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# MIGRATION AND WINTERING OF BLACKCAPS *SYLVIA ATRICAPILLA* IN EASTERN SPAIN

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SUMMARY.—*Migration and wintering of Blackcaps* Sylvia atricapilla *in Eastern Spain*.
**Aims:** To describe the phenology of migratory passages and wintering of Blackcaps.
**Location:** Orange plantations in eastern Spain.
**Methods:** Data were collected between 1997 and 2002 at a Constant Effort Site.
**Results:** We captured between 94 and 206 individuals per season (from September to April of the next year). We used information on seasonal variation of fat score and the distribution of intra-seasonal recaptures to distinguish between the postnuptial passage (from late September to mid October), the prenuptial passage (from early to late April), and the wintering period (from mid October to late March). More juveniles than adults were captured both during the migratory passages and during the winter. A similar proportion of males and females were captured during both passages, while males were more abundant during most of the wintering period. We found no differences in dates of passage between age classes or sexes.
**Conclusions:** We described for the first time in Spain the phenology of both post- and prenuptial migratory passages and wintering of Blackcaps at a particular site during several years. Data presented here, along with other published studies, suggest the existence of differential migration between sexes. Females might winter at lower latitudes than males.

*Key words*: Blackcap, constant effort site, differential migration, postnuptial migration, prenuptial migration, *Sylvia atricapilla*, wintering.

RESUMEN.—*Migración e invernada de la Curruca Capirotada* Sylvia atricapilla *en el este de España*.
**Objetivos:** Describir la fenología de paso migratorio e invernada de la Curruca Capirotada.
**Localidad:** Un naranjal del este de España.
**Métodos:** Hemos utilizado datos recopilados entre 1997 y 2002 en una Estación de Esfuerzo Constante.
**Resultados:** Las capturas oscilaron entre 94 y 206 individuos por estación (desde septiembre de un año a abril del siguiente). Hemos utilizado información sobre la variación estacional en el índice de grasa y la distribución de las recapturas intraestacionales para distinguir entre los periodos de paso postnupcial (entre finales de septiembre y mediados de octubre) y prenupcial (durante el mes de abril) y el periodo de invernada (de mediados de octubre a final de marzo). Tanto en los periodos de paso como durante la invernada se capturaron más jóvenes que adultos. Durante ambos pasos encontramos una proporción similar de machos y hembras, mientras que los machos son más numerosos durante la mayor parte del periodo invernal. No encontramos diferencias en las fechas de paso entre clases de edad o sexos.
**Conclusiones:** Describimos, por primera vez en España, la fenología de los pasos migratorios post- y prenupcial y la invernada de la Curruca Capirotada en un área de estudio concreta durante varios años. Los datos presentados, junto con otros ya publicados, sugieren que hay una migración diferencial entre sexos, de modo que una mayor proporción de hembras pasan el invierno a latitudes más bajas.

*Palabras clave*: Curruca Capirotada, estación de esfuerzo constante, invernada, migración diferencial, migración postnupcial, migración prenupcial, *Sylvia atricapilla*.

## INTRODUCTION

The Blackcap *Sylvia atricapilla* is a breeding bird in the Iberian Peninsula, and it is abundant in the north of Spain and in some habitats of the Mediterranean region (Carbonell, 2003). However, the migratory behaviour of this species determines changes in both the size and the composition of Iberian populations along the annual cycle (reviewed by Tellería *et al*., 1999; see also Tellería & Carbonell, 1999). First, birds migrating from Europe to Africa, and those coming to spend the winter in Spain, increase local populations, or occupy areas where the species does not breed, either briefly (migrating birds) or during the whole

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winter (wintering birds). Second, there are also migratory movements of populations breeding in Spain, either within the Peninsula or between Spain and Africa.

Available information on the migration and wintering of Blackcaps in the Iberian Peninsula comes from three sources: (1) analyses of captures of birds ringed abroad and recaptured in Spain during migration and/or wintering (Cantos, 1992, 1995; Cantos & Tellería, 1994); (2) intensive local studies including capture and identification of birds (Murillo & Sancho, 1969; Cuadrado *et al*., 1995; Grandío, 1997); and (3) phenological data from periodic census in several localities (Costa, 1984; Zamora & Camacho, 1984; Jordano, 1985; Obeso, 1987; Tellería *et al*., 1999). In general, these data place the postnuptial passage between late August and November, with maxima during October, the prenuptial passage between late February and May, with maxima during March, and the wintering period between December and February.

