Blackcap
Sylvia atricapilla

Germán López-Iborra & Joan Castany

Range

The Blackcap's breeding range covers parts of NW Africa and most of Europe eastwards to NW Iran and Kazakhstan (Cramp, 1992; Bairlein et al., 2006; Tellería et al., 1999; Shirihai et al., 2001). Eastern populations and those from N Europe, most of the Britain Isles and central Europe are fully migratory, while those from SW Europe and the Mediterranean Basin are only partially migrant; birds from the Atlantic and Mediterranean islands are largely sedentary (Cramp, 1992; Shirihai et al., 2001). Wintering grounds are in S and SW Europe, NW Africa and the Afrotropics (both in W and E Africa); long-distance movements to tropical Africa are undertaken by birds belonging to the most northerly and easterly populations, east and north from Britain and C Europe (Cramp, 1992; Shirihai et al., 2001).

At the study sites this species only breeds in the wet Balearics and at the Llobregat delta and Els Aiguamolls. The percentage of local breeding birds in the sample from the wet Balearics is high (*c.* 40%), but only very marginal from the Catalan sites (*c.* 1%). The species is a very common wintering bird in the wet Balearics, the S Moroccan oases and some sites in the dry Balearics (Formentera), but much less so at the Catalan study sites and on the smaller islands (where the large majority are migrants). On the smallest islands no or very few wintering birds are present (L'Illa de l'Aire, Conillera, Els Columbrets, L'Illa Grossa and Las Chafarinas).

Migratory route

Recoveries indicate that the main route used in spring follows a SW-NE axis, the exception being birds originating from Britain and parts of NW France, which seem to reach breeding areas following a more due N route NNE from Morocco and S Spain or even NNW from the Balearics (fig. 1). Most birds originate from S Britain, France and C Europe, the vast majority from west of the autumn migratory divide (*c.* 12ºE; Zink, 1973). These results agree with previous published data (Zink, 1973; Cramp, 1992; Wernham et al., 2002; Spina & Volponi, 2009). Although spring migration seems to take place across a broader front than in autumn (Cramp, 1992), a clear tendency to enter Europe through Morocco and SW Spain persists in spring, and most birds move through continental areas in a due NE direction in order to circumvent somewhat the Mediterranean Sea (present data; Zink, 1973; Cantos, 1992). In this respect, it is interesting to note that the species shows a significantly more due N average direction of movement in the Balearics / Els Columbrets than in Catalonia (11.19ºNE and 25.34ºNE, respectively). This pattern is due to the fact that the few recoveries from Britain and W France in NE Spain occur entirely on islands, suggesting that the proportion of birds following a NNW direction there is higher than in continental NE Spain (or, conversely, that in Catalonia a higher proportion follow the dominant NE direction).

An interesting recovery is of a bird ringed on coastal western Spain one spring and recovered at the other extreme of the country, 826 km to the WNW, the following spring. Data from Algeria reveals a misleading prevalence of SSE-NNW movements due to the concentration of recoveries in just one area on the Algerian coast (fig. 1); birds recovered there, in fact, originate from a wide area of Europe, to the NE, N and WNW (Zink, 1973; Spina & Volponi, 2009). The geographical variation in capture rates and frequencies shows that the species is widely trapped in all areas, reaching maximums at Els Aiguamolls in NE continental Spain and on Cabrera in the Balearics (fig. 2).

Phenology

Migration through the W Mediterranean starts before the beginning of the study period, usually by mid-February and even occasionally in late January (Murilllo & Sancho, 1969; Cramp, 1992; Finlayson, 1992; pers. obs.). During early March the influx of birds is still rather low and the main passage period occurs between late March and late April, peaking during the first half of this latter month (fig. 3). Data from Els Columbrets and L'Illa de l'Aire, where the species only occurs during migration, confirms this phenological pattern, with the sole difference that during March passage can be somewhat less marked. This is to be expected since most birds trapped in the study area are migrants and those wintering in the area mostly leave between February and early April; thus, numbers early in the season are, at worst, slightly overestimated. Patterns of passage are identical in Catalonia and the Balearics, while in N Morocco a lack of data from March prevents a rigorous comparison, although available published information indicates that migration tends to take place there earlier (Thévenot et al., 2003). At Gibraltar, migration peaks in late February and March (Finlayson, 1992). On Capri in the C Mediterranean peak passage occurs during the second half of April (Pettersson et al., 1990), suggesting later passage due to birds of more northern and eastern origin migrating through this area (Spina & Volponi, 2009). In SE Morocco trans-Saharan migrants seem to peak in the period late March to mid-April (Smith, 1968; Gargallo et al., unpubl.).

