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## Relationships among wing length, wing shape and migration in Blackcap *Sylvia atricapilla* populations

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Wing length was measured and wing formula recorded for 182 male Blackcaps. These two characters were closely related; frequencies of the three different wing formulae vary in relation to wing length, so that the pointed wing is mostly recorded for longer wings, while the rounded one has a higher frequency among birds with shorter wings. It is suggested that wing formula and wing length are closely related to the migratory tendency of each Blackcap population. Southern populations have a shorter wing, and a rounded one; ringing data show them to be resident or only partially migrant. We suggest that the altitude of breeding areas has the same effect on the population morphology as latitude. In two Sicilian populations of Blackcaps, that breeding at 1700 m has a longer and more pointed wing than that breeding around sea level.

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### INTRODUCTION

One morphological adaptation for migration is a long and pointed wing (Mead 1983).

The more pointed wing is due to differences in primary lengths, so that the wing tips have a rounded or pointed shape depending on the relative lengths of the outermost primaries. In the genus *Sylvia* the wing shape is considered to be adapted to the habitat characteristics (Leisler 1980). The Blackcap *Sylvia atricapilla* is known to have different wing shapes; more pointed in north European populations, well known to be migrants (Williamson 1976, Debussche & Isenmann 1984, Svensson 1984), rounded in southern populations, Gibraltar (Finlayson 1981) and Sicily (Lo Valvo et al. 1985), which are considered to be resident.

While wing length of Blackcaps shows clinal variation with latitude (Klein et al. 1973, Debussche & Isenmann 1984) little is known about relationships between wing formula and latitude or factors such as migratory tendency of the populations.

### METHODS

This study has been carried out with 182 male

Blackcaps, 152 caught in Sicily and Lombardy (north Italy) with mist nets; and 30 skins preserved in the following museums: Museo civico di Storia Naturale di Milano, Museo civico di Terrasini (Palermo), Museo civico di Randazzo (Catania) and Museo di Zoologia dell'Università di Palermo.

Wing length (maximum chord) and weight were measured and the position of the 2nd primary recorded, distinguishing three different categories:

1. wing showing the tip of the second primary between the 5th and the 6th (2nd > 6th).
2. wing showing the tip of the second primary at the same level with the 6th (2nd = 6th).
3. wing showing the tip of second primary between the 6th and 7th or between the 7th and the 8th (2nd < 6th).

Wing formula does not change after a bird has been skinned (Mead 1977), allowing data from museum skins to be added to data from live birds.

### RESULTS

The wing length of the Blackcap is known to show clinal variation, decreasing toward the southern parts of the range. The weight of Blackcaps varies, between populations, with wing length, and is genetically determined (Berthold & Querner 1982).

The same relationships can be seen between wing length and weight of Blackcaps ringed in Sicily (Fig. 1).

RINGING AND MIGRATION

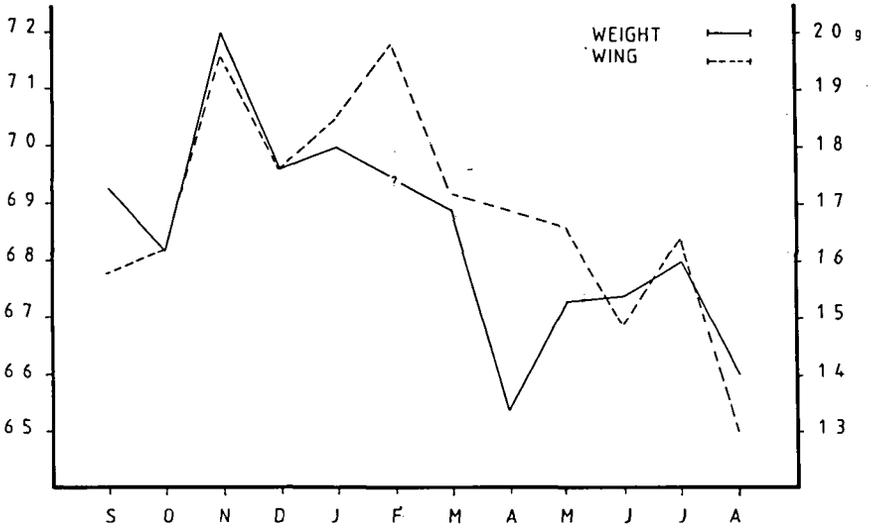


Figure 1. Wing length and weight in the Blackcaps ringed in Sicily (except Etna data) (n = 64 birds).

