The dispersal and migration of the Northern Gannet *Morus bassanus* from Channel Islands breeding colonies

Veron, P. K.[1*] & Lawlor, M. P.[2]

**Correspondence author. Email: pkv@cwgsy.net*
[1] *Ty Coed, Rue du Closel, Vale, Guernsey, GY3 5ES, Channel Islands;*
[2] *St Etienne, Les Effards, St Sampson's, Guernsey, GY2 4YN, Channel Islands.*

Abstract
Around 7,500 pairs of Northern Gannets *Morus bassanus* nest at two long-established gannetries off Alderney, Channel Islands, the second and third most southerly colonies in the world. This paper describes the temporal and spatial distribution within five geographic zones of recoveries of birds ringed as chicks at these colonies. First-year birds migrate south in autumn earlier than those from gannetries further north, many to waters off northwest Africa and some as far south as Senegal, while others move into Mediterranean Waters, perhaps more readily than juveniles from more northern colonies. Some remain in southern latitudes during their second summer but most have returned at least into West European Waters. After their second winter, immature birds tend to summer in Northern Waters, with recoveries often in the vicinity of different gannetries. Most Channel Islands birds probably recruit into their natal colonies, but some have recruited into more recently established gannetries, on Helgoland, Germany and Gjesvær, Finnmark, Norway. Recoveries of adults were mainly from Northern Waters, but also along the coasts of the Bay of Biscay and Atlantic Iberia, at all times of year.

Figure 1. Les Etacs gannetry, Alderney, 22 June 2009. © *Paul K. Veron*

Introduction

There are two Northern Gannet *Morus bassanus* colonies in the Channel Islands, of which Les Etacs (Garden Rocks) is the larger, consisting of two groups of igneous rocks some 0.6 ha in extent (49°42'N 2°15'W). However, it was the smaller Alderney Sandstone stack of Ortac (0.12 ha) (49°43'N 2°15'W) that was colonised first in 1940. Counting during the Occupation of the Second World War was not possible, but by 1946 the gannetries were estimated to hold c. 450 pairs (Ortac c. 250, Les Etacs c. 200) (Dobson & Lockley 1946). Counts using aerial photography found that the colonies contained a minimum of 4,387 Apparently Occupied Sites (AOS) in 1984 (Ortac 2,062, Les Etacs 2,325) (Hill 1989), and 7,409 AOS in 2005 (Ortac 2,547 AOS, Les Etacs 4,862 AOS) (Sanders & Harris 2005), an average rate of increase of 3.3% per annum over the past 55 years. This compares with an average world population growth over the past 60 years of 2% per annum (Wanless *et al*. 2005). It is interesting, however, to also compare this growth rate with that on Rouzic, Sept-Îles, Brittany, France, the nearest gannetry to Alderney, which was established in the 1930s and grew by an average of 8% per annum from 1939 to reach 17,000 pairs in 2005 (Siorat 2004; Grémillet *et al*. 2006).

This paper describes the dispersal and migration of Northern Gannets (hereafter 'Gannets') born in the two Alderney colonies, and compares ring recovery data with that of other gannetries from further north, in relation to age, season and geographical area. Other published studies (Thomson 1939, 1974; Nelson 2002) have principally used data from birds ringed on the Bass Rock in the Firth of Forth, Ailsa Craig in the Firth of Clyde (both Scotland), Grassholm in the Irish Sea, and more recently established colonies in Norway (Barrett 1988). Comparisons are also drawn with an earlier study of Gannets from the Channel Islands colonies (Veron 1988).

Methods

Between 1947 and 2007, 21,823 Gannets were ringed on the two gannetries off Alderney, Channel Islands, and up to 31 December 2007, 728 ringing recoveries of these birds had been reported; 72% of the birds were ringed in the last 20 years, and 43% in the decade 1998–2007 (Table 1). This compares with a ringing total of 72,629 birds for the rest of Britain and Ireland over the period 1910–2007 (Coiffait *et al*. 2008). The two Channel Islands colonies have thus been responsible for 23% of Gannets ringed in Britain, Ireland and the Channel Islands, and provide one of the most significant data sets in the eastern Atlantic.