Males pass somewhat earlier than females (differences in median dates 6 and 5 days in adults and second-year birds, respectively), and adults also precede second-year birds by a few days (5 and 4 days earlier in males and females, respectively; fig. 3). Similar sex and age-related phenological differences have previously been documented for both spring migration and arrival on breeding grounds (Cramp, 1992), but were not found in other studies from Spain and Italy (*e.g.* Cantos, 1992; Spina et al., 1994; Rubolini et al., 2004). Recoveries show no trend in the latitude of capture north of the Pyrenees and the date of passage in the study area.

Biometry and physical condition

Mean values for third primary lengths vary little and range from 55.8 on Las Chafarinas to 57.4 in the wet Balearics (table 1), and in general are very slightly higher than in the C Mediterranean (mean 55.2, n = 896; Spina et al. 1993). Mean wing lengths vary from 73.5 in the dry Balearics to 75.1 in S Morocco. These values are distinctly higher than in local breeding populations from continental Spain and the Balearics (Cramp, 1992; Shirihai et al., 2001; ICO, 2010), further indicating that local birds contribute little to the sample. In fact, figures are similar to those reported in W Europe, the main area of origin of birds trapped in the study area (see above), but lower than in the E Mediterranean, the region through which the larger eastern populations migrate (Cramp, 1998; Morgan & Shirihai, 1997). There is a common decreasing trend in third primary length during the season (fig. 6). Since recoveries do not show any trend regarding the date of passage and their latitude of origin, this tendency may respond to the later passage of second-year birds. Sexual differences in third primary length are very small or non-existent, but second-year birds do have shorter wings than adults (Shirihai et al., 2001; ICO, 2010), a difference that may suffice to explain the observed pattern. On the Tyrrhenian islands, there is a different trend in third primary length, possibly caused by the later passage of larger-sized northern birds (Spina et al., 1993).

Fat reserves are significantly higher in N Morocco and in the dry Balearics than in Catalonia and on Els Columbrets (table 1, fig. 9). Physical condition is similarly higher in the dry and wet Balearics in comparison to Catalonia and Els Columbrets, although the significantly highest values occur in N Morocco, where birds are in better condition than in the south of the country (fig. 8). Fat and physical condition show an overall decreasing trend during the season.

Mean body mass varies from 17.5 on Els Columbrets to 19.7 in N Morocco and, in accordance with fat and physical condition, also shows an overall steady decrease during the migratory period (fig. 8). A similar decrease in body mass and also in fat is reported from the C Mediterranean (Spina et al., 1993; Spina & Volponi, 2009). Averages are significantly higher in the Balearics (both areas) than on Els Columbrets and in Catalonia, although the highest values for all areas are obtained in N Morocco. Mean body mass, fat and physical condition in S Morocco are similar to those of Catalonia, Els Columbrets and the Balearics. At Els

Aiguamolls, one of the sites with the highest number of captures, birds are in markedly (and significantly) poorer condition (fat, body mass) than in the rest of Catalonia (fig. 4). This difference is difficult to explain, but may reflect a higher number of birds arriving directly from sea or, more probably, the negative effects of the area's prevailing northerly winds. When excluding data from this site, body mass in Catalonia is significantly higher than in the Balearics/Els Columbrets (mean 18.9, n = 1,459).

