

Woodchat Shrike

Lanius senator

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Spring migration in the western Mediterranean and NW Africa

Range

The breeding range of the Woodchat Shrike is largely restricted to NW Africa and Mediterranean Europe, and then eastwards to the Caucasus and Iran and with some scattered populations in C Europe and Cyrenaica (Cramp, 1998). Four races are recognized: the nominate *senator* inhabiting most of the mainland Europe; *rutilans* from Iberia and NW Africa; *badius* endemic to the Balearic Islands, Sardinia and Corsica; and *niloticus* in Cyprus and Levant and eastwards (Cramp, 1998; Harris & Franklin, 2000). Compared to the nominate race, *rutilans* is distinctly smaller, while *badius* is slightly larger (Cramp, 1998; own data). Except for a few birds wintering in SW Arabia, all populations winter in sub-Saharan Africa, north of the equator as far as the Sahel; western races winter eastwards to the extreme west of Sudan (Cramp, 1998).

This shrike breeds in the study area, but at the specific ringing sites only on the Balearics at all sites except the smallest islands (L'Illa de l'Aire, Colom, Cabrera and Conillera) and very locally at Els Aiguamolls. Even at these ringing sites, the vast majority of captures are of non-local migrants.

Migratory route

The few recaptures available suggest that the main movements follow a SW-NE direction (fig. 1). Two direct recoveries consist of one bird breeding on Menorca captured on Cabrera 39 days before and another ringed in the Ebro delta and recovered 11 days later in S France. Another recovery suggests some inter-annual variability in migratory routes, since it was ringed in Mallorca in one spring and then in Tunisia in the next. The spring migration of western populations take places further to the east and is thus more direct than in autumn (Zink, 1975; Cramp, 1998). In the C Mediterranean, in spring birds move much more in a due N direction, using a somewhat more westward route in spring than in autumn (Spina & Volpini, 2008). In NW Africa, this species is widespread in spring, and much more common than in autumn (Cramp, 1998; Thévenot et al., 2003).

Apart from Els Columbrets and the Balearic Islands the vast majority of captures are of either the nominate race or *rutilans*. Difficulties in separating these races prevent a more detailed account, but data on wing-length (see below) suggests that *rutilans* is not common in Catalonia but clearly is in Morocco. In both areas a few *badius* are trapped (present data; Ash, 1969; Thévenot et al., 2003). In the Balearics about one third of all captures are of *badius* and the rest of *senator* (and perhaps some *rutilans*). The exact racial composition of captures on Els Columbrets is unknown, but is apparently similar to that observed in the Balearics. The eastern race *niloticus* occurs only very rarely in the Balearics.

Present data and that from C Mediterranean (Zink, 1975; Spina & Volpini, 2008) indicate that birds cross the region in broad front. Captures are quite common at both continental and insular sites (fig. 2). Quite large numbers from L'Illa Grossa, L'Alfacada and La Punta de la Banya, however, suggest that coastal islands and peninsular sites attract more birds than continental areas. In Morocco, the highest numbers occur in the south.

Phenology

Migration through the area takes place from mid-March to the end of May, but mostly from early April to mid-May (fig. 3). Some birds are certainly still on passage in early June (*cf.* Telleria et al., 1999). The overall pattern of passage is obscured by important differences between subspecies. The nominate race (including an unknown number of *rutilans*) migrates distinctly later than *badius* (median date 13 days later according to present dataset) (fig. a). Peak passage in *badius* takes place in mid-April, but from late April to early May in *senator*. In Italy phenological differences between these subspecies are apparently less pronounced (Fracasso et al., 1995).

Our data from Morocco are too scarce and limited to allow a detailed comparison with Catalonia and Els Columbrets/Balearic Islands, although other information indicates that in this area the passage of *senator* takes place somewhat earlier than shown here. In S Morocco it occurs from February onwards, but mostly from mid-March to mid- or late April in the SE and in the N of the country mostly from late March onwards (Smith, 1968; Thévenot et al., 2003; Gargallo et al., unpubl.). North of the Strait at Gibraltar the main passage period is in April (Finlayson, 1992). Passage through the C Mediterranean is also complicated by the involvement of different races, although considering the species as a whole the pattern is rather similar to that described here (Spina et al., 1993; Fracasso et al., 1995).

