Robin Rigg Solway Offshore Wind Farm

Bird Monitoring Programme Report No. 8: construction phase bird surveys October-December 2009 and comparison of construction phase data with previous baseline

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INTRODUCTION

1. This report represents the eighth of the quarterly bird monitoring reports to the Robin Rigg offshore wind farm Monitoring Group [RRMG] and presents the results of the final bird surveys that are being undertaken as part of the construction phase monitoring programme. The surveys reported here cover the work carried out between October and December 2009. This now gives two year's data collection during the construction phase, so the report also compares the bird numbers found with those during the pre-construction baseline.

2. The main aim of this work is to determine the distribution and abundance of seabirds using the Robin Rigg offshore wind farm site and its surrounds during the construction phase of the wind farm. As for the previous baseline surveys reported in the ES, the November 2004 Update Report (Percival *et al*. 2004; referred to hereafter in this report as the *Update Report*), and the previous quarterly bird monitoring reports (Percival et al. 2008a-c and 2009a-d), the survey methods were designed to suit as best possible all of the main bird groups that were being surveyed. Standard methodologies were used, following Komdeur *et al*. (1992) and Camphuysen *et al*. (2004), though these were tailored to suit the local surveying conditions and incorporate recent methodological improvements. In particular the spatial resolution of the data collection was more precise than these standard survey techniques. There were no changes to the survey methods to those employed for the previous baseline surveys.

3. The following construction activities were undertaken during October - December 2009:

    - The east export cable installation.

    - Ongoing commissioning of installed wind turbines.

THE STUDY AREA

4. The surveys that form part of the construction phase monitoring and are reported here used the same study area as that described in the ES. This included the area in which the wind farm is being constructed (10.3km^2), plus an area exceeding 5km around this. The total survey area was 380km^2. Its extent is shown in Figure 1.

SURVEY METHOD

5. Boat-based surveys are being undertaken to provide the data for the construction phase monitoring. The same vessel was used for these surveys as for the ES and the Update Report surveys, the '*Solway Protector*', a Fisheries Protection Vessel (16m length, 18 tonne displacement), apart from the survey on 4 and 31 December 2009. This vessel provided an excellent viewing platform and has the combination of speed (to be able to survey across the range of tidal conditions) and the ability to operate in relatively shallow water. Its viewing platform gives a 4.5m viewing height above the sea surface. Though this is slightly below the JNCC recommended 5m, it gave a very

suitable viewing platform, especially when taking into account the site constraints on a larger boat (which would not have been able to navigate the sandbanks that run through much of the study area). The maximum wind force for observations was reduced from force 5 to force 4 to further ensure that viewing conditions were optimal and were not compromised by the slightly lower viewing height. The *Solway Protector* was unavailable then so alternative vessels of similar specification were used instead, the '*Talisman of Wight*' on 4 December and the '*PV Tiger*' on 31 December. Though the viewing height of the two replacement vessels was slightly lower than the *Solway Protector*, the good viewing conditions and the willingness of the skipper to venture into shallow water depths over Barnhourie Sands led to successful surveys being completed.

6. The same survey transects were used as reported in the ES. The survey route was designed to provide a 2km interval between transects; a total of 10 transects were surveyed, each of about 18km length. This separation distance was chosen to ensure that an adequate sample of the study area was covered for all species, whilst minimising the likelihood that birds may be displaced from one transect to the adjacent one (and hence double-counted).

7. Restricted hours of daylight, weather and tidal conditions meant that it was not always possible to cover the whole survey area in a single day. The surveys were planned to achieve a target of one full low tide survey and one full high tide survey each month (which was achieved during two of the three months, October and December). A combination of adverse weather conditions and mechanical problems with vessels meant that no surveys were carried out in November 2009. A GPS record of the precise route was taken on each trip, so that the location at all times was known. The GPS tracks for each survey are shown in Figure 1. A total of 4½ surveys were undertaken between October and December 2009 on the following dates:
    1) 5 and 7 October 2009 - full high tide run (though restricted in upper parts of some transects by water depth);
    2) 13 October 2009 - full low tide run (though restricted in upper parts of some transects by water depth);
    3) 4 December 2009 - high tide run of the four northern transects (G-J);
    4) 11 December 2009 – full low tide run (though restricted in upper parts of some transects by water depth);
    5) 16 and 31 October 2008 – full high tide run;

8. The observation team included Clive Hartley, Dave Shackleton and Dave Piercy, who were all involved in both observation and recording. The team are experienced ornithologists, well able to identify all the species encountered accurately. All observers also had a good knowledge of the area and its ornithological interests.

9. All birds encountered, their behaviour, flight height and approximate distance from the boat were recorded. Following the JNCC Seabirds at Sea recommendations, birds were recorded into five distance bands (0-50m, 50-100m, 100-200m, 200-300m and 300+m). Birds were recorded continuously, at a steady speed of approximately 12 knots, with the precise time of each observation recorded where possible to give as accurate a position as possible (linking to the GPS position information being recorded simultaneously). A range-finder was used to estimate distances of the birds

from the ship. All records of birds observed flying as well as those on the sea were recorded.

DATA ANALYSIS

10. The raw survey data need to be adjusted to obtain study area population estimates to take into account (a) the survey coverage and (b) the fact that the likelihood of a bird being seen declines with distance from the observer (i.e. detectability is a function of distance from the transect line). Both these corrections were implemented in the ES, the Update Report and the previous Bird Monitoring Reports, in the same way as described here.

11. Allowing for coverage is straightforward. Though the boat survey did cover a high proportion of the study area this coverage is not complete, but this adjustment can be made according to the area covered on each survey.

12. As well as taking into account coverage, it is also important to take into account the fact that the detectability of most birds would be expected to decrease with distance from the observer. Put simply, the chance of seeing a bird close to the observer would be higher than if it were at greater distance. The relationship between detectability and distance can be modelled using software packages such as Distance (Buckland et al. 2001), but for the purposes of this report a simpler approach has been adopted (mainly because the limited number of distance bands makes modelling of the distance function difficult for many of the species encountered in this study). The approach used here is similar to that used by JNCC in their Seabirds at Sea surveys (e.g. Stone et al. 1995), but correction factors have been calculated for each species specifically using the data collected from this survey. Details of these calculations and the correction factors used for each species were given in Appendix 6 of the Update Report, and the same factors have been used here.

13. It should also be remembered that surveys do not produce an absolute count of all of the birds present within the study area. Rather they sample the survey area, and hence the population estimates presented in this chapter are precisely that, best estimates from the data available and not exact counts.

CONSERVATION IMPORTANCE OF BIRD POPULATIONS

14. The same evaluation methods have been used as those in the ES, the Update Report and the previous Bird Monitoring Reports. The principal method used to evaluate the conservation importance of the bird populations in the wind farm area and its surrounds was the standard 1% criterion. The population was considered to be internationally important if it exceeded 1% of the whole bio-geographic population, nationally important if it exceeded 1% of the GB populations. Threshold levels were taken from Austin *et al.* (2008) and Baker *et al*. (2006).

15. Further categories of regional and local importance were used for species that did not reach national importance. The first of these was defined as more than 1% of the regional resource, whilst the latter included all species on the red or amber lists of the

RSPB *et al's* 'Birds of Conservation Concern 3' (Eaton et al. 2009) that did not reach at least regional importance in the study area.

16. The same strategy for the presentation of the results has been used in this report as in the ES, the Update Report and the previous Bird Monitoring Reports. The first step was to establish the bird populations present within the study area during each survey. These data were then used to identify the species present in important numbers, and for each of these, summary distribution maps are presented.

17. As two year's construction phase monitoring survey data have now been collected, a full analysis of the effects of the wind farm construction on bird numbers and distribution has been undertaken and is presented in this report.

SURVEY RESULTS: October-December 2009

18. The data presentation in this section follows that in the ES. This includes correction for survey coverage and species detectability. The study area population estimates derived from each of the surveys is given in Table 1. Birds for which full specific identification was not possible have been included to the species group. Where a range of species and an 'unidentified' component were used within a major group the overall total for that group is also given, e.g. for divers the birds identified to species are given, plus a 'diver sp.' category for the birds that could only be identified as divers.

Table 1. Study area population estimates for each of the monitoring surveys carried out during October-December 2009.

Species	*Survey 1*	*Survey 2*	*Survey 3*[1]	*Survey 4*	*Survey 5*
	5&7 Oct 09	*13 Oct 09*	*4 Dec 09*	*11 Dec 09*	*16&31 Dec 09*
Red-throated Diver	40	20	*19*	55	37
Great Northern Diver	0	0	*0*	2	3
Diver species	128	13	*124*	190	652
TOTAL DIVERS	169	33	*144*	247	692
Great Crested Grebe	0	0	*82*	0	0
Gannet	34	39	*0*	0	0
Cormorant	10	33	*22*	244	341
Goose species	0	0	*0*	0	1
Pink-footed Goose	0	0	*0*	0	205
Scaup	0	0	*180*	0	350
Common Scoter	330	550	*900*	800	480
Goosander	0	0	*0*	0	1
Red-breasted Merganser	0	0	*0*	6	0
Little Gull	0	0	*2*	0	0
Black-headed Gull	54	72	*70*	72	23
Common Gull	169	135	*65*	583	753
Herring Gull	7	27	*27*	280	50
Lesser Black-backed Gull	30	10	*0*	0	0
Great Black-backed Gull	27	20	*9*	73	154
Kittiwake	3	13	*4*	0	0
Gull species	176	20	*4*	120	26
Gull species (small)	65	1	*15*	181	61
Gull species (large)	0	140	*1*	28	2
TOTAL GULLS	531	440	*197*	1,336	1,070
Guillemot	458	162	*102*	45	138
Razorbill	157	305	*45*	17	27
Auk species	427	122	*370*	143	70
TOTAL AUKS	1,042	590	*517*	205	236
Skylark	16	0	*0*	0	0
Meadow Pipit	1	0	*0*	0	0

19. One species new to the surveys was observed during October-December 2009, buzzard. A single individual was observed flying south in north-western part of the study area on 31/12/09.

20. Table 2 compares the peak population estimates for the key species for the October-December period for the wind farm area and for the whole study area during the pre-construction (ES and Update Report) surveys and each of the two years' construction monitoring surveys.

21. Numbers in the study area during October-December 2009 were generally similar to those recorded during the 2008 October-December surveys, though with a higher peak count of divers and cormorants, and comparatively low numbers of guillemot. The peak scaup count was similar to that recorded during the pre-construction

[1] Partial survey - 4 northern transects only.

baseline, largely as a result of being able to access the shallow water in the NW corner of the study area.

22. Numbers in the wind farm area have continued to be very low for all species through all of the surveys (Table 2). The only change post-construction at this time of year has been a reduction in use of the wind farm area by auks (guillemot and razorbill), with the peak numbers of the latter in particular found pre-construction not being repeated during construction.

23. In terms of the conservation importance of these populations within the study area, the peak numbers of red-throated diver, cormorant, scaup and common scoter exceeded the threshold for national importance. Guillemot and razorbill occurred in regionally important numbers. Each of these species is discussed in more detail below.

Table 2. Peak bird counts (adjusted for detectability and survey coverage) in the wind farm and whole study area during October - December.

Species	**Wind farm peak counts:** *Pre-construction*	*Con-struction year 1 (2008)*	*Con-struction year 2 (2009)*	**Study area peak counts:** *Pre-construction*	*Con-struction year 1 (2008)*	*Con-struction year 2 (2009)*
TOTAL DIVERS *	5	1	0	134	521	692
Gannet	2	0	0	17	13	39
Manx Shearwater	0	0	0	0	0	0
Cormorant	0	0	5	4	196	341
Storm Petrel	0	0	0	0	0	0
Scaup	0	0	0	397	0	350
Common Scoter	6	4	1	3,308	600	900
Kittiwake	1	0	3	27	43	13
Guillemot	43	14	14	1,874	1,004	777
Razorbill	201	7	2	1,455	369	385

* *- of those divers identified to species during Oct-Dec 2009, 97% were red-throated diver and 3% great northern diver.*

DIVERS

24. Diver numbers were generally comparatively high during the survey period, as would be expected given their usual seasonal pattern of occurrence. These birds were scattered over much of the study area, but with most seen in the shallower waters of the northern part of the study area, as previously, but also along the eastern edge of the study area (see Figure 2). As previously the large majority of the diver species to be identified (97%) were red-throated divers, though small numbers of great northern were also seen.

