

# WINTERING DISTRIBUTION OF THE BALEARIC SHEARWATER (*PUFFINUS YELKOUAN MAURETANICUS*, Lowe 1921) OFF THE NORTHEASTERN COAST OF SPAIN

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**SUMMARY.**—*Wintering distribution of the Balearic Shearwater* (*Puffinus yelkouan mauretanicus*, Lowe 1921) off the Northeastern coast of Spain. The distribution and numbers of the Balearic Shearwater during the November-February period are discussed. Until the 1980's this subspecies seemed to be concentrated along the coast south of Valencia. Since 1991-1992 this pattern has changed, and up to 10465 birds have been recorded northwards, along the Catalan coast. The subspecies is distributed along the Valencian and Catalan coasts in 9 main areas and numbers vary, reaching a total of ca. 8000-11000 birds. The accuracy of these figures and subspecies identification is discussed. An increase in the wintering population of Balearic shearwaters in Catalan waters has been noted. No parallel increase in breeding populations has been reported. Therefore, a northwards displacement of its main wintering area is a possible explanation. A trophic hypothesis is suggested to explain this winter distribution, given that some important changes in clupeid stocks of the extreme western Mediterranean have been noted. Observed numbers match the known breeding population and post-breeding counts, and thus almost the whole population of the subspecies may occur during the winter in the study area.

**Key words:** Balearic Shearwater, Mediterranean, NE Spain, *Puffinus yelkouan mauretanicus*, winter distribution, winter population.

**RESUMEN.**—*Distribución invernal de la Pardela Mediterránea* (*Puffinus yelkouan mauretanicus*, Lowe 1921) en las costas del Noreste español. Se discute la distribución y población de la Pardela Mediterránea (subespecie balear) en el periodo noviembre-febrero. Hasta los años ochenta, la subespecie se concentraba en las costas valencianas hacia el sur. Desde 1991-1992, la situación cambia y hasta 10.465 aves son censadas en las costas de Cataluña. Actualmente se distribuye a lo largo de las costas catalano-valencianas en 9 áreas principales cuya importancia numérica varía, totalizando unas 8.000-11.000 aves. Se discute la precisión de las cifras obtenidas y de la identificación de la subespecie. La población invernal de pardelas mediterráneas en las costas catalanas ha aumentado. Dado que no se ha citado un aumento de su población nidificante, se sugiere un desplazamiento hacia el norte del área de invernada principal. Se postula una hipótesis trófica para explicar esta distribución invernal, ocasionada por los cambios en los stocks de clupeidos en el extremo occidental del Mediterráneo. La población observada concuerda con la nidificante conocida y con conteos post-nupciales publicados, por lo que casi toda la población de la subespecie podría estar concentrada en la zona durante el invierno.

**Palabras clave:** Distribución invernal, Mediterráneo, NE España, *Pardela Mediterránea*, población invernal, *Puffinus yelkouan mauretanicus*.

## INTRODUCTION

The taxonomic status of the Mediterranean Shearwater (*Puffinus yelkouan*) is still under discussion (Altaba, 1993; Vittery, 1994). The species is already clearly separated from the Manx Shearwater (*Puffinus puffinus*) (Wink *et al.*, 1993), and two subspecies

have been described (Bourne *et al.*, 1988; Del Hoyo *et al.*, 1993). However, Walker *et al.* (1990) have proposed a specific status for both subspecies, and Altaba (1993) treated them in this way. Considering the two forms on a subspecific level, the Levantine Shearwater (*P.y.yelkouan*), with ca. 50.000 breeding pairs (Catchot, 1991), nests sparsely

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from the easternmost Mediterranean to Corsica and Sardinia (De Juana & Paterson, 1986), with a few localities further west (Yeatman, 1976). The only known colonies of the Balearic Shearwater (*P.y.mauretanicus*) are concentrated in the Balearic Islands (De Juana, 1984), where the most recent estimates give a population of 3300 pairs ( $\pm 1174$ ) (Aguilar, 1991). This concentration in a small area increases the vulnerability of this population (Capellà, 1989; Catchot, 1991).

