

Some aspects of the population structure of Storm Petrels *Hydrobates pelagicus* breeding on a Mediterranean island

F. LO VALVO and B. MASSA* *Stazione di Inanellamento, c/o Istituto di Entomologia agraria, V.le delle Scienze 13, 90128 Palermo, Italy*

*Between 1986 and 1998 1,374 adults and 1,708 chicks of Storm Petrels *Hydrobates pelagicus* have been ringed on Marettimo Is. (Sicily, Italy); 207 (15.1%) adults and 31 (1.8%) chicks were subsequently controlled. Only eight adults (0.6%) were recovered twice in different years after ringing. Site tenacity within the study site was observed, both of individuals ringed as adults and of those ringed as chicks, together with high intrapopulation turnover (neither adults after more than six years since ringing, nor individuals ringed as chicks aged more than seven years were recovered). This helps to explain eight cases of individuals ringed as chicks and recovered as breeding adults between one and three years after fledging.*

The population of Storm Petrels breeding in the Mediterranean basin has been estimated at 15-20,000 pairs, though decreasing since 1965, due mostly to human disturbance (Massa & Sultana 1991; Massa & Merne in Hagemeyer & Blair 1997). Following recent censuses, Mediterranean islets holding the largest colonies are Filfla (off Malta, about 5-10,000 pairs) and Marettimo (Egadi Is., off the west coast of Sicily, more than 1,000 pairs) (Massa & Catalisano 1986a, 1986b). Some authors (e.g. Hemery & D'Elbée 1985; Catalisano *et al.* 1988) consider the Mediterranean subspecies *H. pelagicus melitensis* to be taxonomically valid; individuals are characterized by greater size compared to Atlantic ones, *H. pelagicus pelagicus*. Consequently, the conservation of this Mediterranean population is important.

This paper presents some data from a long-term study of Storm Petrels on the island of Marettimo, which suggests important parameters of the population's life-history characteristics.

STUDY SITE

The colony on Marettimo (37°58'N, 12°03'E) is located within a wide cave accessible only from the sea, about 250m long and consisting of four sectors at different levels; the first of them (A) is a wide room, the second one is subdivided in two rather parallel corridors (B and C), and the third (D) is a narrow terrace about 15m long.

*E-mail: zoolappl@unipa.it

The laying period is strongly asynchronous; first arrivals to the colony occur in March and fledging of last young in October. Storm Petrels lay their eggs on the ground, in crevices, burrows, and holes at the sides of the cave walls. Up to the 1970s this species was breeding inside different caves along the western coast of Marettimo, but in recent years these colonies were deserted, due to human disturbance and predation by rats; the only successful colony is inaccessible to terrestrial predators and does not suffer disturbance by tourism and nautical sports during summer (Massa & Sultana 1991).

Nowadays Marettimo is included among the Important Bird Areas of Europe (Grimmett & Jones 1989), among the Special Areas for Conservation in application of Habitats Directive 92/43 and among the Nature Reserves of the Sicilian Regional Plan.

METHODS

Between 1986 and 1997 (with the exception of 1989 and 1995) we visited the colony at least once a year in mid July (in August in 1997), in order to ring adults (brooding the egg or attending recently hatched chicks) and chicks aged more than 15 days. We were not able to ring both partners of each pair, since only one individual was present at the nest. Individuals ringed in one of the four sectors cited above were recorded on a map of the cave; since we did not ring within the entire cave, we know the precise

ringing and recovery sites only of individuals ringed in the sectors A-D, about 50% of the total. Some nests were marked by a plastic strip fixed on the ground, on which the ring number of one or both partners has been written. Since each year Storm Petrels have been ringed following a similar route, lower numbers of rings were used at the entrance of the corridors and higher ones at the end; this allowed us to establish site tenacity following the same numerical sequence of many recoveries along the corridors.