CORMORANT

25. Cormorant numbers recorded during Oct-Dec 2009 were again high in comparison to the pre-construction surveys (with a peak count of 341, well above the threshold for national importance of 230). Numbers during this period within the study area reached again reached national importance. Their distribution is shown in Figure 3.

The main concentration of records during this survey period was in the eastern part of the study area, with fewer in proximity to the wind farm site.

COMMON SCOTER

26. Nationally important numbers of common scoter continued to be found within the study area, though numbers were relatively low in comparison with the pre-construction peak for this period.

27. The distribution of common scoters recorded during Oct-Dec 2009 was quite widely scattered (Figure 4), though most were still recorded in the north-western part of the study area. Numbers within the wind farm site during Oct-Dec 2009 were again very low (peak of only 1 bird).

GUILLEMOT

28. The general pattern of guillemot distribution was similar in the previous surveys, with more birds found in the deeper waters in the south-western part of the study area but a wide overall distribution (Figure 5). Numbers in the wind farm site continued to be relatively low, with a peak of 14 birds during Oct-Dec 2009.

RAZORBILL

29. Razorbills were widely distributed across much of the study area (Figure 6), but with more records in the deeper waters of the southern part of the study area. Numbers in the wind farm site continued to be low (peak 2).

Upper Solway SPA species

30. Use of the study area by the internationally important waterfowl populations on the Upper Solway SPA recorded during the October-December 2009 construction surveys continued much as before, with generally only very low numbers of over-flying birds. Only one SPA qualifying species was seen during the October-December 2009 surveys, pink-footed goose: two flocks (one of 140, the other of 65) seen migrating north over the study area on 31/12/09.

BIRD DISTRIBUTION AND ABUNDANCE: COMPARISON OF 2008 AND 2009 CONSTRUCTION PHASE DATA WITH PRE-CONSTRUCTION BASELINE

31. Now that two year's construction phase data have been collected it is possible to make a more detailed comparison with the pre-construction data collected during 2001-2004. For this report two main analyses have been undertaken, firstly to compare the peak monthly counts, and secondly to compare the bird distributions in relation to the wind farm. The latter included additional analysis of the spatial distribution of diver records in relation to distance from the wind turbines. If the birds were displaced then one would expect that distance to increase after the

turbines had been constructed. This analysis was carried out for three spatial scales: (a) the immediate area of the wind farm (the wind farm site plus a 500m buffer), (b) the wind farm plus a 2km buffer and (c) for the whole study area. The results are summarised in Table 3 for each species: each is discussed in the context of each species in the following section.

Table 3. Median distances between bird records and the wind turbine locations during the pre-construction, and each of the two years' construction surveys.
Note: bold text in shaded cells indicate statistically significant differences[2] between the three periods.

Species	Wind Farm + 500m			Wind Farm + 2km			Whole Study Area		
	Pre-construction	Construction yr1	Construction yr2	Pre-construction	Construction yr1	Construction yr2	Pre-construction	Construction yr1	Construction yr2
Divers	242	231	201	1020	920	850	**5360**	**6500**	**6620**
Gannet	202	219	253	**741**	**852**	**1260**	**4880**	**5180**	**5880**
Manx Shearwater	297	240	181	508	1030	905	4500	4750	5280
Cormorant	214	222	197	879	821	704	**5770**	**4820**	**5850**
Common Scoter	256	209	267	1390	1220	1060	**5280**	**5130**	**4720**
Kittiwake	244	234	209	685	880	850	**4560**	**5760**	**5430**
Guillemot	**228**	**196**	**213**	**910**	**840**	**1270**	**4780**	**5030**	**5450**
Razorbill	244	223	191	**745**	**797**	**1070**	**4310**	**5010**	**5390**

DIVERS

32. Diver numbers in the study area were generally higher during the construction surveys than previously, particularly during November and December (Figure 7). The peak recorded during September during the pre-construction surveys was not however recorded during either year of the construction surveys.

33. Diver distribution in relation to the wind farm remained similar during the pre-construction and construction periods. The zones within 5km of the wind farm continued to be generally under-used in comparison to its area during the construction phase, whilst the area more distant was used more than would have been expected if the birds had been evenly distributed. From this analysis, the diver distribution appeared little changed by the wind farm construction activity that occurred during 2008 and 2009. The results of the analysis of the turbine distances supported this conclusion, with no significant change in distance to turbine locations of divers within 500m or 2km of the wind farm site. Divers in the study area as a whole were found at greater distance from the turbines during construction, though the lack of any significant shift in the zones closer to the turbines would suggest that this has resulted from an increase further from the turbines rather than a reduction closer to them, and is not likely to be related to the presence of the wind farm.

[2] $p<0.05$, Kruskall-Wallis test.

COMMON SCOTER

34. The study area continued to support nationally important numbers of common scoter during the construction phase and their distribution continued to be centred on the western edge of the study area, away from the wind farm site. There were however some differences in the seasonal pattern of occurrence of the birds, with peak numbers in the construction period occurring in June and July and comparatively fewer birds than the pre-construction period in May, August, September and November (Figure 9).

35. The distribution of common scoters recorded during the construction phase was similar to that found previously, with continued under-use of the zone within 2km of the wind farm compared with its area and higher relative use of the more distant parts of the study area (as had been recorded during the pre-construction surveys) (Figure 10). There was no clear evidence of any effect of the wind farm construction activity on this species. The turbine distance analysis suggested that proportionately more scoter were found closer to the turbines across the study area as a whole. Figure 10 suggests that this resulted from an proportionate increase particularly in the 4km zone from the wind farm in the second construction year, and is not likely to be related to the presence of the wind farm.

MANX SHEARWATER

36. Peak Manx shearwater numbers in the study area were slightly higher during the first year of the construction phase, with the highest numbers present earlier than during the pre-construction surveys (with the peak in June rather than August), but lower in the second construction year. This species' use of the study area appears to be transitory rather than a resident population.

37. Manx shearwater distribution in relation to the wind farm (Figure 12) was similar during the construction phase surveys to the pre-construction surveys, using the buffer zones around the wind farm in approximate proportion to their area, though the area within 2-3km of the wind farm was used more in the second construction year. The turbine distance analysis showed no significant change through the survey period at any spatial scale, adding further support to the conclusion that this species was unaffected by the wind farm construction.

GANNET

38. Gannet numbers recorded during the construction phase surveys were higher than previously in both the first and the second years but showed a similar phenology to previously (Figure 13), occurring mainly between April and October.

39. Gannet distribution in relation to the wind farm (Figure 14) was similar during the construction phase surveys to the pre-construction surveys, using the buffer zones around the wind farm in approximate proportion to their area. The turbine distance analysis showed that gannets were found at a greater distance from the turbines in the second construction year in both the 2km buffer and in the whole study area, though the increased numbers in the study area at that time would suggest that this

is more likely to be attributable to increases further from the turbines than a decline in proximity to them.

CORMORANT

40. Figure 15 documents the substantial rise in the study area cormorant population that has taken place since 2001. The peak count has risen from less than 100 during the pre-construction surveys to almost 350 in December 2009. This is likely to be at least partly a result of the increased roosting opportunity in the vicinity of the site provided by the wind turbines and the anemometer mast. The numbers in the study area are now well in excess of the current threshold for national importance (230). Their seasonal pattern of occurrence has also changed, with much higher numbers recorded during the winter period (most previous records had been during Feb-Aug (Figure 15).

41. The area up to 3km from the wind farm site held considerably larger numbers of cormorants than would be expected if their distribution were even across the whole study area (Figure 16), with a corresponding reduction in proportionate use of the area more distant from the wind farm. During the construction period the cormorant population within the study area has increased and its distribution has shifted towards the wind farm (though this was more marked in the first construction year's surveys than the second (possibly as a result of reduced availability of roosting sites when turbines were erected). The turbine distance analysis did not find any significant shift in relation to the wind farm at either the 500m or 2km spatial scales, though the cormorant distribution across the study area as a whole did show a statistically significant shift towards the wind farm in the first construction year (though not in the second).

KITTIWAKE

42. Peak kittiwake numbers were lower in the construction phase surveys than previously, with fewer birds particularly being recorded in what was the previous peak month, June (Figure 17). There were also lower numbers in April and August but a higher peak count in September.

43. The use of the wind farm area was very similar to that recorded previously (Figure 18), with no evidence of any displacement from the wind farm or its surrounds. Overall this species has maintained its wide distribution across the study area. The results of the analysis of the turbine distances supported this conclusion, with no significant change in distance to turbine locations of divers within 500m or 2km of the wind farm site. Kittiwakes in the study area as a whole were found at greater distance from the turbines during construction, though the lack of any significant shift in the zones closer to the turbines would suggest that this has resulted from an increase further from the turbines rather than a reduction closer to them, and is not likely to be related to the presence of the wind farm.

GUILLEMOT

44. Peak numbers of guillemots in the study area were similar during the construction and pre-construction surveys, though higher numbers occurred in November in the pre-construction period, and in March and June-October in the construction period (Figure 19).

45. Guillemot distribution in relation to the wind farm (Figure 20) was similar during the construction phase surveys to the pre-construction surveys, though relatively lower use of the shallower parts of the study area mean that the proportionate use of the wider (area (>5km from the wind farm) was relatively low (Figure 20). The turbine distance analysis found that though distances remained unchanged within 500m of the turbines, those in the 2km zone and the whole study area were statistically significantly greater during the second construction year. There may have been some partial displacement of this species from the wind farm site and its surrounds, though overall numbers have been maintained within the study area.

RAZORBILL

46. Peak numbers of razorbills in the study area were similar during the construction and pre-construction surveys, though the autumn peak count was variable. During the construction surveys this peak occurred in August compared with October in the pre-construction surveys, and no such major peak was recorded during the second construction year (Figure 21). Numbers were higher in both construction years in Mar-Apr.

47. The proportion of razorbill records within the wind farm site and its closer surrounds were slightly lower during the construction surveys, up to the 2km band, whilst there was a corresponding small increase in the proportion found in the 3km, 5km and >5km bands (Figure 22). The results of the turbine distance analysis were similar to those for guillemot, with distances unchanged within 500m of the turbines but those in the 2km zone and the whole study area were statistically significantly greater during the second construction year. There may therefore have been some partial displacement of this species from the wind farm site and its surrounds too, though overall numbers have been maintained within the study area.

CONCLUSIONS

48. Overall comparing the 2008 and 2009 survey data with the pre-construction data gave no clear evidence that the wind farm construction activity has had any significant adverse effects on the bird populations within the study area, though this is perhaps not that surprising given that the wind farm had been located away from the main areas of ornithological interest in the study area. There have been some minor changes in numbers and distribution but no ecologically significant adverse effects that are likely to have resulted from the wind farm construction activity.

49. There has been a major change in the numbers and distribution of cormorants within the study area that is likely to be related to the presence of the wind farm. The total population in the study area has increased substantially, to the extent that it now regularly exceeds the threshold for national importance. The birds' distribution has shown a shift towards the wind farm, and it would appear that the anemometer mast and turbine bases have provided suitable roosting sites for this species, which has led to the increase in numbers in the area.