Most visits to the Alderney colonies have been in mid- to late-June each year, several weeks earlier than most visits to ring chicks at UK colonies (Wanless 2002). Ringing effort to date has focussed on nestlings (fewer than 50 adults have been ringed) and this analysis uses recoveries only of birds ringed as chicks. For the purposes of this study years of life have been determined from 1 May, enabling direct comparisons to be made with the results of Thomson (1939, 1974), Barrett (1988), Veron (1988), and Nelson (2002). We also replicate, with one modification, the four arbitrary geographical zones described by Thomson (1974) for the analysis of recoveries:

Table 1. Annual ringing and recovery totals for Northern Gannets *Morus bassanus* ringed in Alderney.

Year	Ringed	Recovered	Year	Ringed	Recovered	Year	Ringed	Recovered
1947	13	0	1967	0	9	1987	493	23
1948	0	0	1968	0	3	1988	775	12
1949	23	2	1969	0	1	1989	685	21
1950	0	1	1970	0	2	1990	1,025	25
1951	285	5	1971	0	1	1991	276	27
1952	0	2	1972	0	1	1992	800	21
1953	238	3	1973	13	2	1993	862	23
1954	236	5	1974	0	1	1994	551	36
1955	0	2	1975	144	3	1995	0	6
1956	0	3	1976	376	7	1996	500	16
1957	8	3	1977	564	15	1997	900	25
1958	0	2	1978	427	6	1998	362	23
1959	0	1	1979	336	6	1999	1,140	20
1960	0	3	1980	0	12	2000	570	24
1961	0	0	1981	0	8	2001	467	22
1962	0	0	1982	0	10	2002	1,156	30
1963	314	16	1983	621	10	2003	1,050	32
1964	460	10	1984	262	11	2004	1,347	39
1965	240	12	1985	407	16	2005	1,678	25
1966	250	12	1986	317	8	2006	1,361	40
						2007	291	24
						Total	**21,823**	**728**

Northern Waters: Atlantic Ocean north of the latitude of Ouessant, Finistere, France (48°28'N); also the Norwegian Sea, North Sea, Baltic Sea and approaches to the English Channel and Irish Sea;

West European Waters: Atlantic Ocean from the latitudes of Ouessant to that of Punta Alminia on the southern side of the Strait of Gibraltar (35°54'N);

North-west African Waters: Atlantic Ocean from the Strait of Gibraltar to the Tropic of Cancer (23°27'N); and

Tropical Waters: Atlantic Ocean from the Tropic of Cancer southwards. Thomson (1974) included the Mediterranean Sea in West European Waters, but we have followed Veron (1988) and separated this into a fifth zone - **Mediterranean Waters.**

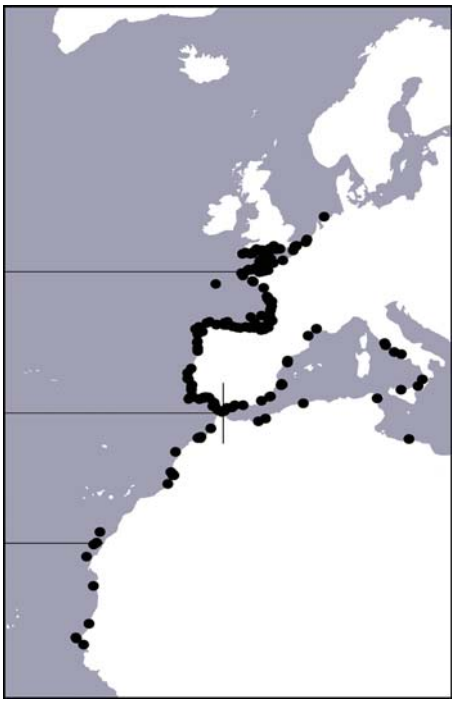

Figure 2. Recoveries of Northern Gannets *Morus bassanus* in their first year of life.

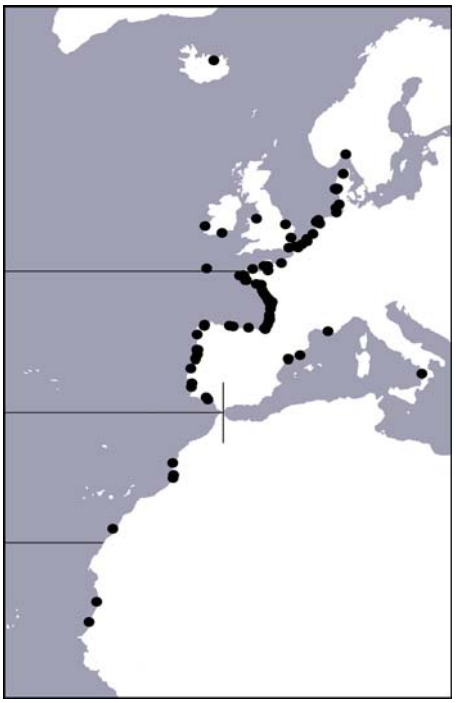

Figure 3. Recoveries of Northern Gannets *Morus bassanus* in their second year of life.