Some authors have detected differences between sexes or age classes both in numbers and in dates of passage. For instance, Cantos (1995), based on data from recaptures of birds ringed abroad, found more males than females, and more young than adults, both during the migratory passage and during the winter. However, in spite of its relative abundance and the studies already published, detailed information on the migration and wintering of Blackcaps in an area, including phenological data, both at the population and at the individual level (derived from ringing data), and possible differences between sexes or age classes, is not currently available. We aim to present here data on these topics, collected during a five-year period at a study area in eastern Spain.

## Study area and methods

### *Study area*

The study was performed in an extensive orange plantation in Sagunto, Valencia (39°42' N, 0°15' O). The Blackcap is a very rare breeder in the study area. For example, Gil-Delgado (1983), did not mention this species among the breeding bird community in his study plot (17 ha) which is close to the study area, and he has not found any nest during the last 10 years, though one breeding pair per year was detected during in 1985, 1990 and 1991 (J. A. Gil-Delgado, *pers. obs.*). On the other hand, during the five years of duration of the present study (see below), only two Blackcaps have been cached between May and July. Therefore, we could assume that the population of Blackcaps in our study area is virtually composed of migrant and wintering individuals.

### *Constant effort site*

Data presented here have been collected in a Constant Effort Site (CES) which was operating within the study area. This method is considered as one of the best to gather data on bird migration at a particular site (*e.g.* Salewski *et al*., 2002). The CES was composed of two sets of mist nets, each of them 33 m long and 14 mm mesh size, separated by about 50 m and placed within orange plantations. The nets were placed once a week just before sunrise, and were operating during four hours. In most cases, the interval between sessions was 6-8 days. Exceptionally, mainly due to bad weather or logistic problems, the interval was longer (up to 11 days in four occasions). In these cases, the period between the following sessions was reduced to a minimum of 5 days until the delay was recovered. During the five-year study period, a mean of one session per week was achieved. Visits to the nets were typically done every 30 minutes.

Although the CES was operating all year round, only data from September to April were included here, since these are those months where Blackcaps were captured (with the exceptions mentioned above). For clarity, data are presented in «seasons» (from September of one year to April of the following year). We analysed here data of five seasons, from September 1997 to April 2002.

Birds captured were ringed with individually numbered metal rings (ICONA) and, from the data gathered, the following are relevant to the present study: date of capture, age (EURING), sex, tarsus length (to the nearest 0.05 mm) and fat score (over a scale of 5; Herrera, 1974). If, for any reason, the value for a particular variable was missing for an individual, this individual was excluded only from the analyses involving the missing variable.

*Approach*

We divided the paper into two parts. We first tried to separate, as far as possible, the periods of migratory passage and wintering in our study area, using criteria based on phenology of captures and recaptures and the characteristics of the birds captured.

First, regarding the temporal distribution of captures, in places where an important migratory passage occurs, maximum of captures during the periods of passage are observed which identify these periods (*e.g.* Costa, 1984; Jordano, 1985; Tellería *et al.*, 1999). Secondly, we expect that individuals who are wintering in the study area would be easier to recapture during the same season than those which are in their way to other wintering quarters. A short stay in stop-over sites is characteristic of Blackcaps in the Mediterranean region (*e.g.* Grandío, 1997 and references therein). Finally, some of the characteristics of the birds which are migrating, as fat score, size and sex or age ratios, are different from those which are already settled (e. g. Grandío, 1997; Cristol *et al.*, 1999; Pérez-Tris *et al.*, 1999; Berthold, 2001).

Variation in some of the above parameters was continuous and not always clear, so the exact point of cutting was selected combining all the information, and was therefore subjective. Once the periods were defined, each bird was exclusively included in one of the phenological periods defined, and the characteristics of the birds captured in each of the periods compared using proper statistical tests.

*Analyses*

To compare the characteristics of the birds between years (first part of the paper), we have considered the same number of weeks each season, fitting it to the year with less weeks of presence of Blackcaps in the study area (2000-01, 27 weeks). To achieve this, we have deleted the data of the central weeks (between mid December and mid January) of the rest of the seasons, both in the analyses and in the related figures (6 weeks deleted in 1997-98, 3 weeks deleted in the other three seasons). We have chosen these weeks from the middle of the winter because we expected to find differences in characteristics between wintering birds and those which were merely passing through on migration, and assume that those captured in the middle of the winter where all wintering birds.

