TRACKING THE MOVEMENTS OF LUNDY'S SHEARWATERS

by

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INTRODUCTION

The Manx Shearwater (*Puffinus puffinus*) is of special importance to the UK since the vast majority of the world population of this remarkable seabird makes its home around the coasts of Britain and Ireland. After a winter spent off the coast of Argentina, approximately 90% of the breeding population of Manx Shearwaters return each spring to the dense island strongholds of Skokholm, Skomer and Rum and a host of other minor colonies around the Irish Sea and the west coast of Ireland.

While Lundy seems to have suitable breeding habitat in abundance, the long-term presence of rats appears to have prevented successful breeding and colonisation of the island by shearwaters. Until recently, only relatively small numbers of shearwaters have been found breeding on Lundy.

However, in 2006 the island was declared rat-free following a programme of rat eradication. Since then, the potential for Lundy to become an important breeding colony appears to have improved greatly. Following the eradication, the number of birds attempting to breed has increased rapidly, with a current estimate of around 1,100 breeding pairs. In recent years, successfully fledged young have even been sighted emerging from their burrows and preparing to embark on their first migration.

Conservation projects such as the removal of rats can have enormously beneficial effects on breeding success at colonies like Lundy, and the protection of nesting habitats can ensure that breeding birds are safe from other damaging impacts. Shearwaters, however, spend most of their lives at sea and their breeding success depends on the resources they find there. Without a similar level of marine protection, our conservation efforts may be described as incomplete at best.

During the breeding season, adult shearwaters must leave the colony on frequent, long-range trips to sea. At the peak of chick growth, each adult in a breeding pair must make a round trip to sea at least every 1-2 days, returning each time with around 55 g of partially digested small fish in order to satisfy their hungry chick. In addition, they must find food for themselves, as well as safe locations to preen and rest. All of this happens away from the colony, out at sea, but where exactly, we do not know.

Large numbers of shearwaters are often sighted in the Bristol Channel close to Lundy. However, the small numbers of birds breeding on the island make it likely that the majority of these birds come from nearby larger colonies, such Skomer and Skokholm. The locations where Lundy birds engage in behaviours such as foraging for prey, preening and roosting, and how variable these are between years, are still largely unknown. This information will be of critical importance in minimising potential threats to the species, particularly from a growing marine renewable energy industry.

In order to learn more about the at-sea movements of breeding birds from Lundy and to find out which areas they use most, we deployed miniature Geographical Position System (GPS) loggers on a number of birds captured on Lundy during the chick-rearing period of the 2009 and 2010 breeding seasons.

GPS TRACKING ON LUNDY

During August 2009, we set up our study plot on the steep sidings just north of the Old Light on Lundy's West Side, in an area of grass and bracken already known to be one of the most densely occupied by breeding birds. Around 50 burrows were selected initially as likely shearwater nests based on the presence of signs of activity such as feathers, faeces and nest material. In order to monitor activity, we placed small bamboo sticks inside each burrow entrance; these are easily knocked down by birds entering or exiting the burrow, indicating that the nest is in use. A total of 20 burrows that showed early signs of use were chosen for the study and these were marked with small numbered marker pegs (see Figure 1, colour plate 8).

Between 1 and 12 August 2009 and 10 and 23 July 2010 we made nightly visits to the colony to inspect burrows and deploy or remove GPS loggers. Our 20 study burrows were netted using purse nets and we inspected them every 15 minutes throughout the nights from dusk until first light.

When we found a bird in one of our nets that had not entered the burrow far enough to disturb the bamboo sticks, the bird was ringed with a metal BTO ring and released on the surface. If the pegs had been disturbed by the bird's entry to (or exit from) the burrow, we assumed that the bird was probably nesting there and the bird was fitted with a miniature GPS logger.

The GPS loggers were small devices weighing only 15 g once sealed in waterproof plastic. We programmed each GPS to record the exact position of the bird every five minutes until the battery was exhausted (most batteries last around ten days). We attached the GPS loggers to the backs of the captured study birds using four or five strips of TESA marine cloth tape, each wrapped around a small bunch of back feathers, allowing the device to sit like a backpack above the bird's centre of gravity (see Figures 2 and 3, colour plate 8). After several nights' work, we managed to deploy GPS loggers on 15 birds in 2009 and 16 birds in 2010.

