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Colonisation and range expansion of inland-breeding Cormorants in England

Stuart Newson, John Marchant, Robin Sellers, Graham Ekins, Richard Hearn and Niall Burton

Abstract Following the establishment of a tree-nesting colony of Great Cormorants *Phalacrocorax carbo* at Abberton Reservoir, Essex, in 1981, the inland breeding population in England has increased considerably. Successful breeding has now occurred at 89 inland sites and, while Cormorants have been actively dissuaded from breeding at a number of these, the inland population in England reached about 2,362 breeding pairs at 48 sites in 2012. Increasing numbers of Cormorants on inland waters in England have intensified conflict between Cormorants and fisheries. This resulted in an increase in the number of Cormorants that could be killed under licence to 3,000 per year during the winters of 2004/05 and 2005/06, after which licences for up to 2,000 birds per year have been issued. There is some evidence that the inland breeding population is now stabilising, mainly as a result of declines at some of the older colonies established in the 1980s and early 1990s. New inland colonies continue to be established, however, most notably through expansion of their range into the southwest.

In 1981 an inland, tree-nesting colony of Great Cormorants *Phalacrocorax carbo* (hereafter referred to simply as 'Cormorants') became established at Abberton Reservoir in Essex (Ekins 1989). Continental birds (*P. c. sinensis*) are known to have played the more important role in the initial colonisation and subsequent development of an inland-breeding Cormorant population in England, but these colonies now comprise both *sinensis* and nominate *carbo* (Goostrey *et al.* 1997; Winney *et al.* 2001; Newson *et al.* 2004).

During the winter period, the situation is quite different in that inland waters in England support Cormorants from a number of breeding populations. In addition to birds of both races from the inland breeding population in England, from about the mid 1960s coastal-breeding *carbo*, mainly from England and Wales, have also shown an increasing tendency to winter on inland waters in England (Rehfisch *et al.* 1999). These, together with an increase in the number of wintering *sinensis* from the continent (Newson *et al.* 2007), have intensified the conflict between Cormorants and fisheries in recent years (Smith *et al.* 2008).

While there is currently no co-ordinated annual monitoring of inland-breeding Cormorants in England, considerable effort has been made to document the subsequent population growth and range expansion up to 1995 (Sellers *et al.* 1997) and subsequently to 2005 (Newson *et al.* 2007). 'Inland' is defined here as breeding away from traditional

coastal cliffs, stacks and offshore islands, although a number of these alternative sites are close to estuaries or open coasts.

Including here two additional sites where counts were obtained after Newson *et al.* (2007) went to press, Cormorants bred successfully in one or more years at 63 inland sites in England between 1981 and 2005, with a maximum of 39 colonies occupied in any one year. While further breeding was discouraged at a number of these sites during this period, the inland-breeding Cormorant population had grown to about 2,200 breeding pairs by 2005. This exceeds the number of coastal-breeding *P. c. carbo* in England, which was estimated to be about 1,430 breeding pairs in 1999–2002 (Sellers 2004).

In 2012, a complete census of inland-breeding Cormorants in England was carried out as part of a European census proposed as part of the EU CorMan ('Sustainable Management of Cormorant Populations') initiative and taken up by the Wetlands International Cormorant Research Group. To maximise this opportunity, additional effort was made to collate nest counts for 2006–11. Together, the results update Newson *et al.* (2007) to present an overview of the colonisation and subsequent range expansion of the inland-breeding Cormorant population in England to 2012.

Methods

Colony counts

Counts of apparently occupied nests (AON), defined as nests in use and sufficiently finished to hold one or more eggs (Bregnballe & Lorentsen 2006), were obtained through a number of sources. First, a review of county bird reports highlighted any nest counts that had already been documented. This identified a few colony counts from 2006 that were not considered by Newson *et al.* (2007), but county reports were generally incomplete and some 2–5 years behind the current year. Second, a review of all previous personal correspondence with site managers, ringers and birdwatchers identified a number of individuals who visit known colonies on a regular basis. Those individuals were e-mailed to see whether they could a) fill any missing gaps in nest counts and b) provide nest counts in 2012. Third, because Grey Herons *Ardea cinerea* have similar breeding requirements to Cormorants, BTO Heronries Census data were interrogated, to extract any incidental nest counts of Cormorants and to identify counters who visit heronries, and who might also count Cormorant nests at the same sites in 2012. Fourth, taking advantage of the massive survey effort for Bird Atlas 2007–11 (Balmer *et al.* 2013), we extracted all records of probable or confirmed breeding of Cormorants for 2008–11. This revealed a small number of new colonies, which were validated by

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458. Great Cormorant, Greater London, February 2010.

contacting county recorders and field observers. Fifth, for a small number of Wetland Bird Survey (WeBS) sites, where counters had not already been identified through the above steps, WeBS counters were e-mailed to try and recruit them as Cormorant nest counters for these sites. Finally, after collating counts and counters identified through the steps outlined above, county recorders were contacted with the details of any remaining gaps in counts, in an attempt to find counters for them.