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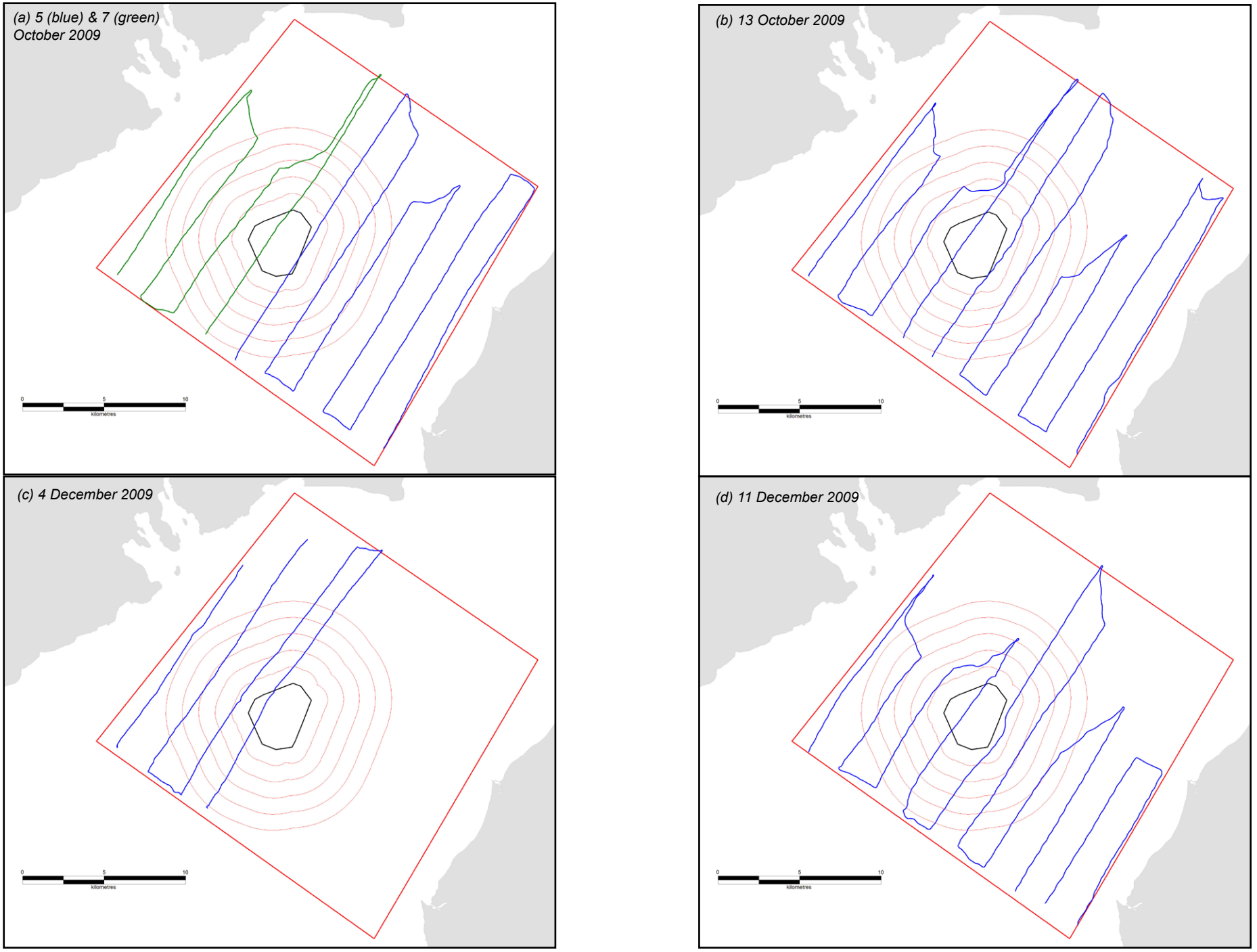
Figure 1. Survey route tracks



