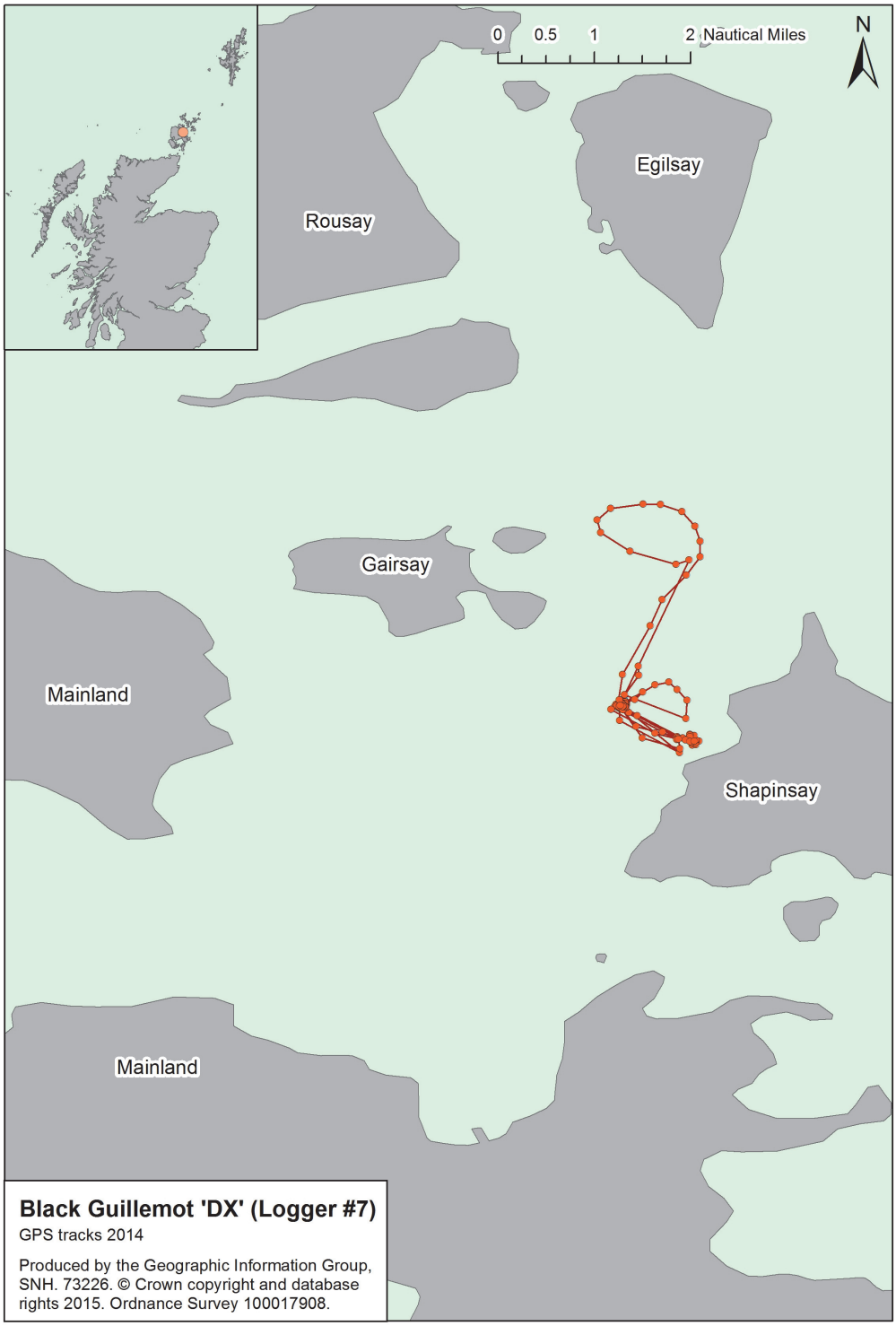

Figure 12: GPS tracks from Bird DX, logger 7, 2014.

