are close to each other. His partner was FF00974, caught first time as adult entering 350 in 1986, when FF00884 was 1 year old. In the following year, FF00884 was found incubating in nest 350 with partner FF00974, where they remained together until 1993, when the female moved nest. The male was not caught until 1995, when he was found entering nest 352 which is 2m away from 350. Incestuous behaviour by *C. diomedea* has been recently noted in Corsican birds (C. Rabouam pers comm.).

Acknowledgments

The author would like to thank M.A.Thake and Dr. Walther Thiede for commenting upon and improving an earlier version of this paper.

References

Brooke, M. 1990. *The Manx Shearwater.* London UK. T.& AD Poyser.

Cachia-Zammit, R. & Borg, J. 1986-87. Notes on the Breeding Biology of the Cory's Shearwater in Malta. *Il-Merill,* 24: 1-9

Greenwood, P.J. 1980. Mating systems, philopatry and dispersal in birds and mammals. *Animal Behaviour,* 28: 1140-1162.

Jouanin,C, Roux, F. & Zino, F.1977. Sur les Premiers Resultats du Bagague des Puffins Cendrés *Calonectris diomedea* aux Iles Selvagens. *L'Oiseau et R.F.O.,* 47: 351- 358.

Jouanin, C, Hemery, G., Mougin, J.L. & Roux, F. 1980. Nouvelles precisions sur l'acquisition de l'aptitude à la reproduction chez le Puffin Cendré *Calonectris diomedea borealis. L'Oiseau et R.F.O.,* 50: 205-215.

Randi, E., Spina, F, & Massa, B. 1989. Genetic Variability in Cory's Shearwater *(Calonectris diomedea). Auk,* 106: 411-417.

Ristow, D, & Wink, M.1980. Sexual dimorphism of Cory's Shearwater. *Il-Merill,* 21: 9-12.

Ristow, D., Feldmann, F., Scharlau, W. & Wink, M. 1990. Population structure, philopatry and mortality of Cory's Shearwater *Calonectris d. diomedea. Vogelwelt,* 111:172-181.

Serventy, D.L. 1956. A method of sexing petrels in field observations. *Emu,* 56: 213-221.

Thibault, J.C. 1993. Natal Philopatry in the Cory's Shearwater *(Calonectris. d. diomedea)* on Lavezzi Island, Corsica. *Colonial Waterbirds,* 16(1): 77-82.

Warham, J. 1990. *The Petrels. Their Ecology and Breeding Systems.* London, UK, Academic Press.

Note on the wintering of the Cory's Shearwater *Calonectris diomedea* in the Mediterranean

John J. Borg, Gilles Bonaccorsi & Jean-Claude Thibault

Introduction

In the Mediterranean the breeding period of the Cory's Shearwater *Calonectris d. diomedea* shows an important inter-annual constancy and a high synchronism between individuals and colonies (Thibault *et al.* 1997), with some annual differences not exceeding several days (Rabouam *et al.* in press). Most birds, whether young or old individuals, leave their breeding grounds between mid- and late October (Round & Swann 1977, Thibault 1985, Cachia-Zammit & Borg 1986-87), rapidly reaching the Atlantic Ocean via the Straits of Gibraltar from mid-October to mid-November (Telleria 1980, Finlayson 1992). Unsuccessful breeders also desert the colony sites, doing so generally earlier than the successful breeders, depending on the failure stage and on individual behaviour (Mougin *et al.* 1988, Thibault *et al.* 1997). This migration results in birds wintering for a relatively short time off South Africa in the South Atlantic and Indian Oceans (Brooke & Sinclair 1978, Mougin *et al.* 1988), although this has never been confirmed by recovered birds ringed in the Mediterranean (Thibault *et al.* 1997). However, Cory's Shearwaters have been recorded wintering in the Mediterranean basin. The aim of this paper is to evaluate and discuss the extent of this wintering.