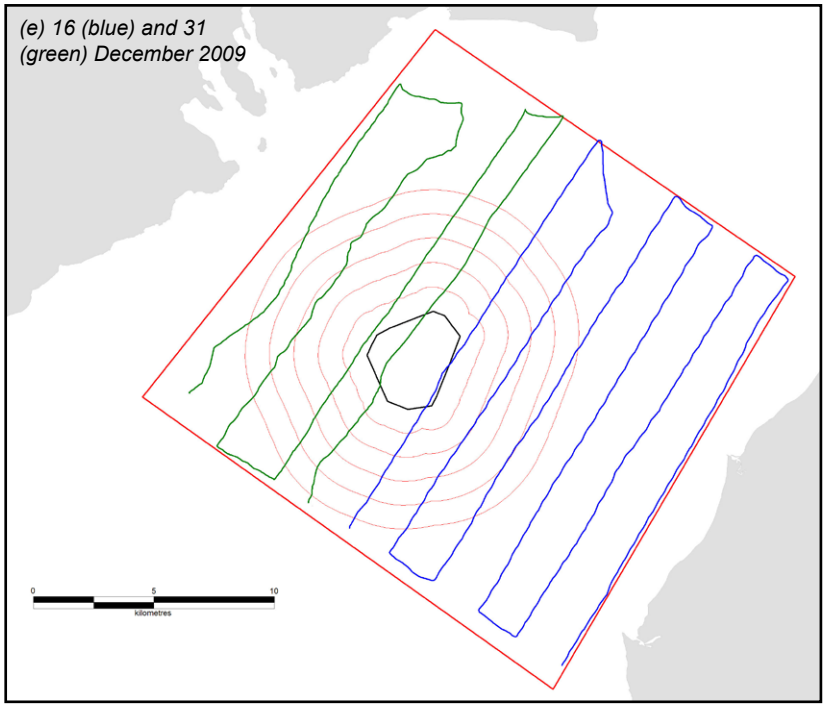

(e) 16 (blue) and 31
(green) December 2009
0
5
10
kilometres

Figure 2. Diver distribution, October - December 2009

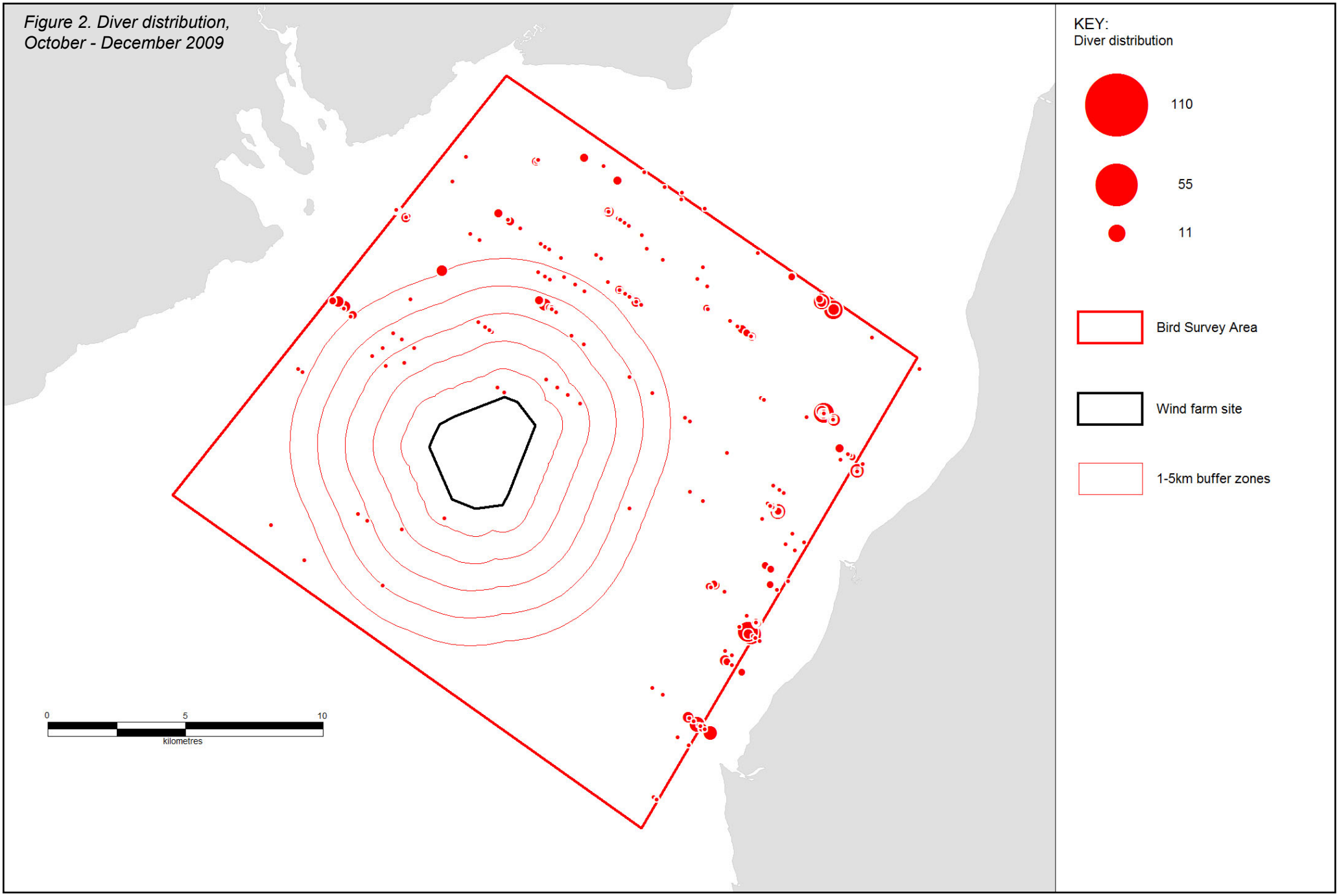


Figure 3. Cormorant distribution, October - December 2009

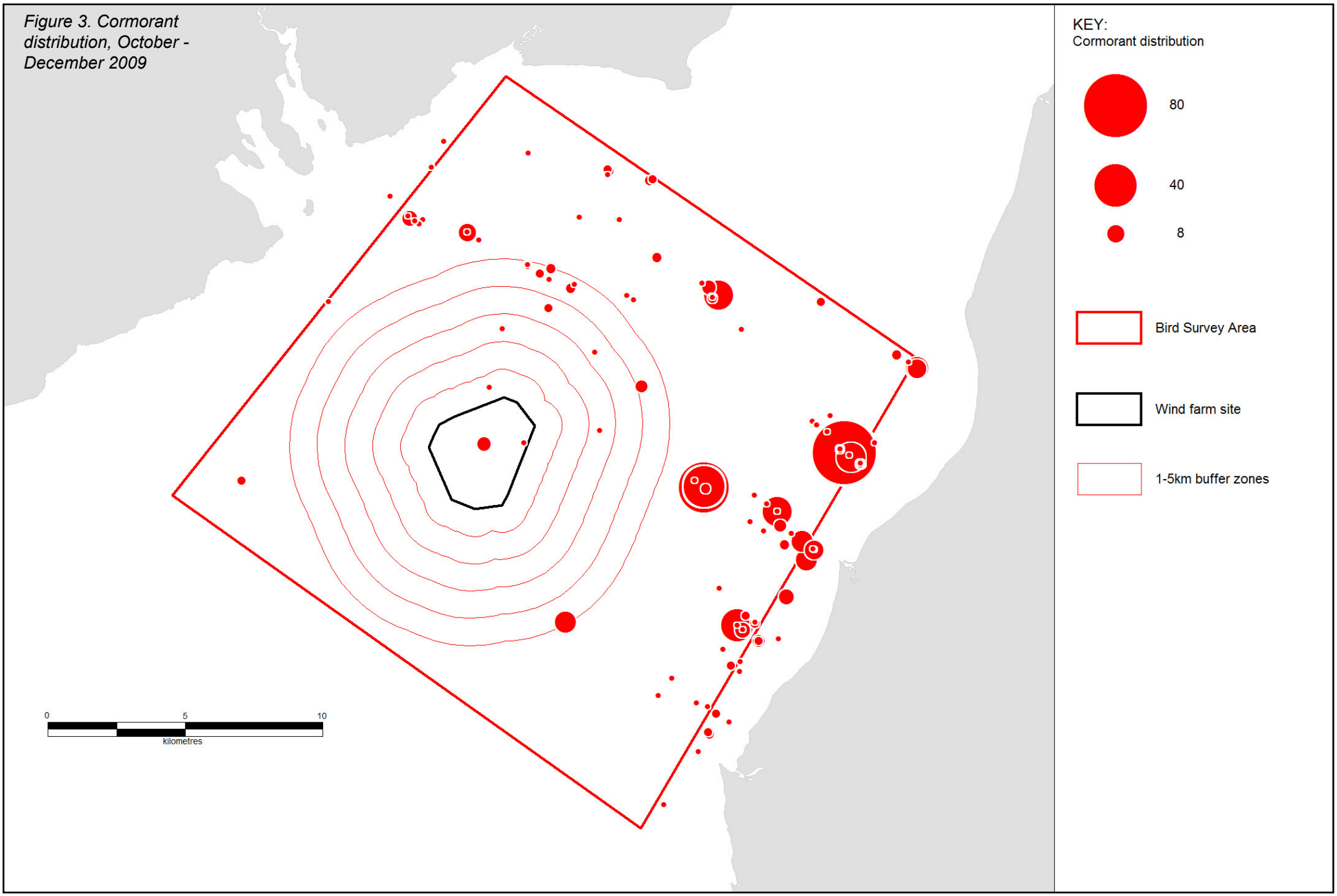


Figure 4. Common Scoter distribution, October - December 2009

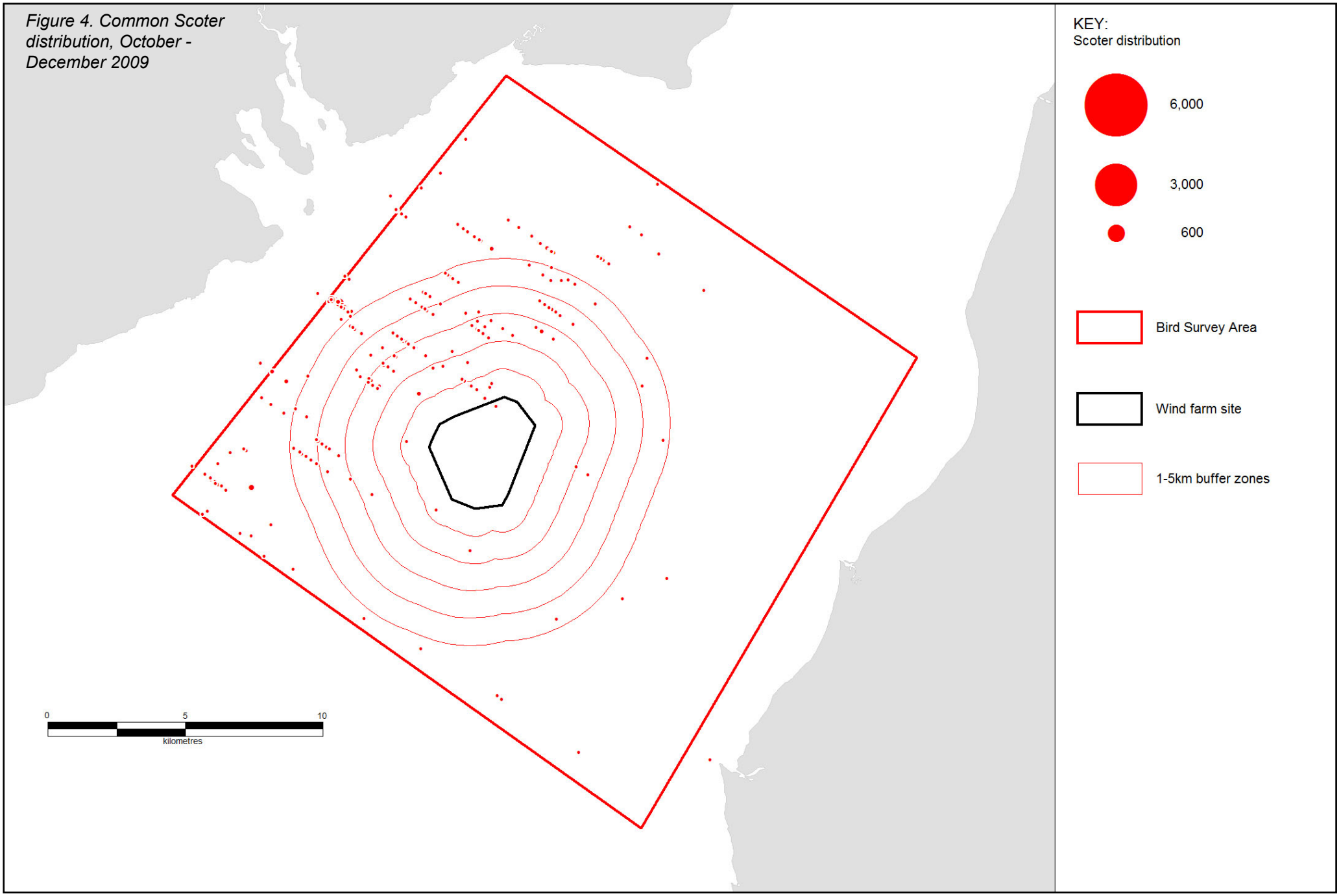


Figure 5. Guillemot distribution, October - December 2009

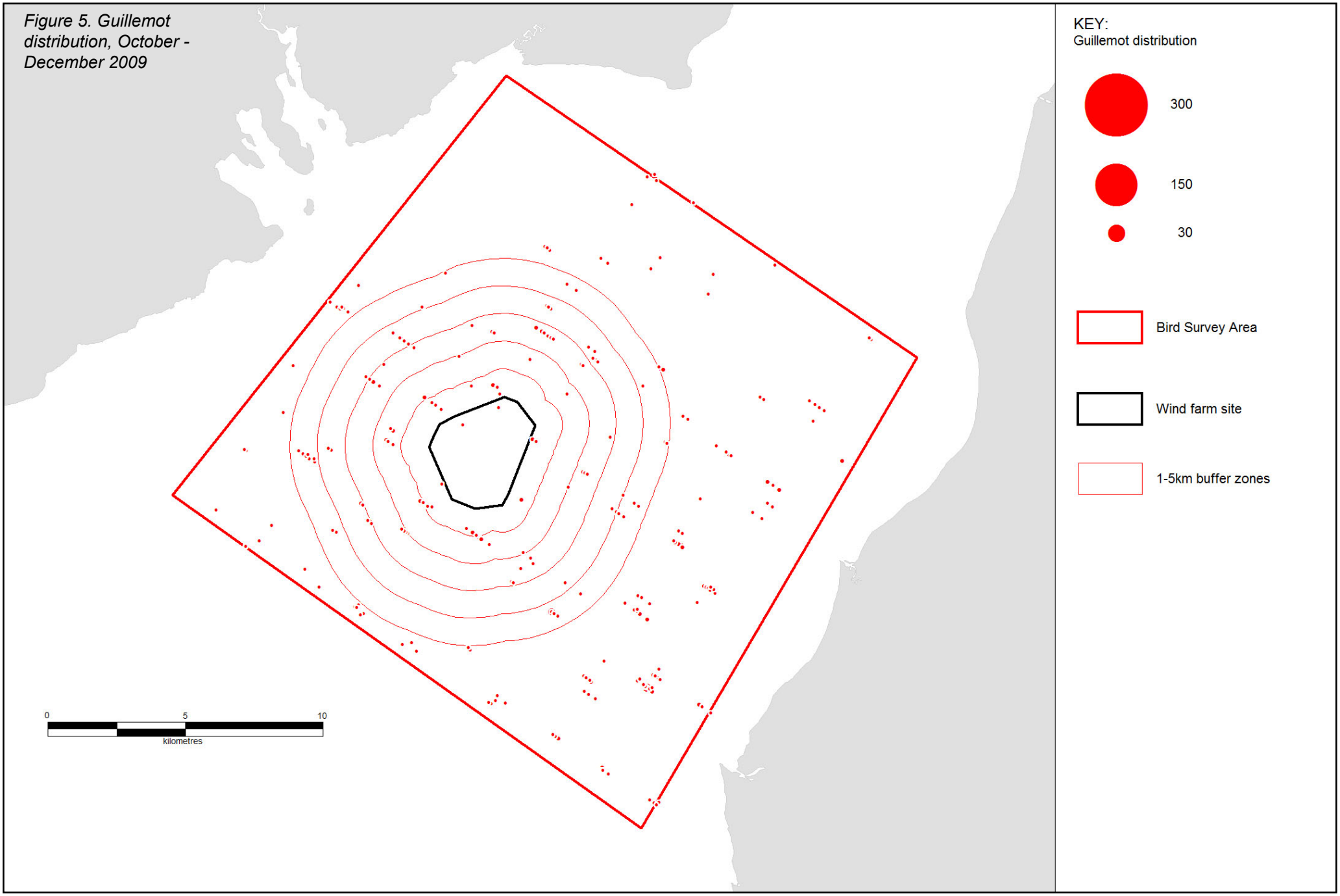


Figure 6. Razorbill distribution, October - December 2009

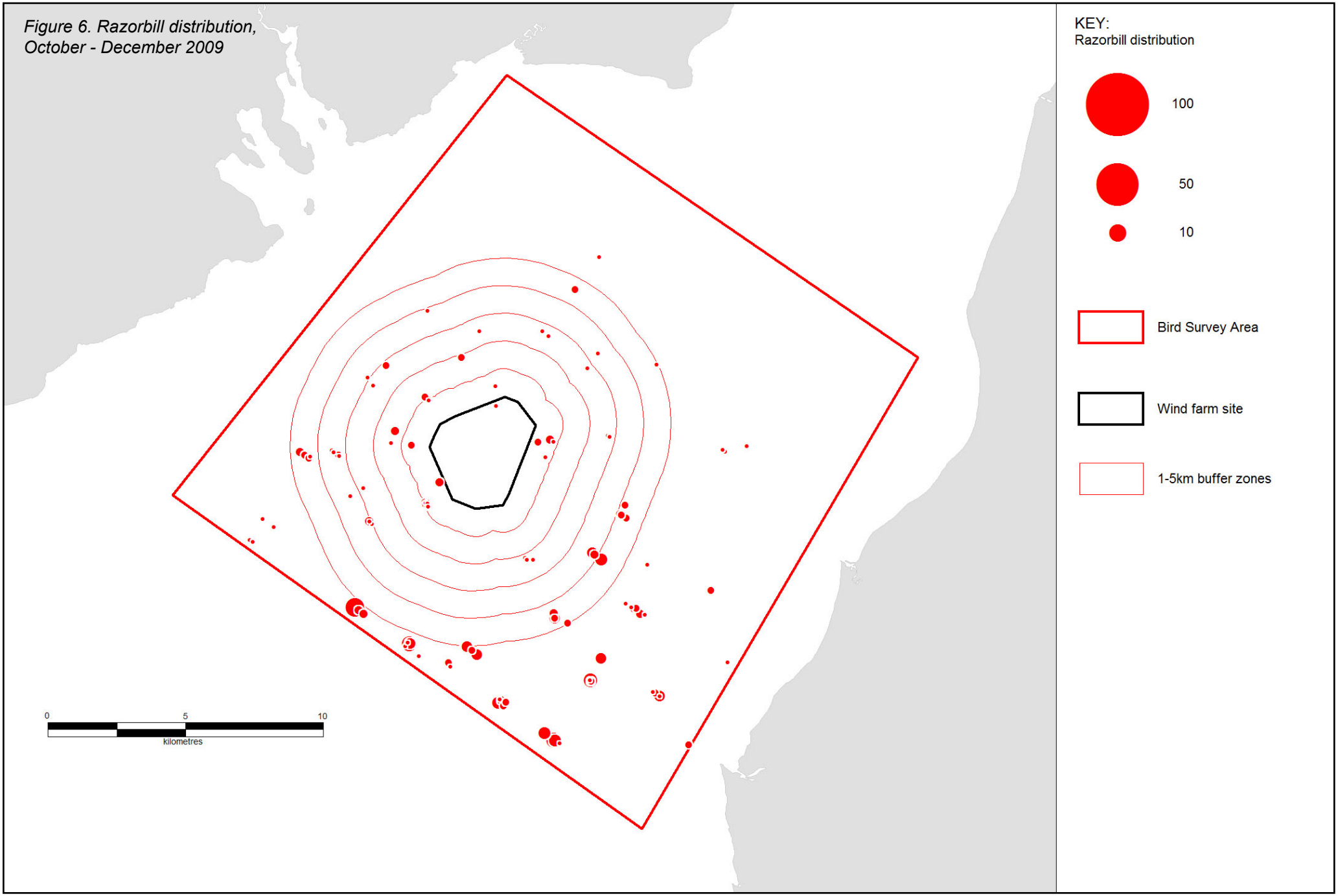


Figure 7. Scaup distribution, October - December 2009