Both subspecies undertake post-reproductive movements. *P.y.yelkouan* moves through the Mediterranean and Black Seas, returning to the breeding colonies as early as November (Vidal, 1985; Bourne *et al.*, 1988; Yesou, 1991). In the NE Spanish coasts this subspecies is rare (Ferrer *et al.*, 1986; Carboneras, 1987; Gutiérrez *et al.*, 1995). On the other hand, *P. y. mauretanicus* is rarely seen in the Mediterranean after the breeding season, almost the whole population passing through the Strait of Gibraltar from May onwards (De Juana & Paterson, 1986). In the Atlantic they have been recorded during the autumn from southern Morocco (Thevenot *et al.*, 1980), to the Bay of Biscay where the main concentration occurs (ca. 8000-10000 birds), (Yésou, 1986; Le Mao & Yésou, 1993), with scattered observations further north. The return passage through the Strait of Gibraltar occurs after moult completion (Bourne *et al.*, 1988), although the subspecies is not recorded in its breeding grounds prior to February-March (Capellà, 1989).

In this paper we discuss the possible movements and location of what may be almost the whole population of the Balearic Shearwater during the November-February period.

## MATERIAL AND METHODS

For all Catalan records, identification of the subspecies has been carried out according to Yésou *et al.* (1990). Six bird carcasses found on the shoreline were examined. Despite some plumage variation, all belonged to this subspecies.

Flocks were counted from the coast during the low activity period of the birds, when they gather in flocks which roost near the shore. The January totals of wintering shear-

waters in the study area for 1991-1994 were calculated from simultaneous, or nearly simultaneous, counts to avoid duplication. We have considered all the observations of flocks (> 50 individuals) on the NE coast of Spain, covering both Catalonia and the Valencia coasts (37° 50'-42° 27' N; 0° 45'-3° 20' E). Data from the Balearic Islands have also been reviewed.

The Balearic Shearwater, like other marine birds, has never traditionally been counted during wintering waterfowl counts (e.g. ICONA, 1994). However, in certain areas winter censuses of this species are regularly carried out (Llobregat Delta since 1983 and recently along Valencia coasts, J.I. Díes, pers. com.). All these data have been considered. However, data prior to 1993 for most of the areas are occasional and not the result of an organized study. The relevant literature has been scanned and, for the Balearics and Valencia region, the data published in the respective bird reports have been analyzed (Appendix). For the years prior to 1994, personal requests for information have been made for the main sites.

Several factors may have affected the accuracy of the figures discussed in this paper. The presence of the uncommon *yelkouan* ssp. in the study area during the winter could have altered an overall estimation of the *mauretanicus* wintering population. Although some *yelkouan* birds have been seen, even in the case of a possible confusion, this will not have affected the overall estimation.

The habit of the Balearic Shearwater of exploiting the continental shelf up to 6 miles off the coast (Carboneras, 1987) and even less than one mile offshore in wintering flocks (pers. obs.) makes us confident of having counted most of the wintering population from the coast. At least during late December-January, flocks were quite stable, and almost no movements occurred between different locations.

## RESULTS

During the 1980s, the subspecies was not infrequent in Catalonia during the winter, although it had rarely been counted (Martínez-Vilalta & Motis, 1989; Gutiérrez *et al.*,

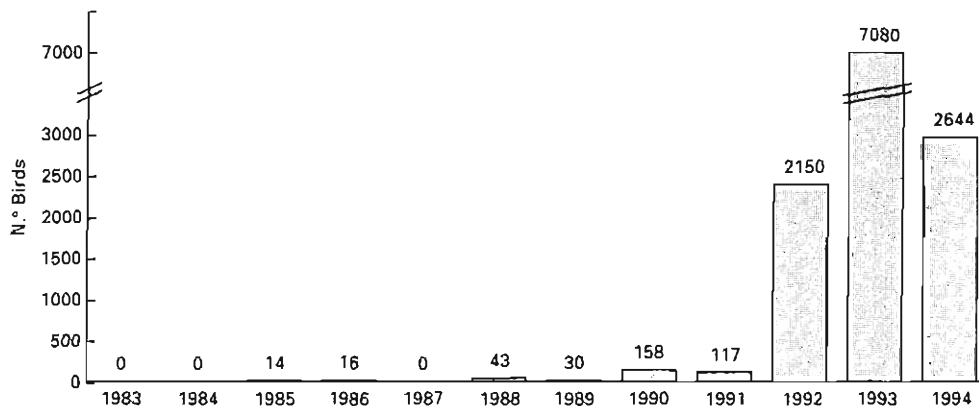


FIG. 1.—January counts of Balearic Shearwater (*Puffinus yelkouan mauretanicus*) during 1983-1994 at Delta del Llobregat. (Barcelona. Catalonia. NE Spain).

