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Post-mortem analysis of bird corpses from the grounding of the MSC *Napoli*

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CONTENTS

Page No.

LIST OF TABLES

Page No.

LIST OF FIGURES

Page No.

1. INTRODUCTION

After being damaged by Hurricane Kyrill, the MSC *Napoli* was deliberately run aground in Lyme Bay, Devon (SY2187) on 20 January 2007. Over the following weeks, a significant volume of fuel oil was spilled into the bay, spreading to cover at least 8km of coastline, and large numbers of dead and dying birds were washed ashore around the bay. Volunteers from the RSPB and RSPCA, members of public and wildfowlers were able to collect many bodies for post-mortem. Birds were collected from various locations along Chesil Beach (SY6675 to SY5783) and as far west as Burton Bradstock (SY4889). A sample of these birds, were stored at the CEFAS laboratory in Weymouth, where the authors were able to undertake post-mortem analyses on 19-21 February 2007.

2. METHODS

Where possible, all birds were assigned to species or family level, aged where applicable on plumage, and scored according to the percentage of the plumage that was oiled according to van Franeker & Meijboom (2002).

For Guillemot *Uria aalge* and Razorbill *Alca torda*, standard measurements were taken to determine age and sex of birds, and to assess their broad geographic origin. Including wing length (maximum chord; Svensson 1992). Wing length in both auk species increases with latitude, so this gives some indication as to the natal origin of individuals involved in the spill. For Guillemots we additionally assigned a score as to the state of moult on the head (white-headed, moulting or brown-headed), and noted the presence/absence of white tips on the greater underwing coverts.

To age the Guillemots, we looked at the following criteria in order:

- Birds with an obvious Bursa of Fabricius were classed as juveniles (first-years)
- Birds with a fully brown head, or moulting into this plumage, were classed as sub-adults/adults. This follows work by Nevins & Carter (2003) that states that adults and older sub-adults moult into alternate (summer) plumage through the winter (October to February) whilst first-year birds do not moult until May or later.
- Degree of ossification of the supra orbital ridge (SOR). This ridge, which is located at the edge of the salt gland depression, is cartilaginous or non-existent in the youngest birds (SOR=1), and ossifies with age, forming a thickened ridge in the oldest individuals (SOR=7). The scoring for the supraorbital ridge used here was taken from Nevins & Carter (2003). Birds with a well-ossified skull (SOR=5) were classed as sub-adults/adults and those with a fully ossified skull (SOR=6 or 7) were classed as adults (Soldaat 2007).
- Males with testis width of greater than 2.5 mm and female with an ovarian follicle diameter greater than 1.5 mm were classed as adults, following work by Anker-Nilssen *et al.* (1988). These birds with wider testes or ovarian follicles had a high likelihood of past breeding activity.

For Razorbill, we classified birds into four age groups according to the structure of the bill after Anker-Nilssen *et al.* (1988), where juveniles = no white bands or grooves on bill, immatures = white band on bill but no grooves, sub-adults = white bands on bill and single groove, or adults = white band on bill and two grooves.

Internally for both auk species, we examined birds for the presence or absence of a juvenile organ the "bursa of Fabricius", and measured the size of the sexual organs (diameter of largest ovarian follicle in females and width and length of the left testis in males). From a sample of oiled and non-oiled auks, liver tissue and oiled feather samples were taken for future toxicological analyses. Following post-mortem, birds were refrozen and stored at the Natural England regional offices in Arne, Dorset.

3. RESULTS

3.1 Species composition

In total, we were able to process 306 corpses, although many of these were incomplete or very old and skeletal. Despite this, most could still be identified to species. The majority of birds were Guillemot and Razorbill, and numbers of each species are shown in Table 1.

3.2 Oiling

Many of the corpses were too decomposed or waterlogged to accurately assess the extent of oiling, but this was possible on 287 birds. Of these, 88 showed no external signs of oiling, with the remainder showing varying degrees of oiling as shown in Figure 1. Samples of liver were taken from a selection of birds, both oiled and clean, for future toxicological analyses, and samples of oil were taken in the form of clipped oiled feathers from 13 of these birds.

3.3 Sex and age structure

Through internal examination of the sexual organs, it was possible to determine the sex of 142 birds (Table 2). For Razorbill, the ratio of male:female was 1:2.3 and for Guillemot was 1:1.

