

The Situation of Penduline Tit (*Remiz pendulinus*) in Southern Europe: A New Stage of its Expansion.

Francisco Valera, Pedro Rey, Alfonso M. Sanchez-Lafuente, Joaquin Muñoz-Cobo

1. Introduction

The range of *Remiz pendulinus* in Europe has entered upon a phase of expansion for the last decades that has been extensively documented (MARTENS 1965, TRICOT 1967, RAINES & BELL 1967, GÖRANSSON & KARLSSON 1973, REICHHOLF-RIEHM & UTSCHICK 1974, FRANZ et al. 1979, FLADE et al. 1986, ISENMANN 1987).

The existence of breeding areas along the Spanish east coast and the French Mediterranean coast has long been known (BURCKHARDT 1948, BERNIS 1954). These areas, according to GÖRANSSON & KARLSSON (1973), are secondary centres for dispersion, whose populations have long remained stationary (TRICOT 1967), not sharing, at least since the very beginning, the expansive tendency of the species in Central Europe (DELIBES et al. 1980). However, a remarkable increase has been noticed lately in the populations of the Mediterranean belt (DELIBES et al. 1980, ISENMANN 1987), so that new territories have joined the original breeding areas of *Remiz pendulinus*.

The expansion process of the species in Central Europe is well documented (FLADE et al. 1986), however, that is not the case for the advance of *Remiz pendulinus* in the Mediterranean Europe. This paper intends to document the development of the expansion in this region in order to acquire a general viewpoint of the movement shown by the species through the European mainland. Furthermore, the status of *Remiz pendulinus* in the Iberian Peninsula has been updated compared to DELIBES et al. (1980).

2. Historical background of the expansion of *Remiz pendulinus* in Europe.

The border of the species' range spread in 1950 in the north up to the mouth of Oder, and in the south up to the regions of Saxony and Bohemia, so that the most western points lay in Czechoslovakia and Austria, near the March and Danube (MEYLAN 1952, TRICOT 1967, GÖRANSSON & KARLSSON 1973, FLADE et al. 1986). Since then, an expansion towards several directions has been recorded: westwards through Central Europe, northwards to Denmark and Sweden, and through the Baltic Sea to the Gulf of Finland (GÖRANSSON & KARLSSON 1973, FLADE et al. 1986 and others).

The westward expansion of eastern populations has followed two routes (TRICOT 1967, FLADE et al. 1986): the first through the maritime Atlantic plain from the mouth of Oder, the second through Central Europe, with the Danube as the major way of access. The development of the populations along the Danube all through this

region resulted in a progression to France following a natural passage in Switzerland between the Jura and the Prealps from Bodensee to Lac Lemane (TRICOT 1967). The connection of the western populations of *Remiz pendulinus* with the breeding centres of the Mediterranean area must have taken place, as TRICOT (1967) suggests, through Swiss territory, where in 1960 GÉROUDET (1960) had already placed the most western point of the advance in the right bank of the Rhone. From that point, the species could well incorporate the breeding area of Camargue.

Some authors regarded the first nests found in the Rhone valley as the effect of pressure by the Mediterranean population (see GÉROUDET 1960), but most authors have finally agreed in the continental origin of these populations (GÉROUDET 1960, TRICOT 1967 and others), because of the great expansion in Central Europe.

The direction of the expansive movement, together with the change in the migratory routes in 1961 (BAUER et al. 1961, MARTENS 1965) should have played an important role in the evolution of the populations in the Mediterranean. In fact, from then onwards, the habit of wintering in southern France (Camargue) and Spain, and lately in Portugal (TEIXEIRA 1980, 1988), has become established (FLADE et al. 1986).

3. Material and methods

The study of the status of this species in the Iberian Peninsula, as well as the possible causes of its expansion is based on a thorough review of the available literature.

The new breeding area in the Guadalquivir was found during searches along the river. In spring, along numerous tributaries of the river and the Guadalquivir itself, point counts were made in order to detect the presence of the species and delimit as far as possible (see FRANZ & THEISS 1983, FLADE et al. 1986) the breeding areas, as well as to study the possible ways of access and colonization followed by *Remiz pendulinus*. During the winter season, when trees have no leaves, the study area was also prospected for nests built the previous spring to prove the breeding of the species. Inhabitants of the towns next to the river were interviewed to date back, with certain reservations, the presence of the species in the study area.