Males migrate only slightly earlier than females in both *senator* and *badius* (median dates differing by only 3 and 1 days, respectively; fig. 3). Adults also migrate somewhat earlier than second-year birds (median dates differing by 2 and 8 days, respectively). Both age-related and, above all, sex-related differences are minor as per published information regarding spring migration and arrival at breeding grounds (Fracasso et al., 1995; Cramp, 1998).

Biometry and physical condition

Mean values for third primary lengths range from 71.9 in Chafarinas to 76.5 in the wet Balearics (table 1). Mean values for wing lengths vary from 94.5 in N Morocco to 101.3, also in the wet Balearics. Reported figures for

the C Mediterranean (Spina et al., 1993; Cramp, 1998; Waldenström et al., 2004) are distinctly higher except when compared to the wet Balearics and to data exclusively for *badius*. This difference is due to the lack of captures of the smallest race *rutilans* in this area and to the fact that *senator* populations passing through there are larger (present data; Fracasso et al., 1995).

There is a marked and significant temporal decrease in third primary length in the dry Balearics, where most birds are trapped (fig. 6). In this species, sexual and age-related size dimorphism is inexistent or at best very slight (own data; Fracasso et al., 1995; Cramp, 1998) and phenological differences in relation to sex and age are minor (see above). Therefore, at least to a large degree, this trend should reflect the temporal variation in racial composition (see above), the proportion of smaller nominate birds becoming progressively higher as the season progresses. Interestingly, however, when considering only *badius* this decreasing trend is still significant and equally noticeable in the dry Balearics and birds progressively go from an average third primary length of c. 76-77 in late March to 73-74 in mid-May. We have no clear explanation for this trend. A temporal decrease in size, albeit less pronounced, is also reported from the Tyrrhenian islands (Spina et al., 1993), although since *badius* is also present there, it is not clear whether this pattern also prevails at subspecific level.

Mean values for fat scores vary between 0.4 on Las Chafarinas and 2.5 in Morocco, while mean body mass varies from 26.1 in S Morocco to 31.6 in the dry Balearics (37.1 in the wet Balearics; table 1). Globally, body mass, fat and physical condition tend to decrease with time (figs. 7-9). These trends, however, seem to be influenced again by temporal variations in racial composition since they disappear when analysing the data at the subspecific level.

Fat reserves are somewhat higher in N Morocco than further north in Catalonia and the dry Balearics (*senator*), but average body mass is similar in all three areas, indicating that birds can regain mass fairly easily en route. Larger size and body mass in the wet Balearics is largely due to the fact that most birds trapped there are *badius*. Only birds trapped at a very few specific sites show distinctly low body mass and fat reserves (fig. 4). This is the case on Els Columbrets, the most isolated and distant islands, and La Punta de la Banya and Las Chafarinas, which apparently mostly attract birds with poorer body condition forced to land at the first available site. Given their situation, a mere 3-4 km from the N Moroccan coast, a good number of the birds stopping at Las Chafarinas may be birds on reverse migration. At Gibraltar, just after crossing the strait, reported mean body mass is also likewise lower than at these latter sites (mean 29.0, $n = 17$; Finlayson, 1981).

Birds trapped in S Morocco are in the worst condition in terms of body mass and physical condition (table 1, figs. 7-8). The two study sites (operated in

different years) show similarly low figures; however, higher average body mass have been reported in other years from nearby areas: 29.3 at Defilia ($n = 68$; Ash, 1969) and 28.4 at Merzouga ($n = 92$; Gargallo et al., unpubl.). Accordingly, and depending on the year and site, body mass in SE Morocco is c. 4-17% lower than in N Morocco, indicating that some refuelling takes place after crossing the Sahara. Similar behaviour is observed in Tunisia, where birds trapped at Gabès near the Saharan border are c. 10% lighter than c. 300 km further north (Castan, 1960; Waldenström et al., 2004).