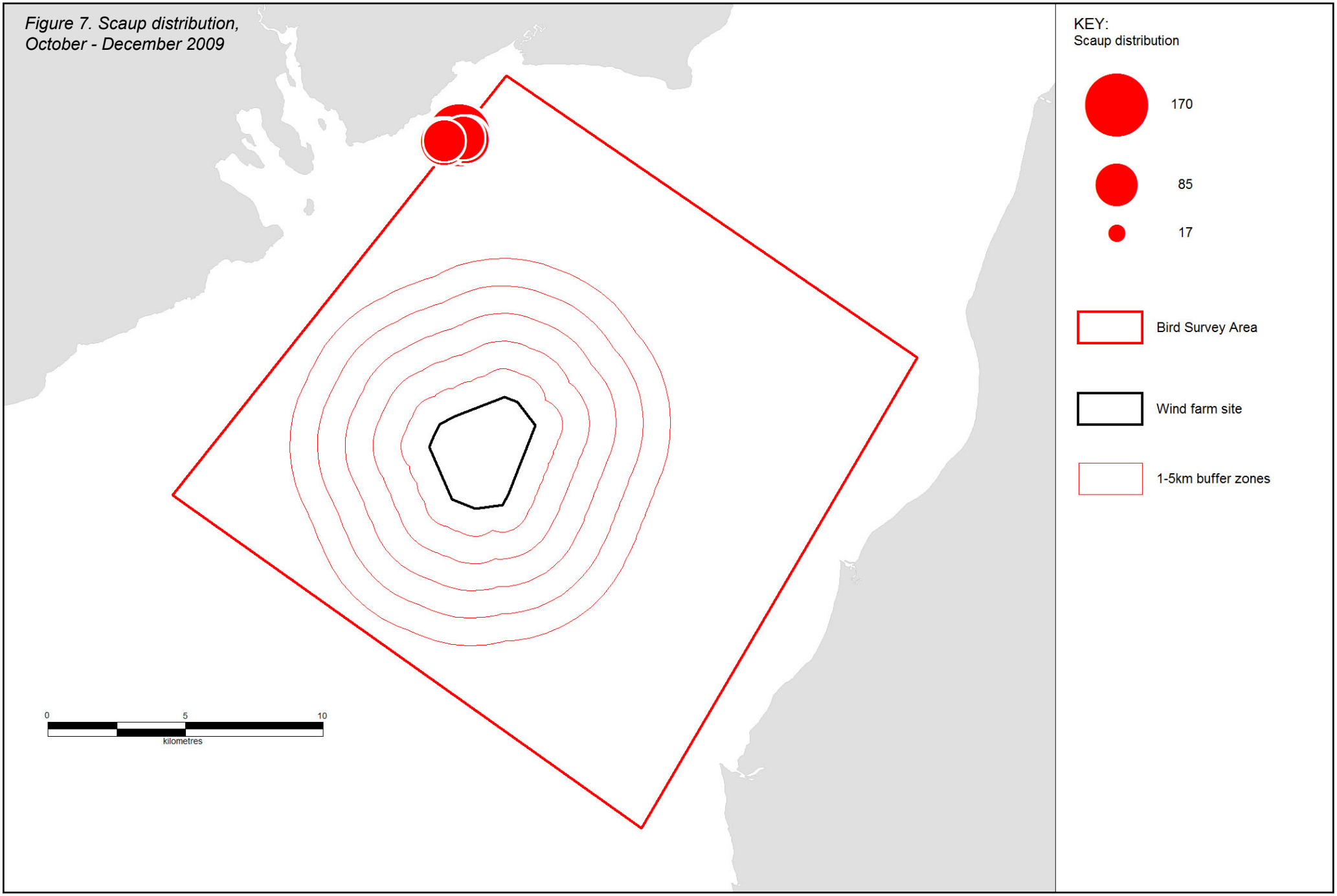


Figure 7. Diver peak monthly counts during the pre-construction and construction phase surveys

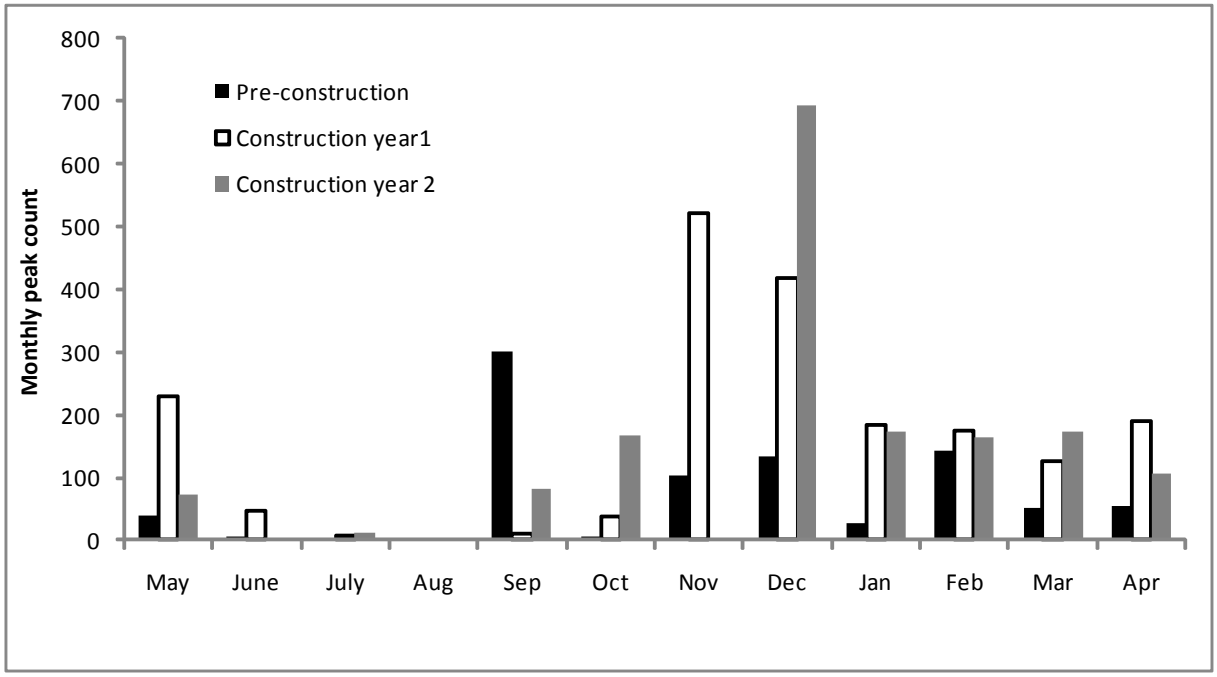


Figure 8. Diver proportional distribution in relation to the wind farm during the pre-construction and construction phase surveys

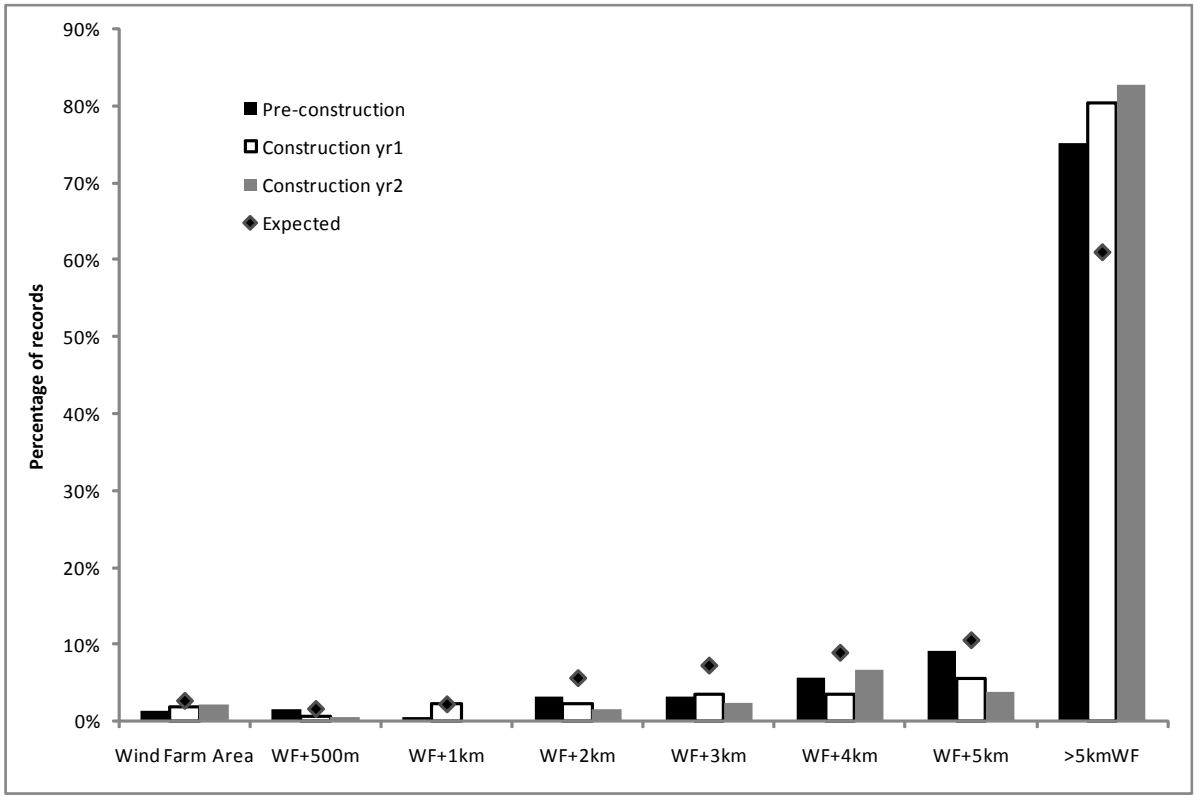


Figure 9. Common Scoter peak monthly counts during the pre-construction and construction phase surveys

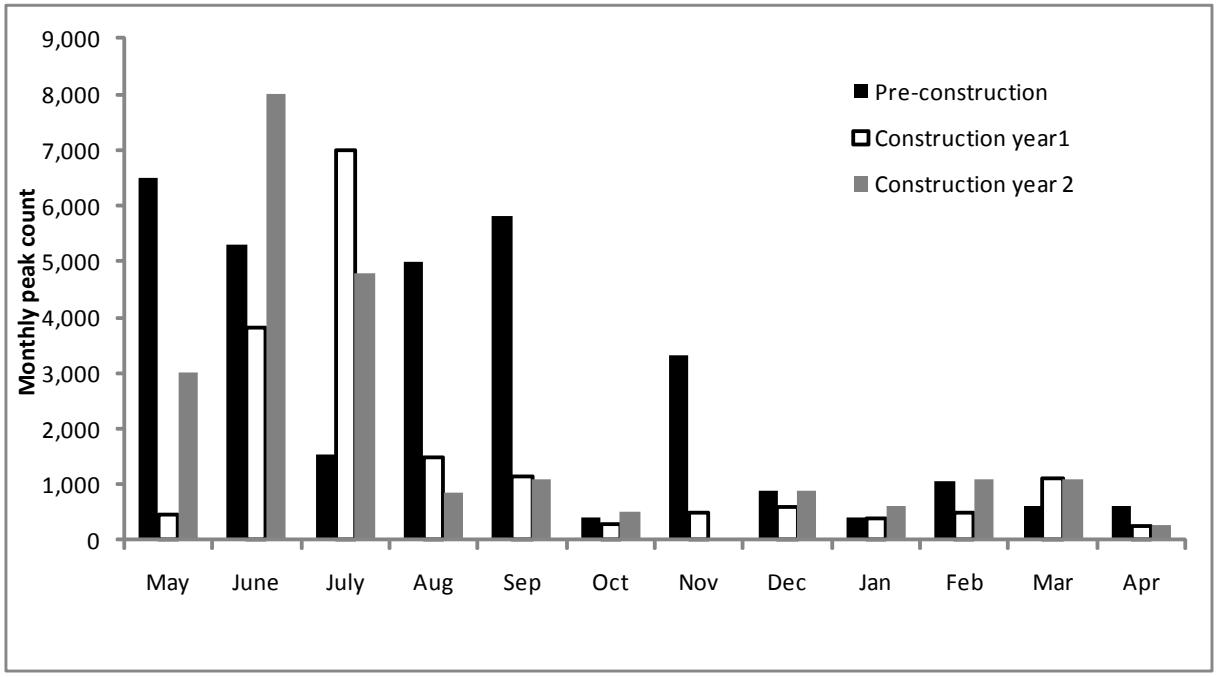


Figure 10. Common Scoter proportional distribution in relation to the wind farm during the pre-construction and construction phase surveys