On the other hand, once the different periods (post-, prenuptial and wintering) had been defined (second part of the paper), we took into account these to analyse the characteristics of the birds. Post- and prenuptial periods were considered to be the first and last four weeks of presence of Blackcaps in the study area each year (see Results). After that, the rest of the weeks of each season, the wintering period (which could have different length each year), was divided into three periods of the same length, assuming the central period the excess or defect of weeks (*e.g.* if there were 16 weeks, we assigned 5 weeks to each of the initial and final wintering period, and 6 weeks to the central period). This was mainly done because there probably was an overlap between migrating and wintering periods. Thus only true wintering birds were expected to be cached during the «central» part of the wintering period, while some overlap between migrating and wintering birds could occur during the «early» and «late» parts of the wintering period as they were defined here.

## RESULTS

*Temporal distribution of captures*

The number of different Blackcaps captured per season (September to April) varied between 94 and 206 during the study years. Including recaptures within the same season, the number varied between 102 and 219 individuals per season (Fig. 1). Blackcaps used to appear in the study area by the end of September or early October (Fig. 1). Since this moment, the species was present in the captures for a period varying between 27 (season 2000-01) and 33 weeks (season 1997-98).

In two seasons, 97-98 and 99-00, (Figs. 1A and 1C, respectively), the number of Blackcaps captured increased during November and December, a maximum was reached by late December and early January, and then decreased until April. This pattern is less clear in the other three seasons, where the distribution of captures was more homogeneous, or showed maxima most probably due to the intrinsic error