Stopover

The percentage of retraps and stopover lengths are rather low (somewhat higher in the wet Balearics probably due to the inclusion of local breeding birds; fig. 5, table 2). There are no significant differences in the average initial body mass between retrapped and non-retrapped birds. Although biometrical data strongly indicates that birds can refuel either in NW Africa or en route through Europe and the islands, stopover data fail to reveal any clear pattern as fuel deposition rates are not significantly different from zero in all cases. This lack of correspondence is probably due to methodological drawbacks. In S Tunisia and SE Morocco other studies show that birds certainly fatten up to some degree during their stay of up to 16 days in the area (Castan, 1960; Ash, 1969; Gargallo et al., unpubl.).

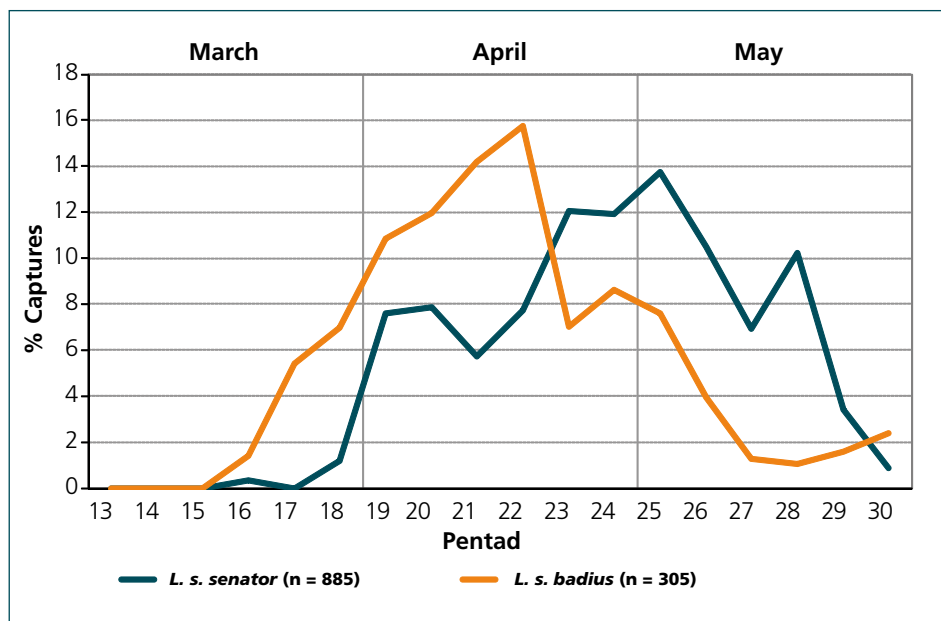


Figure a. Temporal variation in the frequency of captures of *L. s. senator* and *L. s. badius* (data from the Balearic islands only).

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

	n	Wing	Third primary	Body mass	Fat score
Catalonia	220	97.1 \pm 3.0 (88.5-105.0)	73.5 \pm 2.6 (67.0-81.0)	30.7 \pm 3.8 (24.5-43.0)	1.5 \pm 1.1 (0-5)
Columbrets	595	96.9 \pm 3.1 (89.0-105.5)	73.1 \pm 2.6 (66.5-81.5)	29.3 \pm 3.7 (22.3-41.2)	0.9 \pm 0.8 (0-4)
Balearics (dry)	1,276	97.1 \pm 3.5 (86.0-106.0)	73.3 \pm 2.9 (65.0-81.5)	31.6 \pm 4.3 (22.5-46.0)	1.5 \pm 1.0 (0-6)
Balearics (wet)	15	101.3 \pm 2.0 (98.0-104.0)	76.5 \pm 1.7 (74.0-79.5)	37.1 \pm 2.8 (33.3-44.3)	1.7 \pm 0.8 (1-3)
Chafarinas	14		71.9 \pm 2.1 (69.5-76.0)	28.2 \pm 2.2 (22.7-31.1)	0.4 \pm 0.9 (0-3)
N Morocco	10	94.9 \pm 2.1 (91.5-98.5)	72.0 \pm 1.9 (69.5-76.0)	30.6 \pm 2.2 (28.1-33.7)	2.5 \pm 1.1 (1-4)
S Morocco	52	94.5 \pm 2.2 (89.5-98.0)	71.9 \pm 2.0 (68.0-75.5)	26.1 \pm 1.4 (23.6-30.4)	1.1 \pm 0.5 (0-3)
Balearics (dry) <i>senator</i>	609	95.7 \pm 2.9 (86.0-106.0)	72.3 \pm 2.6 (65.0-81.5)	29.6 \pm 3.2 (22.5-43.7)	1.5 \pm 0.9 (0-5)
Balearics (dry) <i>badius</i>	274	100.2 \pm 2.5 (87.0-106.0)	75.3 \pm 2.1 (67.0-81.0)	35.8 \pm 3.1 (24.0-46.0)	1.6 \pm 1.0 (0-5)