We would like to thank D. FRANZ and A. HELBIG for his valuable suggestions and constructive criticism, which have contributed to improve this work. J. PONS, C. LLANDRES and J. FERRER gave interesting information about several aspects of the species. S. VALERA translated the text into English. Our acknowledgement also to MARIÓ SAPENA and P. BELART for their comprehension.

4. Results

4.1. Status in the Iberian Peninsula.

The presence of *Remiz pendulinus* in the Iberian Peninsula has been known for several decades (BERNIS 1954, VAURIE 1959), though, in comparison with the rest of Europe, we may consider the initial populations of the species in Spain to be secondary centres (GÖRANSSON & KARLSSON 1973), only lately affected by the expansive phase shown by the species in Europe (DELIBES et al. 1980).

Since DELIBES et al. (1980) new reports of breeding in the east coast of Spain, in the Duero and Ebro basins have scarcely appeared. Only certain fluctuations in the

populations in Catalonia (PONS pers. com.) occurred, as *Remiz pendulinus* has completely disappeared from the Ebro delta (see, however, FERRER et al. 1986), which confirms the fact that the breeding in that area is characterized by a progressive decrease on the coast, and a slow, though steady, increase inland (PONS pers. com.).

However, in the Tajo basin, after DELIBES et al. (1980), new references to breeding appear (FERNANDEZ et al. 1984, GONZALEZ & GONZALEZ 1984) implying the enlargement of the breeding area in that basin ca. 200 km from the last point where any nest had previously been found.

Similarly, in the Guadiana basin, where the most western possible breeding point was in the province of Ciudad Real (BERNIS et al. 1974, BASANTA & PEREIRA 1977), new records of breeding have been reported in the nearby province of Badajoz (DE LOPE 1983, FERNANDEZ et al. 1984) documenting an advance of ca. 300 kms.

4.2. New breeding area in the Guadalquivir basin.

The breeding along the Guadalquivir has only been recorded in the mouth (GÉROUDET 1954, TRICOT 1967, GÖRANSSON & KARLSSON 1973, DELIBES et al. 1980), though the details of such breeding are not properly documented (VALERA 1988). In contrast, the wintering in Andalusia has been extensively treated by numerous authors (SOLIS & VILLASANTE 1977, DELIBES et al. 1980, MUÑIZ 1981, TELLERIA 1981, FERNANDEZ-CRUZ 1983, ALBA & GARRIDO 1983).

The first data reporting the presence of *Remiz pendulinus* in the Upper Guadalquivir (province of Jaén) allude to wintering individuals (FERNANDEZ-CRUZ 1972, MUÑOZ-COBO & SANTOS 1981). In 1982 we got records of breeding in the previously mentioned area, and in 1983 found one nest in the river Guadalbullón. During the spring of that year a large number of individuals and nests were recorded in the reservoirs on the Central Guadalquivir, so that the breeding in these reservoirs can be regarded as continual since 1983.

After the search in the head of Guadalquivir, we place the upper limit for the breeding area of *Remiz pendulinus* in the foothills of the mountains range of Cazorla, though we cannot exclude the possibility of any isolated breeding upstream. Downstream, the major breeding centre lies in the Guadalquivir reservoirs, the basins of which were prospected during 1986 and 1987, yielding 57 and 42 nests respectively. From here onwards point counts produced nests in several sections of the river until it enters the province of Córdoba. In april 1987, most of Guadalquivir was surveyed within that province, finding nests under construction in many places. The last record, at the limit between the provinces of Córdoba and Sevilla, was of a singing male, suggesting that this area is included in the breeding range, though we could not find the nest.

The breeding has also been proved in some tributaries of the Guadalquivir, particularly remarkably along the Guadalbullón, where many nests were found in sections of the river far from the confluence with the Guadalquivir.

5. Discussion

The breeding of *Remiz pendulinus* in the Mediterranean coasts seems to have existed since long ago, and the presence of this species in the Iberian Peninsula dates back to the late 19th century (VAYREDA & PEREZ ARIAS in REYES y PROSPER 1886, MACHADO in AREVALO 1887, SALVAÑA in CORDERO 1983, LOPEZ SEOANE 1861, IRBY 1895) though the authors do not specify its status. We can surely affirm that the species has bred in the Spanish Mediterranean coast (Levante) ever since the last decades of the 19th century (AREVALO 1887, BOSCA 1916). Similarly, the breeding in the French Mediterranean coast has been reported since the early 20th century (MAYAUD 1936). Later the range was restricted to definite areas (the Guadalquivir mouth, almost the whole Spanish eastern coast and the Gulf of Lion up to the Rhone mouth are considered breeding areas by TRICOT 1967, GÖRANSSON & KARLSSON 1973 and DELIBES et al. 1980). YEATMAN (1976) confirms that, in 1936, the range in France was wider than in the 1970ies. For unknown reasons, the species later limited its range to the most favourable coastal areas. Such areas have recently shown a phase of expansion, most likely due to the welfare of the eastern populations.