[Censos invernales de enero de Pardela Balear (*Puffinus yelkouan mauretanicus*) en el período 1983-1994. Delta del Llobregat. (Barcelona. Catalunya. NE España).]

1995). The numbers counted in the Llobregat Delta from 1981 to 1991 varied up to 158 birds (Fig. 1). The subspecies was more common during migrations and the breeding season (Ferrer *et al.*, 1986; Carboneras, 1987). In 1986-1989, important winter concentrations occurred off the Valencia coasts (Díes & Díes, 1989), where the Balearic Shearwater was present throughout the winter, both off the mainland coast and off the Columbretes islands (Ferrer *et al.*, 1986). In the Balearics, no important wintering flocks were recorded, and the few birds observed there were assumed to belong to the *yelkouan* subspecies (Catchot, 1991). Important concentrations of birds were also recorded in those years further south, in the extreme southwestern Mediterranean, where at least one flock overwintered in the Torremolinos Bay and others around the Alboran Sea (De Juana & Pateron, 1986).

This pattern changed from the winter of 1991-1992 onwards. Between 7417 and 11406 birds have been recorded in the study area each winter since January 1991 (Fig. 2). The flocks arrive in the Llobregat Delta in late November and stay until late January. The January 1993 total census in this area is the highest count for a single locality. Only the areas mentioned above had important flocks, some of which fluctuated in number throughout the winter. Flocks off Tarragona and

Premià additionally included numbers of the *yelkouan* subspecies (160 and 400 respectively, J. M. Arcos, pers. obs.). No important flocks were recorded off the Ebre Delta during these years (A. Martínez-Vilalta, pers. com.) and smaller numbers were seen off the coast in other places. On the Valencia coast, flocks were recorded in four areas (Fig. 2). Smaller flocks of less than 300 birds were recorded irregularly in other areas. No records have been collected from the Balearic islands before February.

## DISCUSSION

The data suggest that there has been an increase in the wintering population of the Balearic Shearwater in the study area. This increase does not seem to be related to a parallel increase of the Balearic breeding population, which could even be decreasing due to rat predation and/or competition with Cory's Shearwaters (*Calonectris diomedea*) among other factors (De Juana, 1984; Aguilar, 1993), although no detailed censuses have been available until recently (Aguilar, 1991).

Therefore, it seems as if we may be seeing a displacement northwards of the main wintering area of the subspecies. During the early 1980s, important flocks were reported in the

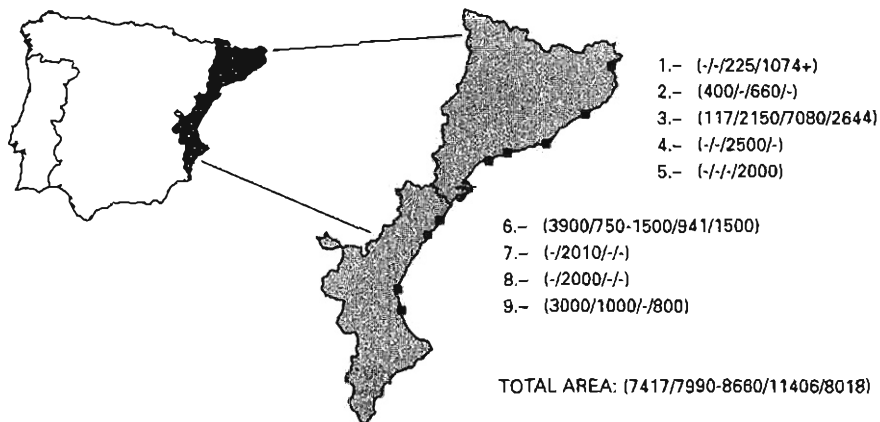


FIG. 2.—Winter distribution and numbers in January 1991-1994 along Catalan and Valencia coasts. NE Spain. 1.—Empordà area, 2.—Premià de Mar, 3.—Barcelona-Delta del Llobregat, 4.—Tarragona, 5.—Torredembarra, 6.—Maestrat-Plana Alta area, 7.—Sagunto, 8.—L'Albufera, 9.—Cullera. [Distribución invernal y censo en el periodo enero 1991-enero 1994 en las costas catalano-valencianas. 1.—Comarca del Empordà, 2.—Premià de Mar, 3.—Barcelona-Delta del Llobregat, 4.—Tarragona, 5.—Torredembarra, 6.—Comarcas del Maestrat-Plana Alta, 7.—Sagunto, 8.—L'Albufera, 9.—Cullera.]