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

	Catalonia	Columbrets	Balearics (dry)	Balearics (wet)	Chafarinas	N Morocco
All retraps	-0.59 \pm 0.89 (21)	-0.15 \pm 0.66 (24)	0.21 \pm 0.32 (112)	-0.64 \pm 0.91 (2)		
Retraps >1 day	0.19 \pm 0.30 (7)	-0.41 \pm 0.50 (13)	0.01 \pm 0.26 (51)			

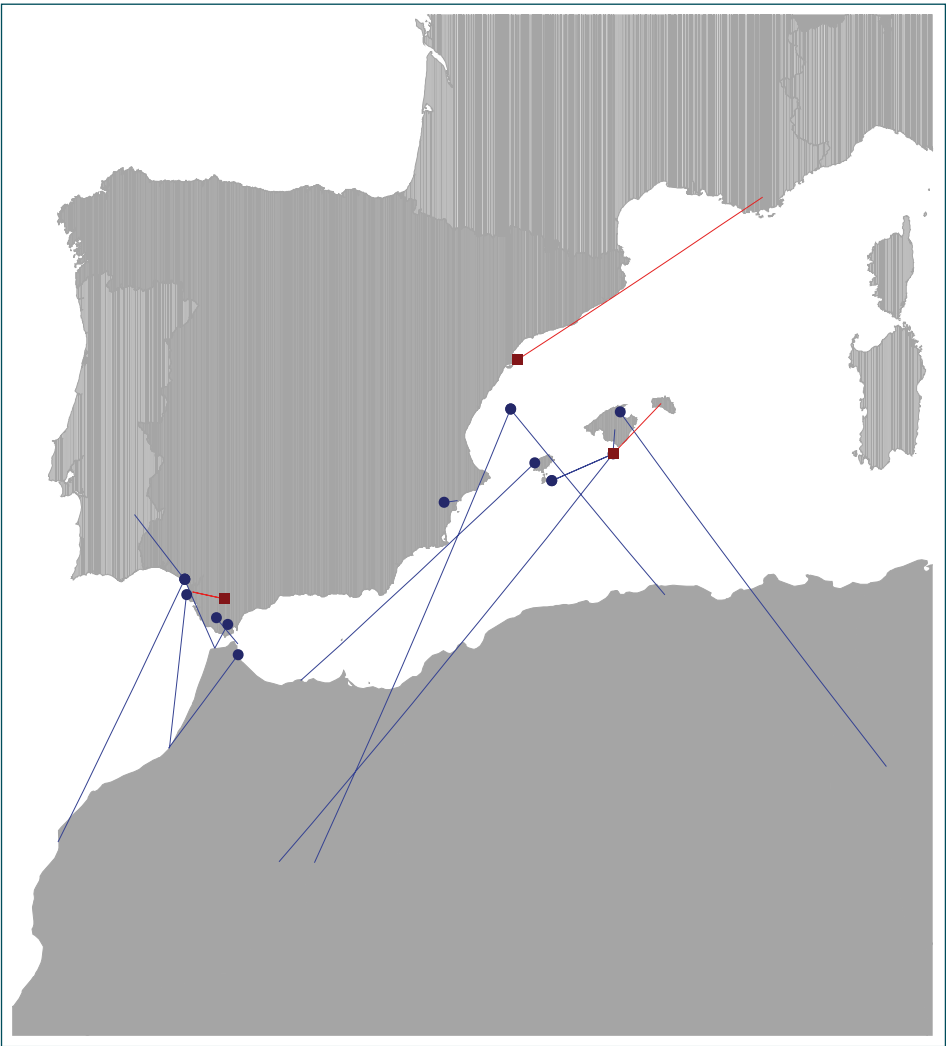


Figure 1. Map of recoveries of birds captured in the study area during the study period (March to May).