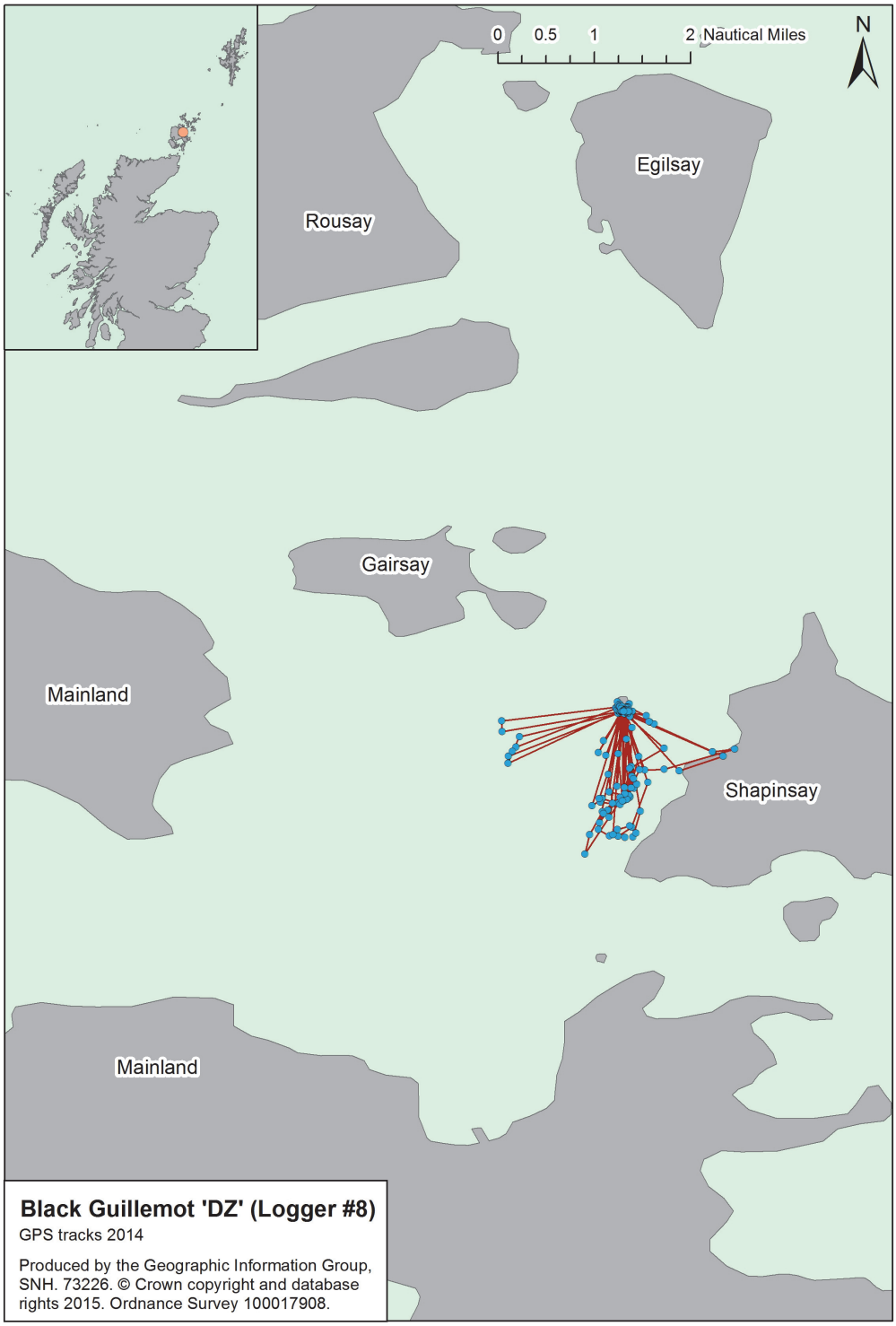

Figure 13: GPS tracks from Bird DZ, logger 8, 2014.

Figure 14: GPS tracks from Bird FA, logger 9, 2014.