extreme western Mediterranean (De Juana & Paterson, 1986), with some thousands also off the coast of Valencia. Since 1991, the importance of the Catalan coast as a wintering area for the Balearic Shearwater has increased, with a parallel decrease in the numbers observed off the Valencia coast. These fluctuations suggest that balearic shearwaters have little fidelity to wintering quarters in the Mediterranean, in contrast to the situation regarding moulting areas on the Atlantic coast of France (Le Mao & Yésou, 1993).

After moult completion, balearic shearwaters do not return directly to their breeding grounds in the Balearic Islands as was suspected until now (Ferrer *et al.*, 1986; Le Mao & Yésou, 1993), and where no records exist before February. The Balearics are not very productive from the point of view of food resources during this part of the year (Margalef, 1984; Sostoa, 1990). The shearwaters are concentrated in more productive mainland coastal areas at this time of the year, where important stocks of pelagic fish (Clupeidae, mainly Anchovy *Engraulis encrasicolus* and Sardine *Sardina pilchardus*) which make up the greater part of their diet (Cramp *et al.*, 1977; Le Mao & Yésou, 1993), are available (Margalef, 1984; Sostoa, 1990; García *et al.*, 1994).

The observed change in wintering distribution could be explained from a trophic point of view, since clupeid stocks in the Alboran Sea have declined markedly during the last decade (García *et al.*, 1994) and there has been a parallel recovery of the Catalan populations (Perterra, 1992).

The total estimated number of 8000-11000 birds agrees with the number of breeding birds found in the Balearics (Aguilar, 1991), with movements recorded through the Strait of Gibraltar and Atlantic coasts (Bourne *et al.*, 1988), and with the sizes of summering and moulting flocks recorded in the Bay of Biscay (Le Mao & Yésou, 1993). If these estimations are accurate, nearly the whole population of the Balearic race of the Mediterranean Shearwater occurs during the winter in the study area. This puts greater emphasis on the vulnerability of the populations of this subspecies and on the need for further research into the relationships between shearwaters and fishery exploitation.

ACKNOWLEDGEMENTS.—J. M. Arcos, J. Vázquez, A. Vázquez, R. Armada, J. Martí, Bernat Garrigós, Eric Streich, Jordi Sargatal, Rosa Fernández, Rosa Llinàs, Estació Ornitològica del Parc Natural dels Aiguamolls de l'Empordà and A. Martínez-Vilalta

kindly supplied their personal observations. J. I. Díes provided some unpublished information on the Valencia region and also commented an earlier draft. Dr. Eduardo de Juana kindly reviewed an early draft. Dra. I. Palomera gave us valuable information on fisheries, stocks and clupeid biology. Thanks to the observers who collaborated in the Llobregat Delta January censuses. Thanks also to Michael Lockwood, who improved the English version of the draft. The comments of Keith Clamer, and an anonymous referee improved the manuscript.