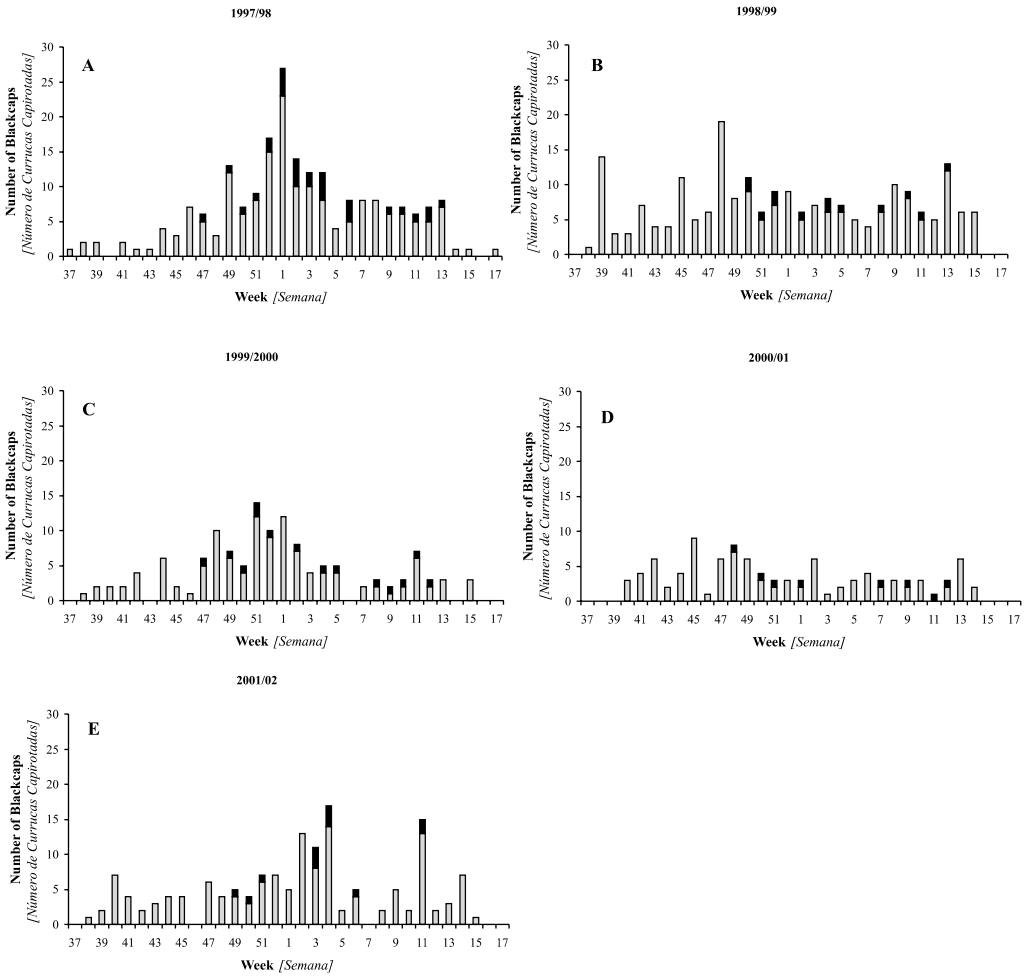


FIG. 1.—Number of Blackcaps captured each week in the study area during the period 1997-2002. Grey: First captures in that year; Black: Intraseasonal recaptures. Week 37 is the third week of September; Week 1 is the first week of January.
*[Número de currucas capirotadas capturadas cada semana en el área de estudio durante el periodo 1997-2002. Gris: Primeras capturas de ese año; Negro: Recapturas intraestacionales. La Semana 37 es la tercera semana de septiembre, y la Semana 1 es la primera semana de enero.]*

of the method. Anyway, in no season could we see clear maxima associated with probable dates of migratory passage either post- or prenuptial.

### *Characteristics of the birds*

The fat score was about 1.5-2.0 during the first four weeks of presence in Sagunto (Fig. 2). This index was below 1.5 from weeks 5 to 23, with the only exception of one week. From week 23 onwards, the fat index was increasing until values above 2.0 by the end of the period of presence of Blackcaps in the study area. Tarsus length did not show a clear pattern of change, being around 20.5 mm during the season. Finally, it can not be observed clear seasonal patterns in sex or age-class ratios, appearing in general more males than females, especially

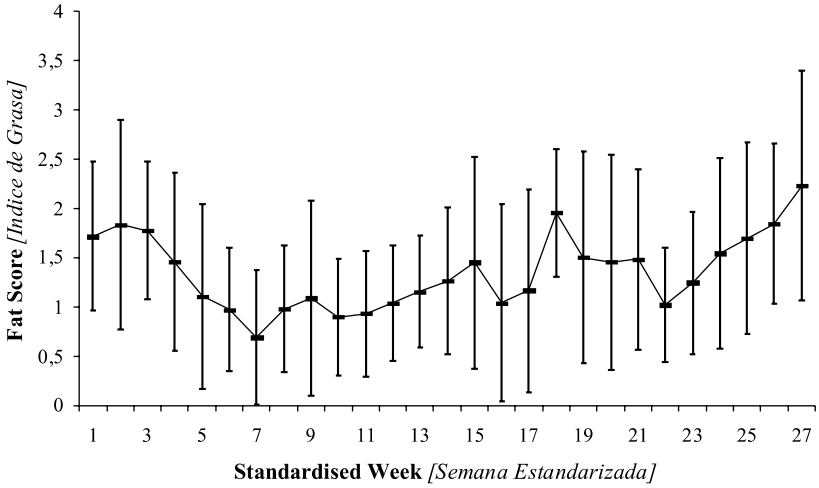


FIG. 2.—Fat score of the Blackcaps captured during 1997-2002 (all years pooled). The central weeks of some years were deleted to achieve the same number of weeks each year. Week 1 is the first week where Blackcaps were captured each year (see text for details).
*[Índice de grasa de las currucas capirotadas capturadas durante el periodo 1997-2002 (todos los años juntos). Se han eliminado las semanas centrales de algunos años para que todos los años tuvieran el mismo número de semanas. La Semana 1 es la primera semana en la que se capturaron currucas ese año (ver texto para más detalles).]*

during the second part of the season, and more young than adults during all the season.

### *Distribution of recaptures*

The percentage of birds captured more than once per season varied between 4% and 12%. The first week that we captured a bird which was captured again in the study area during the same season varied between mid October and early December in different seasons. Counting the weeks since the presence of Blackcaps in the study area, the individuals captured before the sixth week, with only one exception, were not captured again during the same season (Fig. 3; see also Fig. 1). After the sixth week, some of the individuals captured were recaptured during the same season (Fig. 3). Considering the individuals recaptured at least four weeks after their first capture, there was a significant increase in their fat content during this period (average fat score in the first capture (± *SD*) 0.89 ± 0.62; average fat score in the last capture = 1.37 ± 0.83; $n = 26$, paired $t$-test, $t_{25} = 3.37$, $P = 0.02$).

By the end of the season, the last week when we recaptured an individual previously captured this season varied between the third week of March and the first week o April, in other words, between three and five weeks before the Blackcaps left the study area (Fig. 3; see also Fig. 1).