On the Tyrrhenian islands mean body mass is slightly lower than in the Balearics/Els Columbrets (mean 17.0, n = 896; Spina et al., 1993). The average in N Morocco is identical to that reported from N Tunisia (19.7, n = 44; Waldenström et al., 2004), but higher than at Kaifiene, also in N Morocco (17.9, n = 26; Smith ,1979). At Gibraltar, excluding local breeding birds, *c.* 80% of birds have large amounts of fat (fat bulging at tracheal pit; Finlayson, 1981) and average body mass is very close to that in N Morocco (mean 19.9, n = 255; data from March-April; Langslow, 1976). In Seville, 150 km to the north, body mass is still higher (mean 22.3, n = 97; Rodríguez, 1985). Averages from observatories in S Britain (18.1, n = 578; Langslow, 1976) and the Netherlands (18.0, n = 8; Cramp, 1992) are very similar to those from Catalonia and the dry Balearics, although somewhat lower than in the former area (when excluding Els Aiguamolls). The average obtained from S Morocco is distinctly higher than from the nearby but much smaller oases of Defilia (14.1, n = 181; Ash, 1969) and Merzouga (15.6, n = 33; Gargallo et al., unpubl.). This difference most probably reflects the fact that at the latter two sites most of the captures correspond to trans-Saharan migrants, while in our two study sites, both located in large oases, a higher proportion of wintering birds is present. In fact, averages at Defilia and Merzouga are roughly similar to those reported in S Israel in the E Mediterranean, also at the northern fringe of the desert (mean 15.4, n = 3,585; Morgan & Shirihai, 1997).

According to available data, birds trapped just after crossing the Sahara are in worst condition, with an average body mass distinctly lower than during the breeding season (Langslow, 1976; ICO, 2010) and *c.* 22-29% lower than in birds captured in Senegal just before crossing the Sahara (mean 20.0, n = 273; March-May data; Ottoson et al., 2001). This picture is obscured when looking at data from the larger oases, where the species is a very common wintering bird (Thévenot et al., 2003; pers. obs.). Wintering or migrating birds obtain the highest energetic reserves in N Morocco and S Spain, suggesting that at least a substantial part of these birds will undertake long-distance movements northwards (present data; Langslow, 1976; Finlayson, 1981; Rodríguez, 1985). Interestingly, the gain in mass in these areas is equivalent or even higher to that shown by trans-Saharan migrants in Senegal: in both cases birds pass from mid-winter masses of *c.* 17-18 g to *c.* 20 g (*c.* 22 in Seville) in spring (Langslow, 1976; Rodríguez, 1985; Ottoson et al., 2001). Averages are still high on L'Illa Grossa (mean 21.0, n = 7; fig. 4), *c.* 300 km south of Catalonia; averages of *c.* 19 g at most Catalan sites and of *c.* 18 in S Britain and C Europe indicate a progressive depletion of reserves along the continental route and once more indicate that S Spain and N Morocco are key areas for fattening up. Other than at Els Aiguamolls, body condition in continental NE Spain is distinctly higher than in the insular sites (Balearics/Els Columbrets), suggesting that birds crossing the sea have to tackle a more demanding route in terms of energy consumption.

Stopover

The percentage of retraps is low in all areas and the mean stopover length ranges from 3 to 7 days, with no significant differences between areas (table 2, fig. 5). Birds remaining in Catalonia and the dry Balearics are in poorer condition when first captured than those not trapped again, indicating that a higher proportion of birds in poorer condition end up staying at these sites. Moreover, in these areas and on Els Columbrets birds have fairly obvious negative fuel deposition rates; a similar pattern is found in the Balearics but is not significant. The only area where birds show a positive fuel deposition rate is in N Morocco, although there too it is not significant.

As indicated by biometrical data, these results point to the unsuitability of NE Spain and the Balearics/Els Columbrets as stopover areas, since most birds that need to stop seem to end up staying unsuccessfully at these sites. The low number of retraps and inconclusive fuel rates obtained in N Morocco indicate that, although birds certainly fatten up in this area, most mass gain takes place outside the specific study sites. These ringing sites apparently mostly trap birds already on active migration.

Table 1. Mean (± SD), range and sample size of main biometric parameters according to area.

	n	Wing	Third primary	Body mass	Fat score
Catalonia	4,121	73.6 ± 2.1 (61.0-81.0)	56.6 ± 1.8 (50.0-63.0)	17.8 ± 2.1 (11.8-26.0)	2.9 ± 1.6 (0-8)
Columbrets	542	74.1 ± 2.4 (60.0-81.5)	56.4 ± 2.0 (50.0-63.0)	17.5 ± 2.5 (12.0-27.0)	2.7 ± 1.7 (0-8)
Balearics (dry)	4,381	73.5 ± 2.2 (59.0-81.0)	56.2 ± 1.9 (50.0-63.0)	17.9 ± 2.7 (11.4-29.3)	3.3 ± 1.7 (0-8)
Balearics (wet)	154	73.7 ± 2.2 (69.0-80.0)	56.6 ± 1.9 (51.5-62.5)	18.5 ± 2.1 (12.9-24.1)	3.3 ± 1.5 (0-7)
Chafarinas	5		55.8 ± 0.8 (55.0-57.0)	18.4 ± 1.7 (16.5-21.1)	3.6 ± 2.2 (0-5)
N Morocco	283	73.8 ± 2.3 (59.5-80.0)	56.6 ± 1.8 (51.0-62.0)	19.7 ± 2.6 (13.0-26.0)	3.4 ± 1.8 (0-7)
S Morocco	31	75.1 ± 2.0 (72.0-79.0)	56.6 ± 1.6 (54.0-59.0)	17.5 ± 1.4 (15.8-20.3)	2.9 ± 1.4 (1-5)