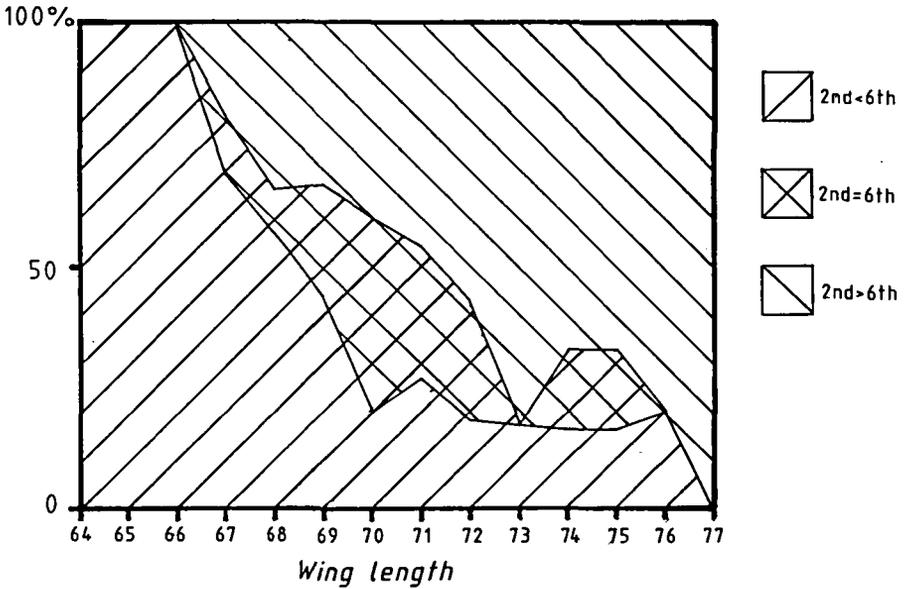


Figure 2. Relationship among wing length and frequencies of the three different wing formulas (n = 182 birds).

Moreover, as shown in Figure 2, there is evidence of a relationship between wing length and wing formula. The frequencies of the three wing formulae vary as follows: the pointed wing ( $2nd > 6th$ ) is mostly recorded for longer wings ( $> 72$  mm), while the rounded shape ( $2nd < 6th$ ) has a higher percentage for shorter wings ( $< 68$  mm); the intermediate wing formula ( $2nd = 6th$ ) is mostly recorded for intermediate values of wing length.

In Figure 3 is shown the presence of the three wing formulae in 57 birds ringed in Sicily at different times during the year.

Furthermore, we observed that the same differences noticed for populations breeding at different latitudes occurs at different altitudes. Blackcaps breeding at 1700 m on Etna volcano ( $n = 8$ ) have a mean wing length of 70 mm and 40% of them have a pointed wing formula, while in another ringing station on the sicilian coast ( $n = 21$ ) breeding Blackcaps have a shorter wing (66 mm) and all of them have a rounded wing formula.

## DISCUSSION

The northern populations are prevalently migrant. Just a few individuals winter in their breeding areas, for example in Great

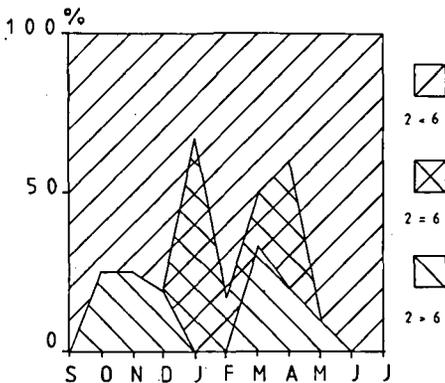


Figure 3. Frequencies of the different wing formulae in the Blackcaps ringed in Sicily at different times of year ( $n = 77$ ).

Britain (Langslow 1979, Simms 1985) and central Europe (Debussche & Isenmann 1984). These populations have a longer and more pointed wing, which is an adaptation to migration.

On the other hand, southern populations are mostly resident, as demonstrated from recovery data of ringed birds at Gibraltar (Finlayson 1981) and Sicily (Lo Valvo et al. 1985, La Mantia 1985). Also the island subspecific populations (*atlantis*, Azores Is.; *heinken*, Madeira and Canary Is.; *koenigi*, Balearic Is.; *paluccii*, Sardinia and Corsica) are considered resident (Williamson 1976). All these populations have a shorter and rounded wing.

This relationship among wing length, wing formula and migratory trends was also found in the German population of the Dunnock *Prunella modularis* (Mead 1983), in some species of the genus *Phylloscopus* (Gaston 1974, Lovei 1983) and in the Firecrest *Regulus ignicapillus* (Scebba & Lovei 1986).

The Sicilian populations seems to follow this rule, as shown in Figures 1 and 3. The pointed wing formula is recorded only during migration, while the rounded one, typical of the breeding population, is recorded during the whole year, due to the fact that Sicilian Blackcaps are resident. The intermediate wing formula is recorded during the winter, and this could indicate that the origin of the Blackcaps wintering in Sicily is Central Europe because these populations probably have high percentages of this wing formula, together with an intermediate wing length.

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