## BIBLIOGRAPHY

- AGUILAR, J. S. 1991. Resum de l'atlas d'ocells marins de les Balears. 1991. *Anuari Ornitològic de les Balears*, 6: 17-28.
- 1993. Seguiment de la població reproductiva de *Puffinus yelkouan mauretanicus* al Parc Nacional de Cabrera. 1993. *Anuari Ornitològic de les Balears*, 8: 51-53.
- ALTABA, C. R. 1993. La sistemàtica i la conservació de la biodiversitat: el cas de les baldrigtes (*Puffinus*). *Anuari Ornitològic de les Balears*, 8: 3-14.
- BOURNE, W. R. P., MACKRILL, E. J., PATERSON, A. M. P. & YÉSOU, P. 1988. The Yelkouan Shearwater *Puffinus (puffinus?) yelkouan*. *British Birds*, 81: 306-319.
- CAPELLÀ, LI. 1989. Observaciones sobre la Pardela Pichoneta (*Puffinus puffinus mauretanicus*) de las Baleares. In, GOB (Eds.): *Aves Marinas. GIAM*. Formentera, 1988. pp. 61-68. GOB, Palma de Mallorca.
- CARBONERAS, C. 1987. *Alas en la mar*. Col·lecció Norai 3. Ajuntament de Badalona-CMB-IME Badalona. Badalona.
- CATCHOT, S. 1991. Contribució al coneixement de les Procellariiformes a l'illa de Mallorca. *Anuari Ornitològic de les Balears*, 6: 3-12.
- CRAMP, S. & SIMMONS, K. E. L. (Eds.). 1977. *The Birds of the Western Palearctic*. Vol 1. Oxford University Press. Oxford.
- DE JUANA, E. 1984. The status and conservation of seabirds in the Spanish Mediterranean. ICBP Technical Publication, 2: 347-361.
- & PATERSON, A. M. 1986. The status of the seabirds of the extreme western Mediterranean. In, Medmaravis & Monbailliu, X. (Eds.): *Mediterranean Marine Avifauna*, pp. 39-106. Springer Verlag. Heidelberg.
- DEL HOYO, J., SARGATAL, J. & ELLIOT, A. (Eds.). 1993. *Handbook of the Birds of the World*. Vol. 1. Lynx. Barcelona.
- DÍES, B. & DÍES, J. I. 1989. Fenología y status invernal de las aves marinas presentes en L'Albufera de Valencia. In, GOB (Eds.): *Aves Marinas. GIAM*. Formentera, 1988, pp. 127-136. GOB. Palma de Mallorca.
- FERRER, X., MARTÍNEZ-VILALTA, A. & MUNTANER, J. 1986. *Història Natural dels Països Catalans*, vol. 8: *Ocells*. Fundació Enciclopèdia Catalana. Barcelona.
- GARCÍA, A., PALOMERA, J., LIORZOU, B., GIOVANARDI, O. & PLA, C. 1994. Northwestern Mediterranean Anxovy. Distribution, Biology, Fisheries and Biomass estimation by different methods. Comission of the European Communities. Project NA.3.730. Mimeographical report.
- GUTIÉRREZ, R. & ABAD, N. 1989. *Aproximació al coneixement de la fauna vertebrada de les Reserves Naturals Parcials del Delta del Llobregat*. Generalitat de Catalunya (DARP). Barcelona. Mimeographical report. 184 pp.
- ESTEBAN, P. & SANTAUFEMIA, F. X. 1995. *Els Ocells del Delta del Llobregat*. Lynx Eds. Barcelona.
- ICONA 1994. Comité Español del Convenio de Ramsar. Actas de la XIII reunión técnica de coordinación sobre el convenio de Ramsar. Madrid. Mimeographical report. 95 pp.
- MARGALEF, R. 1984. Le plancton de la Méditerranée. *La Recherche*, 15: 1082-1094.
- MARTÍNEZ-VILALTA, A. & MOTIS, A. 1989. *Els Ocells del Delta de l'Ebre*. Lynx Eds. Barcelona.
- LE MAO, P. & YÉSOU, P. 1993. The annual cycle of Balearic Shearwaters and western-Mediterranean Yellow-legged Gulls: some ecological considerations. In, Aguilar, J. S., Monbailliu, X. & Paterson, A. (Eds.): *Estatus y Conservación de Aves Marinas*, Actas del II Simposio MEDMARAVIS, pp. 135-146. SEO. Madrid.
- PERTIERRA, J. P. 1992. Biología pesquera de la anchoa (*Engraulis encrasicolus*) del litoral catalán. Tesis Doctoral. Universitat Politècnica de Barcelona. 281 pp.
- SOSTOA, A. 1990. *Història Natural dels Països Catalans. Volum 11: Peixos*. Fundació Enciclopèdia Catalana. Barcelona.
- THEVENOT, M., BERGIER, P. & BEAUBRUN, P. 1980. *Compte rendu d'ornithologie marocaine. année 1979*. Institut Scientifique. Rabat.
- VIDAL, P. 1985. Premières observations sur la biologie de reproduction du Puffin des Anglais yelkouan *Puffinus puffinus yelkouan* sur les îles d'Hyères. In, *Oiseaux marins nicheurs du Midi et de la Corse*, pp. 58-62. Annales du C.R.O.P. No. 2. Aix-en-Provence.
- VITTEY, A. 1994. Status of the two forms of Mediterranean Shearwater. *British Birds*, 87: 189.
- WALKER, C., HARRISON, C. & WRAGG, G. 1990. A new shearwater from the Pleistocene of the Canary Islands and its bearing on the evolution of certain *Puffinus* shearwaters. *Historical biology*, 3: 203-224.