Methods

In autumn, the majority of the birds leave the Mediterranean rapidly, but are regularly recorded in several areas until late November; in spring they return to the colony sites gradually from late February to late March (Thibault *et al.* 1997). We have therefore only selected data obtained from 1 December to 31 January to be considered as corresponding to wintering birds. Data are derived from both published as well as unpublished sporadic observations. Standardised observations at sea by boat and by plane were conducted off the French coast (Bouches-du-Rhône, Var and Alpes-maritimes) and Corsica (G. Hémery, unpubl. data). Finally, we eliminated records which evidently concerned other species, e. g. record of birds calling at night close to the shore in January (Moltoni 1975) are best referred to the Levantine Shearwater *Puffinus yelkouan.*

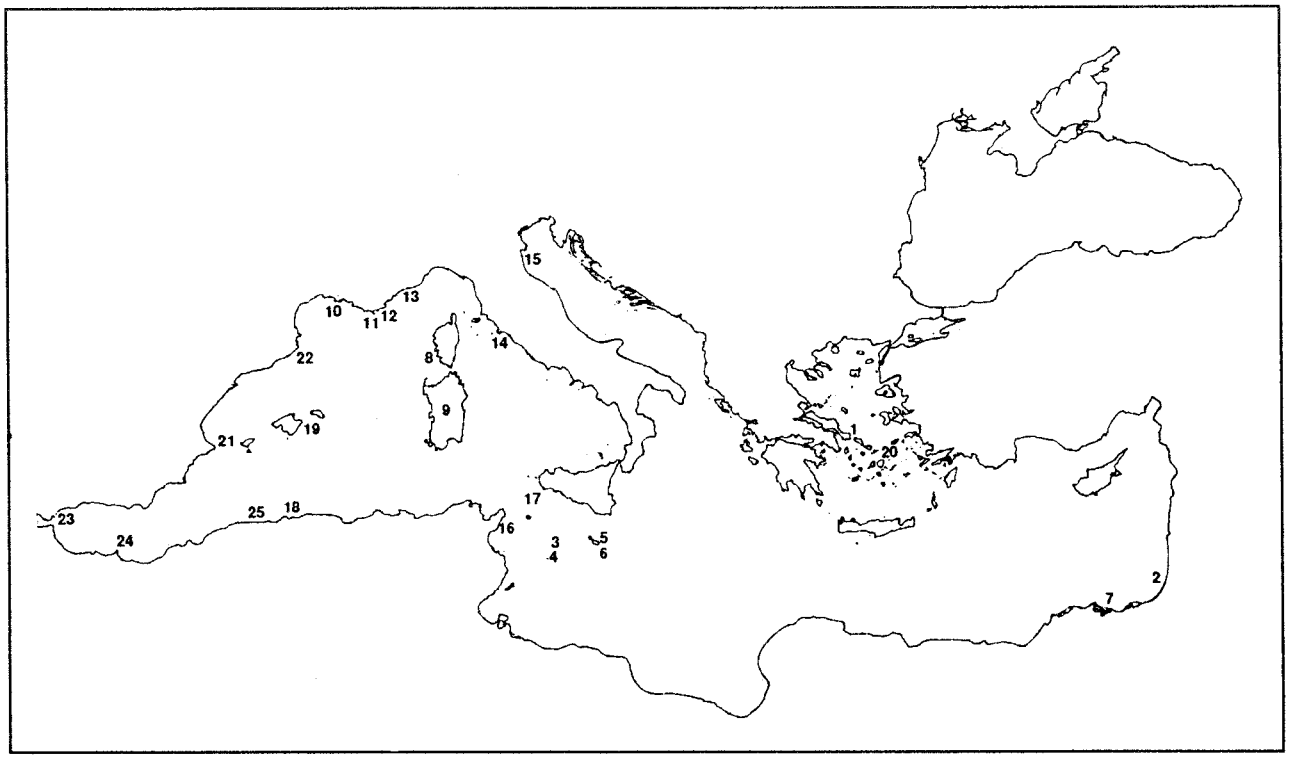

Fig 1. Wintering records of Cory's Shearwater in the Mediterranean (see Table 1 for location of records).