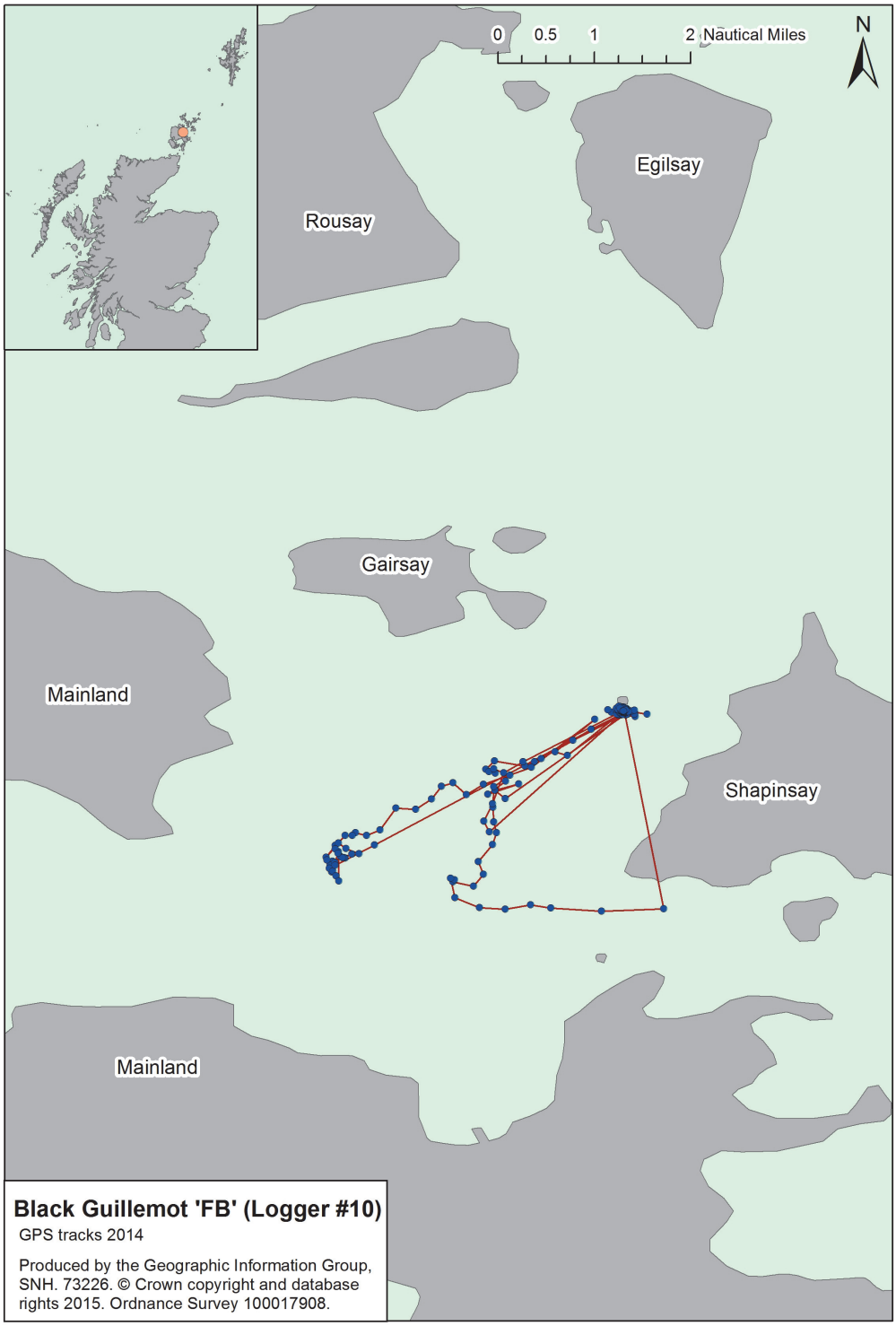

Figure 15: GPS tracks from Bird FB, logger 10, 2014.

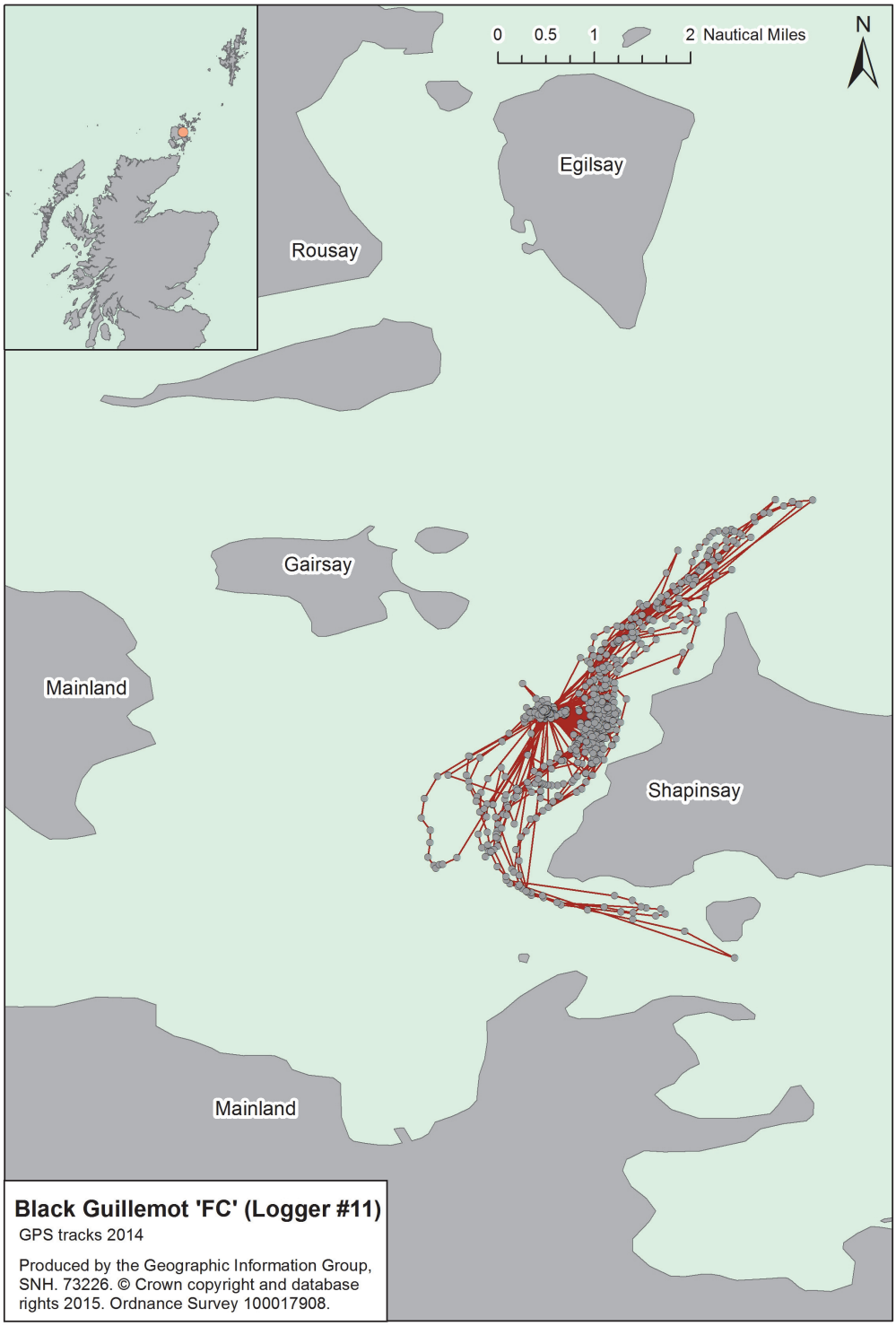

Figure 16: GPS tracks from Bird FC, logger 11, 2014.