### *Defining migrating and wintering periods*

The seasonal distribution of captures does not give clues to define migrating and wintering periods, since no apparent, consistent, maxima were detected during the study years. The only clear seasonal pattern observed in the different characteristics of the captured birds studied was their fat content (see above). These data define an initial and a final period, of about four weeks each, where fat content of the birds was relatively high, suggesting probable periods of passage.

Another set of data is that on recaptures of the same individuals within the same season. These data show that, at least from mid October to early April there were individuals settled

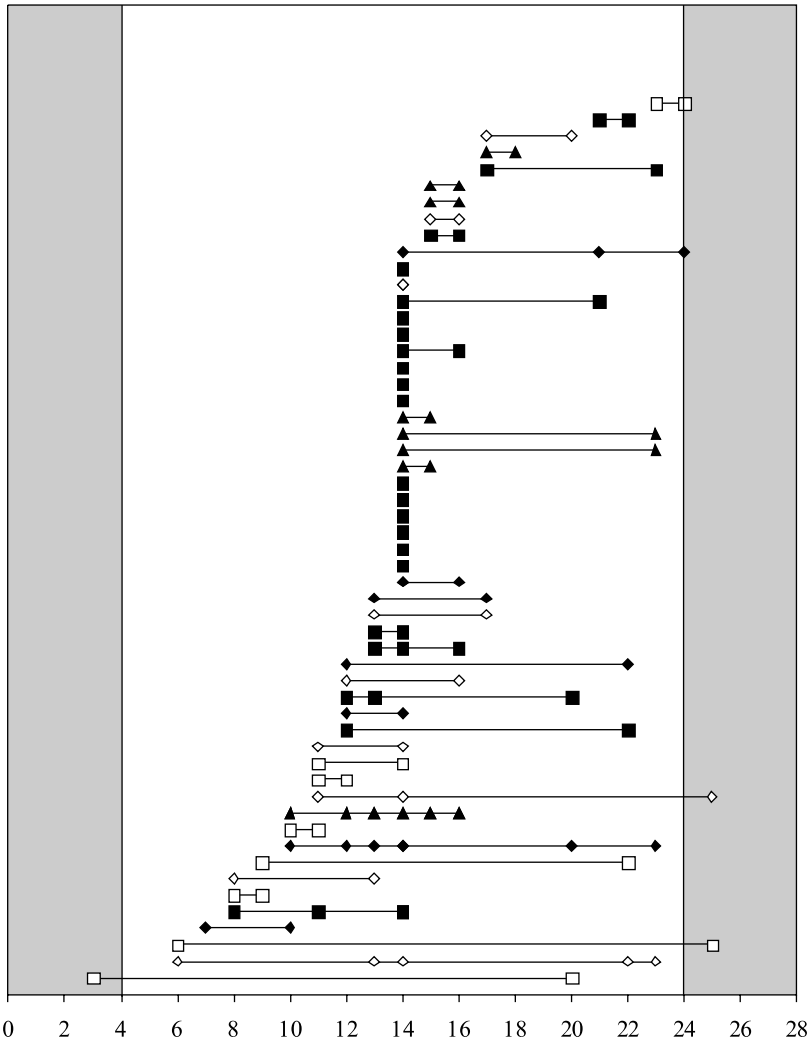


FIG. 3.—Individual capture histories of Blackcaps captured more than once within a season during the study period. Each point indicates a capture of this bird and lines join the captures of the same individual. Weeks standardised as in Fig. 2. All the captures occurred in the deleted weeks are concentrated in Week 14 (e.g. there is only one point if the individual was captured and recaptured within the missing weeks). The presumed periods of migratory passage are shaded. Different symbols were used for birds captured each year: Black square: 97-98; white rhomb: 98-99; black rhomb: 99-00; white square: 00-01; black triangle: 01-02.

*[Historias individuales de captura de las currucas capirotadas capturadas más de una vez durante una estación durante el periodo de estudio. Cada punto indica una captura de ese individuo y las líneas unen las capturas de un individuo. Semanas estandarizadas como en la Fig. 2. Todas las capturas realizadas durante las semanas que se han eliminado se han concentrado en la Semana 14 (e.g. sólo se presenta un punto si ese individuo se ha capturado dos veces durante las semanas eliminadas). Se presentan sombreados los supuestos periodos de paso migratorio. Se han utilizado símbolos distintos para los diferentes años: Cuadrado negro: 97-98; rombo blanco: 98-99; rombo negro: 99-00; cuadrado blanco: 00-01; triangulo negro: 01-02.]*

in the study area, which could be considered as wintering birds. Before that period (from late September to mid October) the individuals captured were not recaptured again in the study area during the season, while after it (early to late April), the individuals captured have not been captured before in this season, suggesting that, at least most of them, were passing across the study area and not settled there. Obviously, the overlapping of migrating and wintering individuals was possible, and can not be discriminated with the recapture data.