We were able to identify the majority of Guillemots as sub-adults, adults or juveniles, although a sample of birds remained for which criteria were not conclusive to assign these to one or other age group. A majority of the birds we could age were adults (77%), with 20% classed as subadult/adult and 3% were juvenile. Birds of unknown age (60 individuals) were more likely to be subadults or juveniles than adults, as they do not fall into any of the three adult criteria listed above (head moult, SOR, testis/ovary size), though we could not be sure of this.

For Razorbill, the majority of birds were adults or sub-adults (82% of aged birds), whilst 18% were juveniles or immatures (Table 3).

Comparing the sex of Guillemots and Razorbills in relation to age, in the latter there was a greater proportion of females in all ages classes. In Guillemots though, 63.6% of adults of known sex were male, whereas in all other age categories (including unknown) only 26.5% were male (Table 5).

3.4 Standard biometrics

Wing measurements (maximum chord) were taken from 142 Guillemots and 96 Razorbills. The mean, standard deviation and range of which are shown in Table 6. There was no significant difference in the mean wing length between the sexes in either species (Figs 2 and 3), although there was an age-related difference in wing length of Razorbills (Fig 4), with juveniles tending to have shorter wings than sub-adults and adults.

3.5 The natal origin of Guillemots and Razorbills

Figure 5 makes a comparison between the wing length of Guillemots from this study and wing measurements from breeding colonies and from the *Erika* and *Tricolor* oil spills. Colonies are ordered according to latitude, with an increase in wing length with latitude. This is shown more clearly in Fig. 6. This provides strong evidence that the majority of Guillemots involved in the *Napoli* incident were likely to have originated from colonies in the south of England, Wales or

Ireland. This is supported by the fact that we found no birds of the 'bridled' form, which is more predominant in northern colonies (Birkhead 1984).

Barret *et al.* (1997) showed that there is also a strong clinal increase in wing length with latitude for Razorbill. The mean wing length of 190.6 mm in this study shows that most birds are likely to have been of the *islandica* race (breeding in Iceland, the Faeroes, Britain, Ireland and France) and within this race are most likely to have been from a southerly population.

3.6 Additional birds

In addition to the beached birds analysed here, we were able to add to this sample 78 birds (72 Guillemot and 6 Razorbill) that had died in care at RSPCA centres. As these birds may be a biased sample, they were excluded from these analyses and will be reported on separately with RSPCA.

4. RING RECOVERIES

To date, we have received details of 15 birds involved in the *Napoli* incident (13 Guillemot and two Razorbill). Individuals were all found along the coastline around Chesil Beach and reported in the days following the incident. These birds came from several breeding colonies where large numbers of birds are ringed (Figure 7). These ring recoveries do indicate age and origin, though the distribution of ringing sites will be affected by ringing effort.

Great Saltee Island, Wexford, Ireland

- M51882 (Razorbill) – ringed as a pullus in 1986
- X00795 (not oiled) – ringed as a pullus in 1991
- X46623 (not oiled) – ringed as a pullus in 1994
- X48821 (found in post-mortem sample) – ringed as a pullus in 1995
- R03773 – ringed as a pullus in 1999
- R11765 – ringed as a pullus in 2000
- R26407 – ringed as a pullus in 2001

Sanda Island, Strathclyde, Scotland

- T77986 – ringed as an adult in 1994
- X49978 – ringed as a pullus in 1998
- X36674 – ringed as a pullus in 2000

Skomer Island, Pembrokeshire, Wales

- X19947 – ringed as a pullus in 1995
- R07946 – ringed as a pullus in 2001

Other colonies

- T82747 – Ynys Gwylan Islands, Gwynedd, Wales, ringed as a pullus in 1998
- M96661 (Razorbill, not oiled) – Fair Isle, Shetland, ringed as a pullus in 2002

Finally, (FRP) DA225561 was originally found following the *Erika* spill in December 1999. It was successfully rehabilitated, ringed and released off the Brittany peninsula in January 2000. It was subsequently found alive in Lyme Bay but later died in care.

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This work was carried out under contract EIT-37-03-004 for Natural England. We would like to thank Michael Coyle and other staff at Natural England and JNCC for their help in setting up the work, and especially to Paul Haywood, Robert Bartlett and staff at CEFAS Weymouth for allowing us to store the collected corpses at their laboratory and granting us access to their post-mortem facilities. Advice and guidance was freely given by Kees Camphuysen and Edward Soldaat and Rob Robinson commented on a draft of this report.