Number (seeFig1)	Localities	Number	Date	Reference
Eastern Med				
1	off Chalkis I.	<80	Dec 1980	Handrinos & Akriotis (1997)
1	off Chalkis I.	<80	Dec 1982	Handrinos & Akriotis (1997)
2	Israel (Medit. coast)	small number	"throughout the year"	Shirihai (1996)
7	Egypt	"small number throughout the year"		Goodman & Meininger (1989)
15	Adriatic	1	Dec 1982	Pandolfi & Santolini (1985)
15	Adriatic	1	Dec 1983	Pandolfi & Santolini (1985)
20	Aegean Sea	43	Dec 1957	Horváth[1959, cited by Cramp & Simmons (1977)]
Sicilian Channel				
3	Pelagian Is.	3	Jan 1968	Moltoni (1970)
4	Pelagian Is.	>70	Jan 1971	Moltoni (1970)
5	off Filfla	2	Dec 1983	This work
6	off Malta	1	Dec 1989	This work
16	Gulf of Gabès	"up to several hundred"	"Dec-Jan"	Deleuil (1958)
16	Tunisian coasts	"large flocks after storm"	"winter"	Blanchet (1955)
16	Tunisian coasts	"oiseaux tunisiens sédentaires et erratiques"	"winter"	Castan (1954-55)
16	Tunisian coasts	"reste commune en hiver Czajkowski v.v "		Mayaud (1982)
17	Sicilian channel	present, but no detailed data	"winter"	Iapichino & Massa (1989), Brichetti et al. (1992)
Western Med				
8	Corsica	1	Jan 1995	This work
9	Sardegna	"regular", but few data		Grussu (1996)
10	Camargue	1	Dec 1985	Isenmann (1993)
10	Camargue	30	Jan 1988	Isenmann (1993)
11	Port-Cros I.	4	Jan 1992	A. Blasco (CEPE)
12	Provence	1	Dec 1994	O. Iborra (CEPE)
13	Provence	>10	Dec-Jan 1981	Yeatman-Berthelot (1991)
14	Tyrrhenian Sea, off Roma	1	Dec	Fraticelli (1983)
18	Algérie	2	9 Dec 1976	Jacob (1983)
18	Algérie	3	21 Jan 1978	Jacob (1983)
19	Balearic Is.	isolated and irregular	Dec-Jan	Ferrer et al. (1986)
21	Comunidad Valenciana	"rare as wintering"	24-27 Dec	Paterson (1997)
22	Cataluña	5	Jan 1985	Paterson (1997)
23	Strait of Gibraltar	possibility of wintering, but only one data	5 Dec	Paterson (1997)
23	Strait of Gibraltar	"few are seen in the strait"	"winter"	Finlayson (1992)
24	Alhoceima, Maroc	pullus ringed on 26/08/89 (Balearics)	recovered on 15/01/90	Anon. (1990)
25	Algérie	flying ringed on 05/10/78 (Balearics)	recovered Jan 1989	Anon. (1990)

Table 1. Records of Cory's Shearwater wintering in the Mediterranean.

Results

Data are included in Table 1 and Figure 1. Sightings are scattered even where regular sea-watching and prospecting by boat have been conducted. Observations come from most areas of the Mediterranean but mostly from the central and western parts. In fact two areas emerge above all:

1 the Maltese archipelago is visited by a few birds more or less regularly over a study period of nearly two decades
2 the Tunisian coast where some records suggest a possible regular wintering.

Generally, records concern single birds or small groups of less than 100 individuals, except along the Tunisian coasts where indicated numbers are higher. Data from Egypt and Israel consist of occasional observations. Two recoveries concern birds ringed in the Balearics (Table 1).

Discussion

Several works have indicated that regular wintering occurred in the Mediterranean, mainly restricted to the Sicilian Channel, including the Gulf of Gabès (Cramp & Simmons 1977, Iapichino & Massa 1989, Brichetti *et al.* 1992). It is true that during the last decades there have been several records of single birds around the Maltese archipelago (Table 1), but the numbers remain low and does not lead one to consider the area as a centre of wintering. Reports from the Tunisian coasts from the 1950s and the 1970s have indicated a more significant number of birds, but data seem vague and they have not been confirmed by recent and detailed records.

So far the available data allow us to forward the hypotheses that there is a wintering area involving flocks of several hundred birds or more, restricted to Tunisian coasts, leading some birds to visit more or less regularly the Maltese and Pelagian islands, occurrence elsewhere being rare. Most records come from the central Mediterranean where 55% of the overall population breeds (Zotier *et al.* 1992), this area being the most favourable owing to

1 proximity of the largest thermal front and
2 the most regular summer winds (Zotier *et al.* in press).

Concerning the origin of wintering birds, the only two recoveries to date indicate occurrence of local birds. This may be confirmed by the lack of incoming birds from the Atlantic Ocean into the Mediterranean at this time of year (Finlayson 1992). Despite a long breeding season from spring to autumn, the Cory's Shearwater is able to tolerate the seasonal productivity of the Mediterranean which is a winter productive oligotrophic basin, owing to

1 the occupation of the most productive and windy areas, and
2 its relatively pelagic foraging strategy.