After a series of fluctuations of the populations in southern France (YEATMAN 1976, BLONDEL & ISENMANN 1981), ISENMANN (1987) reports an increase of breeding *Remiz pendulinus* at the southwestern limits of its Mediterranean breeding area in France, which was paralleled by an increase of the Iberian population.

Except for the isolate breeding point in the Guadalquivir mouth, the distribution in the Iberian Peninsula is cleared documented and the spreading of the species has taken place in a southwestern direction as in the rest of Europe (TRICOT 1967, RAINES & BELL 1967, GÖRANSSON & KARLSSON 1973, BONHAM & ROBERTSON 1975, FRANZ et al. 1979, FLADE et al. 1986, ISENMANN 1987).

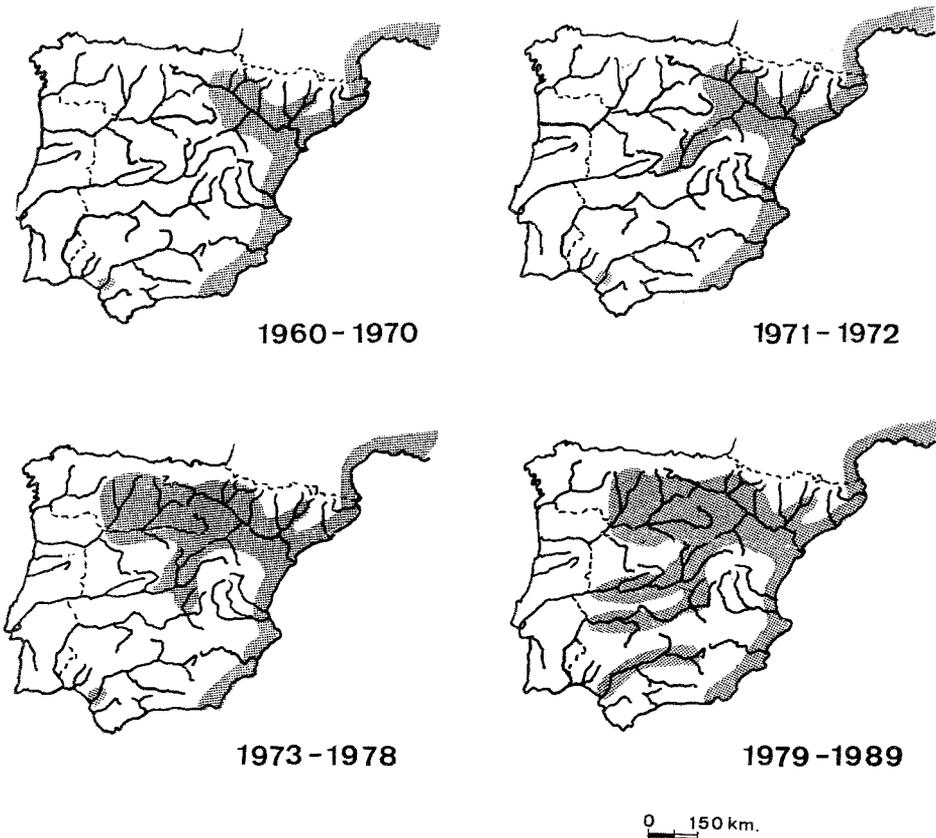
The breeding in the Guadalquivir mouth is not so well documented and, though accepted by DELIBES et al. (1980), has shown no expansion (VALERA 1988).

Both, in the Tajo and in the Guadiana basins, the range extension is from east to west, following the flow of the rivers towards the mouth, so that these watercourses have performed the function of the routes for spreading. The important role played by rivers in the settlement and in the directions followed by the species, as they are used as routes of access and of geographic dispersion, has been well documented in all of Europe (see TRICOT 1967, SCHROTH & HELBIG 1985, FLADE et al. 1986).

