

Effectiveness of disturbance methods and egg removal to deter large gulls *Larus* spp. from competing with nesting terns *Sterna* spp. on Coquet Island RSPB reserve, Northumberland, England

Vivienne Booth¹ & Paul Morrison²

¹Royal Society for the Protection of Birds, The Lodge, Sandy, Bedfordshire SG19 2DL, UK

²16 Sea View, Amble, Northumberland, NE65 0BE, UK

Corresponding author e-mail: vivienne.booth@rspb.org.uk

SUMMARY

On Coquet Island (5.4 ha), northeast England, a rapid increase in numbers of nesting herring *Larus argentatus* and lesser black-backed gulls *L. fuscus* raised concerns that the internationally important tern breeding colony would be displaced. The combined effect of several non-lethal control methods and systematic egg removal on these large gull species from 2000-2009, have been reductions in the number of gull pairs attempting to nest (from a peak of around 250 pairs to less than 20), the area occupied for nesting and nest density. The presence of the tern colony has been maintained, with increases in the population (5-year average) of roseate *Sterna dougallii*, arctic *S. paradisaea* and common terns *S. hirundo*.

BACKGROUND

Coquet Island (Northumberland, northeast England), supports internationally important numbers of breeding roseate *Sterna dougallii* and Sandwich terns *S. sandvicensis* (5-year means 2004-2008, around 80 and 1,000 pairs, respectively). Nationally important numbers of common tern *S. hirundo* (c.1,100 pairs) also breed on the island. The population of Arctic terns *S. paradisaea* in 2000 (c.800 pairs), represented 1.5% of the UK population (Mitchell *et al.* 2004). Coquet Island is a designated Site of Special Scientific Interest (SSSI) and a Special Protected Area (SPA), managed by the Royal Society for the Protection of Birds (RSPB) as a nature reserve since 1970 for its breeding seabird interest.

Between 1997 and 2000, the previously stable breeding populations of herring *Larus argentatus* and lesser black-backed gulls *L. fuscus* (around 10 and 20 pairs each year between 1980-1996), suddenly expanded by

445% and 920% respectively (Fig. 1), an increase which coincided with disturbance at the Isle of May (Fife) and the Farne Islands (Northumberland).

Large gulls (such as herring and lesser black-backed) can cause displacement of nesting terns through predation and competition for nest space (Morrison & Allcorn 2006). On Coquet Island, tern colonies were once distributed across much of the island, but since 1976, following a previous expansion of the gull colony, these have become concentrated in the southwest corner.

To avoid displacement of terns from the island, a programme of large gull disturbance was instigated in 2000 combined with egg and nest destruction under consent and licence of Natural England (the governmental conservation authority in England). The aim of this management was to restore the number of large gulls nesting to a low level, and to restrict the distribution of nests to the northeast

of the island, the furthest point from the tern colony and the area that large gulls have historically occupied.

Here, we present results of ongoing work to limit the numbers and distribution of the two large gull species nesting on Coquet. Our intention is not to review the gull scaring methods, as these have been covered by Morrison and Allcorn (2006) but to evaluate the success of the programme of disturbance and egg removal.

ACTION

Large gull disturbance techniques: A suite of disturbance techniques was employed from 2000 to 2008 to reduce the attractiveness of Coquet Island to breeding herring and lesser black-backed gulls. The reason for using several methods was to reduce habituation of the gulls to any single technique. Disturbance was primarily focussed on the southern end of the island to prevent large gulls settling to nest around the tern colonies, however use of some of the methods was effective over the whole island (see Morrison & Allcorn 2006).

Disturbance of large gulls on Coquet is restricted to the last two weeks of March before the arrival of Atlantic puffins *Fratercula arctica* and black-headed gulls *Larus ridibundus* to breed. There is therefore only a short period when techniques affecting the whole island could be used. These included: a gas gun firing over the plateau or intertidal zone; bird-scarer rockets fired over intertidal zone; and scarer rope, which produces small explosions at intervals (for details of disturbance methods and frequency of use, see Morrison & Allcorn 2006). Use was dependent on weather conditions in this period, for example, rockets cannot be used in windy conditions (and therefore were not used in 2004, 2005 and 2008), while scarer ropes are extinguished by wet weather (and therefore were not used in 2002, 2004 and 2005).