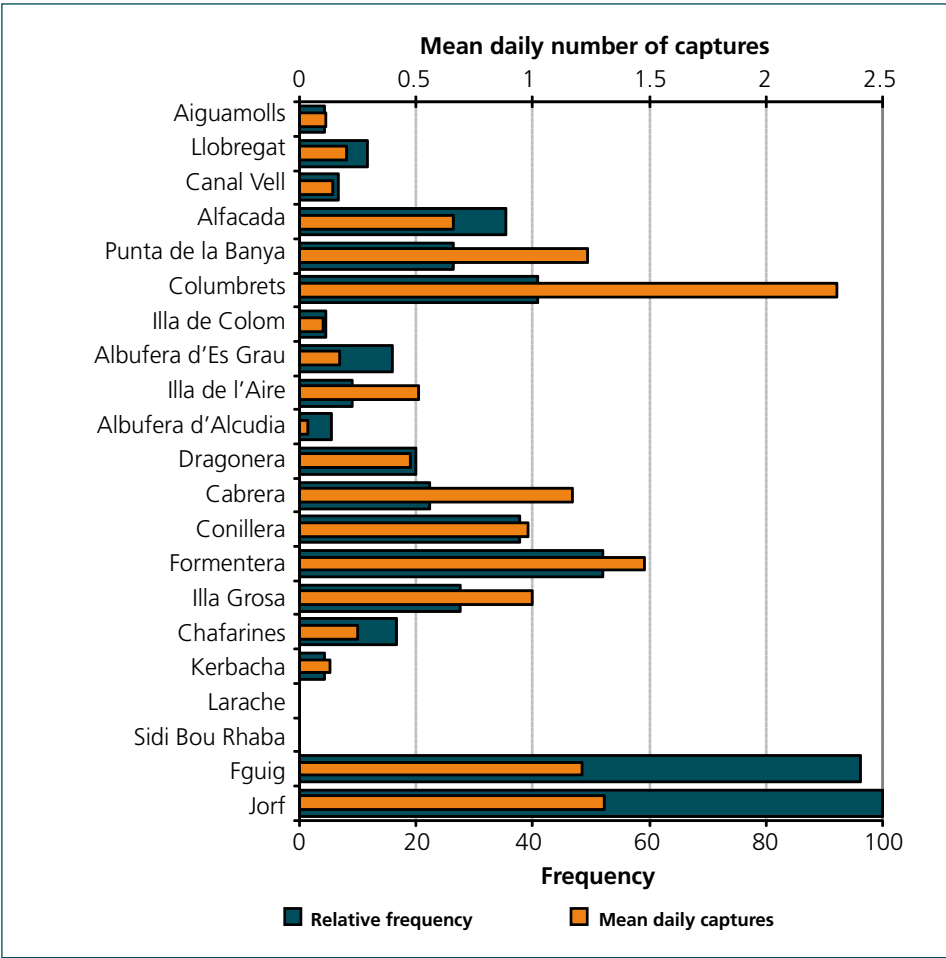


Figure 2. Relative frequency of captures and mean daily numbers according to site during the standard period (16 April to 15 May).