Considering the first four weeks as a «post-nuptial passage», and the last four weeks as a «pre-nuptial passage», and the period between them as a «wintering period», the different captures of a particular individual, with only five exceptions, were placed within the wintering period (Fig. 3). Only one individual captured during the post-nuptial passage was recaptured during the wintering period, while four individuals captured during the wintering periods were recaptured during the pre-nuptial passage. These results support the definition of the phenological periods based on the fat content of the birds, as well as the probable overlap between birds passing over the study area and those settling there during the autumn or preparing to leave during early spring.

*Inter-annual recaptures*

We had 28 inter-annual recaptures (birds captured during a particular season and recaptured in any of the following ones) during the study period. The percentage of birds recaptured varied between 2.2% (season 01/02) and 9.6% (season 00/01). All the inter-annual recaptures occurred during the wintering period defined in the previous section, with the exception of one bird that was recaptured during the pre-nuptial period. Therefore, this data set also supports the above definition of periods.

*Age, sex and biometry of the birds in the different phenological periods*

Grouping the five studied seasons, we found no significant differences in the percentages of young and adults in each of the five periods considered ($\chi^2_4 = 8.99$, $P = 0.061$), finding more young than adults overall (64% *vs*. 36%; $\chi^2_1 = 48.33$, $P < 0.001$). There were, however, significant differences in the percentages of males and females between periods ($\chi^2_4 = 23.26$, $P < 0.001$). *A posteriori* tests (Zar, 1996) produced two homogeneous groups. The first one included the post- and prenuptial periods and the early wintering period ($\chi^2_2 = 1.50$, $P = 0.47$), where the proportion of males and females was similar (51% *vs* 49%). The second one included the central and late wintering periods ($\chi^2_1 = 2.50$, $P = 0.11$), with more males than females (67% *vs* 33%).

To identify possible differences in the dates of passage between sexes or age classes we divided each passage period into two halves of two weeks each. We did not find significant differences between sexes ($\chi^2_1 = 0.01$, $P = 0.91$) or age classes ($\chi^2_1 = 1.74$, $P = 0.19$) during the post-nuptial passage. The same was true for the prenuptial period (sex: $\chi^2_1 = 0.69$, $P = 0.41$; age classes: ($\chi^2_1 = 0$, $P = 1$). Therefore, we did not detect differences in the date of passage between sexes or age classes in neither the post- nor in the prenuptial periods.

Mean tarsus length did not vary between the five periods considered ($F_{4,804} = 1.207$, $P = 0.306$). However, there were significant differences in mean fat score ($F_{4,805} = 17.459$, $P < 0.001$; Fig 4). *A posteriori* Scheffe tests showed that fat score was significantly lower in the early wintering period than in any other one, while it was higher both in the post- and in the prenuptial migration passages, though differences were not significant between the post-nuptial and the late wintering periods.

## Discussion

*Are there migratory passages?*

Although for the second part of this study, related to the definition and analysis of passage and wintering periods, we assumed the existence of migratory passages, it is adequate to discuss this decision with some more detail. Results on the abundance of birds did not show maxima which could be associated to migratory passages, as occurred, for example, in the Marismas del Guadalquivir, southern Spain (Jordano, 1985). There, fairly clear maxima could be seen around October and around April, which could be associated with migratory pas-