The use of a herring gull distress call (broadcast through a megaphone) did not disturb puffins and black-headed gulls, so use was continued until eiders *Somateria mollissima* and terns arrived to breed in mid-April. Thereafter the only disturbance method

employed was deliberate approach towards large gulls by the wardens.

Effectiveness of disturbance methods was qualitatively assessed by Morrison and Allcorn (2006). Disturbance techniques were often used in combination e.g. the distress call with active human disturbance, and therefore individual effectiveness cannot be quantitatively assessed.

Egg removal and nest mapping: Systematic searches for large gull nests were conducted from the end of May each year. Eggs and nests were destroyed throughout the breeding seasons of 2000-2008, and the location and number of eggs was recorded within a grid of 20 x 20 m squares covering the whole island. The search method evolved over the study period: initially (2000-2001) weekly searches of the whole island were conducted by one or two people, between 2002 and 2006 the island was searched weekly by up to four people. In 2007 and 2008, up to five people undertook a fortnightly search.

Through mapping of data collected during the systematic egg searches, the combined effect of these methods (disturbance plus egg/nest destruction) on the distribution and numbers of large gull nests across the island was assessed from year to year.

CONSEQUENCES

Number of gull nests and area of occupancy: The combined number of herring and lesser black-backed gull nests destroyed each year between 2000 and 2009 are summarised in Table 1. The total number of nests destroyed each year declined significantly between 2000 and 2009 (Spearman's rank order correlation: $r_s = -0.95$ $N = 9$ $P < 0.001$; Fig. 1) from 807 to 52 nests (including pairs re-laying).

The number of gull-occupied grid squares was reduced ($r_s = 0.96$ $N = 9$ $P < 0.001$) and the overall density of nests within each occupied grid square declined ($r_s = 0.80$ $N = 9$ $P = 0.010$). The grid squares still occupied are located in the northeast corner of the island, the area furthest from the tern colonies (Fig. 2).

Table 1. Number of herring and lesser black-backed gull nests destroyed on Coquet Island, 2000-2009.

Year	Number of large gull nests destroyed
2000	807
2001	745
2002	673
2003	346
2004	271
2005	100
2006	244
2007	113
2008	66
2009	52
Total	3,417

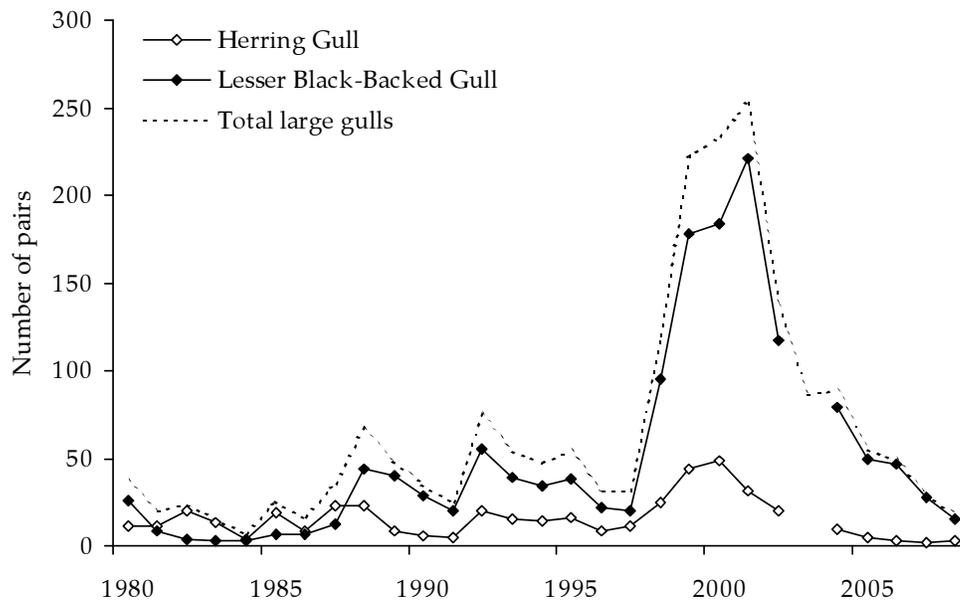


Figure 1. The number of pairs of herring gull and lesser black-backed gull attempting to breed on Coquet Island between 1980 and 2008.