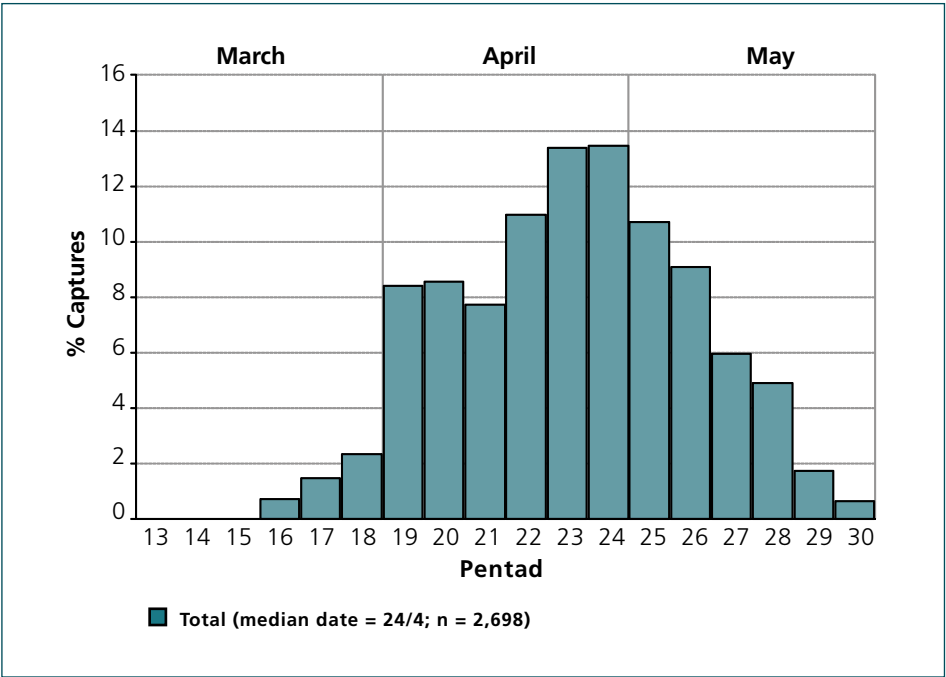


Figure 3. Frequency of captures during the study period.

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

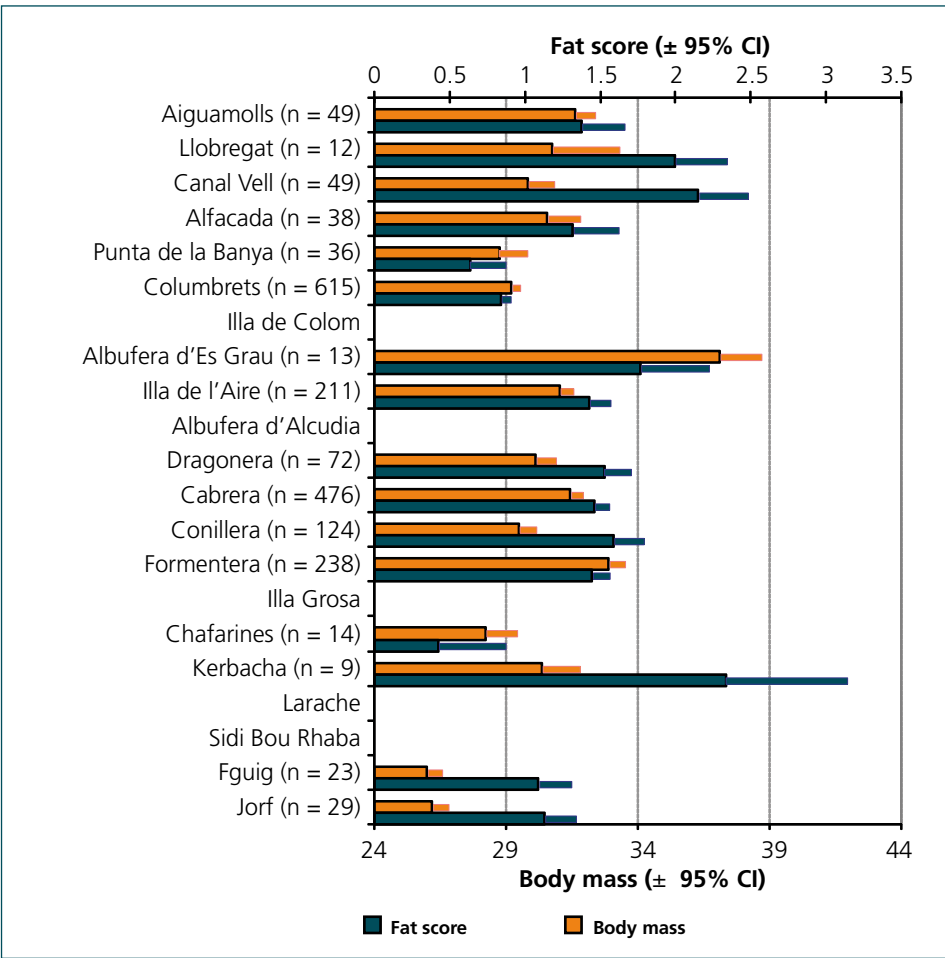
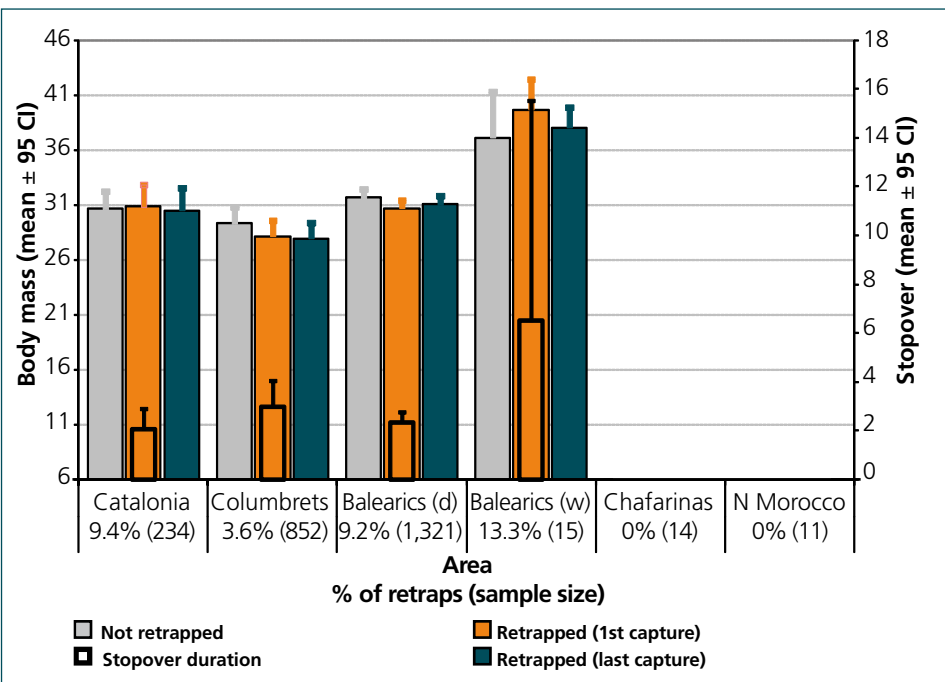