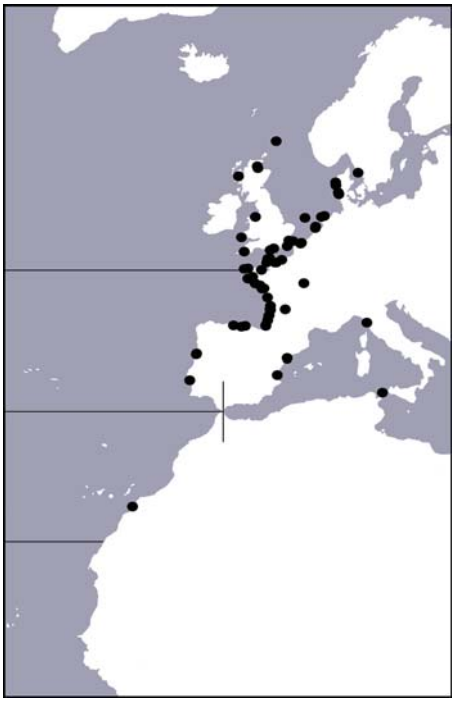

Figure 4. Recoveries of Northern Gannets *Morus bassanus* in their third year of life.

Results

The recovery rate for Channel Islands ringed Gannets was 3.3%, compared to 5.7% for the British Ringing Scheme (Coiffait *et al*. 2008). This lower rate may be because the Jersey address on the rings is not as well recognised and known as the London address on British rings, and also because the increased ringing effort in the Channel Islands in the past decade (when 43% of the birds have been ringed) means a large number of such Gannets are still alive, and will be recovered in the decade(s) ahead. It may also be explained in part because recovery rates for Gannets have declined in recent years (Wanless 2002). This will have affected the recoveries from Channel Islands-ringed birds proportionately more as a higher percentage of the overall ringing total relates to birds ringed in more recent years.

First-year birds: There is a strong tendency for first-year Gannets to migrate south (Figure 2, Table 2). After fledging from late July onwards, most head to the Western Approaches of the English Channel before turning south into the Bay of Biscay and continuing onwards to Iberia. While many continue south to reach Northwest African Waters and even Tropical Waters off Mauritania and Senegal, others turn east at the Strait of Gibraltar and enter Mediterranean Waters, penetrating at least as far east as Sicily, Italy, Tunisia and Libya. This broadly follows the pattern established from ringing of Gannets in Britain and Ireland (Wanless 2002).

Second-year birds: Most second-year birds had returned to West European or Northern Waters by July and August, and some earlier than this (Figure 3, Table 2). Many birds visit gannetries as early as their second year (Nelson 2002), and Channel Islands-ringed birds of this age have been recovered near several gannetries other than their natal ones, including Great Saltee and Little Skellig, Ireland, Helgoland, Germany and Raudinupur, Iceland. Most will not venture as far south in subsequent winters as they did on their first autumn migration, and while second-year birds mainly wintered in West European Waters, others stayed in Northern Waters throughout the year. The three recoveries in Mediterranean

Waters in May–July may have related to birds that had remained there after their first migration, although the September recovery there and the four in Northwest African Waters in October–December could have involved birds that had summered further north and made a second migration south.

Third-year birds: This is the first age category where most recoveries were from Northern Waters, with reports in every month except December and February (Figure 4, Table 2). The tendency for immature Gannets to visit different colonies in the summers before first breeding may be reflected by recoveries of third-year birds near Grassholm, Wales, and in Shetland. A substantial number of third-years continue to move south in the autumn, as there were 23 recoveries of this age group from West European Waters, spread throughout the year, but half in the winter months of October–January. Third-year Gannets continued to be found in Mediterranean Waters, with four recoveries, one each in May, September, March and April, but the only bird recovered further south was in Northwest African Waters in July.