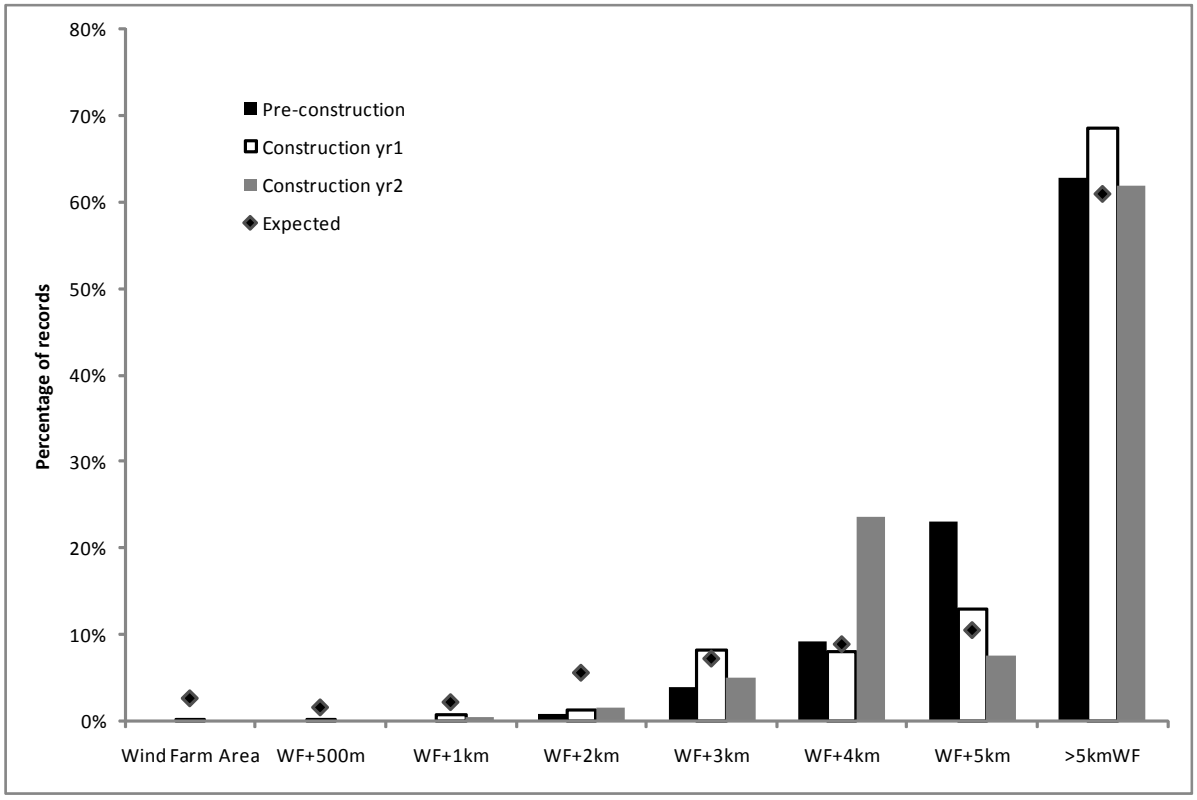


Figure 11. Manx Shearwater peak monthly counts during the pre-construction and construction phase surveys

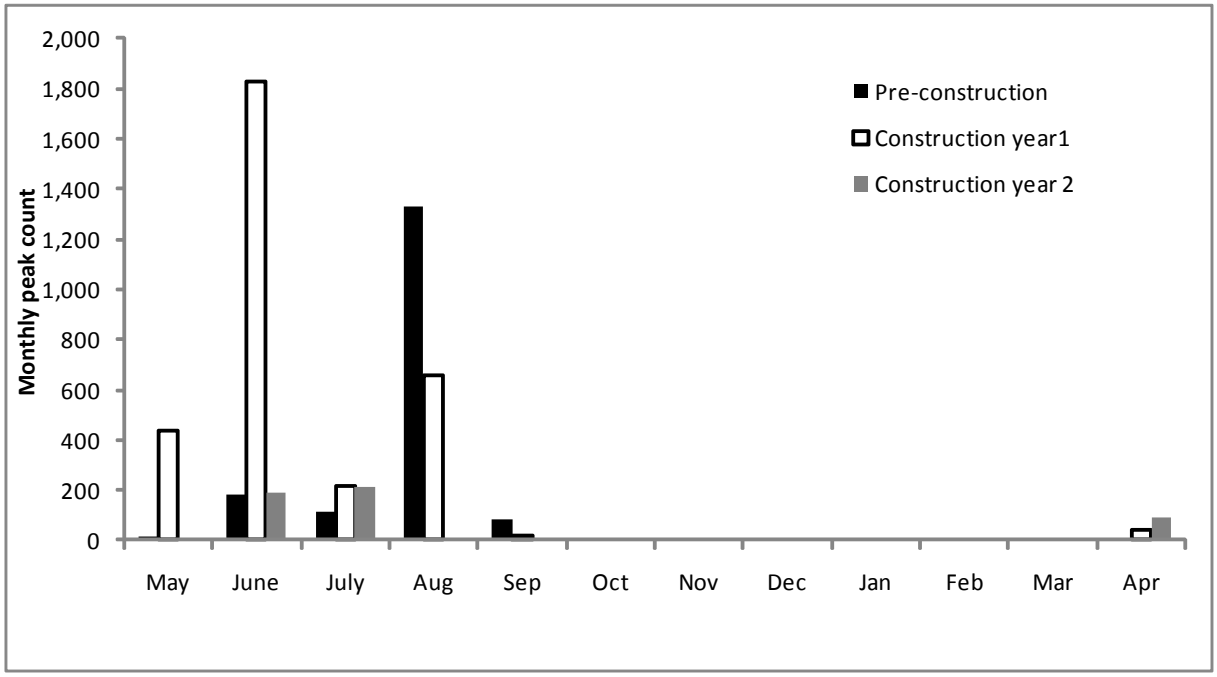


Figure 12. Manx Shearwater proportional distribution in relation to the wind farm during the pre-construction and construction phase surveys

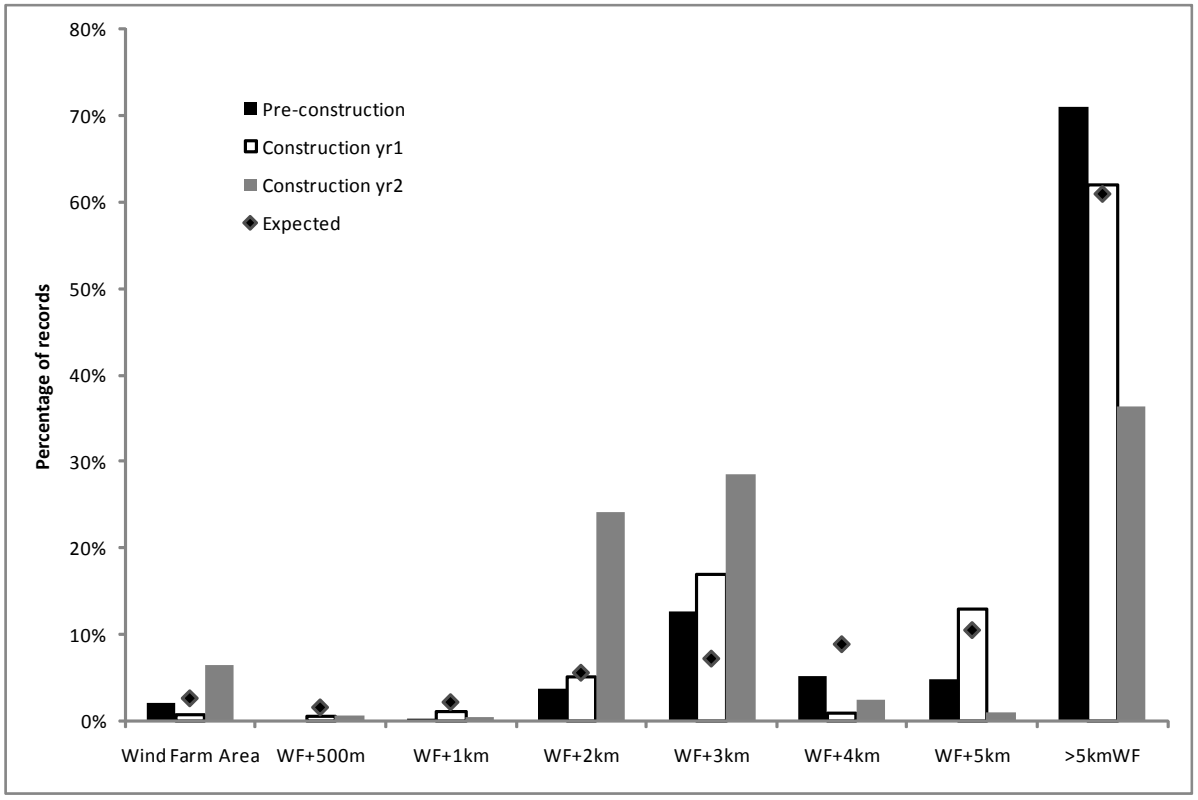


Figure 13. Gannet peak monthly counts during the pre-construction and construction phase surveys

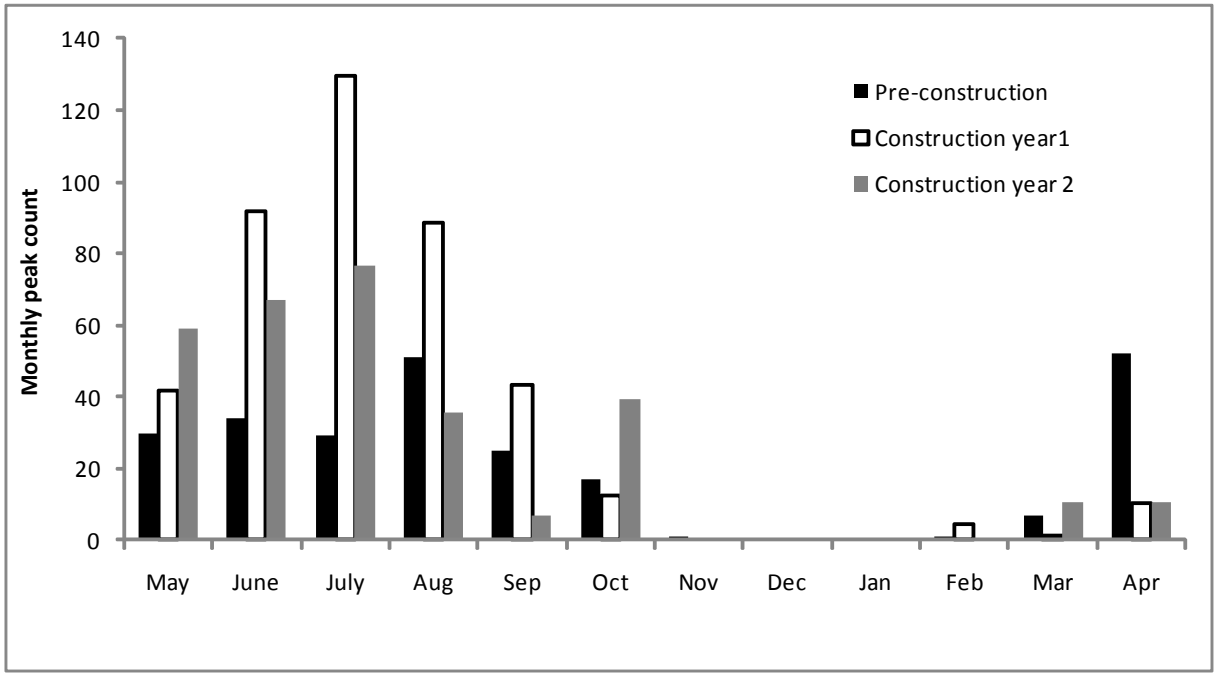


Figure 14. Gannet proportional distribution in relation to the wind farm during the pre-construction and construction phase surveys