REFERENCES

Alvarez, D. & Pajuelo, M.A.F. (2004) Differential migration in a wintering population of Common Guillemots *Uria aalge* affected by the *Prestige* oil spill. *Ardeola* **51**(2), 451-454.

Anker-Nilssen, T., Jones, P.H. & RqStad, O.W. (1998) Age, sex and origin of auks (Alcide) killed in the *Skagerrak* oiling incident in January 1981. *Seabird* **17**, 64-73.

Barret, R.T., Anker-Nilssen, T. & Krasnov, Y.V. (1997) Can Norwegian and Russian Razorbills *Alca torda* be identified by their measurements?, *Marine Ornithology* **25**, 5-8.

Birkhead, T.R. (1984) Distribution of the bridled form of the Common Guillemot *Uria aalge* in the North Atlantic. *J. Zool. Lond.* **202**, 165-176.

Camphuysen, C.J. (1989) Biometrics of auks at Jan Mayen. *Seabird* **12**, 7-10.

Camphuysen, C.J. Heubeck, M., Cox, S.L., Bao, R., Humple, D., Abraham, C. & Sandoval, A. (2002) The *Prestige* oil spill in Spain. *Atlantic Seabirds* **4**, 131-140.

Camphuysen, C.J. & Leopold, M. (2004) The Tricolor oil spill: characteristics of seabirds found oiled in The Netherlands. *Atlantic Seabirds* **6** (3), 109-128.

Cramp, S. (Ed.) (1985) The Birds of the Western Palearctic, Vol. IV. Oxford University Press, Oxford, London, New York.

Grantham, M.J. (2005) Age structure and origins of British & Irish Guillemots *Uria aalge* recovered in recent European oil spills. *Atlantic Seabirds* **6** (3), 95-108.

Harris, M.P., Halley, D.J. & Swann, R.L. (1994) Age of first breeding in Common Murres. *Auk* **111**, 207-209.

Hope Jones P. (1988) The European cline in wing-length of guillemots *Uria aalge*. *Seabird* **11**, 19-21.

Mitchell, I.P., Newton, S.F., Ratcliffe, N. & Dunn, T.E. (2004) *Seabird Populations in Britain and Ireland.* T & A.D. Poyser, London.

Soldaat, E.G. (2007) *The Seabird Osteology Pages, Guillemot skull development*, www.seabird-osteology.info

Svensson L. (1992) *Identification Guide to European Passerines.* 4th edn. Svensson, Stockholm.

Van Franeker, J.A. & Meijboom, A. (2002) Litter NSV - Marine litter monitoring by Northern Fulmars: a pilot study. ALTERRA-Rapport 401. (Alterra, Wageningen, 72pp).

Weir D.N., Kitchener A.C., McGowan R.Y., Kinder A. & Zonfrillo B., 1997, Origins, population structure, pathology and diet of samples of diver and auk casualties of the *Sea Empress* oil spill. CCW *Sea Empress* Contract Report.

Species name	Fresh corpses	Old corpses
Fulmar *Fulmarus glacialis*	1	3
Gannet *Morus bassanus*	0	4
Black-headed Gull *Larus ridibundus*	1	0
Lesser Black-backed Gull *Larus fuscus*	0	1
Herring Gull *Larus argentatus*	1	4
Great Black-backed Gull *Larus marinus*	0	2
Kittiwake *Rissa tridactyla*	1	2
Unidentified large gull	*0*	*1*
Guillemot *Uria aalge*	141	27
Razorbill *Alca torda*	82	22
Little Auk *Alle alle*	0	1
Unidentified auk	*12*	*0*
TOTALS	**239**	**67**

Table 1. Species composition of beached birds analysed following the *Napoli* incident.

	Male	Female	Unknown
Guillemot	44 (49%)	45 (51%)	79
Razorbill	16 (30%)	37 (70%)	51

Table 2. Number (and percentage where sexed) of male and female Razorbills and Guillemots found following the *Napoli* incident.

Criteria	Code	Age	Number (% of aged birds)
No white band or grooves on bill	0+0	Juvenile	16 (17%)
White band on bill but no grooves	W+0	Immature	1 (1%)
White band on bill and single groove	W+1	Sub-adult	35 (37%)
White band on bill and two grooves	W+2	Adult	43 (45%)
		Unknown	9
		TOTAL	**95**

Table 3. Ages of Razorbills according to bill structure found following the *Napoli* incident.