In order to retrieve the valuable data from the GPS loggers, the devices must be recovered intact. It was therefore necessary for us to recapture each of the tracked birds once they returned to the colony after their trips to sea.

And so we waited… In 2009 clear skies and a big moon conspired to produce a series of fantastically bright nights. While we sat waiting nervously for the return of the birds, so they sat (we later learned from the data – Figure 6, colour plate 11) rafting offshore, reluctant to return to the colony without the cover of darkness. We learned from this experience, and in 2010 we avoided tracking during the full moon. Even so, clear nights and an ever-growing moon hampered our effort to collect the stragglers in the second year too.

Eventually though, the birds returned carrying their GPS loggers and were recaptured using the same method as the initial capture, or on occasion by hand on the surface. Small LED lights on the devices were useful in alerting us to GPS birds wandering around the colony on foot. In order to remove the GPS loggers from returning birds, we carefully peeled back the strips of tape to release the device. We then carefully removed the strips of tape from the birds' feathers before returning them to their burrows. After many long nights, in 2009 we managed to recover 11 of our GPS loggers, 10 of which had successfully logged data, while in 2010 we recovered 15, all of which had logged data.

A few birds did not return in time for us to remove their GPS loggers. The devices left attached to these birds would have fallen off after about 2-3 weeks as the tape gradually loses its stickiness and detaches from the feathers.

WHERE DO THE SHEARWATERS GO?

Figures 4 and 5 (colour plates 9 and 10) show the routes of the 10 birds tracked from Lundy in 2009 and the 15 birds tracked from Lundy in 2010. Each individual bird is tracked in a different colour. These maps show that in both years many birds from Lundy made relatively short-range trips. Much of the time, Manx Shearwaters from Lundy did not go more than 100 km or so from the colony, with the majority of tracks constrained to the greater Bristol Channel and Celtic Sea area. In particular, many birds headed towards the North Devon coast. This suggests that, at least during the time of our study, there were adequate prey resources located fairly locally and that these were exploited by shearwaters breeding on Lundy.

Some birds, however, did travel much further. One bird tracked during 2009 travelled north through the Irish Sea to the area between the Isle of Man and Dundalk Bay. This feat of navigation and endurance was repeated in 2010 by another four birds, suggesting that this may be a relatively common behaviour for birds from Lundy. These birds may have made such long journeys in order to exploit potentially high densities of prey associated with the Irish Sea Front located in this region. The very wiggly sections of the birds' tracks may indicate those specific areas in which they stopped to search for prey.

Another bird in 2010 made an interesting and unexpected longer-range journey, travelling along the coast around the tip of Cornwall and into the Channel, venturing as far as Dartmouth before returning to the colony via a similar route. This was the first bird we have ever followed into the Channel using GPS.

As well as finding food, the sea is important to Manx Shearwaters as a relatively safe place to rest and preen. Shearwaters are extremely vulnerable to predators on land and, apart from their nocturnal visits to the colony to incubate their egg or feed their chick within the safety of their burrow, they tend to roost in large flocks, or rafts, out at sea. To give an indication of just how important the waters around Lundy are for rafting shearwaters Figure 6 (colour plate 11) shows part of a track from one bird within about 10 km of the island. Each black dot represents one five-minute recording of position (or GPS fix), so closely spaced points occur where the bird is rafting, drifting slowly on the water. Curved lines of closely spaced points occur where the bird drifts on a turning tide. The rafting activity seen here occurred over the course of five nights and is representative of the level of local rafting activity seen in the majority of birds tracked during this study.