Fourth-year birds: The pattern of movement for fourth-year Gannets was similar to that of third-year birds, although even fewer migrated out of Northern or West European Waters at any time in the year (Figure 5, Table 2). Most fourth-year birds remain in Northern Waters throughout the year, with some moving into West European Waters, but mainly in the Bay of Biscay, with only four recoveries in Iberia. Many fourth-year birds will be summering at or near established gannetries preparing for their first breeding attempt, normally at age five (Nelson 2002), and Channel Islands-ringed birds were found in the vicinity of Les Etacs and Ortac, Great Saltee, Bass Rock, Scotland, Bempton Cliffs, England, and Helgoland.

Fifth-year, and older birds: By this age Gannets have become successful hunters, with the skills and experience to catch sufficient food in the shorter daylight hours of the northern winter, cope with the frequent stormy weather in these latitudes at this time of year, avoid the energy demands of a long southward migration, and remain close to their colony. Most

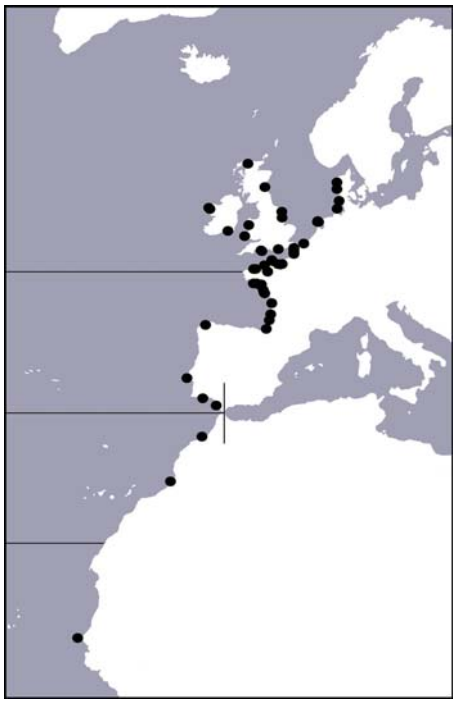

Figure 5. Recoveries of Northern Gannets *Morus bassanus* in their fourth year of life.

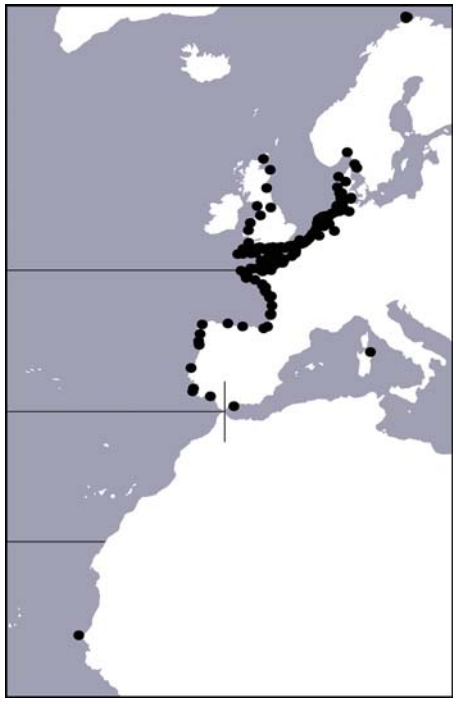

Figure 6. Recoveries of Northern Gannets *Morus bassanus* in their fifth year and older.

(265/300, 88%) recoveries of adult Gannets were in Northern Waters, largely from the Channel coasts of France and England, and the southeast North Sea, i.e. within foraging range of the Alderney colonies, although there was evidence of some summering and/or breeding much further north, in Scotland and in northern Norway (Figure 6, Table 2). A few adults continue to make a long southward migration in winter, such as one recovered in its ninth year in Senegal and the two in the Mediterranean, which included a 19-year-old found on the east coast of Sardinia.

Table 2. Distribution by month and geographic zone of recoveries of Northern Gannets *Morus bassanus* ringed in Alderney, 1947–2007.