Table 2. Variation in fuel deposition rate (g/day) according to area and type of retraps involved (mean ± 95% CI and sample size are given).

	Catalonia	Columbrets	Balearics (dry)	Balearics (wet)	Chafarinas	N Morocco
All retraps	-0.17 ± 0.07 (269)	-1.04 ± 0.78 (16)	-0.40 ± 0.11 (220)	-0.26 ± 0.27 (6)		0.29 ± 0.37 (16)
Retraps >1 day	-0.06 ± 0.05 (184)	-0.4 8 ± 0.30 (8)	-0.10 ± 0.07 (134)	-0.17 ± 0.25 (5)		0.25 ± 0.38 (13)

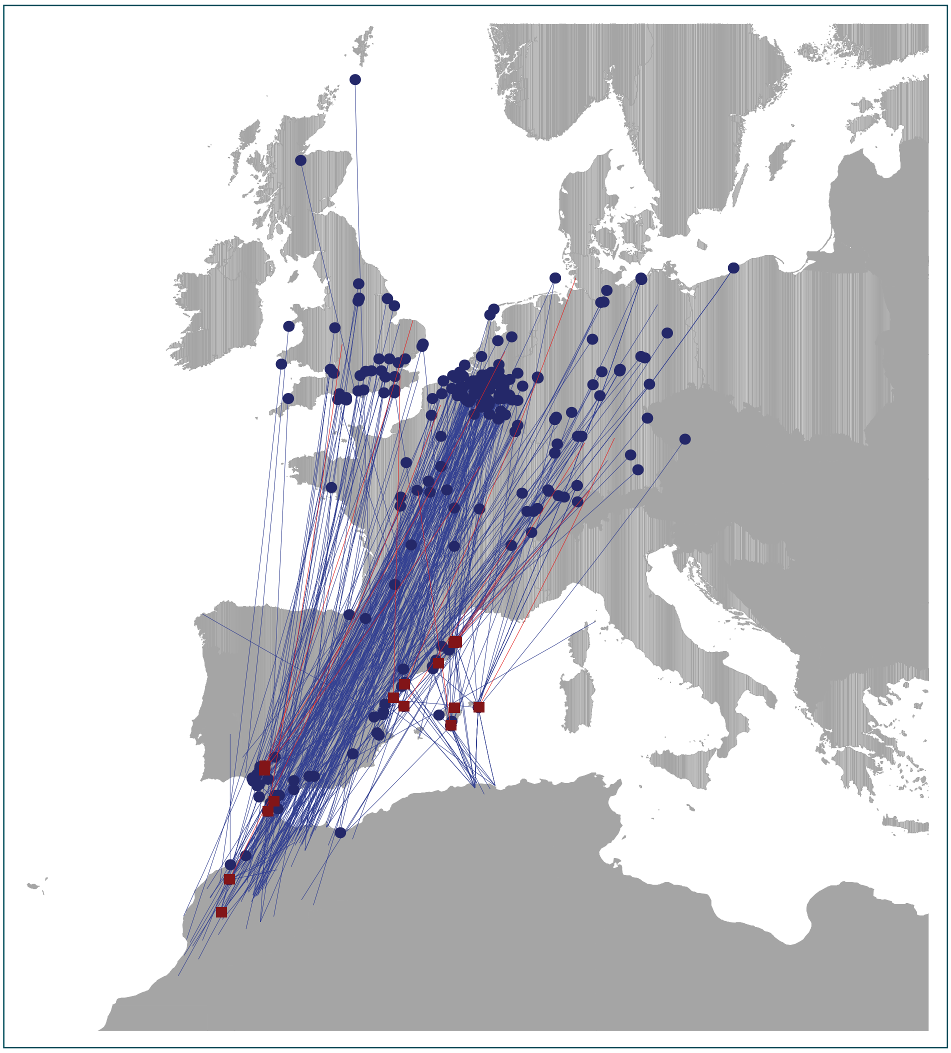

Figure 1. Map of recoveries of birds captured in the study area during the study period (March to May).