Displaying a mass of individual tracks to represent the areas that are important to the group of tracked birds as a whole can prove to be misleading. A long time spent at one location by one

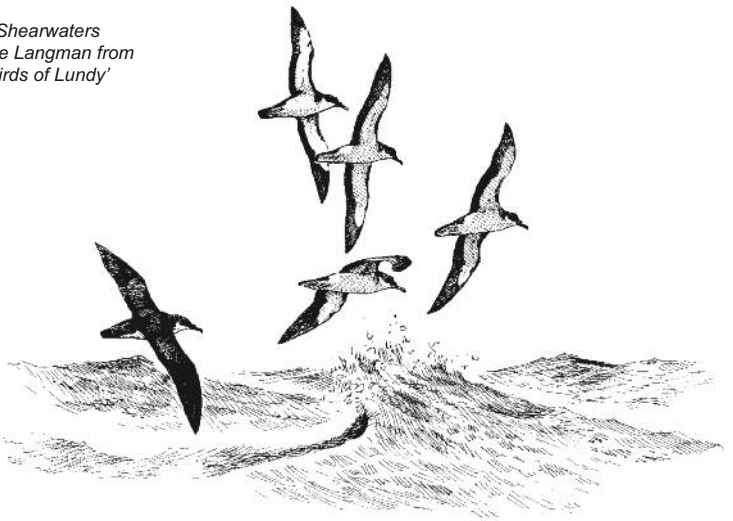
bird can give the impression that this area is of particular importance to all birds, when in fact other birds may never go there. To represent more fairly the relative importance of different areas to birds breeding on Lundy, we calculated contour lines that enclose the densest aggregations of GPS fixes for all birds in each year of the study (Figures 7 and 8, colour plates 12 and 13). In these figures, the purple line encloses the densest 50% of all the locations recorded for all birds. These are the most important areas, where most birds spent most of the time. Similarly the red line encloses 70% of all bird activity and the yellow line encloses 95%. Almost all of the bird activity falls within the yellow line, including the less frequented areas.

Drawing firm conclusions from the comparison of bird distributions in different years is often difficult, especially when we have only 10 and 15 birds to compare. In addition, the tracking was done at slightly different times of the year (early August in 2009 and late June in 2010) so any variability may be due to the time of year rather than real differences between years. Nevertheless, looking at the contour plots of bird activity for 2009 and 2010, we can see that the distribution of Lundy birds at sea was broadly similar between years, but with some interesting variability.

In both years the waters around Lundy were clearly very important, although the distribution was shifted south towards the North Devon coast in 2010. In 2010, more birds were also recorded flying further afield. The range of 'local' trips appears to have been slightly greater, with birds venturing further west into the Celtic Sea. 2010 also saw more birds making long-range trips north to the Irish Sea frontal region. As a result, the level of bird activity recorded there was similar to that recoded in the waters immediately adjacent to Lundy.

In 2011, we will be returning to the study colony on the western slopes of Lundy to deploy yet more GPS loggers and collect an important third year of data. This information will be vital to our understanding of the variability in the location of resources used by Manx Shearwaters. The continued success of the Lundy shearwater colony will certainly depend on a solid understanding of the areas of sea that are important to these birds. Furthermore, if the planning of the proposed Atlantic Array Wind Farm Project adjacent to Lundy is to be undertaken in a way that is sensitive to local marine life, inclusion of the information that we are collecting on Lundy will be essential.

Manx Shearwaters
by Mike Langman from
'The Birds of Lundy'



ACKNOWLEDGEMENTS

This work would not have been possible without the help and support of the staff and volunteers of Lundy. In particular we would like to thank the warden Nicola Saunders for her invaluable help in planning the work and in assisting with the deployment and retrieval of devices. The authors would also like to thank Helen Booker (RSPB), Tim Jones and Tim Davis (Lundy Field Society) and Tony Taylor for invaluable assistance, discussion and encouragement. Financial support was kindly provided by generous awards from the Birds of Lundy Fund and the RSPB, with additional support from Oxford University and Microsoft Research, Cambridge.