Figure 17: GPS tracks from Bird FD, logger 12, 2014.

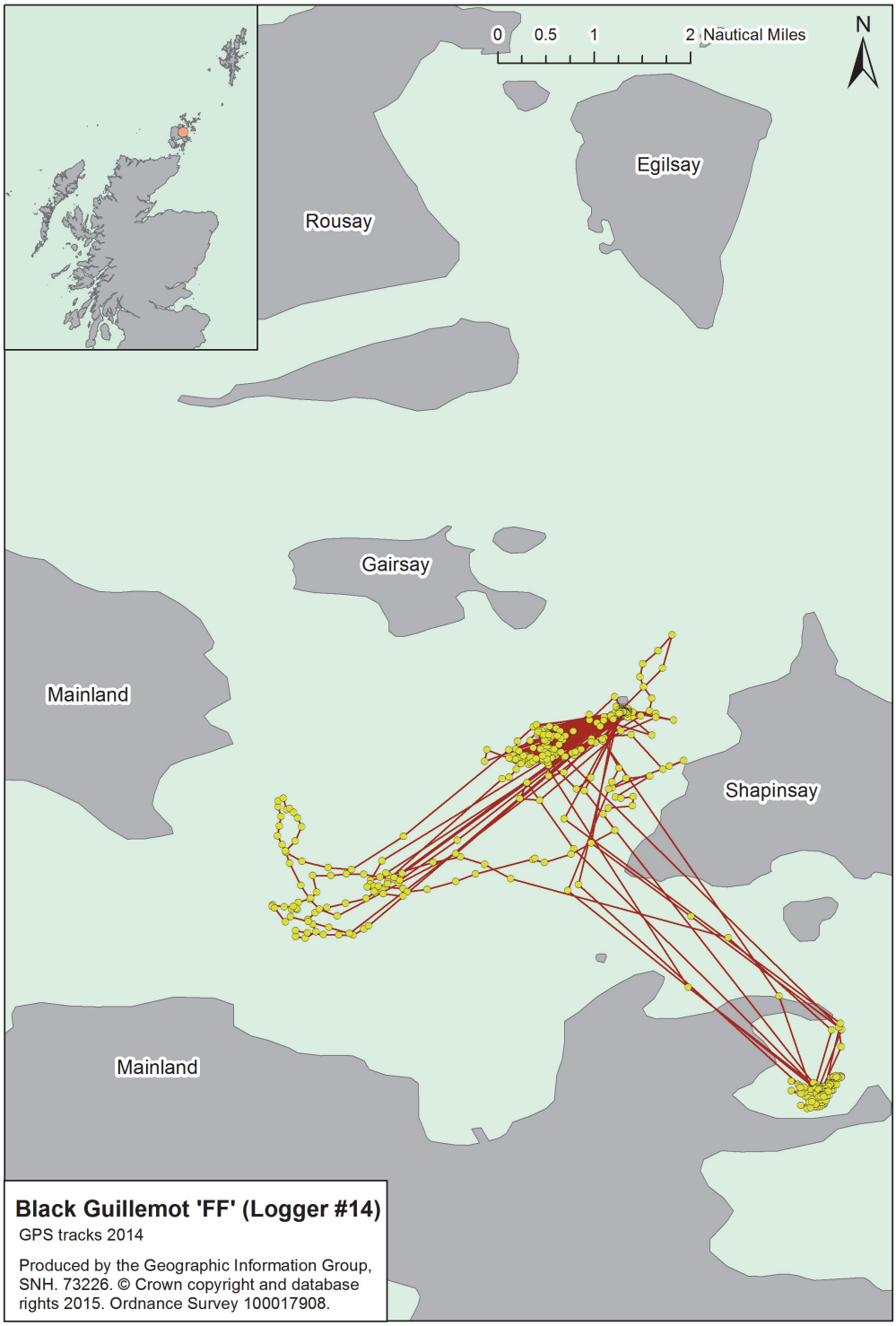

Figure 18: GPS tracks from Bird FF, logger 14, 2014.