Following Bregnballe & Lorentsen (2006), a colony is defined as a group or groups of nests that are within 2 km of one another. Groups in close clusters are often referred to as 'subcolonies'. A single nest is sufficient to be termed a colony as long as it is not located within 2 km of other colonies. While considerable effort has been made to compile a complete list of colonies for each year, it is possible that some breeding attempts have

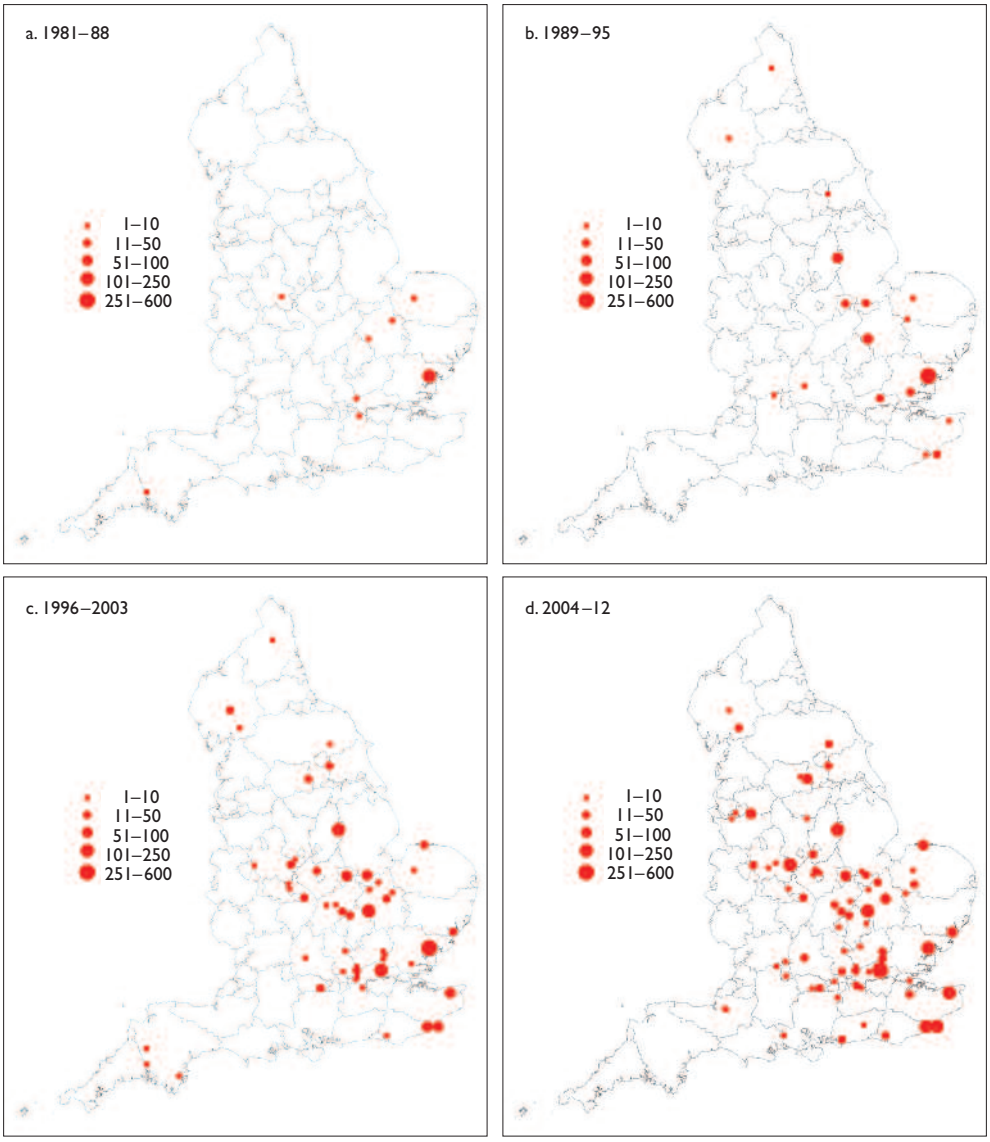

Fig. 1. Inland Great Cormorant *Phalacrocorax carbo* colonies in England with successful breeding in one or more years. These maps show the extent to which the number of colonies increased during the periods (a) 1981–88, (b) 1989–95, (c) 1996–2003 and (d) 2004–12. Dot size indicates average number of Apparently Occupied Nests at each site over the period. Confidential sites are shown at a low spatial resolution.

been missed, with details either unreported or unavailable. Despite the large and often conspicuous nest of this species, counts of AONs are not necessarily straightforward. Where there was more than one count for a particular site and year, the largest count is reported here. The locations of most sites referred to in this paper have already been published, but locations are not disclosed in a few cases where confidentiality was requested.