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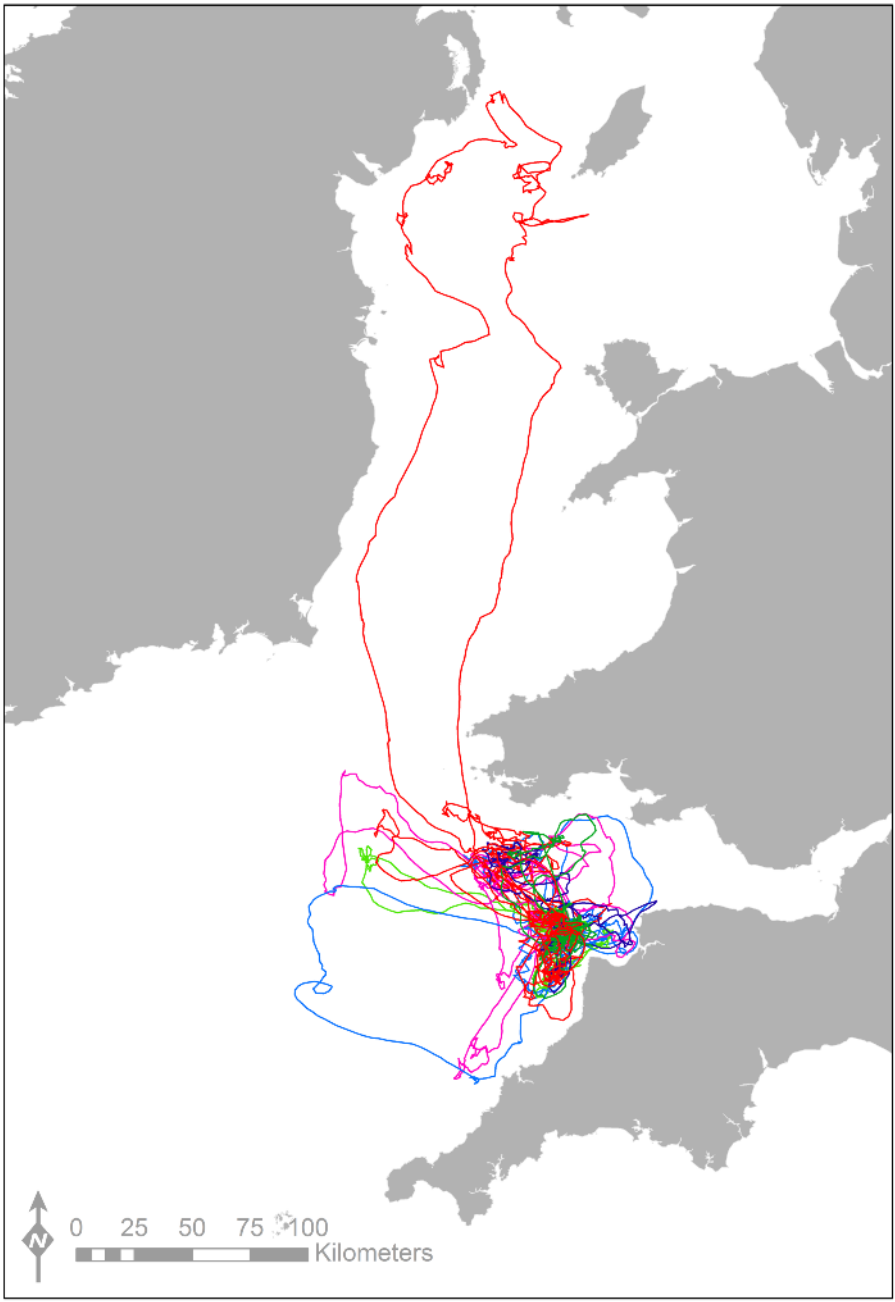
PLATE 8

Figure 1. Example study nest (OX8) in the study colony on the steep sidings just north of the Old Light on the island's West Side.

Figure 2. The GPS device is positioned to sit like a backpack above the bird's centre of gravity, leaving the wings completely free to move.