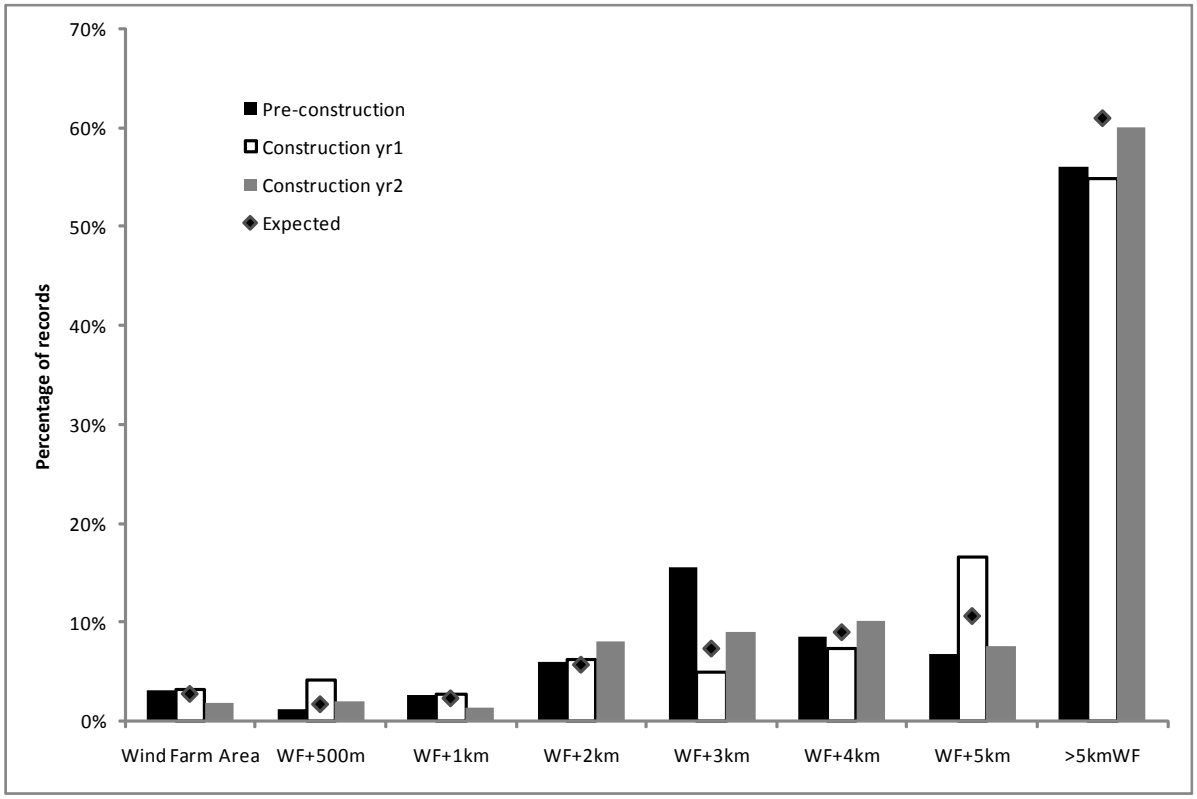


Figure 15. Cormorant peak monthly counts during the pre-construction and construction phase surveys

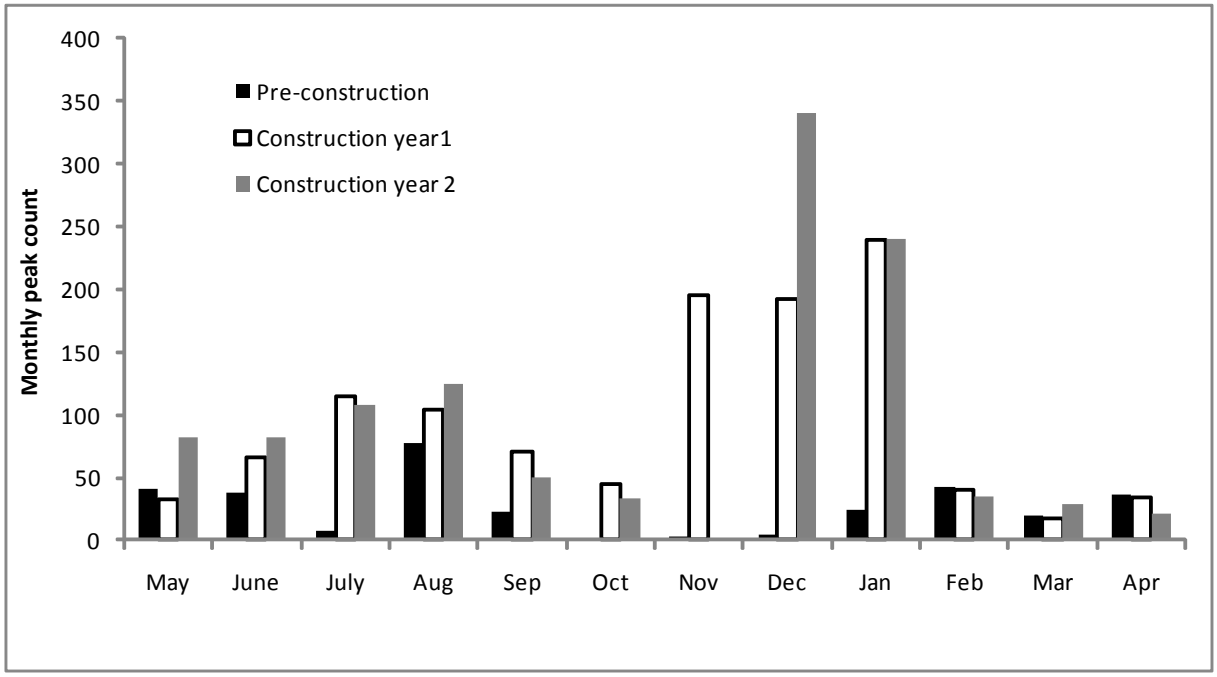


Figure 16. Cormorant proportional distribution in relation to the wind farm during the pre-construction and construction phase surveys

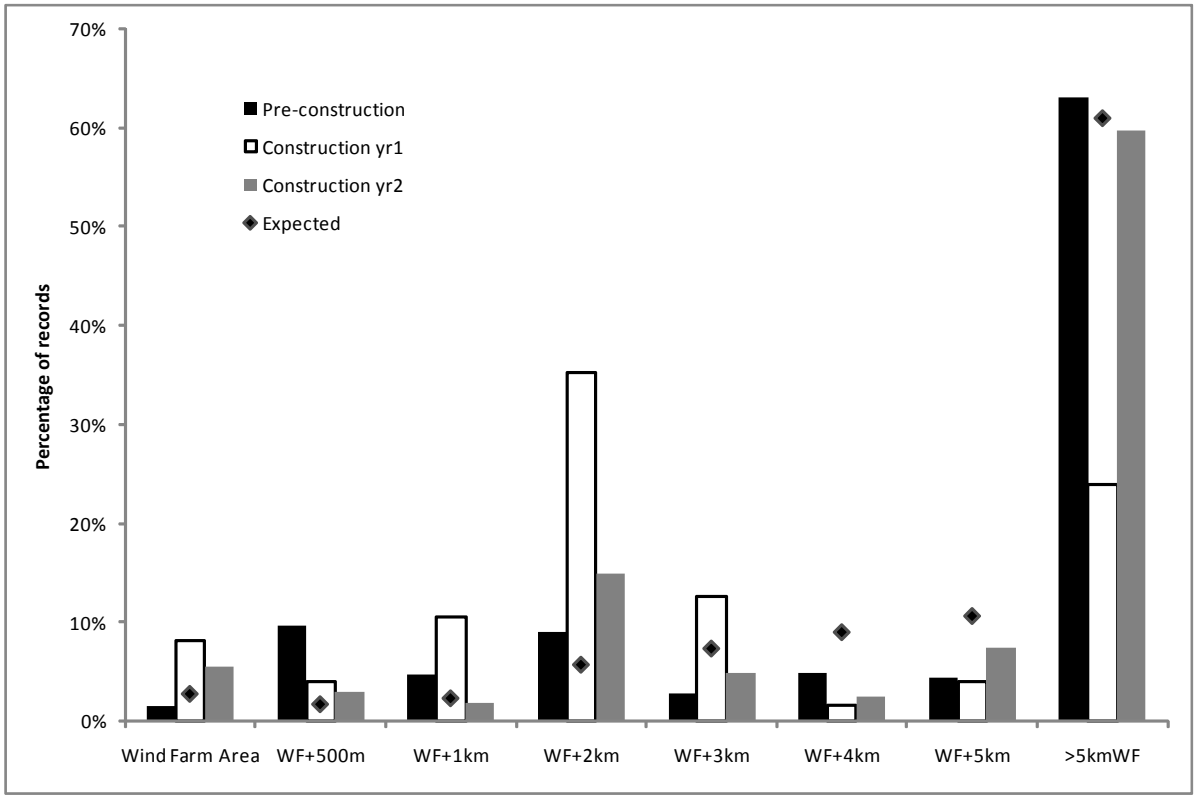


Figure 17. Kittiwake peak monthly counts during the pre-construction and construction phase surveys

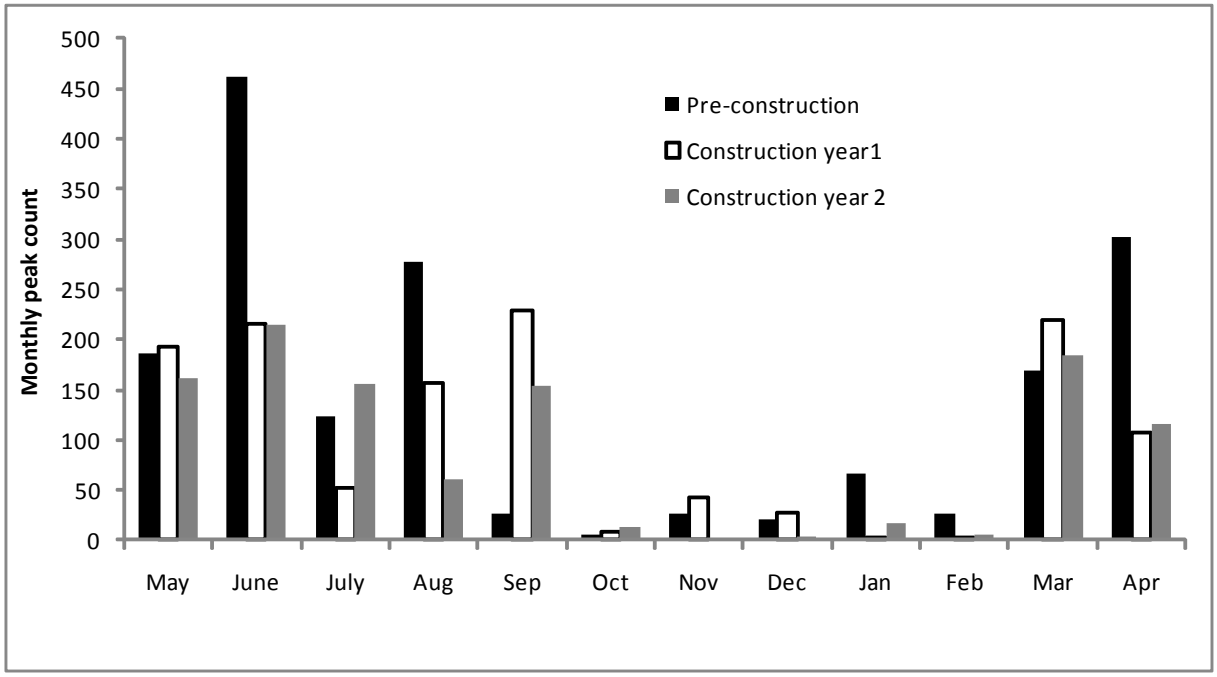


Figure 18. Kittiwake proportional distribution in relation to the wind farm during the pre-construction and construction phase surveys