Age	Zone	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Total
1st year	Northern			1	28	32	5	1		2		1	1	71
	West European		1	2	17	51	22	7	2			1		103
	Mediterranean					4	6	10	4	4	1		1	30
	NW African						6	3			1		1	11
	Tropical						1	1		2	4			8
	Total	**0**	**1**	**3**	**45**	**87**	**40**	**22**	**6**	**8**	**6**	**2**	**3**	**223**
Age	**Zone**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**Total**
2nd year	Northern	1	3	7	11	2	4	1	1		1		1	32
	West European	2		7	8	7	9	1	3		3	1	5	46
	Mediterranean	1	1	1		1								4
	NW African						2	1	1					4
	Tropical	1											1	2
	Total	**5**	**4**	**15**	**19**	**10**	**15**	**3**	**5**	**0**	**4**	**1**	**7**	**88**
Age	**Zone**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**Total**
3rd year	Northern	5	1	9	7	2	2	2		2		1	3	34
	West European	4	1	1	1		4	5	1	1		4	1	23
	Mediterranean	1				1						1	1	4
	NW African			1										1
	Tropical													0
	Total	**10**	**2**	**11**	**8**	**3**	**6**	**7**	**1**	**3**	**0**	**6**	**5**	**62**
Age	**Zone**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**Total**
4th Year	Northern	3	6	5	10		1	2	1	3		1	4	36
	West European	1	2			2			3	2	3	2	1	16
	Mediterranean													0
	NW African				1								1	2
	Tropical								1					1
	Total	**4**	**8**	**5**	**11**	**2**	**1**	**2**	**5**	**5**	**3**	**3**	**6**	**55**
Age	**Zone**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**Total**
5th Year+	Northern	42	28	22	18	19	17	9	9	10	21	44	26	265
	West European	1	2	1	4	1	6	3	2	8	2	1	1	32
	Mediterranean											1	1	2
	NW African													0
	Tropical										1			1
	Total	**43**	**30**	**23**	**22**	**20**	**23**	**12**	**11**	**18**	**24**	**46**	**28**	**300**

Discussion

Most juvenile Channel Islands Gannets probably head west soon after fledging, to the mouth of the English Channel, before turning south into West European Waters. There were, however, autumn records of first-year birds that had moved east up the English Channel to be found dead in northeast France (four) and The Netherlands (two), but whether these would have attempted to winter in Northern Waters or headed west again and then south is unknown. An earlier study of Gannets ringed in the Channel Islands found no winter recoveries of first-year birds in Northern Waters, and only three in October (Veron 1988), while the more extensive data examined here revealed only one recovery in winter (January, The Netherlands) and one in spring (April, Dorset, England). For young birds, the advantages of migrating south to the seas off Africa or in the Mediterranean presumably outweigh the demands of such a journey.

An analysis of 1,413 Gannets found dead on beached bird surveys in The Netherlands between 1970 and 2000 found that between January and May 86% were in adult plumage (Camphuysen 2001). Immatures, which were recorded throughout the year, increased in June, peaked in July and August, and declined in autumn. Juveniles were most frequent between September and November, with only a very small number found in winter and spring. Data from coastal seawatching and ship-based surveys at sea, with a one-month time-lag, agreed with this pattern of occurrence. However, despite the proximity of the Alderney colonies and the large number of chicks ringed there in recent years, the lack of recoveries from the southern North Sea suggest few, if any, Gannets from the Channel Islands spend their first winter there.

Of all recoveries of birds in their first year, 46% were along the coasts of the Bay of Biscay and Atlantic Iberia, south to the Strait of Gibraltar. The frequency of recoveries from this area is perhaps unsurprising given that these coastlines are heavily populated, and ringed Gannets are quite likely to be reported if found dead on beaches or as a direct result of man's fishing activities. Seawatching in the mid-1990s at Cape St Vincent, the southwest tip of Portugal, showed that southerly passage of Gannets in autumn peaked in October/November (Walker 1996). The proportion of first-years among birds heading south in 1994/95 was highest in September (33%) and October (11%), and remained at 6% or less through that winter amongst either southbound or northbound birds, before rising in April to between 14% (northbound) and 17% (southbound). Most first-year recoveries of Channel Islands Gannets in West European Waters (93/103, 90%) were before the end of October; this and the lack of recoveries from January to April (apart from one at Camaret-sur-Mer, Brittany, France in March 2004) suggests they migrate quickly south in autumn to winter in Northwest African, Tropical or Mediterranean Waters. One remarkable recovery was of a very advanced chick ringed on 4 June 1977 and found at Santander, northern Spain on 6 July. Most Gannets from the Alderney colonies fledge from late July to mid August and, unsurprisingly given their southern location, reach West European and Northwest African Waters ahead of those from colonies further north. Of first-year recoveries in West European