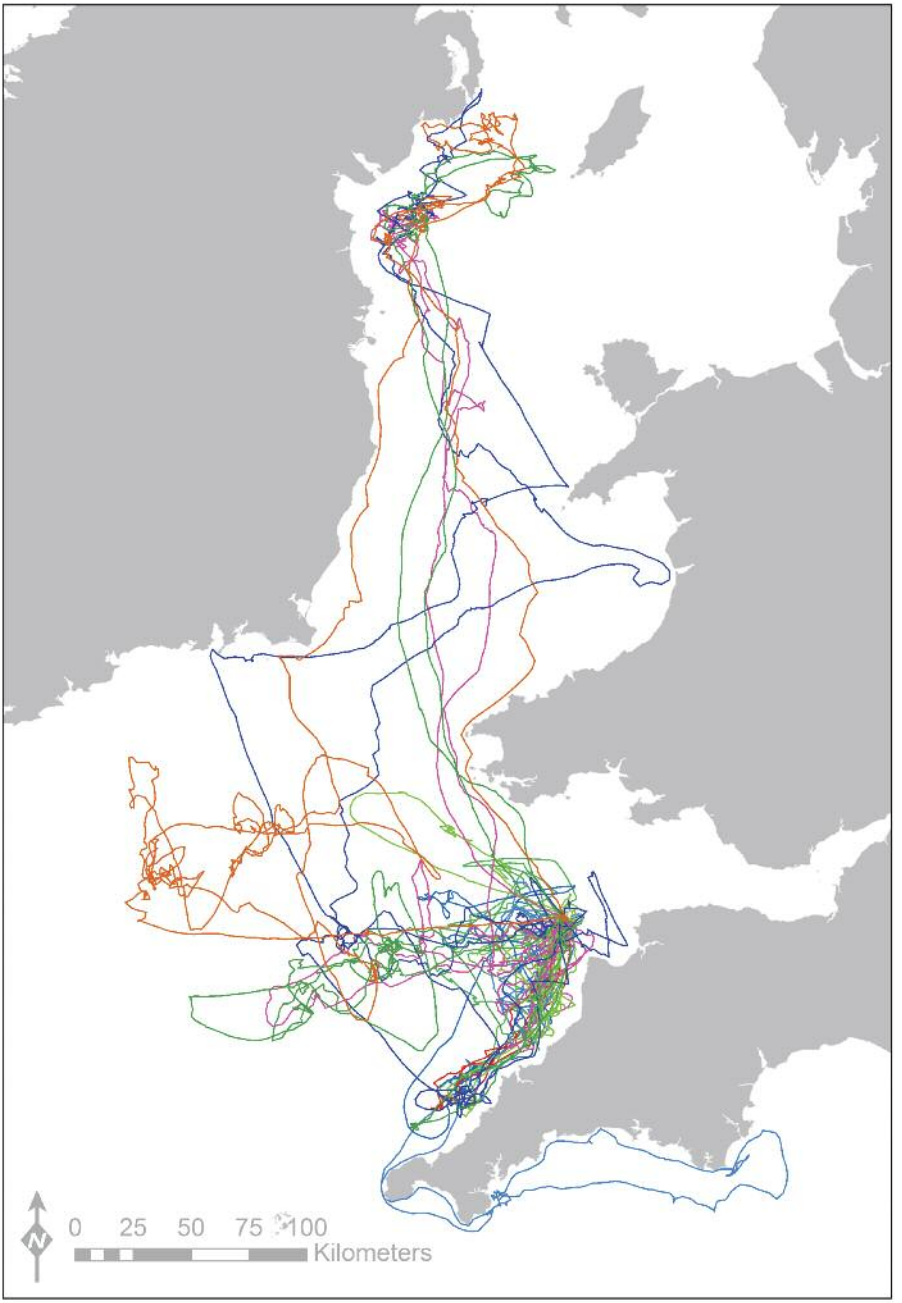
Tracking the movements of Lundy's Manx Shearwaters
– see pages 76–80.

Figure 3. An example GPS attachment. A sealed GPS logging device attached to a bird using TESA tape.