Effectiveness of searches: The effectiveness of the systematic search effort for gull eggs was assessed by the number of chicks found, as each of these represents an egg which was previously missed. The number of chicks found decreased through the study, as the number of people searching for nests was progressively increased, (despite the change from weekly searches to searching once every two weeks from 2007). The number of man-hours spent searching is thought to have remained generally constant throughout the study. This suggests that the allocation of greater resources to less frequent searches was more efficient in a situation where highly methodical searches are possible.

It is unlikely that the improvement in efficiency is due to individuals improving their searching technique, as experienced searchers have been present throughout, teaching the method to newcomers to ensure consistency. The trend towards increased efficiency persists despite increasingly dense vegetation (a Yorkshire fog *Holcus lanatus* dominated grass sward) on the island making the location of nests more difficult in recent years. It might seem that given far fewer nesting herring and lesser black-backed gulls, it would be easier to target and locate specific gull nests. However, this was not the case as there is no vantage point from which incubating birds can be easily viewed, thus it is not apparent where nests are without ground searches.

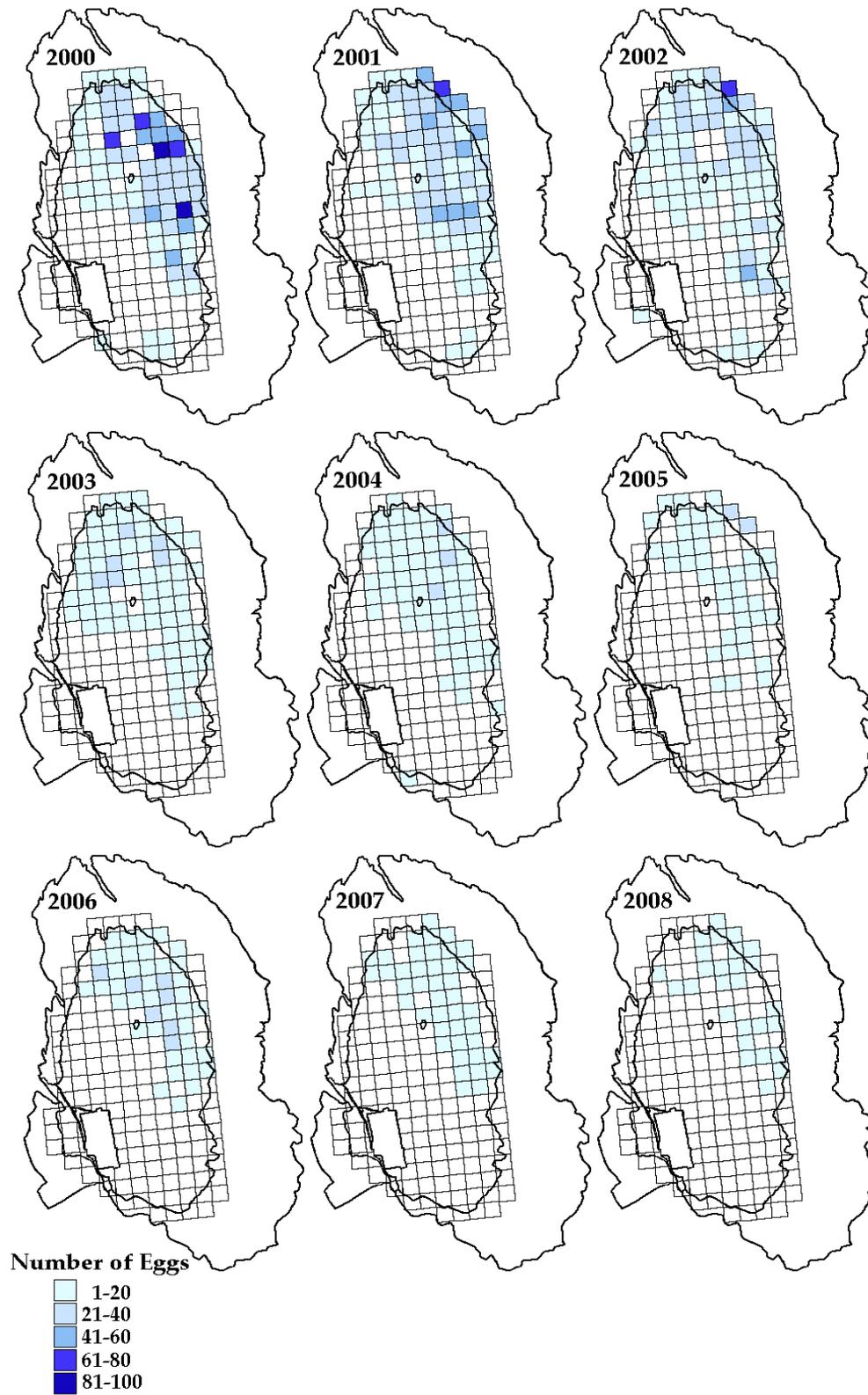


Figure 2. Outline of Coquet Island and the intertidal area at the mean low water mark, showing distribution and number of large gull eggs per 20 x 20 m grid-square (as a measure of nesting density) between 2000 and 2008. Tern colonies are located primarily in the southwest corner of the island around the lighthouse.

Discussion and conclusions: Gull scaring was initially resource intensive, with large numbers of large gulls initially appearing resistant to disturbance methods such as active human disturbance (Morrison & Allcorn 2006). The sustained programme of disturbance and egg destruction between 2000 and 2008 has however, overtime, resulted in a greatly reduced population of large gulls nesting on Coquet with nesting now limited to the northeast of the island, which is compatible with continued use of the island by breeding terns.