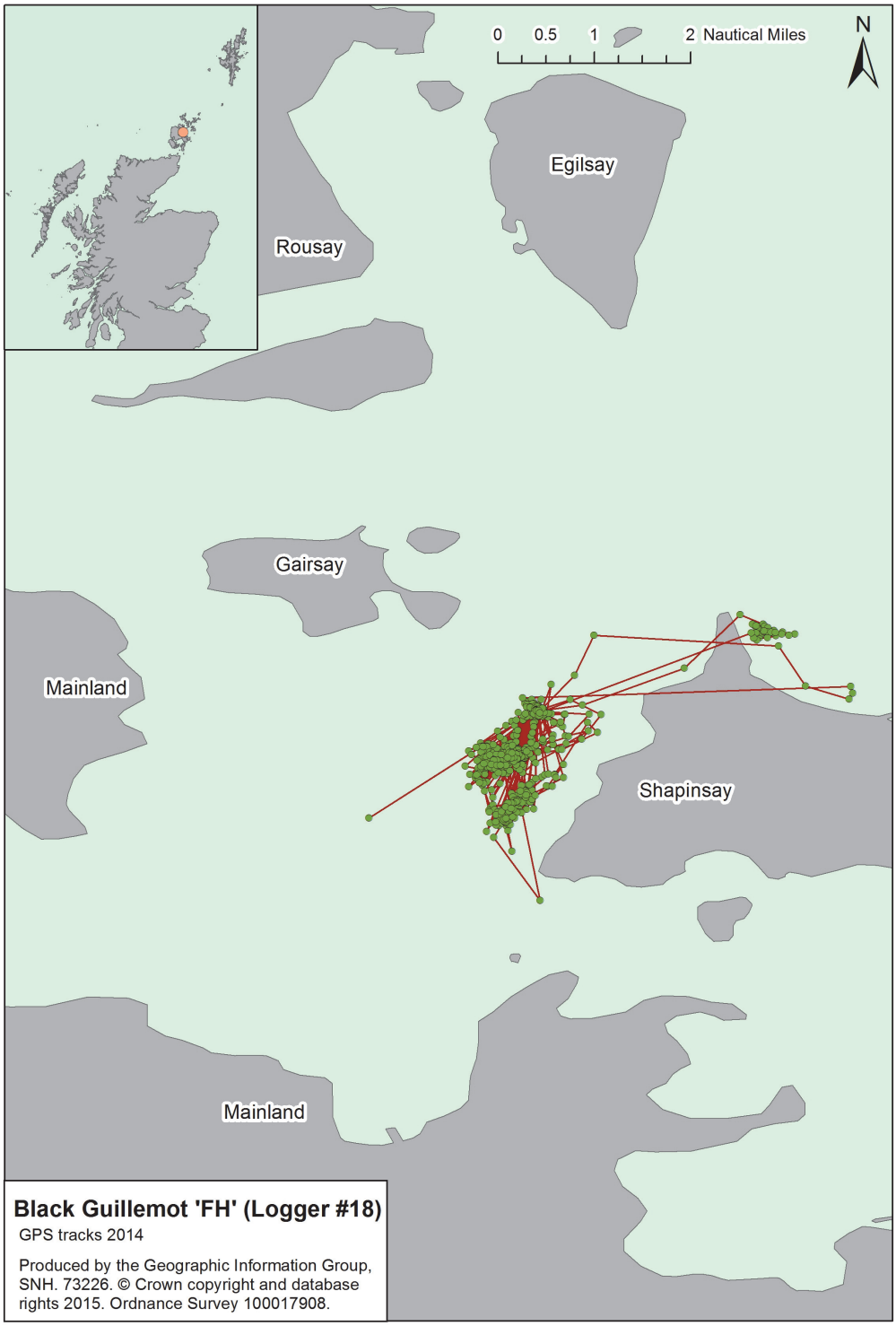

Figure 19: GPS tracks from Bird FH, logger 18, 2014.