Dealing with missing counts

We aimed to obtain or collate colony counts for every colony in every year. In practice a complete count was not possible, and 4% of colony counts were not available for certain years (51 missing counts from a possible 1,240). While the proportion of missing counts is small, to minimise the chance of these influencing the population trend, we estimated values for the small number of missing counts by interpolation, assuming a constant rate of proportional annual change.

Results and discussion

Development of the inland breeding population

Following the establishment of a colony of nine pairs at Abberton Reservoir in 1981, the colony grew rapidly to 310 pairs by 1988. During this period, confirmed breeding (a single nest in most cases) was reported from a further seven sites: in Cambridgeshire (two sites), Cornwall, Greater London, Norfolk, Staffordshire and Surrey (fig. 1a).

Between 1989 and 1995, a further nine colonies were established: in Cambridgeshire (Paxton Pits), Cumbria (Haweswater), East Yorkshire (Lower Derwent Valley), Essex (Walthamstow Reservoirs), Kent (Stodmarsh and Dungeness), Leicestershire & Rutland (Rutland Water), Lincolnshire (Deeping St James) and Nottinghamshire (Besthorpe Pits). Successful breeding was reported from a further eight sites, although breeding at these sites was short-lived (fig. 1b). The colony at Haweswater is interesting in that field observations suggest that the colony may hold only nominate *carbo* rather than *sinensis* (SEN pers. obs.), and may not be related to the core inland population development.

The period between 1996 and 2003 was characterised by rapid growth of existing colonies and the establishment of new colonies at a further 16 sites (fig. 2). This included the successful establishment of colonies in Bedfordshire, Berkshire, Cambridgeshire, Derbyshire, Essex, Greater London, Leicestershire & Rutland, Norfolk, Northamptonshire, Oxfordshire, Staffordshire, Suffolk, Sussex, Warwickshire and Yorkshire. Successful but short-lived breeding was also reported from a further 24 sites (fig. 1c). These included Willington Gravel-pits (Derbyshire), where breeding on a pylon was reported for the first time in England, in 1998 (James & Key 2001), although breeding here was subsequently discouraged. It is believed that illegal shooting of Cormorants during the breeding season at Besthorpe and Deeping St James,

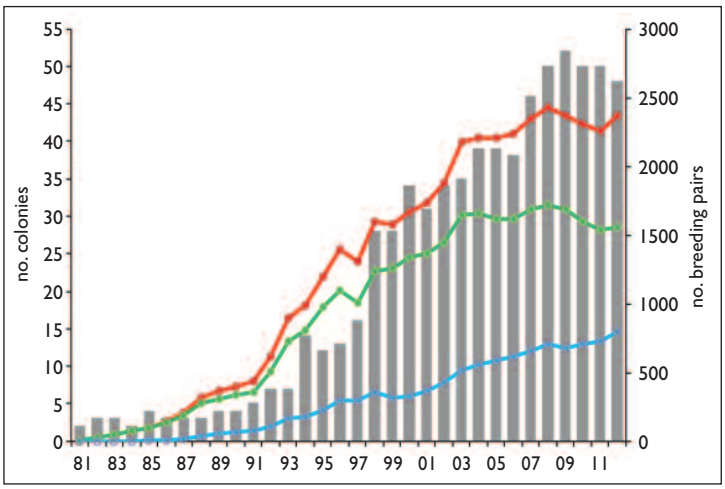

Fig. 2. Population growth (red line) and number of inland Great Cormorant *Phalacrocorax carbo* colonies (columns) in England between 1981 and 2012. In addition, we provide an estimate of the number of *P. c. sinensis* (green line) and *P. c. carbo* pairs (blue line) based on a relationship between colony age and percentage *P. c. sinensis* presented in Newson *et al.* (2007).

in 2000 at least, is thought to have influenced breeding numbers at those sites, with shooting suspected at a number of other sites during this period. Legal control of Cormorants was also carried out at Haweswater from 1999 onwards, to reduce the potential for predation of Schelly *Coregonus stigmaticus*, a threatened freshwater whitefish.

Data for the period 2004–12 suggest that the inland breeding population had stabilised at about 2,300 pairs (fig. 2). However, this trend is mainly the result of continued declines in numbers breeding at the larger, older colonies established in the 1980s and early 1990s, including Abberton Reservoir, Paxton Pits, Besthorpe, Walthamstow Reservoirs and Rutland Water. Cormorants are usually faithful to their natal colony, but as a colony nears its carrying capacity an increasing proportion of (mostly) younger birds breed elsewhere, either by moving to existing colonies or by establishing new ones (Newson 2000). Between 1993 and 1996, about 7% of Cormorants hatched at Abberton dispersed (Newson 2000), but the proportion breeding (or attempting to breed) away from the colony increased to 12% in 1997 and 18% in 1998 (Newson 2000). In contrast to these declines, however, colonies established between 1996 and 2003 have remained fairly stable or increased over the same period, while successful breeding was reported from 15 additional sites (fig. 1d). New colonies have become established mainly within the existing breeding range, although there has been a notable expansion into the southwest: Somerset (two colonies), Wiltshire (two colonies) and Gloucestershire (one colony). These colonies raise the possibility for further expansion of the inland breeding population, into Wales.