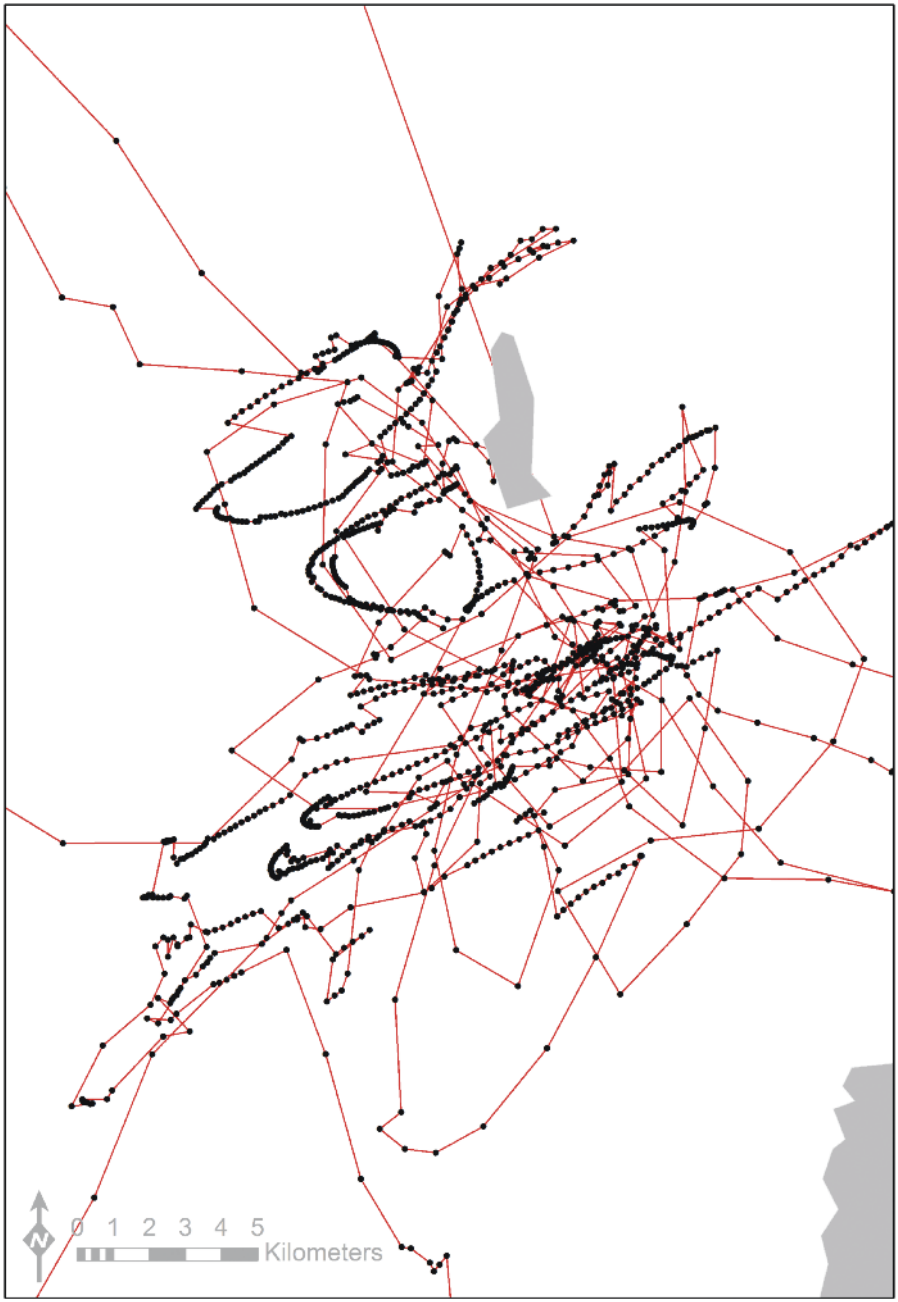


Manx Shearwaters – Figure 4 (page 78). The tracks of 10 individual Manx Shearwaters breeding on Lundy, while away from the colony on foraging trips during the chick rearing season of 2009.