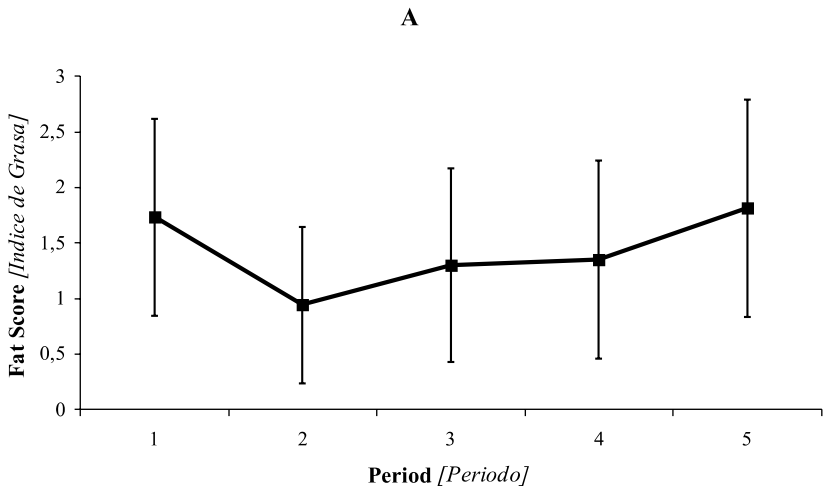


FIG. 4.—Fat score of the Blackcaps captured in each of the five phenological periods defined (1: postnuptial passage; 2: early wintering; 3: middle wintering; 4: late wintering; 5: prenuptial passage).
*[Índice de grasa de las currucas capirotadas capturadas en cada uno de los periodos fenológicos definidos (1: paso postnupcial; 2: periodo inicial de invernada; 3: periodo medio de invernada; 4: periodo final de invernada; 5: paso prenupcial).]*

sages, being the densities much lower during the winter. By contrast, our data from Sagunto might suggest that the birds were simply arriving and settling in the study area. However, some of the other results, especially those related to differences in fat score and sex ratios along the season, as well as the temporal distribution of recaptures, suggest that some passage does occur, though it seems to be of low intensity.

On one hand, birds captured during the first weeks carried more fat than birds captured later on, suggesting that they had enough reserves to continue travelling further south. This idea is supported by the virtual absence of recaptures of these birds in the study area during the winter, though the probabilities of recapture would be higher for those arriving and settling earlier. After these few weeks, birds captured had lower fat scores; in fact, it was in this period when the fat score of the captured individuals was lower of all the season. Some of these individuals were recaptured in the study area during the winter, clearly indicating that they settled there, and their fat content had increased significantly from the first to the second capture. A similar interpretation has been put forward by Ottosson *et al*. (2001) for Blackcaps trapped in Senegal. Individuals arriving to winter in their study area had low fat scores, while those probably going further south showed higher scores. The above results combined suggest that most individuals captured during the first few weeks did not settle in the study area for wintering, while those arriving later, with less fat, did settle and spent the winter in Sagunto. The seasonal variation of sex ratio also supports this conclusion, since the proportion of males and females was similar during the weeks considered of passage, while males were more abundant in the wintering population.

A similar situation occurred by early spring. Fat content of Blackcaps was higher during the last few weeks of presence in Sagunto, the proportion males/females was again similar, and most captured individuals were new (not captured before in the study area during this winter). The increase in fat score could be interpreted as an accumulation of fat by the wintering individuals before leaving (*e.g.* Ottosson *et al*., 2001). However, there were virtually no recaptures during the last weeks, so we can not observe whether this accumulation occurred in particular individuals. This same absence of recaptures, and the clear change in sex ratio, suggest a change in the population, the most probable reason being the arrival of new individuals in prenuptial migration.

Finally, it is known that Blackcaps are relatively loyal to the wintering areas (Cuadrado *et al*., 1995). The fact that virtually all inter-annual recaptures were from birds first captured during what we considered the wintering period supports the idea that birds captured during the periods considered as of passage were actually passing over the study area, and did not settle there. All these results suggest that migratory passages (both post- and prenuptial) did occur during the study period. The exact passage periods are less clear and, in spite that we have tried to find criteria to delimit these periods, it is almost sure that some overlapping between birds passing over and settling for wintering occurred.

*Migratory passages*

Our results suggest that, in the study area, the postnuptial passage lasts about four weeks which, depending on the year, could occur between mid September and late October. These dates are included in the wide postnuptial passage period suggested by data on recaptures (late August to November) and, moreover, agree with the dates of the maximum passage, located during October (*e.g*. Murillo & Sancho, 1969; Cantos, 1992; 1995; Grandío, 1997). The duration of the prenuptial passage was also estimated to last about four weeks which, depending on the year, could be located between mid March and late April. Similar dates were reported by Murillo & Sancho (1969) in Doñana.

The proportion of males and females was similar in both the post- and the prenuptial passages in our study area. These results differ from those presented by Cantos (1995), who found more females than males in both passages. Murillo and Sancho (1969) found more males than females during the prenuptial passage, but a similar proportion during the postnuptial one. Our data suggest that both males and females travel more or less together up to our study area. As shown in the results, the higher proportion of males captured during the wintering period suggest that more females than males continue travelling further south.