But why do most birds leave the Mediterranean? Three non-exclusive hypotheses can be put forward to explicate its migration from the Mediterranean:

1 to maintain a behaviour character of the nominate form in relation to its relative recent arrival in the Mediterranean during the late Pleistocene (Alcover *et al.* 1992), stirred by a low but constant gene flow from the Atlantic (Thibault & Bretagnolle, in press)
2 to benefit from the seasonality of the Mediterranean which peaks in productivity in February (Margaleff 1985), when the birds begin to return from their wintering in the Atlantic Ocean
3 to reduce the competition with wintering birds for food resources (Alcidae, Laridae, Sulidae).

References

Anon. 1990. Recuperacions i autocontrols d'anellament. *Anuari Ornitologic de les Balears,* 5: 78-88.

Alcover, J.A., Florit, F., Mourer-Chauvir, C. & Weesie, P.D.M. 1992. The avifaunas of the isolated Mediterranean islands during the Middle and Late Pleistocene. *Contribution in Sciences Series, Nat. Hist. Mus. Los Angeles,* 36: 273-283.

Blanchet, A. 1955. Les oiseaux de Tunisie. *Mém. Soc. Sci. Nat. Tunisie.* 1-82.

Brichetti, P., De Franceschi, P. & Baccetti, N. (Eds) 1992. *Fauna d'Italia. Uccelli,* 1. Calderini. Bologna.

Brooke, R. K. & Sinclair, J. C. 1978. Preliminary list of southern African seabirds. *Cormorant,* 4:10-17.

Cachia-Zammit, R. & Borg, J. 1986-87. Notes on the breeding biology of the Cory's Shearwater in the Maltese Islands. *Il-Merill,* 24: 1-9.

Castan, R. 1954-55. Liste des oiseaux capturés ou observés au cours de l'année 1954 dans le Caîdat de l'Aradh et plus particulierement dans l'oasis de Gabès. *Bull. Soc. Sci. Nat. Tunisie,* 8: 1-157.

Cramp, S. & Simmons, K.E.L. (eds.) 1977. *The Birds of the Western Palearctic.* Vol. 1. Oxford University Press, Oxford.

Deleuil, R. 1958. Sur les oiseaux de mer des côtes Tunisiennes. *Oiseau & Rev.fr.Orn.,* 28: 228-232.

Ferrer, X., Martinez I Vilalta, A. & Muntaner, J. (Eds.) 1986. *Historia Natural dels Parsos Catalans,* vol. 12 (Ocells). Enciclopedia Catalana, Barcelona.

Finlayson, C 1992. *Birds of the Strait of Gibraltar.* T & A D Poyser, London.

Fraticelli, F. 1983. Osservazioni di uccelli marini dalla costa dell'Oasi Naturale W.W.F. (Roma). *Riv. it. Orn.,* 53, 45-55.

Goodman, S. M. & Meininger, P. L. 1989 *The Birds of Egypt.* Oxford University Press, Oxford.

Grussu, M. 1996. Check-list of the Birds of Sardinia (First Part). *Riv. it. Orn.,* 65: 113-122.

Handrinos, G. & Akriotis, T. 1997. *The Birds of Greece.* Christopher Helm, London.