Using an observed relationship between colony age and the percentage of *sinensis* recorded at six inland colonies in the late 1990s (after Newson *et al.* 2007), we estimate that, by 2012, approximately two-thirds of the inland breeding population shows characters of *sinensis*. However, intergrades between the two races (identified by molecular work) have been shown to occur at inland colonies in England (Goostrey *et al.* 1997; Winney *et al.* 2001). The level of intergradation and the influence of that on Cormorant biometrics is unknown, but it is possible now that distinction between the two subspecies is becoming blurred.

Continued growth or stabilisation?

Control measures, to limit the expansion of the Cormorant population and minimise the impact on inland fish stocks, have been implemented in several European countries (Smith *et al.* 2008). In the UK, to prevent serious damage to fisheries, licences have been made available since autumn 1996 for

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459. Great Cormorants, Warwickshire, March 2013.

limited control of local wintering Cormorant populations by shooting. Initially, the numbers of licences involved were small (licences to control up to 517 Cormorants nationally per year), while shooting was considered mainly as a technique for scaring, rather than a means of population control (CSL 2005). In 2004, however, there was an increase in the number of birds that could be controlled per year, with an upper limit of 3,000 individuals for two years, and up to 2,000 birds annually thereafter (Smith *et al.* 2008). In practice, the number of Cormorants reported as shot each winter in England between 2004/05 and 2011/12 ranged between 1,227 and 1,885 individuals. Recently, data from WeBS (the main source of counts used to estimate annual peak counts; Holt *et al.* 2012) and current population estimates of the national winter Cormorant population (Musgrove *et al.* 2013) have been used to examine the extent to which control intensity (proportion of the local population shot per winter) is associated with site-level population change (Chamberlain *et al.* 2013). However, there was no clear difference in population growth rate of wintering Cormorants between sites that had experienced control versus sites where no control had been exercised. This suggests that Cormorant removal at local sites is having little effect on longer-term (i.e. year-to-year) population size at the site level, presumably being buffered by local movements. It is unclear, however, how control has influenced Cormorant numbers at a larger, regional (or even national) scale and we also do not know the influence of control on the inland or coastal breeding populations. While there are some signs that the inland breeding population is beginning to stabilise in overall numbers, new colonies continue to be established, so it is difficult to predict how the inland breeding population will change in the future.

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Notes

Mediterranean Gulls at a Hampshire pig farm

Pig farms across the UK, their open, bare fields dotted with the corrugated arches of pig shelters, have long been known to attract birds, especially gulls and corvids (mainly Rooks *Corvus frugilegus* and Jackdaws *C. monedula*). An outdoor pig farm near Sopley, in the Avon valley, Hampshire, covers several fields and extends to about a square kilometre in total. Although 8 km from the coast at Christchurch Harbour (in Dorset), the pig fields attract large numbers of commoner gulls. In recent years there have been rarer species too, including a Sabine's Gull *Xema sabini* in August 2011, an Iceland Gull *Larus glaucoides*, four Ring-billed Gulls *L. delawarensis* and a count of 85 Mediterranean Gulls *L. melanocephalus* on 16th July 2011. In the summer of 2013, Mediterranean Gulls reached exceptional numbers, matched at few UK localities away from breeding sites. After 180 in early July, numbers reached 625–650, mostly adults, on 18th July, and at least 300 remained at the end of the month.

Counts in 2013

In early July 2013, David Taylor counted 160 Mediterranean Gulls on and around the Sopley pig farm, and on 8th July I visited the site and counted a conservative 360; others saw at least 380 that day (www.chog.org.uk). The vast majority were adults in breeding plumage, well into moult but still with complete hoods, with single-figure numbers of first- and second-summers. There were around 750 Black-headed Gulls *Chroicocephalus ridibundus*, 100 or so immature Herring Gulls *L. argentatus*, a few Lesser Black-backed Gulls *L. fuscus graellsii* and one Common Gull *L. canus*. On 11th July, I counted a jaw-dropping 540+ Mediterraneans, mostly adults still with complete hoods, but c. 15–20 each of first- and second-summers. As usual, the adults were distinctively vocal in flight but seemingly silent on the ground. On 18th July, I counted 625–650, again mostly adults, now rapidly losing their

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