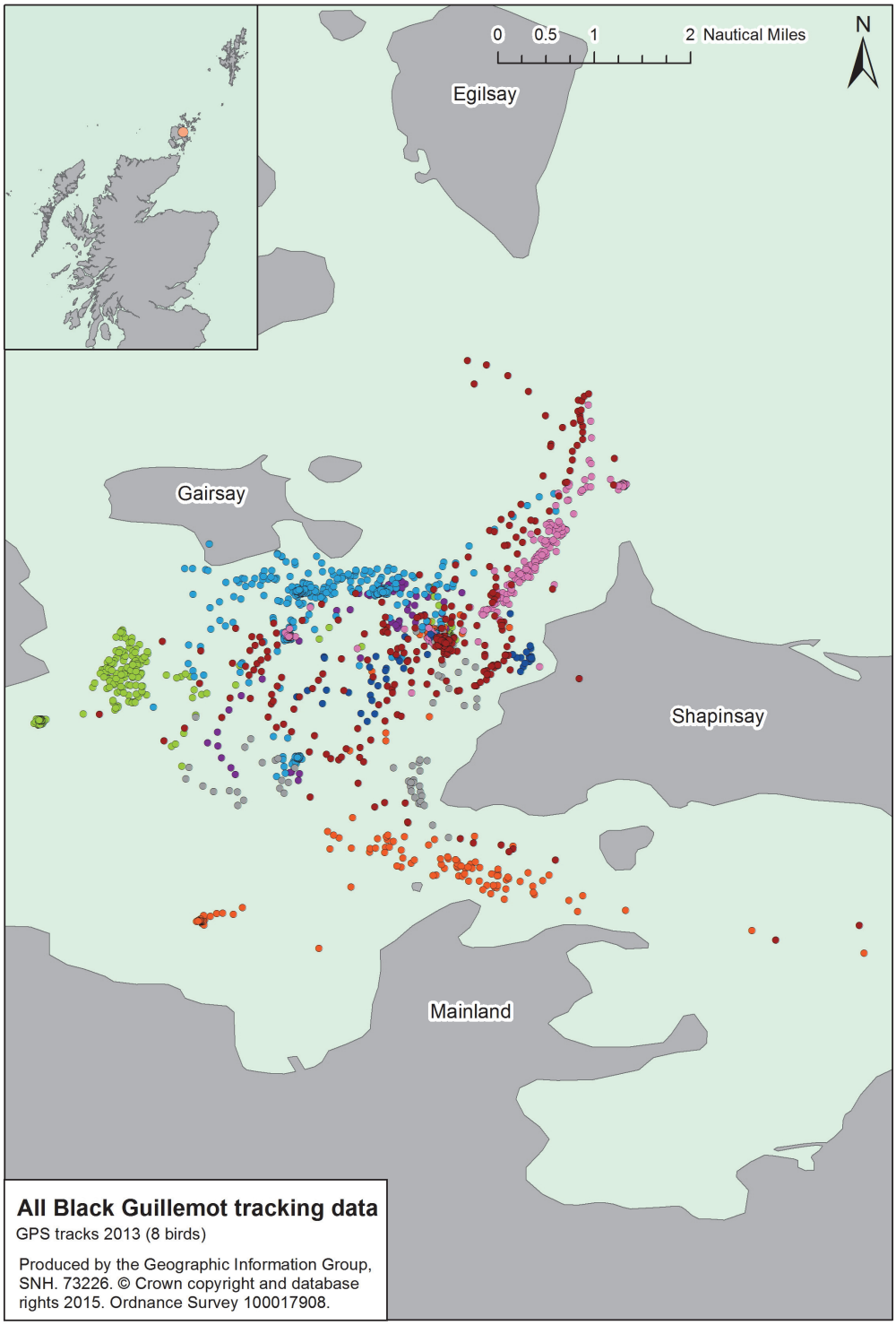

Figure 20: GPS tracks from all eight birds tracked off Shapinsay, Orkney in 2013

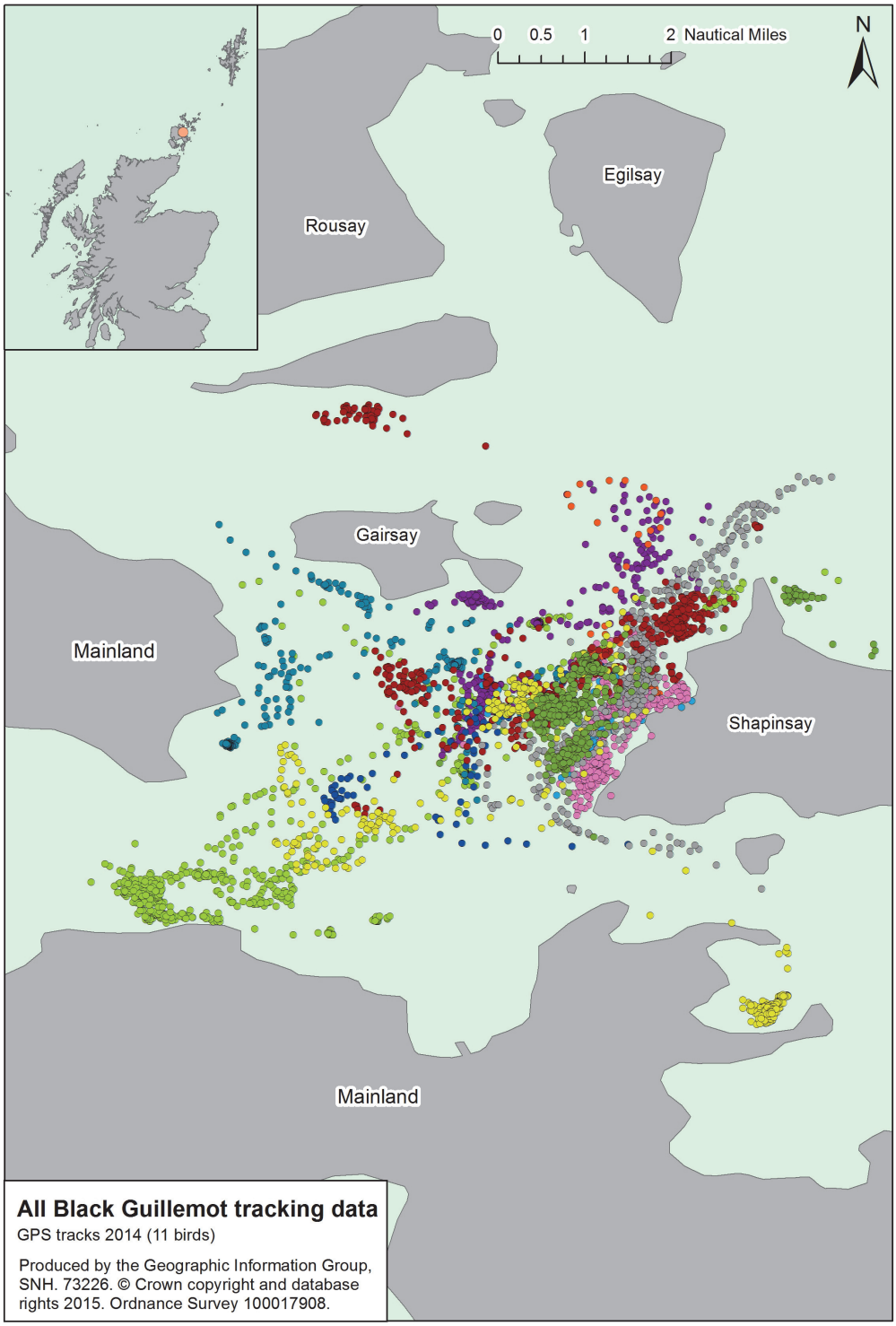

Figure 21: GPS tracks from all 11 black guillemots tracked off Shapinsay, Orkney in 2014

3.3 Foraging behaviour of black guillemots as observed by GPS tagging

The maximum foraging range recorded during incubation and chick rearing in eight black guillemots tagged during 2013 was 7.45 km / 4.02 nautical miles (10.1km / 5.45 nautical miles avoiding land) and the mean-max (mean across the maximum foraging range for each of the eight birds) was 4.51km (±1.87km) or 2.44 nautical miles. Adult birds were observed to make repeated visits to individual-specific foraging areas. For example, individual AA foraged almost exclusively to the West of the colony whereas individual BV foraged almost exclusively to the North East of the colony, individuals AI and CA foraged to the South of the colony but these areas did not overlap. BX foraged mainly to the East of the colony and AB foraged to the northwest. The two immature birds ranged more widely; in particular individual CB used the largest area of all birds tracked and visited areas in all directions from the colony, however both immature birds were also tracked for longer periods (eight days) than the adult birds.

Where possible foraging areas from the 2013 tagging were visited by boat to observe and record the seabed habitat in those areas (Figure 23). The habitat could be characterised as relatively shallow water with kelp and sandy, shingle or rocky seabed. This is in agreement with the known foraging preference for black guillemots within the sublittoral zone and observations for this species in Orkney where it is often seen to be carrying the butterfish, a sublittoral species (Walton, 2004).