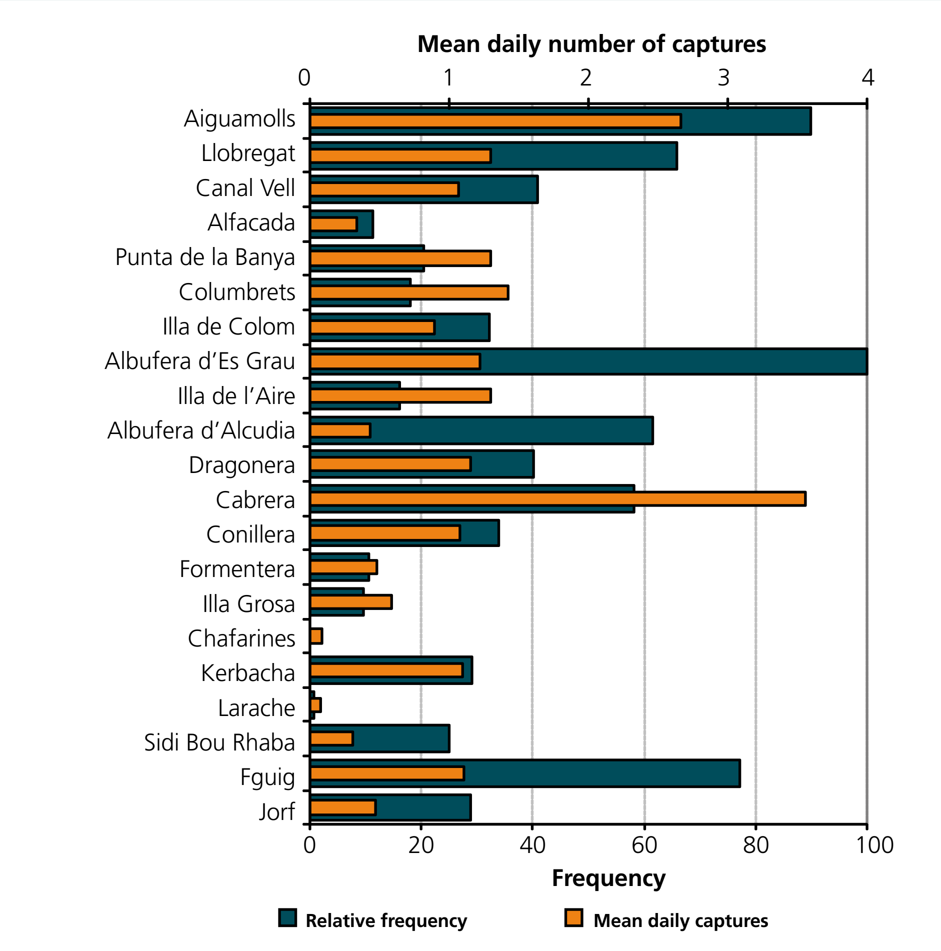

Figure 2. Relative frequency of captures and mean daily numbers according to site during the standard period (16 April to 15 May).