Males of many species use to arrive earlier than females to the breeding grounds, and several hypotheses have been proposed to explain this fact (review in Morbey & Ydenberg, 2001). Among these, the competition between males to get a good territory seems to be the one explaining most cases among birds. If this is so, males should pass before females in spring, since females could delay the return to the breeding area to arrive when breeding conditions are favourable. This pattern has been found in many bird species (*e.g*. Otahal, 1995; Yong *et al*., 1998; Morris & Glasgow, 2001). For Blackcaps in Spain, this was also found by Murillo and Sancho (1969) in Doñana, but neither our data, nor those reviewed by Cantos (1995) found this trend. As far as our data concern, it should be taken into account that we have a wintering population, so we had not a clean distinction of «passing» birds. It should be noted that males were more abundant in our wintering population, and that sex ratio balanced during the prenuptial migratory period. This change in sex ratio might be hiding possible differential timings in the migration of males and females. Furthermore, differences in the dates of passage between males and females could be too small to be detected with our frequency of sampling. For example, significant differences between sexes have been detected in American Redstarts *Setophaga ruticilla* with only two days of difference in mean date of arrival (Morris & Glasgow, 2001). This would be undetectable with our data. We did not find differences in dates of postnuptial passage between sexes, which seem to be common in Blackcaps and other passerines (Murillo & Sancho, 1969; Cantos, 1995; Yong *et al*., 1998).

There were more juveniles than adults in both passages, results which agree with other local studies in Spain (Murillo & Sancho, 1969; Grandío, 1997). Since this result also coincides with that found during the winter in Sagunto, it seems that there is not differential migration related to age at least up to our study area. However, Cantos (1995), considering recaptures of birds ringed abroad, found an opposite result, with more adults than juveniles in both passages. This is perhaps an artefact of his data set, since adults would be more abundant among the ringed population.

Postnuptial migration timing might be dominated by the capacity of birds to cope with the challenges to face. The age of the birds, and therefore their experience, might be cru-

cial, and adults could be expected to migrate before juveniles, as it happens in several species (*e.g.* Woodrey & Moore, 1997; Lawn, 1998; Waldenström & Lindström, 2001), though exceptions have been also documented (*e.g.* Morris & Glasgow, 2001). Grandío (1997), in an intensive study of Blackcaps in Irún, found that adults passed before juveniles during the postnuptial passage, while Murillo and Sancho (1969), in Doñana, found that adults passed before juveniles in both passages. We did not found any trend for adults to pass before juveniles in our study area, and our data agree with those presented by Cantos (1995) in his review of recaptures of ringed birds. Again, the frequency of sampling might preclude the detection of small differences if they existed.

To summarise, the results offered by different studies, including the present one, are not consistent in relation to dates of passage of different sexes or age classes. These inconsistencies are not rare in studies of migration. For example, Yong *et al.* (1998) showed similar discrepancies when they compared several studies on the Wilson's Warbler *Wilsonia pusilla*. Clearly, a good understanding of migratory passages for this and other species at a national scale needs a network of key study sites with intensive sampling and standardised methodology.

### *Wintering period*

We conclude from our data that Blackcaps captured from early November to mid March were individuals wintering in our study area. Depending on the year, this period could be lengthened both forwards, until the second week of October, and backwards, util the first week of April.

During the wintering period, we captured more males than females, results similar to those obtained by Cantos (1995). As we found that sex ratio was about 1 during the migratory periods, these results suggest that females continued migration further south. It is common among migratory birds that males winter closer to the breeding grounds than females do (review in Cristol *et al*., 1999). Murillo & Sancho (1969) captured more male than female Blackcaps during the first half of the winter in Doñana, but proportions balanced from January until the end of the winter. This increase in the proportion of females towards the south, as it happens for example in the White-throated Sparrow *Zonotrichia albicollis* (Jenkins & Cristol, 2002), agrees with the idea of differential migration between sexes.

We captured more juveniles than adults during the wintering period. Cantos (1995) found the opposite pattern, and conclude that juveniles should winter at lower latitudes than adults. Again, we think that it might be a bias in this data set towards adults among the ringed birds. More studies performing systematic trapping in particular sites at different latitudes are necessary to elucidate whether the pattern observed at our study area varies with latitude.

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