RESULTS

In eleven seasons we ringed 1,374 adults (Table 1) and 1,708 chicks (Table 2). Since then we have recovered 207 (15.1%) individuals ringed as

adults and 31 (1.8%) ringed as chicks. The percentage of adults recovered 1-6 years after ringing ranged between 0 and 53.8%. Only eight adults (0.6%) were recovered twice in different years after ringing. The low number of adults recovered in 1997 reflects the late visit to the colony; by August chicks are well developed and adults attend them only at night.

One individual ringed as a chick at Marettimo on 16 July 1987 was recovered two years later (on 15 July 1989) at Filfla Is. (36°N, 14°E, Sicilian Channel, about 300kms east of Marettimo), and another ringed as a chick at Marettimo on 26 July 1992 was recovered five years later (on 8 July 1997) at Cabrera Is. (39°08'N, 2°56'E, about 800kms west of our study site); another ringed as adult at Filfla on 15 June 1991 was recovered,

Table 1. Adult Storm Petrels ringed and recovered at Marettimo between 1986 and 1998.

	Ringed	1987	1988	1990	1991	1992	1993	1994	1996	1997	1998	Recovered	%
1986	193	20	10	2								32	16.6
1987	267	-	8	7								15	5.6
1988	40	-	-	7	1			1				9	22.5
1990	142	-	-	-	1	9	6	12				28	19.7
1991	21	-	-	-	-		1	2				3	14.3
1992	106	-	-	-	-	-	18	19	15		5	57	53.8
1993	117	-	-	-	-	-	-	9	18	1	2	30	25.6
1994	225	-	-	-	-	-	-	-	18		5	23	10.2
1996	228	-	-	-	-	-	-	-	-		10	10	4.4
1997	3	-	-	-	-	-	-	-	-	-	-		
1998	32	-	-	-	-	-	-	-	-	-	-		
Total	1,374	20	18	16	2	9	25	43	51	1	22	207	

Table 2. Storm Petrels ringed at Marettimo as chicks and recovered as breeding adults between 1986 and 1998.

	Ringed	1987	1988	1990	1991	1992	1993	1994	1996	1997	1998	Recovered	%
1986	200			1								1	0.5
1987	173	-	1	1								2	1.2
1988	28	-	-				2					2	7.1
1990	125	-	-	-		1		1				2	1.6
1991	129	-	-	-	-		1	3			2	11	8.5
1992	172	-	-	-	-	-			3		1	5	2.9
1993	153	-	-	-	-	-	-				2	2	1.3
1994	227	-	-	-	-	-	-		1		2	3	1.3
1996	133	-	-	-	-	-	-	-	-		1	1	0.7
1997	164	-	-	-	-	-	-	-	-	-	2	2	1.2
1998	204												
Total	1,708	0	1	2	0	1	4	4	9	0	10	31	

five years later (on 14 July 1996), on a nest site at Marettimo. This demonstrates a certain gene flow between different colonies of the Mediterranean. Also one individual ringed as a chick at Marettimo on 16 July 1994 was recovered on 10 October 1994 at Skikda (Algeria, 37°N, 6°34'E, about 500kms to the SW).

We detected site tenacity of breeding birds within different sectors of the cave. Table 3 shows the total number and percentage of adults ringed in each sector and recovered in the same or in a different sector of the cave; the majority of adults (88 out of 107 checked, 82.2%) were recovered in the same nest where they had been ringed. We also observed nest-site fidelity of individuals to the sector of the cave and to sites close to where they were ringed as chicks (17 of 23 chicks recovered, all brooding egg; Table 4).

Individuals ringed as chicks were recovered as breeding adults, one (4 ind.), two (4 ind.), three (4 ind.), four (7 ind.), five (9 ind.), six (1 ind.) and seven (2 ind.) years after fledging (Table 2).