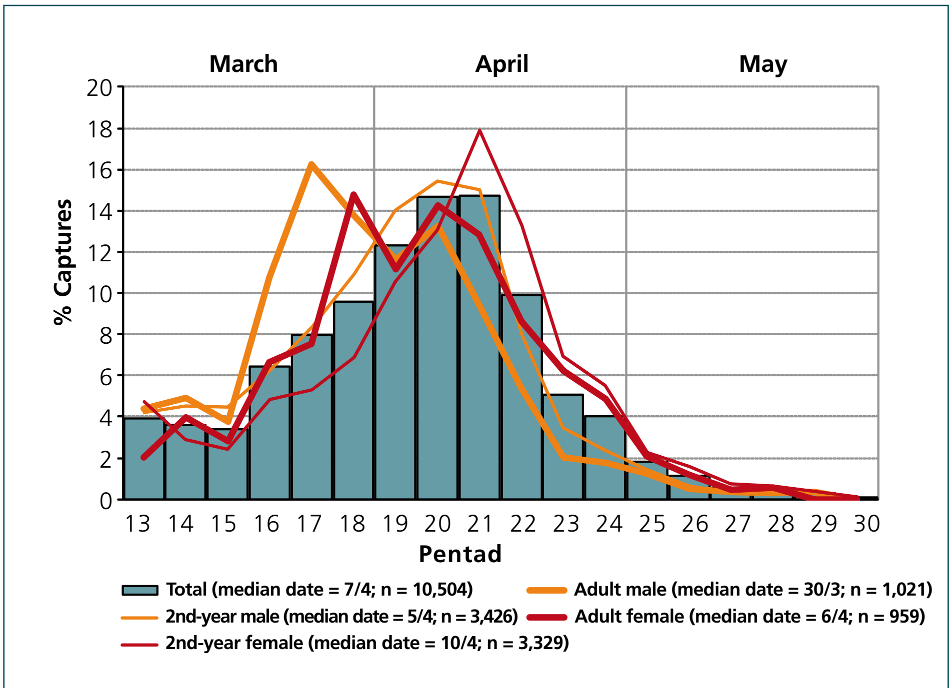

Figure 3. Frequency of captures during the study period.

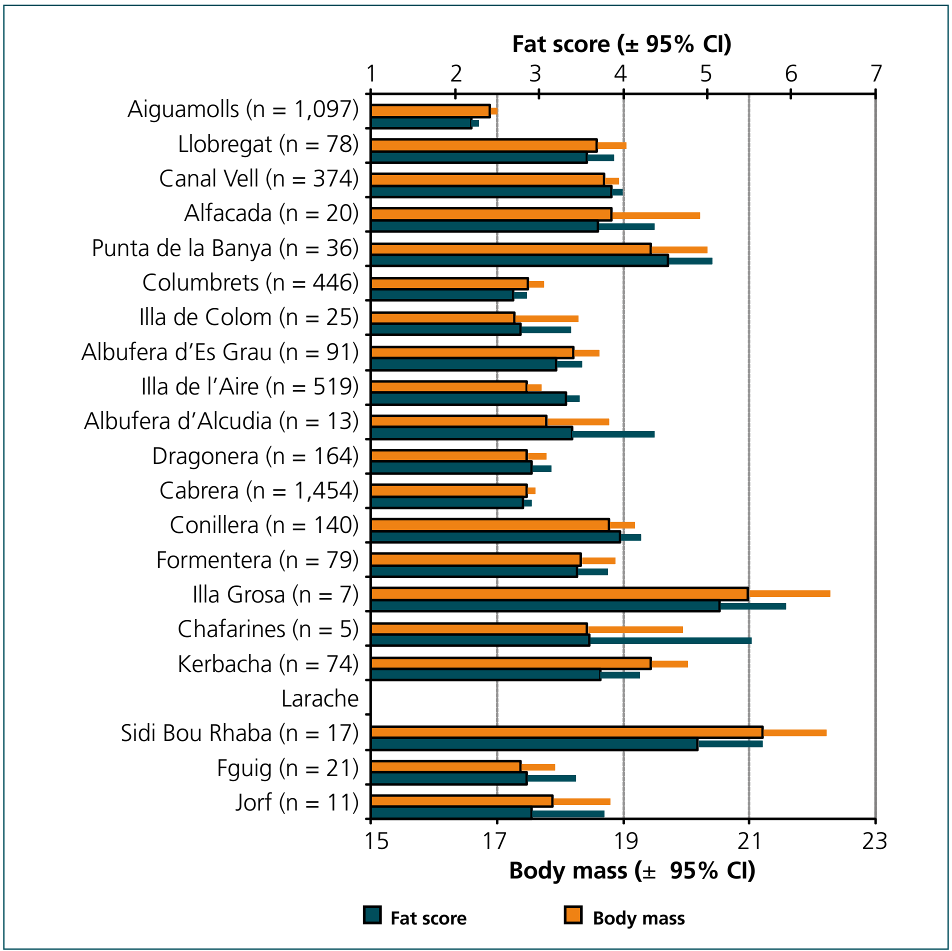

Figure 4. Variation in body mass and fat score according to site during the standard period (16 April to 15 May).