The population of three species of terns on Coquet Island has increased over the study period (comparing the mean population size 1998-2001, when the large gull populations were highest, with 2004-2008): roseate tern from 36 to 80 pairs; Arctic tern from c.770 to c.1,070 pairs; and common tern from c. 970 to c.1,100 pairs. Declines in the Sandwich tern population (from c.1,500 to c.1,000 pairs) are thought to be within the normal range of variation for this species (Mitchell *et al.* 2004) although the reason for the decline is unclear.

The reduced breeding large gull population can now be successfully maintained with a relatively low level of effort. The four methods of large gull disturbance which are considered by wardens to be most reliable and effective are: gas gun, scarer rope, rockets, and active human disturbance (Morrison & Allcorn 2006). Use of these is dependent on the weather conditions, and only carefully targeted human disturbance is employed throughout the breeding season, together with egg removal.

As the problem with large gulls on Coquet is primarily that of displacement of terns through competition for nest space rather than

predation of tern eggs and chicks, non-breeding large gulls (which tend to remain on the intertidal beach area) are not considered to be of concern. On Coquet, the intertidal zone is quite distinct from the grassy plateau (surrounded by low cliffs about 2 m high) which is where the majority of birds breed. Opportunistic predation of roseate tern eggs and chicks is minimised by the provision of nest boxes (Morrison & Gurney 2007), and predation levels are monitored, however, the protection provided by the boxes would not be sufficient to guard against displacement.

ACKNOWLEDGEMENTS

We thank all the assistant wardens and volunteers who undertook the disturbance, nest searching and monitoring work.

REFERENCES

- Mitchell P.I., Newton S., Ratcliffe N. & Dunn T.E. (2004) *Seabird Populations of Britain and Ireland*. T.& A.D. Poyser, London, UK.
- Morrison P. & Allcorn R.I. (2006) The effectiveness of different methods to deter large gulls *Larus* spp. from competing with nesting terns *Sterna* spp. on Coquet Island RSPB reserve, Northumberland, England. *Conservation Evidence*, **3**, 84-87.
- Morrison P. & Gurney M. (2007) Nest boxes for roseate terns *Sterna dougallii* on Coquet Island RSPB reserve, Northumberland, England. *Conservation Evidence*, **4**, 1-4.

Conservation Evidence is an open-access online journal devoted to publishing the evidence on the effectiveness of management interventions. The pdf is free to circulate or add to other websites. The other papers from Conservation Evidence are available from the website www.ConservationEvidence.com