Age	Number (% of aged birds)	
Juvenile	3	(3%)
Sub-adult/adult	22	(20%)
Adult	83	(77%)
Unknown	60	
TOTAL	**168**	

Table 4. Age classes of Guillemots found following the *Napoli* incident.

		Male	Female	Unknown
Guillemot	Juvenile	1	1	1
	Subadult/adult	3	8	11
	Adult	35	20	28
	Unknown	5	16	39
Razorbill	Juvenile	2	3	11
	Immature	0	1	0
	Subadult	5	10	20
	Adult	9	19	15
	Unknown	0	4	5

Table 5. Sex composition in relation to age of Guillemots and Razorbills found following the *Napoli* incident.

	Male Mean (n)	Female Mean (n)	All Mean (range)	n
Guillemot	196.3 (43)	196.0 (45)	196.5 (180-213)	142
Razorbill	192.4 (16)	193.5 (37)	190.8 (180-205)	96

Table 6. Wing measurements of Guillemots and Razorbills found following the *Napoli* incident.

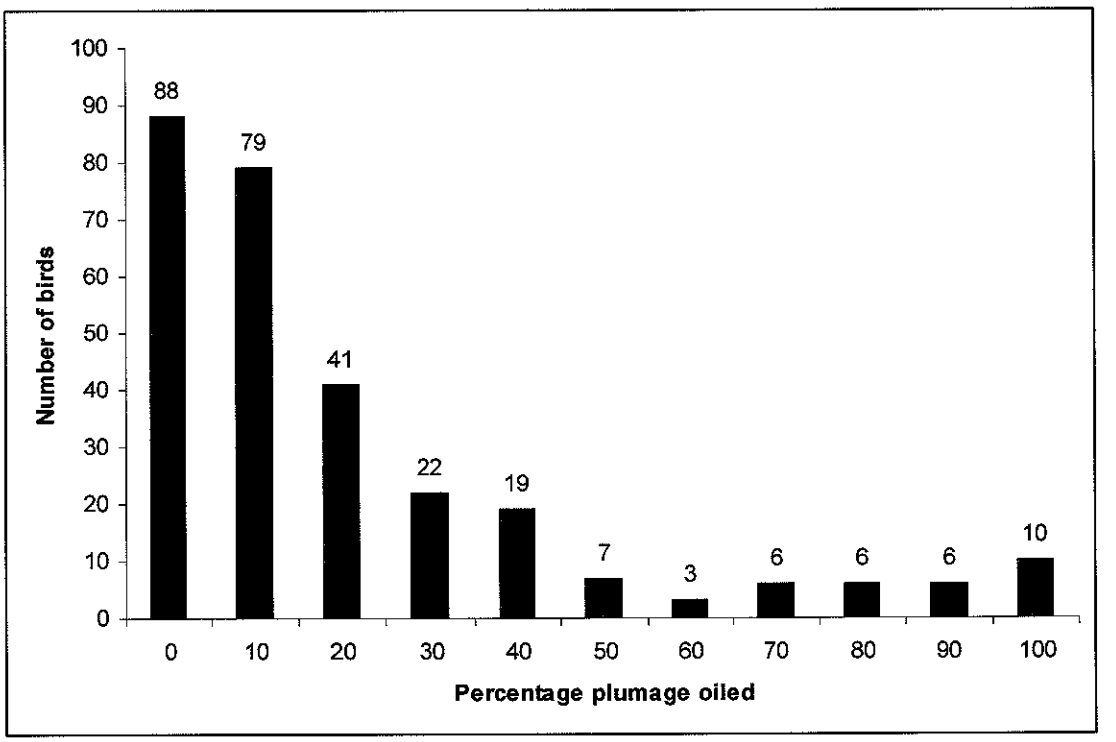

Figure 1. Extent of oiling on beached birds following the *Napoli* incident (all species). The sample size of birds in each category is shown above the bars.