All individuals in 2013 spent considerable periods using man-made objects such as disused fish farm structures (e.g. AA, figure 10) and navigation buoys (e.g. the easternmost cluster of locations for individual BV are located on a Northern Lighthouse Board navigation buoy) or other islands (e.g. AD spent time on the Holm of Boray to the East of the colony) between feeding bouts.

The maximum foraging range recorded 2014 in 11 black guillemots was 8.04km / 4.34 nautical miles (8.85km / 4.78 nautical miles avoiding land). The mean maximum foraging range for each of the 11 birds was 4.97km (±1.66km) or 2.68 nautical miles. No incubating birds were tagged in 2014. Adult birds were observed to make repeated visits to individual-specific foraging areas as in 2013. For example, individual DJ (Figure 2) foraged in an area to the South West of the colony whereas individual FA (figure 7) foraged almost to the East of the colony along the coast of Shapinsay. As in 2013, individuals spent considerable periods using man-made objects such as disused fish farm structures, navigation buoys or other islands between feeding bouts (e.g. birds DN, DJ, DX).

The maximum foraging range over both years was 7.45 km / 4.02 nautical miles (10.1km / 5.45 nautical miles avoiding land) with an overall mean maximum foraging range of 4.77 km / 2.58nautical miles. In 2013 the two immature birds ranged more widely visiting areas in all directions from the colony, however both immature birds were also tracked for longer periods (eight days) than the adult birds in that year. Tag retention improved in 2014, the mean in 2013 was 3.8 days, in 2014 it was 6.7 days. In 2014 an adult was tracked (FH, figure 12) for 17 days. During this time the bird ranged over a very small area and foraged in only three separate areas, suggesting that the wider ranging of immature birds in 2013 was not just caused by the longer duration of tag deployment.