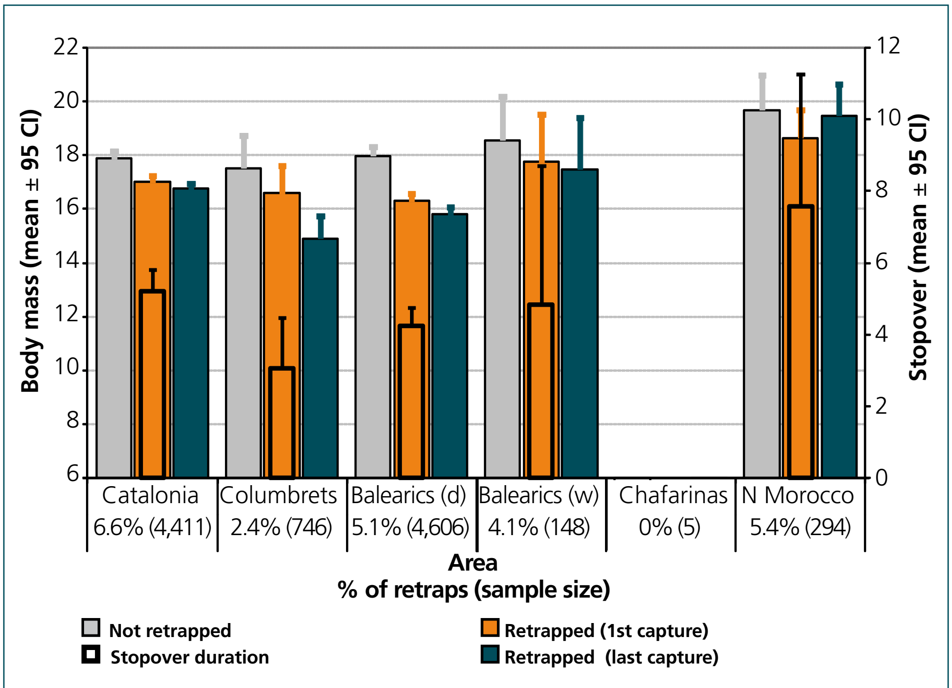

Figure 5. Variation in body mass by trapping status, minimum stopover length and frequency of retraps according to area.

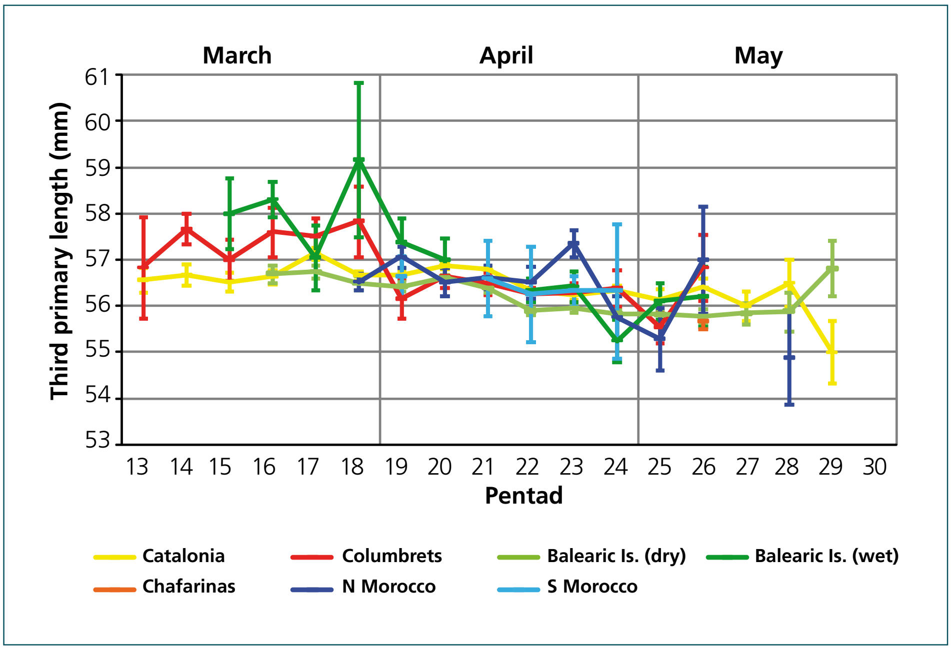

Figure 6. Temporal variation of third primary length according to area.