Figure 7. Ringing Northern Gannet *Morus bassanus* chicks on Ortac, Alderney, 22 June 2009. © *Paul K. Veron*

Waters of chicks ringed on the Bass Rock, only 3% and 24% were in August and September, respectively (Nelson 2002), compared to 17% and 50% for chicks ringed on Alderney. This pattern of earlier movement continues into Northwest African Waters. While there were no first-year recoveries from either colony there in September, 19% of first-year Bass Rock recoveries in this zone were in October compared to 55% of those from Alderney.

Veron (1988) previously speculated that Channel Islands-born Gannets entered the Mediterranean Sea more readily than birds from colonies further north, although Nelson (2002) concluded there was no evidence that Gannets from different British colonies follow different migration routes, and Wanless (2002) stated that birds from all east Atlantic colonies intermingle in the winter. However, there have now been 30 recoveries of first-year birds in the western Mediterranean compared to 19 in Northwest African and Tropical Waters. Ringed birds may be more likely to be found and reported along the more populated Mediterranean coasts but this would apply irrespective of colony of origin, and this ratio (61:39) seems higher than for first-year birds ringed at colonies in Britain and Ireland (Wanless 2002).

Of the 11 recoveries of first-year Channel Islands Gannets in Northwest African Waters, nine were in October or November, when they could have been still migrating south, and the other two were in February and April. This suggests that many of the juveniles that continue south beyond the Strait of Gibraltar migrate through Northwest African Waters to reach wintering grounds in Tropical Waters. Although there were only eight recoveries from this zone, six were in January or February, the other two being in October and November. Gannets tend to migrate shorter distances after their first winter (Wanless 2002), and a second-year bird in April was the only report of an immature in Tropical Waters (one in May, i.e. fledged the previous year, had probably remained there from its first winter).

Recently, the deployment of geolocation data loggers on adult Gannets breeding on the Bass Rock found that individuals displayed variable migratory behaviours, with discrete winter home ranges in different areas of the eastern Atlantic (Kubetzki *et al*. 2009). Of 22 adults, ten wintered in an area of upwelling off northwest Africa, where they were believed to have been associating with pelagic fisheries, and profiting from discards.

Figure 8. Ortac gannetry, Alderney, 22 June 2009. © *Paul K. Veron*

This high proportion of adults wintering so far south was surprising, given previous knowledge of wintering areas based on ringing recoveries (Wanless 2002). Another study, demonstrating later breeding at 17 Gannet colonies in the eastern Atlantic (including Les Etacs), suggested this might be associated with adults wintering further south than in the past, rather than any local or larger-scale environment effects in the vicinity of colonies (Wanless *et al*. 2008). However, the recovery data from Alderney did not indicate any change in adult wintering areas with only one bird recovered in either Northwest African or Tropical Waters (a nine-year-old in Senegal in February 1992), and no evidence of a southward shift in the distribution of recovery latitudes of adults in winter (November to January inclusive) during 1998–2007 (median latitude: 51°6'N, n = 21) compared to 1970–1997 (median latidude: 49°55'N, n = 20; Mann-Whitney *U*-test: $U = 175$, $P = 0.361$). In both periods the southernmost recoveries were in northwest Iberia.

Gannets in their second year wander widely in Northern Waters, with recoveries in southwest Ireland, on the west and southeast coasts of England, and in the eastern North Sea. Perhaps the most surprising was that of a bird found buried in snow in northern Iceland in May 2001. While many, or most such birds will return to the Channel Islands in subsequent summers, and recruit into their natal colonies, this wandering behaviour helps the species establish and consolidate new colonies. Six Alderney-born Gannets have been found nesting on Helgoland, one being recorded there each summer from 1999 to 2003, and more surprisingly, three Gannets from the second most southerly gannetry in the eastern Atlantic have helped colonise the most northerly in the world, on Gjesvær, Finnmark, Norway (71°N).