Figure 5. Variation in body mass by trapping status, minimum stopover length and frequency of retraps according to area.



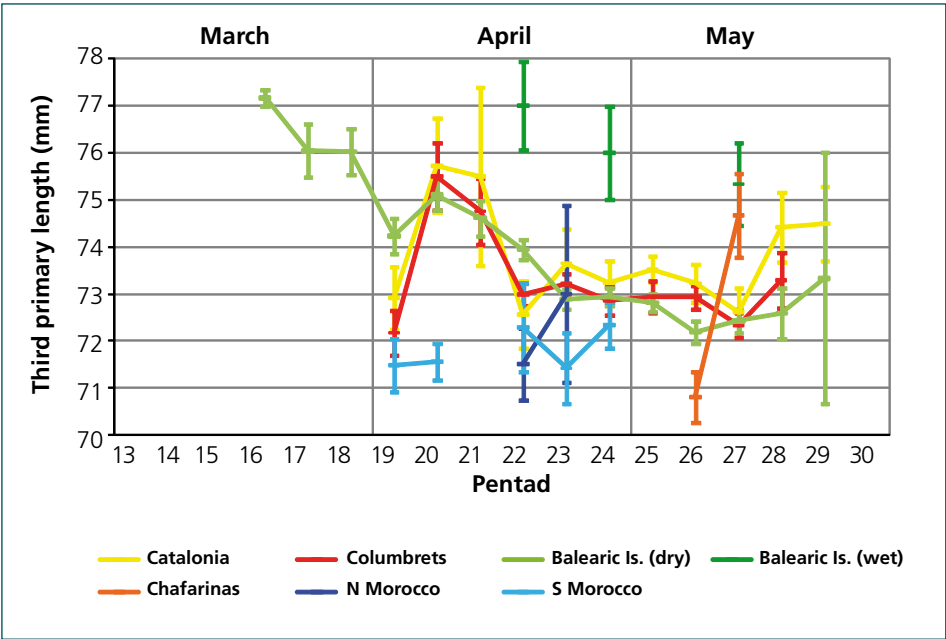


Figure 6. Temporal variation of third primary length according to area.