Iapichino, C. & Massa, B. 1989. *The Birds of Sicily. An annotated check-list.* B.O.U. Check-list no.11, Tring.
Isenmann, P. 1993. *Oiseaux de Camargue.* Société d'Études Ornithologiques, Paris.
Jacob, J.-P. 1983. Oiseaux de mer de la côte centrale d'Algerie. *Alauda,* 51: 48-63.
Margaleff, R. (Ed.) 1985. *Western Mediterranean.* Pergamon Press. Oxford.
Mayaud, N. 1982. Les oiseaux du nord-ouest de l'Afrique. Notes complementaires. *Alauda,* 60: 45-67.
Moltoni, E. 1970. Gli uccelli ad oggi riscontrati nelle Isole di Linosa, Lampedusa e Lampione (Isole Pelagie, Canale di Sicilia, Mediterraneo). *Riv. it. Orn.,* 40: 77-283.
Moltoni, E. 1975. L'avifauna dell'Isola di Capraia (Arcipelago Toscano). *Riv. it. Orn.,* 45: 97-217.
Mougin, J.-L., Jouanin, C., & Roux, F. 1988. Les migrations du Puffin cendré *Calonectris diomedea. Oiseau & Rev. fr. Orn.,* 58: 303-319.
Pandolfi, M. & Santolini, R. 1985 Osservazioni di uccelli marini nel tratto di litorale adriatico tra le foci del fiume Uso (Bellaria, Forlì) e Metauro (Fano, Pesaro). *Riv. it. Orn.,* 55: 31-40.
Paterson, A.M. 1997. *Las aves marinas de España y Portugal.* Lynx Edicions, Barcelona.
Rabouam, C., Thibault, J.-C. & Bretagnolle, V. In press. Geographic variation in the breeding biology of the Cory's Shearwater: an effect of size or environment ? In *Seabird Ecology in the Mediterranean and Coastal Zone Management.* (Eds. MEDMARAVIS and J. Walmsley), Univ.: Tunis.
Round, P. D. & Swann, R. L.1977. Aspects of the breeding of Cory's Shearwater *Calonectris diomedea* in Crete. *Ibis,* 119: 350-353.
Shirihai, H. 1996. *The Birds of Israel.* Academic Press, London.
Telleria, J. L. 1980. Autumn migration of Cory's Shearwater through the Straits of Gibraltar. *Bird Study,* 27: 21-26.
Thibault, J.-C. 1985. La reproduction du Puffin cendré *Calonectris diomedea* en Corse. Oiseaux marins nicheurs du Midi et de la Corse. Annales C.R.O.P. (Aix-en-Provence) 2: 49-55.
Thibault, J.-C. & Bretagnolle, V. In press. A Mediterranean breeding colony of Cory's Shearwater *Calonectris diomedea* in which individuals show behavioural and biometrical characters of the Atlantic subspecies. *Ibis.*
Thibault, J.-C., Bretagnolle, V. & Rabouam, C. 1997. *Calonectris diomedea* Cory's Shearwater. BWP Update 1: 75-98.
Yeatman-Berthelot, D. 1991. *Atlas des oiseaux de France en hiver.* Societé Ornithologique de France, Paris.
Zotier, R., Thibault, J.-C. & Guyot, I. 1992. Known population and distribution of cormorants, shearwaters and Storm Petrels in the Mediterranean. *Avocetta,* 16: 118-126.
Zotier, R., Bretagnolle, V. & Thibault, J.-C. In press. Biogeography of the Marine Birds of a Confined Basin, the Mediterranean. *Journal of Biogeography.*

First record of the Manx Shearwater *Puffinus puffinus* in Malta: evidence from morphometric data and DNA analysis.

John J. Borg, Joe Sultana, Petra Heidrich and **Michael Wink**

The breeding range of the Manx Shearwater *Puffinus puffinus* is in the North Atlantic, with the largest colonies found in the British Isles. The majority of the birds migrate to South America; the adults start moving in July followed by the juveniles in September (Cramp and Simmons 1977). Occasionally birds are reported away from their normal route. Up to 9 birds were recovered in Switzerland between 1866 and 1990. All were recovered in September, except one in July (Juillard 1992).

The Manx Shearwater does not venture into the Mediterranean regularly. A Welsh ringed bird was recovered during its first winter, in February, on the French Mediterranean coast (Blondel & Isenman 1981).

A *Puffinus* shearwater was found at the Freeport at Marsaxlokk Bay, on the SE coast of Malta, on 6 September 1995. On close examination it was identified as a first year Manx Shearwater *Puffinus puffinus*. A blood sample was also taken for DNA analysis.

The plumage was distinctly different from that of the Levantine Shearwater *Puffinus yelkouan.* The head was black with white feathers near the base of the bill, lores and behind the ears forming a crescent shape. The chin and the throat were also white. The upperparts were jet black and the underparts were white with grey mottling along the flanks and sides of breast. The tail was black, with the undertail coverts white with faint grey markings. Underwings were mostly white with black wingtips and black trailing edges and with grey markings and pattern on carpal and axillaries. The iris was dark brown, the bill black and the feet a deep pink with black markings and blotches. The plumage was fresh with no apparent traces of wear or bleaching - this suggested a recently fledged bird.

The following are the measurements of the bird as compared with an average from 13 birds belonging to the species *Puffinus yelkouan.* Numbers 1-6 denote the different measurements of the bill (see Fig 1):