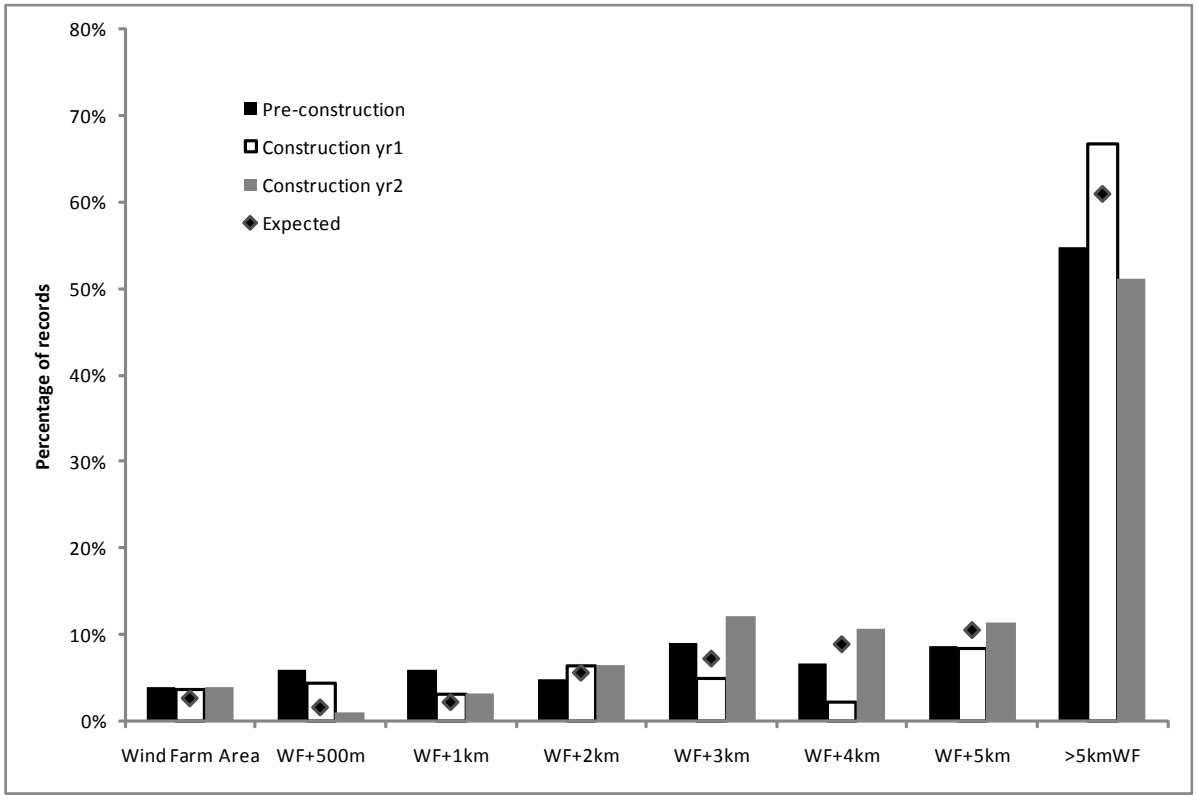


Figure 19. Guillemot peak monthly counts during the pre-construction and construction phase surveys

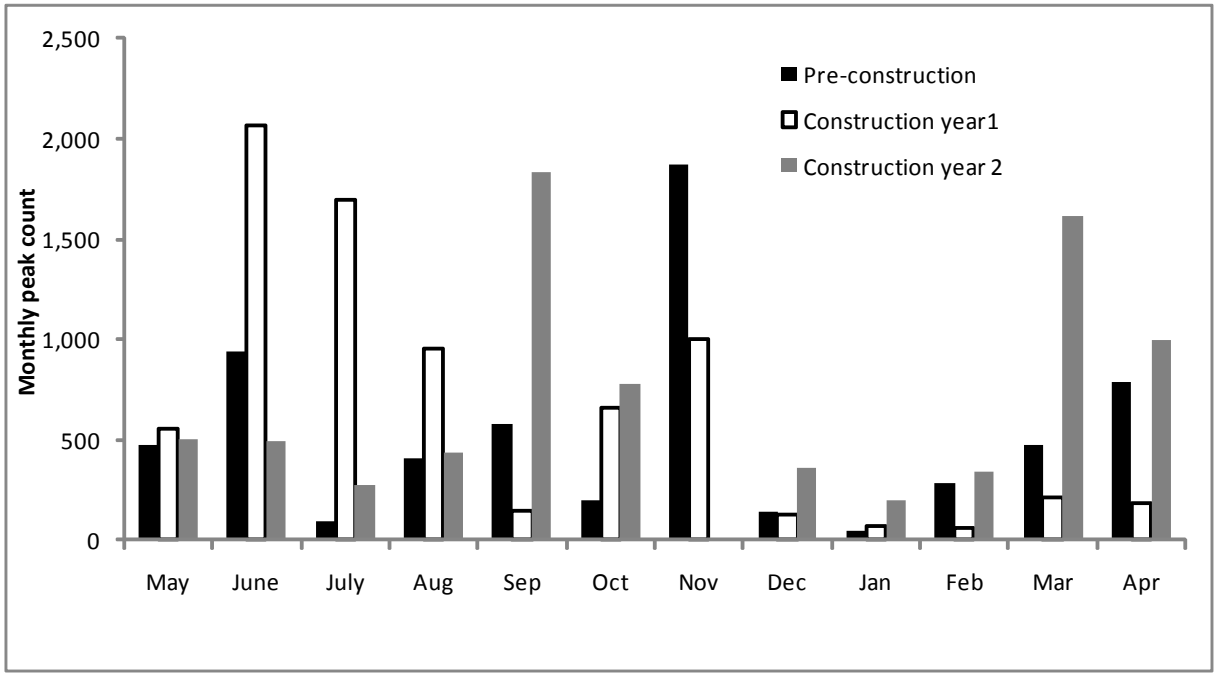


Figure 20. Guillemot proportional distribution in relation to the wind farm during the pre-construction and construction phase surveys

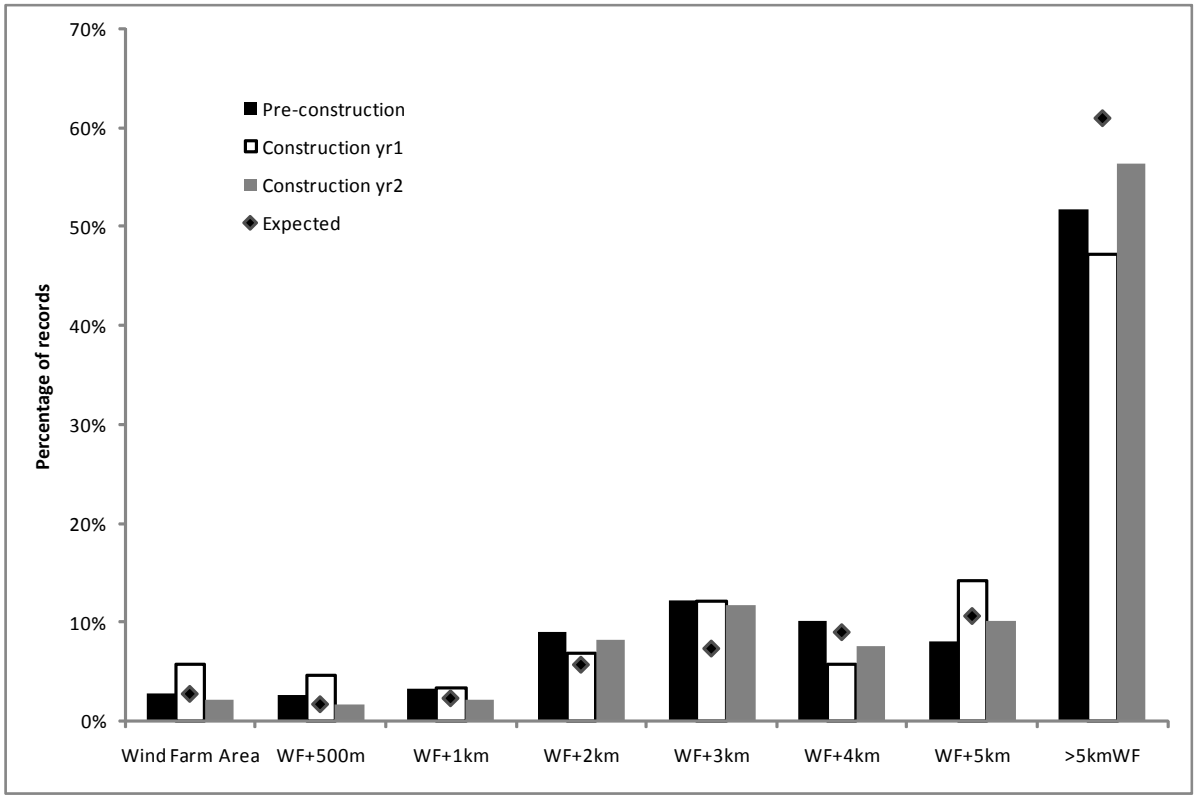


Figure 21. Razorbill peak monthly counts during the pre-construction and construction phase surveys

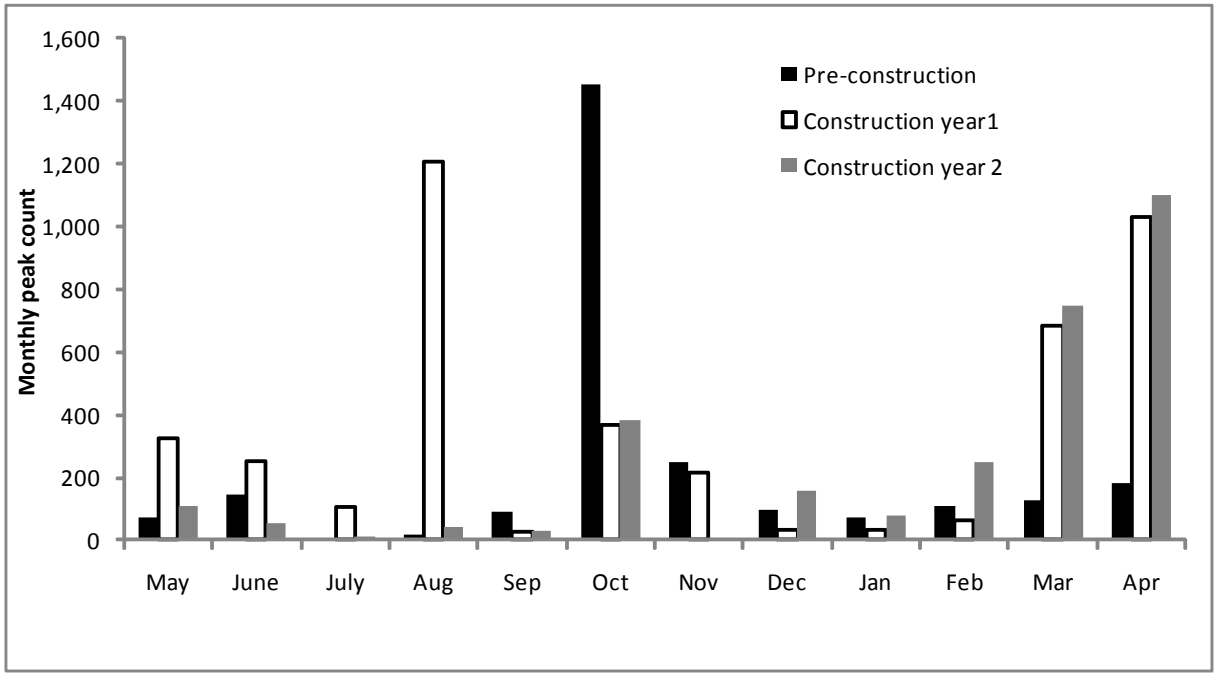


Figure 22. Razorbill proportional distribution in relation to the wind farm during the pre-construction and construction phase surveys