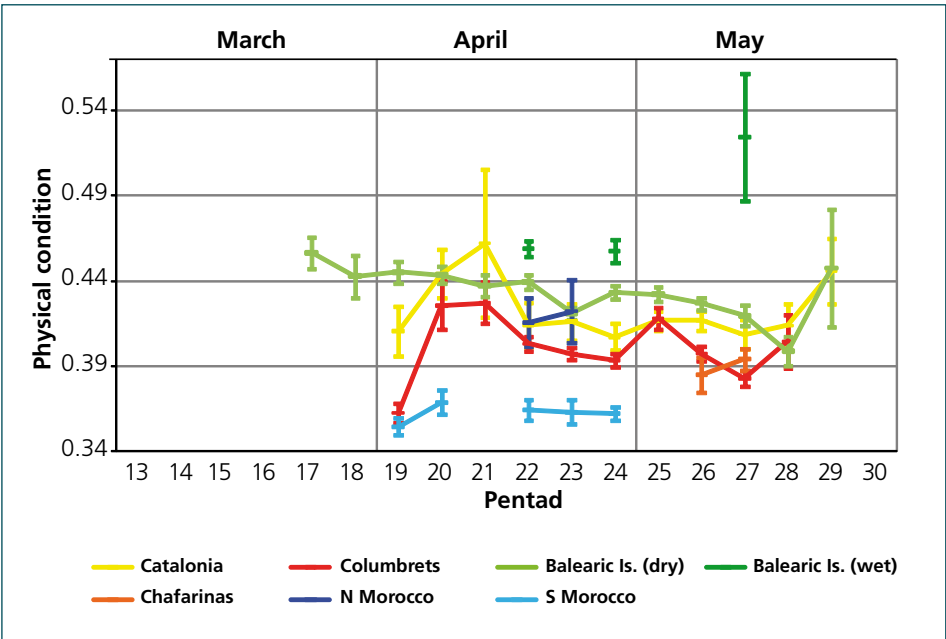


Figure 7. Temporal variation of physical condition according to area.

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

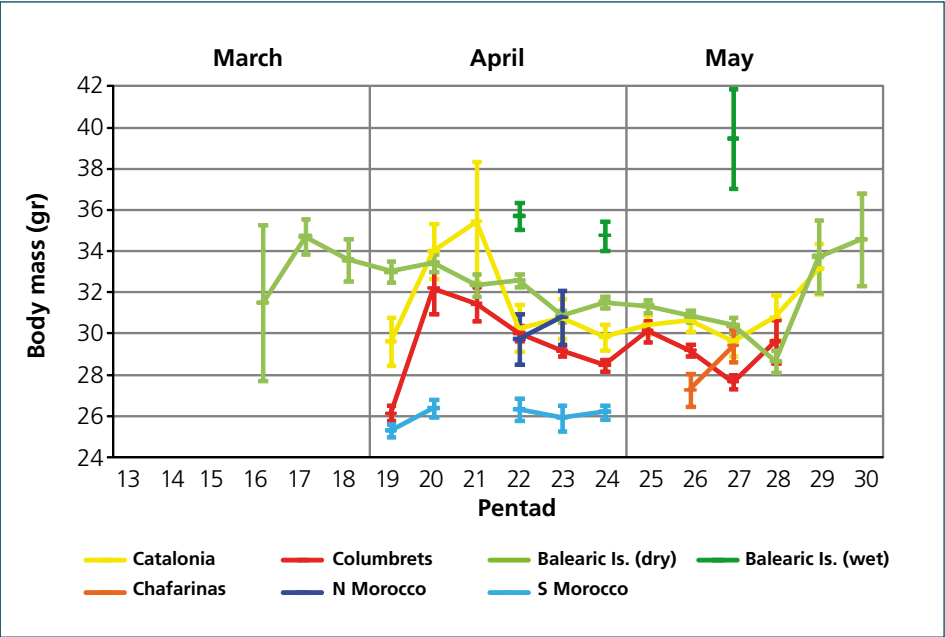


Figure 9. Temporal variation in fat score according to area.