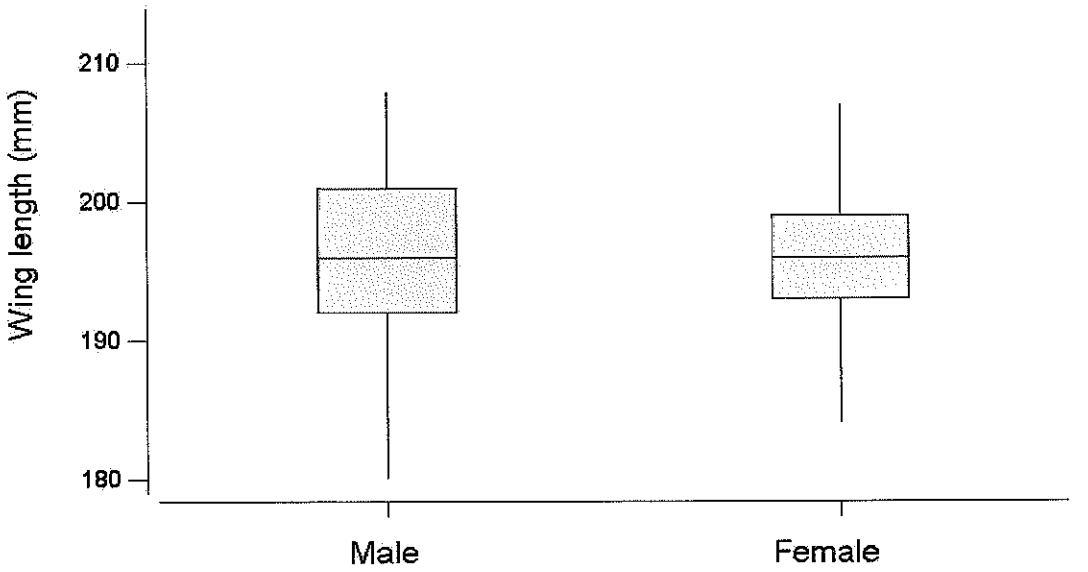

Figure 2. Wing length of Guillemots by sex (box plots showing mean, 95% confidence intervals and range) found following the Napoli incident.

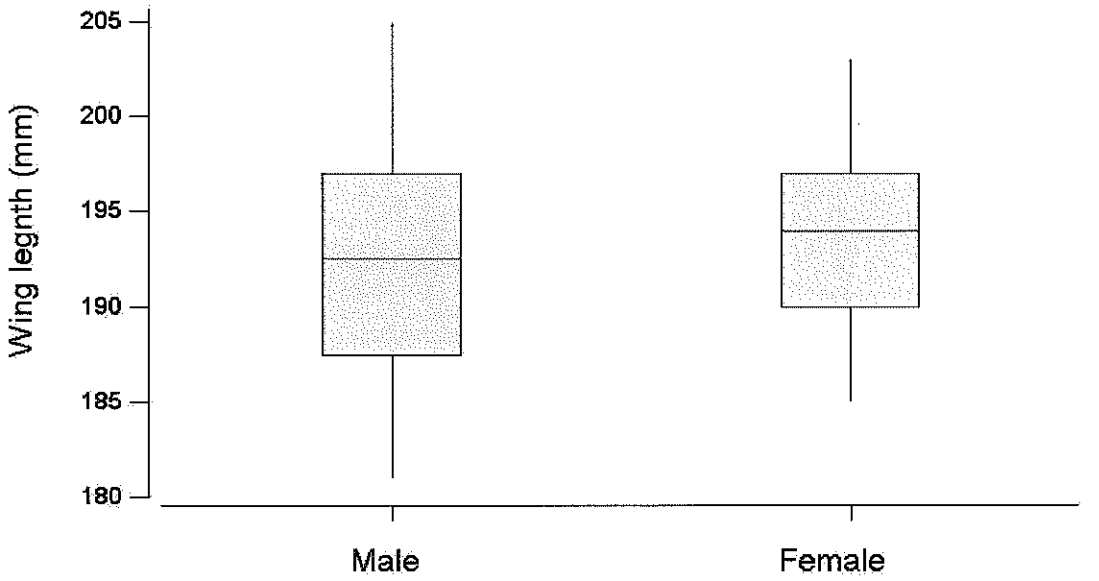

Figure 3. Wing length of Razorbills by sex (box plots showing mean, 95% confidence intervals and range) found following the Napoli incident.