To date there has been no systematic effort to read rings on adults nesting in the Alderney gannetries. However, many carry rings and every ring seen closely so far has been from the Channel Islands Ringing Scheme. Of c. 20 ringed birds found tangled in nylon rope or netting on the rocks, only one has ever been found nesting in the colony it was not born in, one ringed as a chick on Les Etacs and recovered tangled in netting on Ortac. It is therefore reasonable to assume that it is normal for Gannets in the Channel Islands to breed in their natal colonies, although the difficulty of detecting a bird that had been ringed as a chick elsewhere in colonies such as Rouzic, Grassholm or Great Saltee should not be under-estimated.

Acknowledgements

We are indebted to Margaret Austin for the copy of the Gannet recovery database, and for her meticulous administration of the Channel Islands Ringing Scheme. Thanks also to Carole Kinnersly and Catherine Veron for inputting data. We are also grateful to all ringers over the past 60 years who have visited the gannetries. The States of Alderney kindly granted permission for these ringing trips, and over the years some highly skilled boatmen have landed us on the rocks, principally in recent decades Francis Herivel (retired) and Richard Keen. Finally we thank Sarah Wanless, Stephen Votier and David Grémillet and two anonymous referees for their constructive comments on earlier drafts of this paper.

References

Barrett, R. T. 1988. The dispersal and migration of the Gannet *Sula bassana* from Norwegian colonies. *Ringing & Migration* 9: 139–145.

Camphuysen, C. J. 2001. Northern Gannets *Morus bassanus* found dead in The Netherlands, 1970–2000. *Atlantic Seabirds* 3: 15–30.

Coiffait, L., Clark, J. A., Robinson, R. A. , Blackburn, J. R. , Grantham, M. J., Marchant, J. H., Barber, L. , De Palacio, D. , Griffin, B. M. & Moss, D. 2008. Bird ringing in Britain and Ireland 2007. *Ringing & Migration* 24: 104–144.

Grémillet, D., Pichegru, L., Siorat, F. & Georges, J-V. 2006. Conservation implications of the apparent mismatch between population dynamics and foraging effort in French northern gannets from the English Channel. *Marine Ecology Progress Series* 319: 15–25.

Hill, M. G. 1989. The Alderney Gannetries - photographic counts of Ortac and Les Etacs, Channel Islands, 1979–1989. *Seabird* 12: 45–52.

Kubetzki, U., Garthe, S., Fifield, D., Mendel, B., & Furness, R. W. 2009. Individual migratory schedules and wintering areas of northern gannets. *Marine Ecology Progress Series* 391: 257–265.

Lockley, R. M. & Dobson, R. 1946. Gannets Breeding in the Channel Islands. *British Birds* 39: 309–312.

Nelson, J. B. 2002. *The Atlantic Gannet.* 2nd edition. Fenix Books, Norfolk.

Sanders, J. G. & Harris, M. P. 2005. The Alderney Northern Gannetries - photographic counts of Ortac and Les Etacs, Channel Islands in 2005. *Atlantic Seabirds* 7: 75–82.

Siorat, F. 2004. Fou de Bassan. In: Cadiou, B., Pons, J. M. & Yésou P. (eds.) *Oiseaux marins nicheurs de France métropolitaine (1960–2000)*: 70–73. Editions Biotope, Mèze.

Thomson, A. L. 1939. The migration of the Gannet: results of marking in the British Isles. *British Birds* 32: 282–289.

Thomson, A. L. 1974. The migration of the Gannet; a reassessment of British and Irish ringing data. *British Birds* 67: 89–103.

Veron, P. K. 1988. Movements of gannets ringed on Les Etacs and Ortac, Alderney, Channel Islands. *Ringing & Migration* 9: 37–43.

Walker, F. J. 1996. Observations of movements of North Atlantic Gannets *Morus bassanus* from Cape St Vincent, Portugal. *Seabird* 18: 44–48.

Wanless, S. 2002. Northern Gannet (Gannet) *Morus bassanus*. In: Wernham, C. V., Toms, M. P., Marchant, J. H., Clark, J. A., Siriwardena, G. M. and Baillie, S. R. (eds.) *The Migration Atlas: movements of the birds of Britain and Ireland*: 115–127. Poyser, London.

Wanless, S., Murray, S. & Harris, M. P. 2005. The status of northern gannet in Britain and Ireland in 2003–2004. *British Birds* 98: 280–294.

Wanless, S., Harris, M. P., Lewis, S., Frederiksen, M. & Murray, S. 2008. Later breeding in northern gannets in the eastern Atlantic. *Marine Ecology Progress Series* 370: 263–269.