DISCUSSION

The Storm Petrel is a long-lived bird, its maximum life expectancy being between 20 and 32 years (Cramp & Simmons 1977; Riddington, pers comm); its maturity and first breeding occur generally between four and five years after fledging. Mediterranean populations winter within the Mediterranean basin; the habit of wintering locally may affect vulnerability to abiotic factors and thus mortality. During eleven seasons of our research we recovered a modest percentage of adults, and recovered no adults more than six years after ringing, nor individuals ringed as chicks aged more than seven years. We also observed the existence of site fidelity both of adults and chicks. Other Mediterranean data on this species (Sultana & Borg (in press), who have ringed for 30 years at Filfla Is.) confirm the species' site fidelity and suggest a maximum longevity of 20 years. One explanation of our results may be a lower life expectancy in Mediterranean populations compared to Atlantic ones, bringing about high population turnover and first breeding at a very young age. This means that the mean age of individuals in colonies should be low and intra-population turnover high.

Table 3. Site fidelity of adults: number (and percentage) of individuals ringed and recovered in the four sectors (A-D) of the cave.

	A	B	C	D
A	7	3	4	
B	4	10		1
C	2	1	47	2
D			2	24

Table 4. Site fidelity of Storm Petrels ringed as chicks: number of individuals ringed and recovered in the same or different sector (A-D) of the cave.

	A	B	C	D
A	3			1
B		7	1	
C			2	1
D		2		5

With regard to conservation implications, Tucker & Heath (1994) include the Storm Petrel in the SPEC2 category and treat it as localized; on the basis of our data and those reported by other authors above quoted, the Mediterranean population has to be considered in the vulnerable status and in moderate decline. Preventing or minimizing human disturbance at breeding colonies during the nesting season is therefore very important.

ACKNOWLEDGEMENTS

We thank R. Riddington very much for his useful comments on a first draft of this paper; we are also grateful to Adelaide Catalisano, Gabriella Lo Verde and Leonardo Parisi for their assistance during the study.

REFERENCES

- Catalisano, A., Lo Valvo, F., Lo Verde, G. & Massa, B. (1988) Dati biometrici sull'Uccello delle tempeste (*Hydrobates pelagicus*). Atti IV Conv. ital. Orn., *Naturalista siciliano*, 12 (suppl.), 261-265.
- Cramp, S. & Simmons, K.E.L. (1977) *The Birds of the Western Palearctic*. Vol. I. Oxford University Press.

- Grimmett, R.F.A. & Jones, T.A. (1989) *Important Bird Areas in Europe*. I.C.B.P. Techn. Publ. no 9, Cambridge.
- Hagemeijer, W.J.M. & Blair, M.J. (1997) *The EBCC Atlas of European breeding birds. Their distribution and abundance*. T. & A.D. Poyser.
- Hemery, G. & D'Elbée, E. (1985) Discrimination morphologique des populations atlantique et méditerranéenne de Petrel tempête *Hydrobates pelagicus*. *Oiseaux marins nicheurs du Midi et de la Corse. Annales du CROP*, 2, 63-67.
- Massa, B. & Catalisano, A. (1986a) Observations on the Mediterranean Storm Petrel *Hydrobates pelagicus* at Marettimo Isle. *Avocetta*, 10, 125-127.
- Massa, B. & Catalisano, A. (1986b) Status and conservation of the Storm Petrel *Hydrobates pelagicus* in Sicily. (Medmaravis & Monbailliu, eds) *Mediterranean Marine Avifauna*, pp 143-151.
- Massa, B. & Sultana, J. (1991) Status and conservation of the Storm Petrel *Hydrobates pelagicus* in the Mediterranean. *Il Merill*, 27, 1-5.
- Sultana, J. & Borg, J. (in press) Notes on the Storm petrel *Hydrobates pelagicus* in Malta. *MEDMARAVIS Tunisia 1995*.
- Tucker, G.M. & Heath, M.F. (1994) *Birds in Europe: their conservation status*. BirdLife International, Cambridge.

(MS received 18 March 1998; MS accepted 31 March 1999)