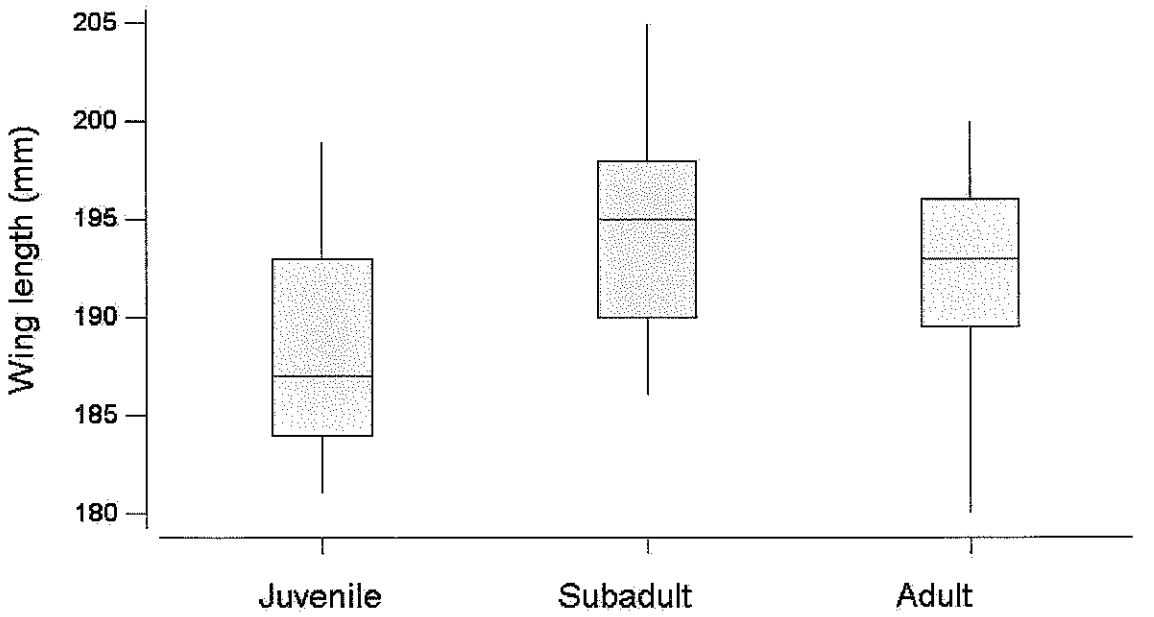

Figure 4. Wing length of Razorbills by age class (box plots showing mean, 95% confidence intervals and range) found following the Napoli incident.