PLATE 10

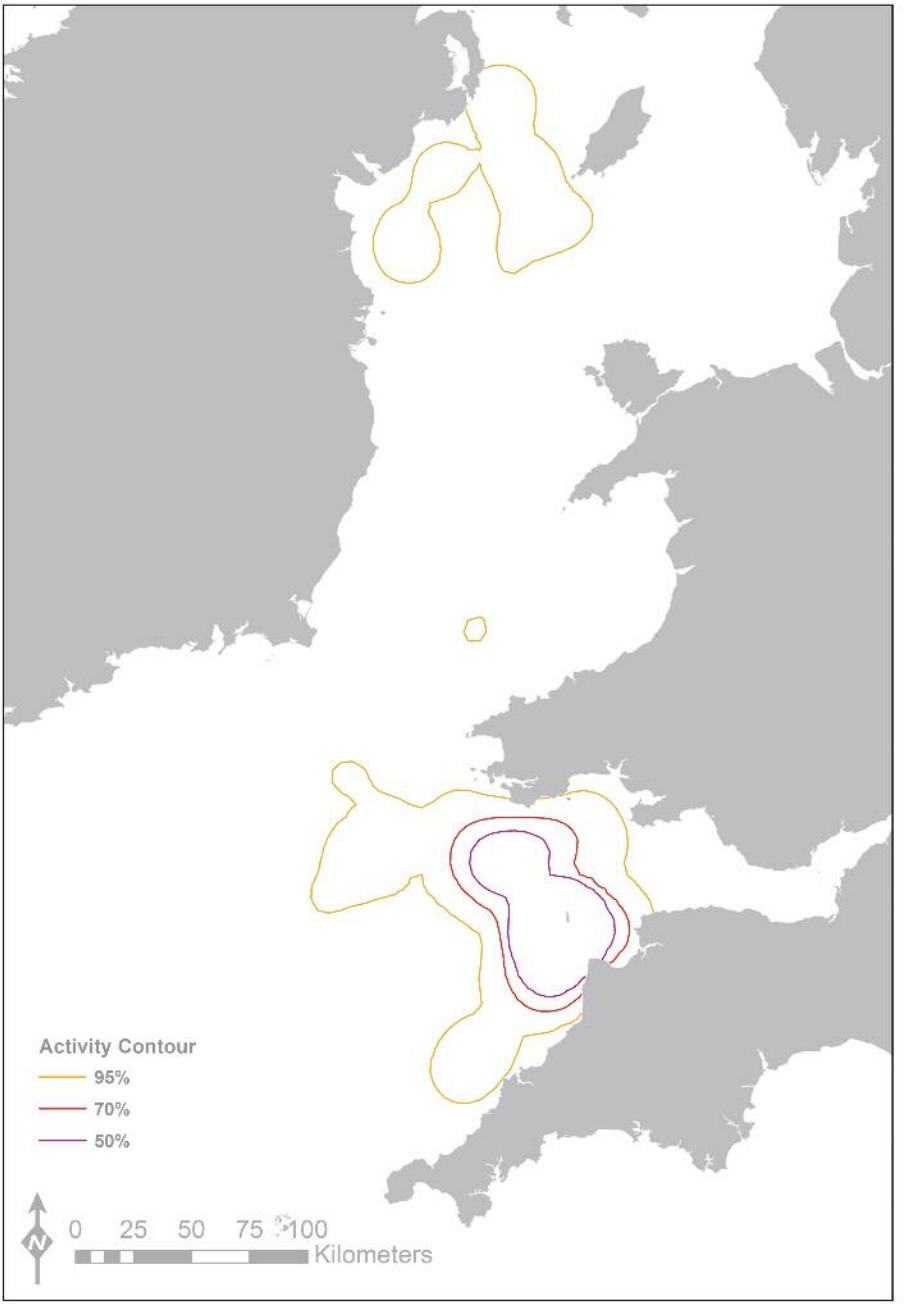


Manx Shearwaters – Figure 5 (page 78). The tracks of 15 individual Manx Shearwaters breeding on Lundy, while away from the colony on foraging trips during the chick rearing season of 2010.