As for the causes of the expansion, DELIBES et al. (1980) and FLADE et al. (1986) consider several factors (dispersion dynamics, genetic mutation, alternations in the habitat, climatic changes . . .) as the possible causes of the expansive tendencies of the species. As a rule, it is difficult to determine the precise causes of range extensions of any species (BONHAM & ROBERTSON 1975), but, in this case, the artificial creation of zones suitable to *Remiz pendulinus*, as in Germany (see FLADE et al. 1986), has been conclusive. The creation of reservoirs in meadows along the Upper Guadalquivir in the 1950s has regulated the destructive effects of the floods, frequent in the Mediterranean area, upon the riparian vegetation, favouring, thus, the expansion of *Remiz pendulinus*.

(see FERRER et al. 1986). The reservoirs themselves with great proliferation of *Typha* and *Phragmites*, may have played a decisive role in the settlement of the species as they have provided much new suitable habitat. Similarly, along the rivers Tajo and Guadiana, *Remiz pendulinus* has appeared at recently built reservoirs located in the final course of the rivers within Spanish territory.

The settlement of new winter quarters in Spain since 1961 (FLADE et al. 1986), together with the creation of new areas for the wintering and breeding is, in broad outline, consistent with the observations of human inhabitants of the first breeding areas. Therefore, the recent modification of the environment may have favoured the regular breeding of *Remiz pendulinus*. The influence of the newly created wetlands is admitted by TANNER (1979) and RUGER et al. (1986): "the building of reservoirs may, in some cases, have favoured the settlement in new areas by some species, or the increase of their reproductive rates".



Expansion of the breeding area of Penduline Tit in the Iberian Peninsula 1960-1989. — Die Ausbreitung der Beutelmeise auf der Iberischen Halbinsel von 1960-1989.

Most authors agree that the expansive process shown by *Remiz pendulinus* in Europe during several decades has a sequential character (GÖRANSSON & KARLSSON 1973, FLADE et al. 1986), and we can say the same for the spreading of the species in the Iberian Peninsula.

We can add a fourth stage to the three already described for the expansion of *Remiz pendulinus* in the Iberian Peninsula (DELIBES et al. 1980), now that, since 1978, the species has extended the breeding area ca. 200 km in a west and southwest direction following the Tajo, and ca. 300 km following the Guadiana. Similarly, it has settled in the Guadalquivir Valley, enlarging the breeding area, according to our data, at least 170 kms along the river. However, LLANDRES (pers. com.) records the breeding between the mouth of Guadalquivir and the last point where we registered the species. We can, therefore, affirm that *Remiz pendulinus* breed along the whole Guadalquivir (see fig.). The effects of this new wave can be noticed since 1981. This last stage in the expansion throughout the Iberian Peninsula is of great importance compared the former stages. Actually, according to FLADE et al. (1986), during the period 1930—1965 the border of the species' range advanced ca. 300 km in Europe in a west direction, and after a stationary period (1965—1975), a new wave took place (since 1975), extending the breeding area ca. 250 km west and ca. 200 km north.

In conclusion, the extreme limits of the breeding range presently extend north to the south coast of Finland (Brit. Birds 78: 644), west possibly to Belgium (DIEDERICH & LAFONTAINE 1984) and — as we have seen — southwest to Extremadura in the southwestern quadrant of the Iberian Peninsula (see FERNANDEZ et al. 1984).

Given the proximity of the western most records along the rivers Tajo and Guadiana to Portugal, the breeding area of *Remiz pendulinus* may soon extend to this country.

Summary

The present status of *Remiz pendulinus* in the Iberian Peninsula is updated after a new expansive stage, so that we can distinguish four expansive waves. The recent spreading resulted in an extension by ca. 200 km of the breeding area following the river Tajo and by ca. 300 km following the Guadiana. Likewise, *Remiz pendulinus* has colonized the only remaining great river in the Iberian Peninsula, the Guadalquivir, at least along 170 km. This range extension is considerable and compares with a similar development in Central Europe. A factor possibly supporting the expansion may have been the artificial creation of wetlands (reservoirs), improving existing and creating new habitats suitable for the species. At present, *Remiz pendulinus* breeds discontinuously from the southern coast of Finland to the southern coast of Spain.

Zusammenfassung

Die heutige Verbreitung der Beutelmeise (*Remiz pendulinus*) auf der Iberischen Halbinsel wird nach einer neuerlichen Ausbreitungsphase in 4 Karten für die Zeiträume 1960—1970, 1971 und 1972, 1973—1978 und 1979—1989 dargestellt. Die jüngste Ausbreitungswelle führte zu einer Erweiterung des Brutgebietes um ca. 200 km entlang des Tajo und um ca. 300 km entlang des Guadiana. Außerdem besiedelt die Beutelmeise jetzt auch den letzten übriggebliebenen Fluß der Iberischen Halbinsel, den Guadalquivir, auf einer Länge von mindestens

170 km. Diese Ausbreitung ist von ihrer Ausdehnung her noch weitreichender als die in jüngster Zeit in Mitteleuropa festgestellte. Möglicherweise wird diese letzte Ausbreitungswelle durch den künstlichen Bau von neuen Feuchtgebieten (Stauseen) begünstigt, die für die Art neue Lebensräume darstellen. Die Beutelmeise ist heute von der Südküste Finnlands bis zum südlichen Spanien als Brutvogel verbreitet.