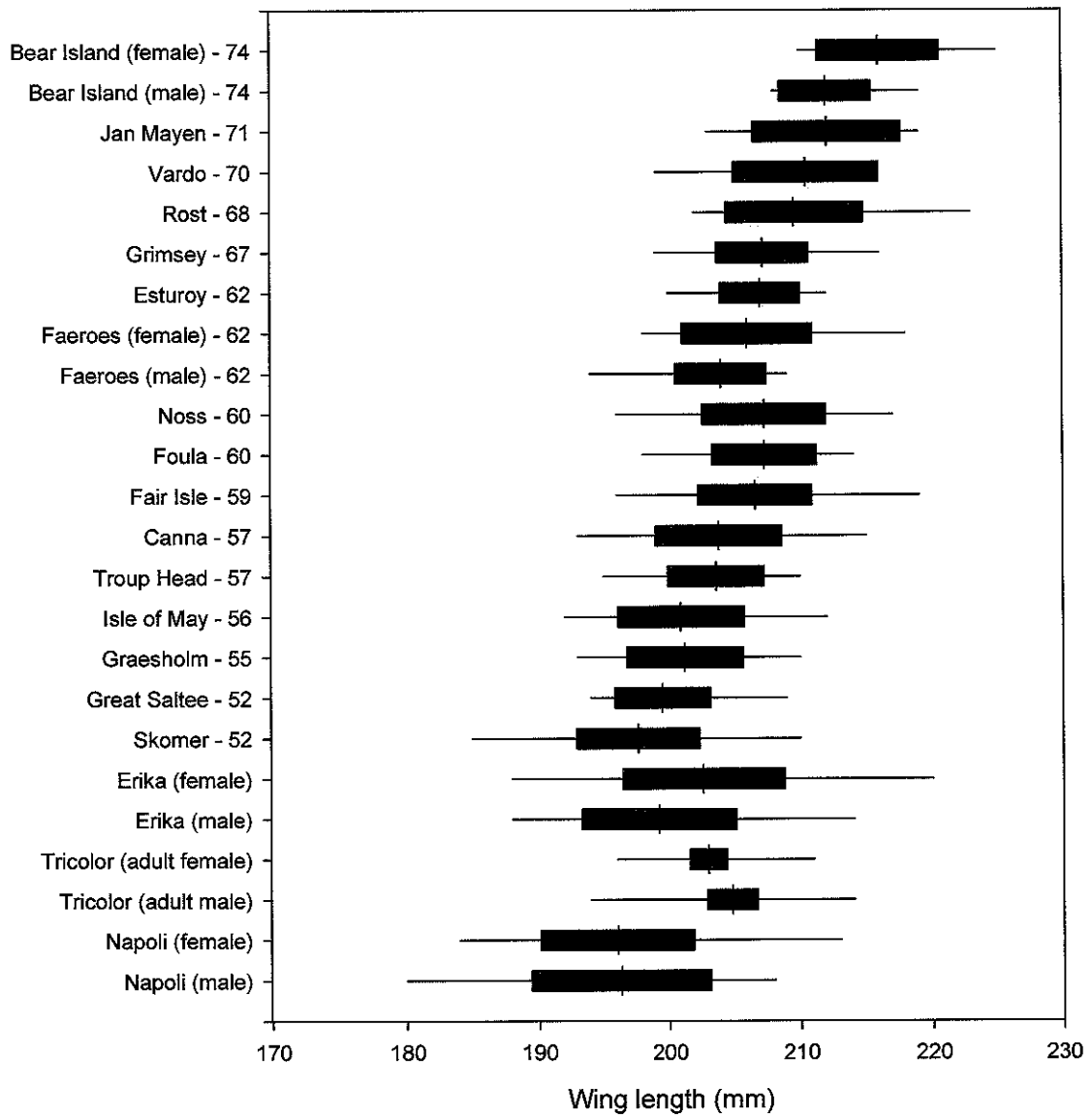

Figure 5. Wing lengths of Guillemots from breeding colonies, showing mean, standard deviation and range (from Camphuysen 1989, Cramp 1985, Hope Jones 1988). Also shown are similar figures from the *Tricolor* (Camphuysen & Leopold 2004) and *Erika* (Cadiou *et al.* 2004) oil spills, and from the current analyses.

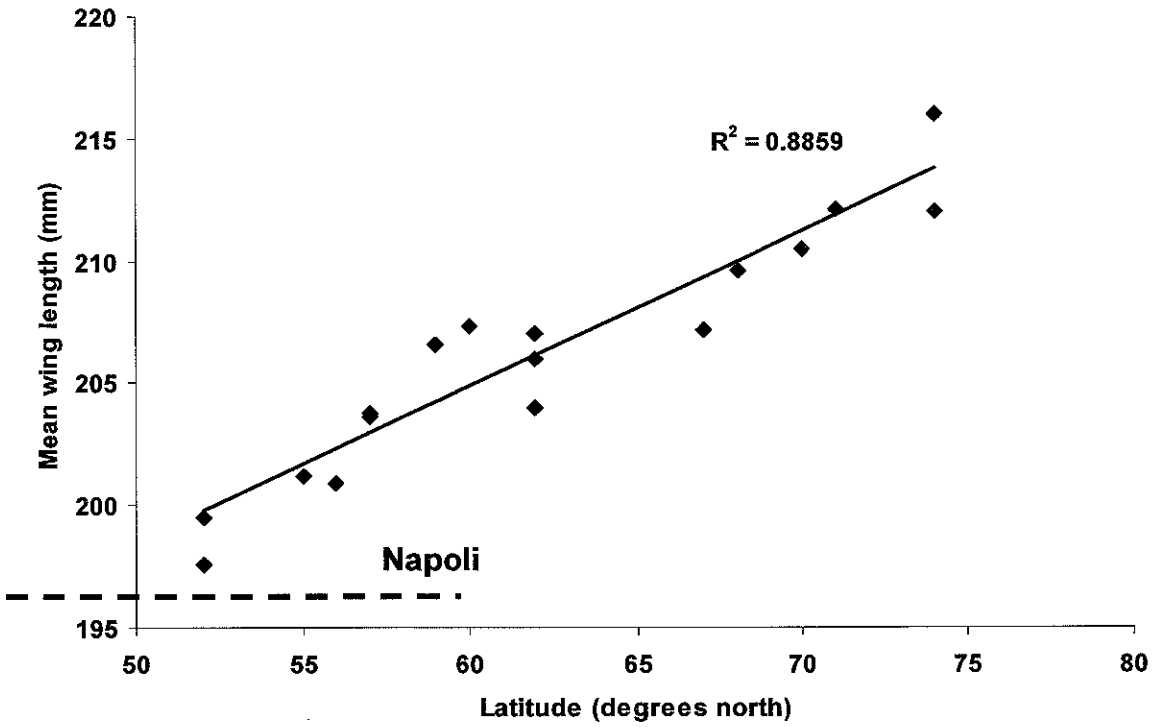

Figure 6. Mean wing length of Guillemots with increasing latitude within Europe (sources as in Figure 5). The mean wing length of the Napoli birds is marked by a dotted line.