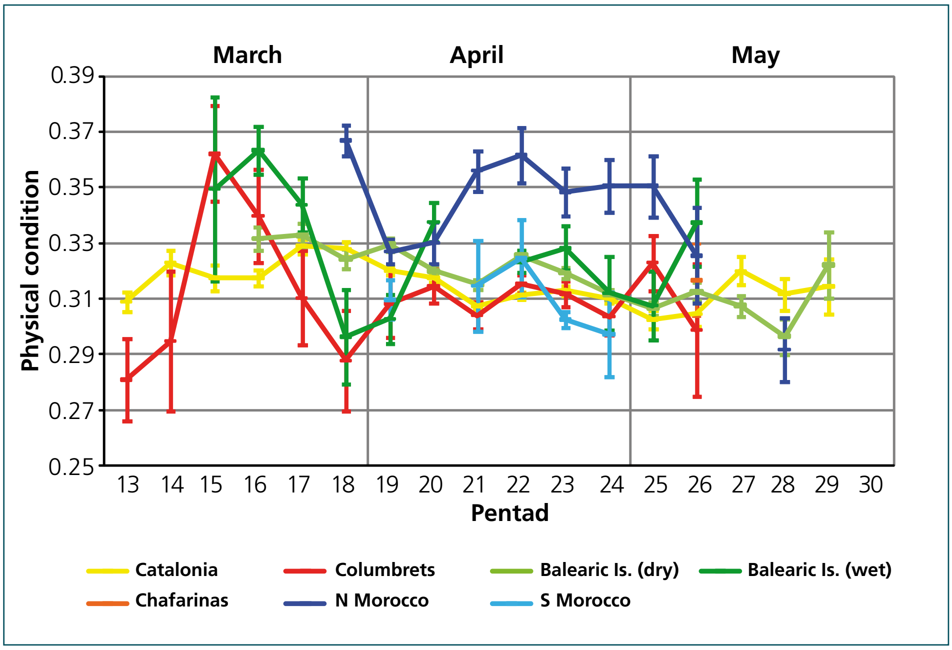

Figure 7. Temporal variation of physical condition according to area.

Figure 8. Temporal variation in body mass according to area.

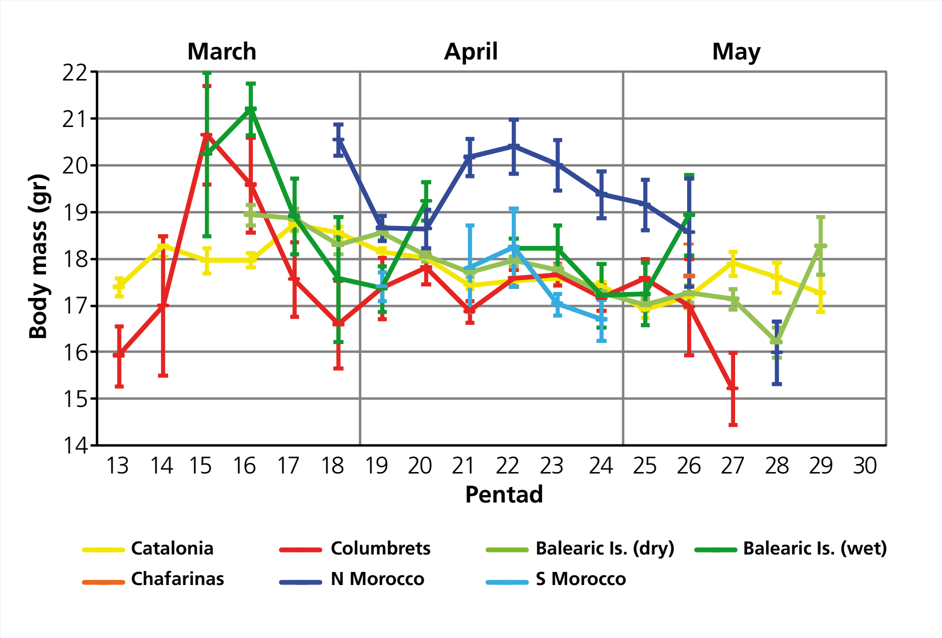

Figure 9. Temporal variation in fat score according to area.