- WINK, M., HEIDRICH, P., RISTOW, D. 1993. Genetic evidence for speciation of the Manx Shearwater *Puffinus puffinus* and Mediterranean Shearwater *Puffinus yelkouan*. *Vogelwelt*, 114: 226-232.
- YEATMAN, L. 1976. *Atlas des Oiseaux nicheurs de France, de 1970 à 1975*. Société Ornithologique de France. Paris.
- YÉSOU, P. 1986. Balearic Shearwaters summering in Western France. In, Medmaravis and Monbailliu, X. (Eds.): *Mediterranean Marine Avifauna*, pp. 513-517. Springer Verlag. Heidelberg.
- 1991. Le Puffin des Anglais. In Yeatman, L. & Berthelot, D. (Eds.): *Atlas des oiseaux de France en hiver*. pp. 58-59. Société Ornithologique de France. Paris.
- , PATERSON, A. M., MACKRILL, E. J., BOURNE, W. R. P. 1990. Plumage variation and identification of the Yelkouan Shearwater. *British Birds*, 83: 299-319.

[Recibido: 3.3.95]  
[Aceptado: 27.6.95]

#### APPENDIX

Sources of data which are not included in the References. [*Fuentes no incluidas en la bibliografía.*]

Arcos, J. M., Premià de Mar, 2000 birds, 5.12.1992; 660 birds, 8.1.1993. In *litteris*; Arcos, J. M., Tarragona, 2500 birds, 5.1.1993. In *litteris*; Colla ecologista de Castelló. 1994. Peñíscola-Borriana, 750-1500 birds, January 1992. *Anuario Ornitológico Comunidad Valenciana 1992*: 15; Díes, J. I., Díes, B. & Caletrio, J. 1989 (Eds.) *Anuario Ornitológico Comunidad Valenciana 1987*; Díes, J. I. & Díes, B. 1990 (Eds.) *Anuario Ornitológico Comunidad Valenciana 1989*; Díes, J. I. & Díes, B. 1992. (Eds.). Cullera, 3000 birds, 10.1.1991. *Anuario Ornitológico Comunidad Valenciana 1991*; Díes, J. I. & Díes, B. 1994. (Eds.). Albufera de Valencia, 2000 birds, 22.1.1992., Cullera, 1000 birds, 10.1.1992. *Anuario Ornitológico Comunidad Valenciana 1992*; Díes, J. I. & Díes, B. 1994 (Eds.). *Anuario Ornitológico Comunidad Valenciana 1993*; GOB, 1991. *Anuari Ornitològic de les Balears*, 5: 40-70; González, J. M. & López-Jurado, C. 1992. *Anuari Ornitològic de les Balears*, 6: 69-102; González, J. M., López-Jurado, C., Rebassa, M., Triay, R. & Catchot, S. 1993. *Anuari Ornitològic de les Balears*, 7: 75-104; González, J. M., Rebassa, M., Sunyer, J., López-Jurado, C., Catchot, S., Triay, R., Cardona, J. E., Martínez, O., Prats, J. M. & Romero, M. 1994. *Anuari Ornitològic de les Balears*, 8: 67-104; Parc Natural Aiguamolls de l'Empordà Bird Observatory, Roses Bay-Pals Gulf: 5000 birds, 6.12.1993, 225 birds, 18.1.1993, 1074 birds, 18-23.1.1994, 50 birds, 8.2.1994. In *litteris*; Prades, R., Sánchez, F. J. & Gómez, M. A. 1992. Peñíscola-Borriana, 3900 birds, January 1991. *Anuario Ornitológico Comunidad Valenciana 1991*: 14; Prades, R. & CEC. 1994. Peñíscola-Borriana, 941 birds, January 1993. *Anuario Ornitológico Comunidad Valenciana 1993*; Vázquez, J., Vázquez, A. & Armada, R., Torredembarra, 2000 birds, January 1994; Yuste, M. 1994. Sagunto, 2010 birds, 14.1.1992. *Anuario Ornitológico Comunidad Valenciana 1992*: 15.