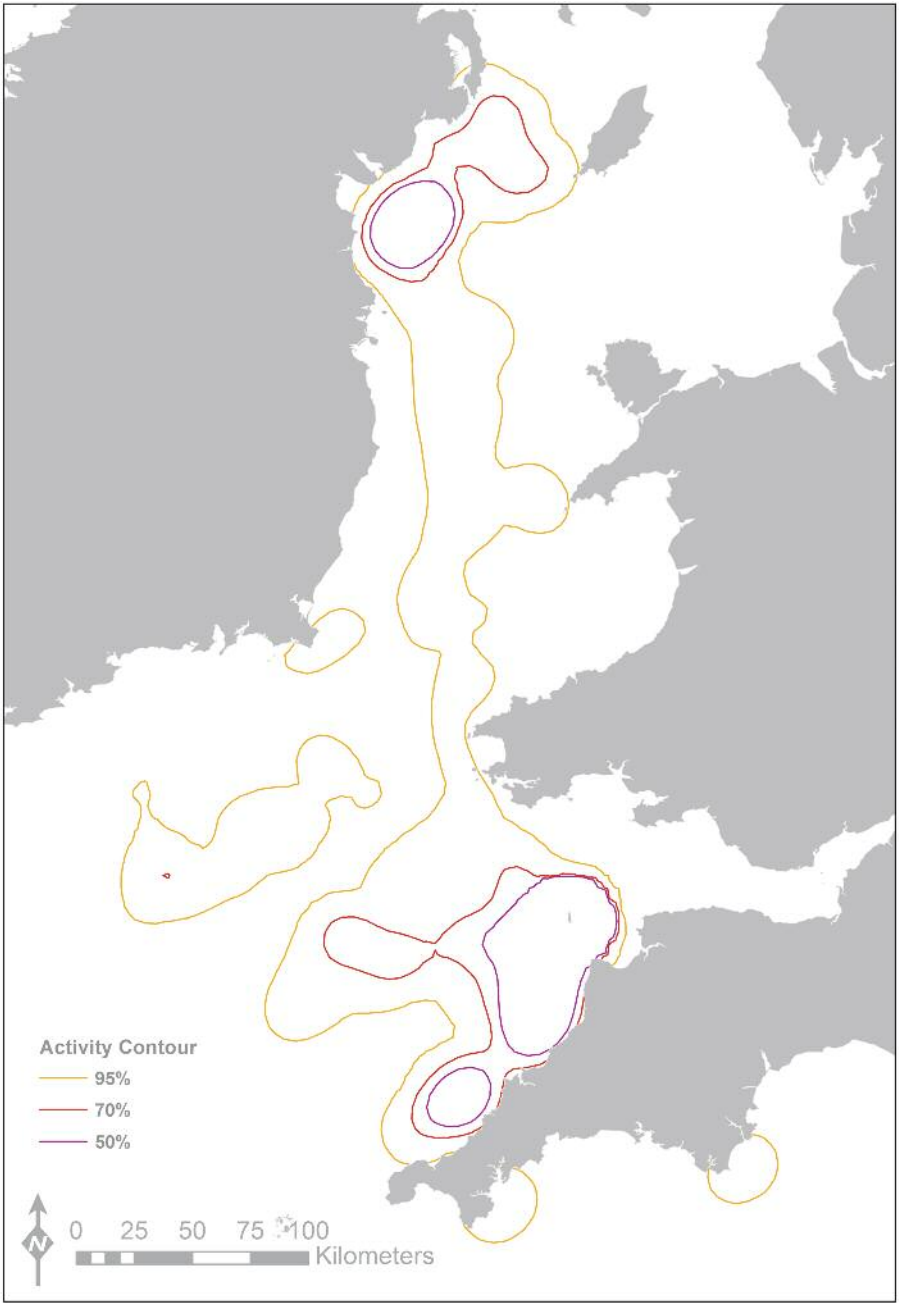


Manx Shearwaters – Figure 6 (page 78). Part of a track from a single bird in 2009 showing the extent that the waters around Lundy were used for rafting over the course of five nights. Each black dot is a five-minute recording of position, so closely spaced points occur where the bird is rafting, drifting slowly on the water. Curves of closely spaced points occur where the bird drifts on a turning tide.

PLATE 12



Manx Shearwaters – Figure 7 (page 77). Activity contours for the combined data from the 10 individual Manx Shearwaters tracked during the chick rearing season of 2009. These contours include 50%, 70% and 95% of the locations recorded by the GPS loggers, indicating the areas where the shearwaters from Lundy spent most of their time at sea.



Manx Shearwaters – Figure 8 (page 79). Activity contours for the combined data from the 10 individual Manx Shearwaters tracked during the chick rearing season of 2010. These contours include 50%, 70% and 95% of the locations recorded by the GPS loggers, indicating the areas where the shearwaters from Lundy spent most of their time at sea.