Literature

- ALBA, E., & M. GARRIDO (1983): Observaciones invernales de aves en la desembocadura del río Guadalhorce (Málaga). Años 1977 a 1981. *Alytes* I: 225—244. • AREVALO, J. (1887): Aves de España. Mem. Real Acad. Ci. 11. Madrid. • BASANTA, L., & P. PEREIRA (1977): Noticiario breve: Pájaro Moscón (*Remiz pendulinus*). *Ardeola* 23: 236—237. • BAUER, K., B. HUFNAGEL & T. SAMWALD (1961): Vom Zug der Beutelmeise (*R. p.*). *Vogelwarte* 21: 122—128. • BERNIS, F. (1954): Prontuario de la avifauna española (incluyendo aves de Portugal, Baleares y Canarias). *Ardeola* 1: 11—85. • BERNIS, F., J. ARAUJO & E. DE JUANA (1974): Posible reproducción del Pájaro Moscón (*R. p.*) en el valle del Guadiana. *Ardeola* 20: 382. • BLONDEL, J., & P. ISENMANN (1981): Guide des Oiseaux de Camargue. Neuchâtel, Paris. • BONHAM, P. F., & J. C. M. ROBERTSON (1975): The spread of Cetti's Warbler in North-West Europe. *Brit. Birds* 68: 393—408. • BOSCA, A. (1916): Fauna Valenciana. Geografía del Reino de Valencia. Barcelona. • BURCKHARDT, D. (1948): Zur Brutbiologie der Beutelmeise (*R. p.*). *L. Orn. Beob.* 45: 7—31. • CORDERO, P. (1983): Aves del Maresme. Barcelona. • DELIBES, M., L. COSTA, J. GISBERT, O. LLAMAS & I. TIRADOS (1980): Sobre la expansión reciente del Pájaro Moscón (*R. p.*) en la Península Ibérica. *Ardeola* 25: 193—206. • DE LOPE, F. (1983): La avifauna de las Vegas Bajas del Guadiana. *Doñana Acta Vertebrata* 10: 91—121. • DIEDERICH, J., & R. M. LAFONTAINE (1984): Mesanges Remiz (*R. p.*) a Zetrud-Lumay (Brabant) et evolution du statut de l'espece en Belgique et au Grand-Duche de Luxembourg. *Aves* 21 (1): 1—7. • DOBROWOLSKI, K., & E. NOWAK (1965): On the distribution of Penduline Tit (*R. p.*) in Poland. *Acta Orn.* 9: 77—119. • FERNANDEZ, A., I. J. FERRERO, T. GARCIA, T. GULLICK & J. A. ROMAN (1984): Nidificación del Pájaro Moscón, *R. p.* en Extremadura. *Alytes* II: 177—178. • FERNANDEZ-CRUZ, M. (1972): Actividades del Centro de Migración de la S. E. O. Bienio 1969—70. *Ardeola* 16: 5—31. • Ditto (1974): Actividades del Centro de Migración de la S. E. O. Bienio 71—72. *Ardeola* 20: 5—35. • Ditto (1983): Actividades del Centro de Migración de la S. E. O. Años 1973—1978. *Ardeola* 29: 5—165. • FERRER, X., A. MARTINEZ & J. MUNTANER (1986): Historia Natural dels Països Catalans. 12. Ocells. Enciclopèdia Catalana, S. A. Barcelona. • FLADE, M., D. FRANZ & A. HELBIG (1986): Die Ausbreitung der Beutelmeise (*R. p.*) an ihrer nord-westlichen Verbreitungsgrenze bis 1985. *J. Orn.* 127: 261—287. • FRANZ, D., W. KORTNER & N. THEISS (1979): Invasionsartiges Auftreten der Beutelmeise *R. p.* im Oberen Maintal 1978 und ihre Brutbiologie. *Anz. orn. Ges. Bayern* 18: 1—21. • FRANZ, D., & N. THEISS (1983): Brutbiologie und Bestandsentwicklung einer Farbberingten Population der Beutelmeise (*R. p.*). *Verh. orn. Ges. Bayern* 23: 393—442. • Ditto (1985): Die Beutelmeise (*R. p.*) — eine in Ausbreitung begriffene Vogelart. *Vogelschutz* (2/85): 25—26. • GÉROUDET, P. (1954): La vie des Oiseaux. Les Passereaux II. Neuchâtel. • Ditto (1960): Première nidification de la Mésange rémiz dans le pays de Genève. *Nos Oiseaux* 25: 241—249. • GONZALES, L. M., & J. L. GONZALEZ (1984): Nueva localidad de cría de *Remiz pendulinus* en la Península Ibérica. *Doñana Acta Vertebrata* 11: 327. • GÖRANSSON, G., & J. KARLSSON (1973): Pungmesens *Remiz pendulinus* expansion i Europa och dess förekomst i Sverige. *Vår Fågelv.* 32: 107—110. • IRBY, L. H. (1895): The Ornithology of the Straits of Gibraltar. 2^a Edición. London. • ISENMANN, P. (1987): Zur Ausbreitung der Beutelmeise in Westeuropa: Die Lage an der