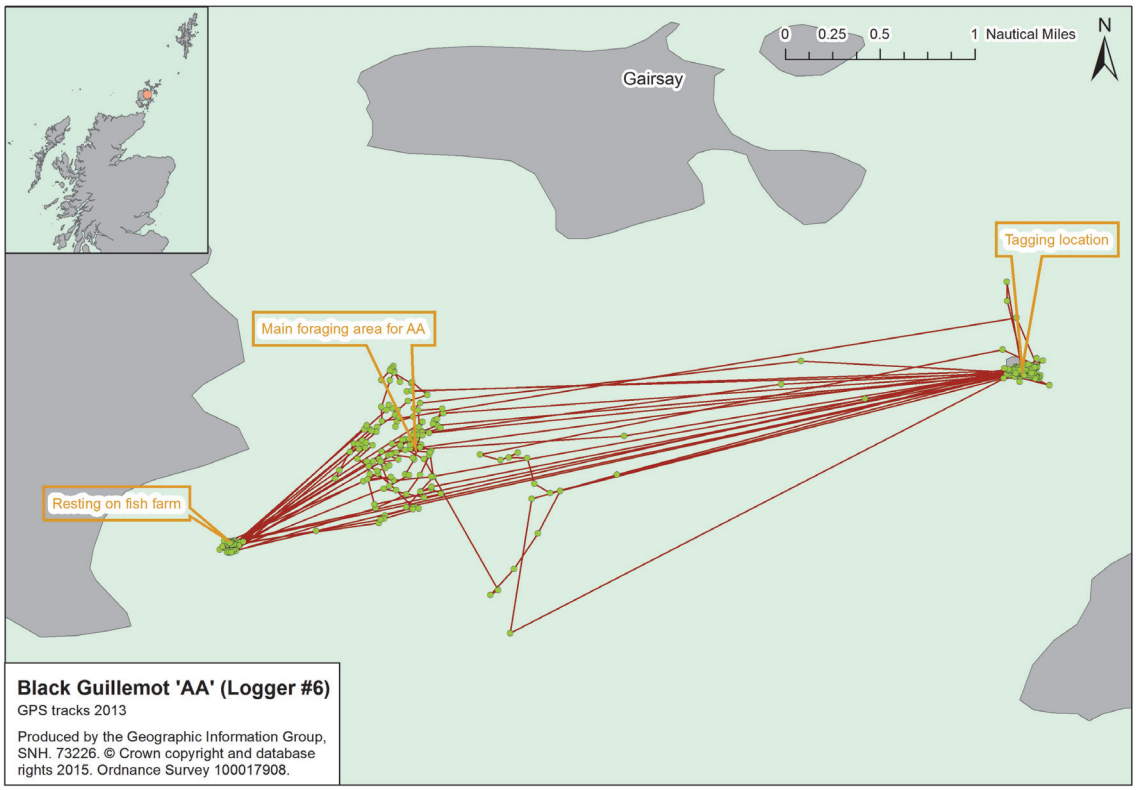

Figure 22: Foraging and resting areas for Bird AA

Figure 23: Photograph of the foraging habitat of AA which was relatively shallow water with kelp (dark areas) and sandy/ shingle seabed.

3.4 Impact of tagging on birds

The average breeding success of this colony was recorded by Paul Hollinrake as part of an on-going study (Paul, Hollinrake, unpublished data) and was 1.15 chicks per nest (from a sample of 55 nests). Two adults were caught on their nests whilst incubating eggs and fitted with tags. These were: AI who hatched two chicks, but both died before fledging and AA who hatched two chicks but only one fledged. Adult AI was caught on nest to be tagged on 20th June on 2 eggs and re-caught to remove the tag on 23rd June on one chick and one egg. At the next visit on the 12th July only one chick remained in the nest but the chick had died by the 19th July, 26 days after tagging. Nest number 22, adult AA was caught on nest 16th June when incubating 2 eggs. Two medium size chicks were present on 12th July but only one remained on the 19th July. This was one of few chicks to die at medium size-class.

For mist netted birds it was not always possible to observe which nest they returned to. BV was caught just outside nest 42 with food which was being brought to a nest which strongly suggests that this adult was nesting in nest number 42. This nest fledged two chicks successfully. AC flew from nest nine into the mist net when caught, and this nest also fledged 2 chicks. Previous information suggests that black guillemots are sensitive to handling, particularly on the nest, though neither bird captured in on the nest in 2013 deserted, one fledged young and the other failed to fledge young. The recommendation would still be for future projects to also use mist netting and remote download tags in preference to methods involving recapture of adults on the nest.

Tagged birds were observed from a distance while at ‘club’ sites. Tagged birds were observed preening around the tag area.

Breeding success was not looked at in 2014 alongside the tagging work.

4. DISCUSSION

This study was a pilot study to develop a method to successfully track black guillemot. Catching birds using mist nests and remote download tags was found to be a reliably way to track this species. The Ecotone tags used performed fairly well but four tags did not provide any data. The longest foraging trip was 7.45km (10.1km avoiding land). This study has considerably increased the amount of tracking data available for a species known to be particularly challenging to track and has allowed an initial assessment of the variation between years.

Typically black guillemots were feeding in shallow areas with kelp and individual birds used a small number of feeding sites repeatedly. Black guillemots use manmade and natural objects in the environment for resting between foraging bouts. It is of note that the foraging ranges and behaviour were very similar between 2013 and 2014, but further analysis of the data would be needed to quantify this. The methods used to track this species worked well but some colonies, where black guillemot numbers are low and birds nest in inaccessible areas, would not be suitable to catching black guillemots, as was the case in 2014 on Sanda.

Similar tagging at other colonies would greatly increase our knowledge of black guillemot foraging as this is likely to vary between colonies. The methods used here provide a good basis from which to carry out black guillemot tracking at more locations. Further survey of areas identified as foraging habitat for black guillemots in this study would greatly increase our knowledge of habitat preferences for black guillemots. Habitats could be characterised by their depth, habitat and sediment type, dominant prey species and current flow. This would be a powerful and relatively straightforward method to characterize the habitat preferences of black guillemots.

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ISBN: 978-1-78391-376-3

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