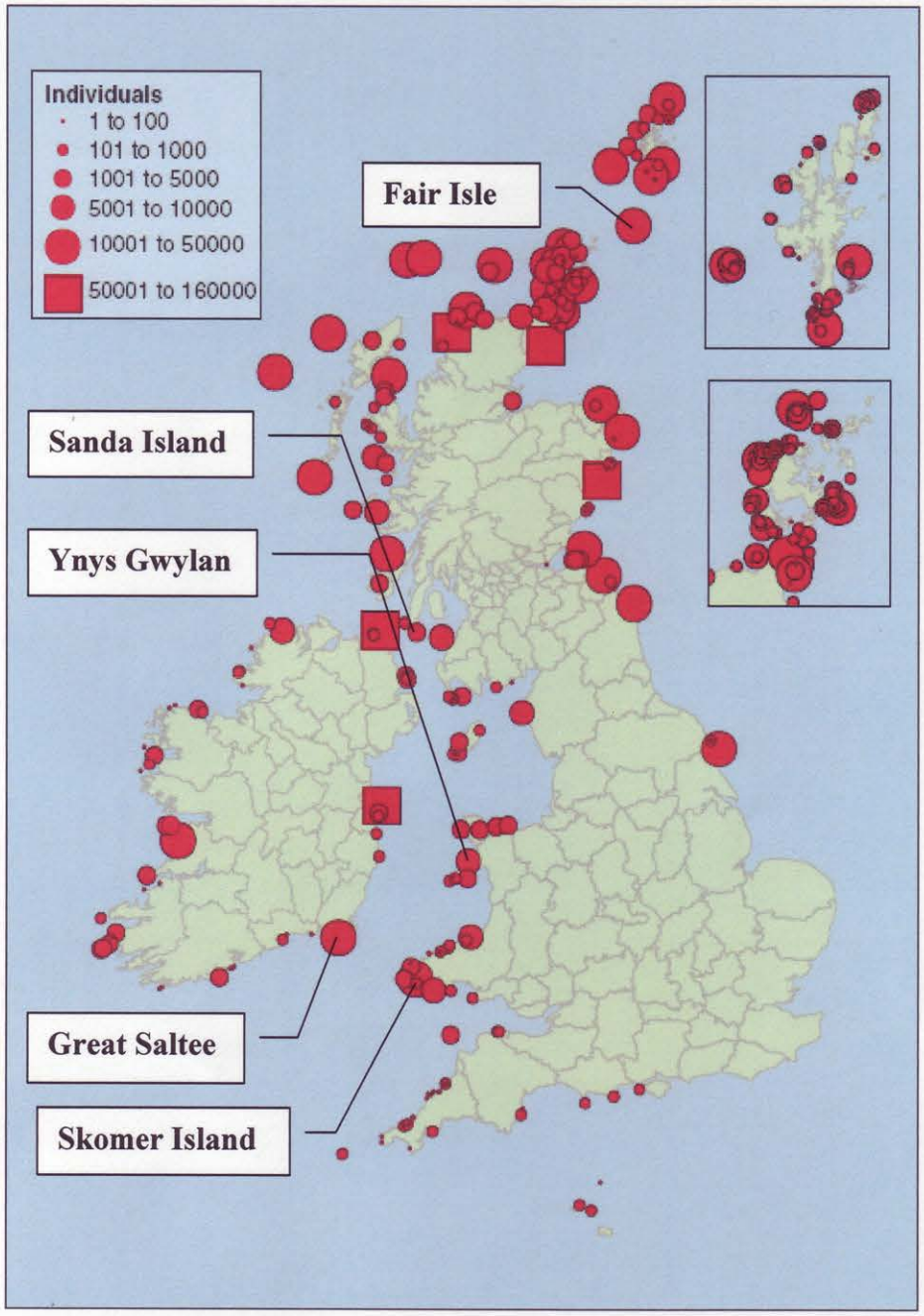

Figure 7. Distribution of Guillemot colonies in Britain and Ireland, with colonies from which ringed birds recovered from the *Napoli* oil spill originated highlighted. Reproduced from Mitchell *et al.* (2004), with permission from JNCC.