südwestlichen Verbreitungsgrenze. J. Orn. 128: 110—111. • LOPEZ-SEOANE, V. (1861): Catálogo de las Aves observadas en Andalucía. Revista de los progresos de las Ciencias Exactas, Físicas y Naturales. Madrid. • MARTENS, J. (1965): Der Einflug der Beutelmeise (*R. p.*) nach Mitteleuropa im Herbst 1961. Vogelwarte 23: 12—19. • MAYAUD, N. (1936): Inventaire des Oiseaux de France: 109. • MEYLAN, P. (1952): La Mésange rémiz a niché en Suisse. Nos Oiseaux 225: 269—281. • MUÑIZ, H. (1981): Noticiario ornitológico. Ardeola 28: 161. • MUÑOZ-COBO, J., & T. SANTOS (1981): Noticiario ornitológico. Ardeola 28: 161. • RAINES, R. J., & A. A. BELL (1967): Penduline Tit in Yorkshire: a species new to Britain and Ireland. British Birds 60: 517—520. • REICHHOLF-RHIEM, H., & H. UTSCHICK (1974): Die Beutelmeise *R. p.* am Unteren Inn und ihr Vorkommen in Mitteleuropa. Anz. orn. Ges. Bayern 13: 280—292. • REYES y PROSPER, V. (1886): Catálogo de Aves de España, Portugal e Islas Baleares. Ed. facsimil (1986). Badajoz. • RÜGER, A., C. PRENTICE & M. OWEN (1986): Results of the IWRB International Waterfowl Census 1967—1983. IWRB Spec. Publ. 6. • SCHROTH, M., & A. HELBIG (1985): Die Beutelmeise (*R. p.*), Brutvogel in der Untermainebene. Vogel und Umwelt 3: 339—343. • SOLIS, F., & J. VILLASANTE (1977): Noticiario breve. Ardeola 23: 237. • TANNER, M. F. (1979): Wildfowl, reservoirs and recreation. W. S. A. C. Rep. 5. London. • TEIXEIRA, A. M. (1980): Sucessão anual da avifauna num caniçal (*Phragmites communis* Trin.) do Estuário do Sado. Secr. Estado do Ordenamento e Ambiente. Centro de Estudos de Migrações e Protecção de Aves. • Ditto (1988): Invernada de Aves en Portugal. Areas importantes e prioridades de conservação. Pags. 185—194. In: J. L. TELLERÍA, Invernada de Aves en la Península Ibérica. Monogr. S. E. O. 1: 185—194. • TELLERÍA, J. L. (1981): La migración de las aves en el Estrecho de Gibraltar. II. Aves no planeadoras. Madrid. • TRICOT, J. (1967): Expansion actuelle de la Mésange Rémiz (*R. p.*) en Europe. Aves 4: 3—14. • VALERA, F. (1988): Expansión y biología de reproducción de *R. p.* en el Valle del Guadalquivir. Granada. • VAURIE, C. (1959): The birds of the Palearctic Fauna. Passeriformes: 548. London. • YEATMAN, L. (1976): Atlas des oiseaux nicheurs de France de 1970 á 1975. Paris.

Authors' address: Depto. de Biología Animal, Ecología y Genética. Facultad de Ciencias Experimentales. Universidad de Granada, E-23071 Jaén, Spain.