

## Record of an intermediate form between *Orthetrum coerulescens* (Fabricius) and *O. anceps* (Schneider) in southern Spain (Anisoptera: Libellulidae)

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A transitional male of the *Orthetrum coerulescens* complex was collected at El Romeral, Malaga, Spain in 1991 - the first such record for the Iberian Peninsula. The structure of the genitalia is illustrated and compared with typical forms of *O. coerulescens*, *O. anceps* and intermediate forms from Sicily.

### Introduction

*Orthetrum coerulescens* and *O. anceps* are two closely related taxa which are difficult to separate. In particular there is no reliable method of distinguishing between the females (e.g. BARTENEFF, 1930; MAUERSBERGER, 1994; KLINGENBERG, 1994). Both taxa occur in the Palearctic. The main range of *O. coerulescens* is northwestern Europe, whilst *O. anceps* occurs chiefly in North Africa, Sardinia, the southern Balkans and the Near East. Their ranges overlap in the Balkans (MAUERSBERGER, 1994) and Sicily (KLINGENBERG, 1994). Males with features intermediate between the two taxa have been recorded within populations both in The Mediterranean and the Balkans, especially in the areas of overlap (BARTENEFF, 1930; ADAMOVIC, 1967; DUMONT, 1977a, 1977b; CARFI et al., 1980; MAUERSBERGER, 1985, 1994; PETERS & HACKETHAL, 1987; ASKEW, 1988; KLINGENBERG, 1994).

*O. anceps* occurs on the African side of the Straits of Gibraltar. *O. coerulescens* is known only on the Iberian side, (e.g. FERRERAS-ROMERO, 1989; OCHARAN LARONDO, 1987), except for one doubtful female record from North Africa given by McLACHLAN (1889). Though, in a distribution map, BARTENEFF (1930) suggested *O. anceps* might occur in southern Spain (Fig. 1) and DUMONT (1977b) also expected *O. anceps* or intermediates between *O. coerulescens* and *O. anceps*, records of such are lacking.

The first record of an intermediate form of *O. coerulescens* and *O. anceps* in southern Spain is presented here. It is compared with intermediates from Sicily (KLINGENBERG, 1994).

### Material and methods

One male of the *O. coerulescens* species complex was collected near El Romeral, Malaga, South Spain, on 19.10.1991. It was examined and the following features recorded: abdominal length, left forewing length, pterostigma length, number of cells between veins  $M_3$  and  $M_4$  in left forewing, number of doubled cells between veins  $Rs$  and  $R_{4+5}$ , and form of the anterior lamina of the accessory genitalia. The data were compared with the results from KLINGENBERG (1994). Measurements were made with dial calipers, the accessory genitalia were recorded by drawings and macro-photography.

## Results

The male specimen has features typical of the *Orthetrum coerulescens* complex. Each wing, except the left hindwing, has one cell doubling between the veins Rs and Rspl. Blue pruinosity covered the abdomen completely, and reached the metathorax. The frons was dark. The pterostigmas were reddish-brown, and the membranules whitish. Compared with the intermediate forms from Sicily, it was larger than the average (Tab. I), and the number of cells between the veins  $M_3$  and  $M_4$  in the left forewing, 21, was also slightly above average (cf. Fig. 2).

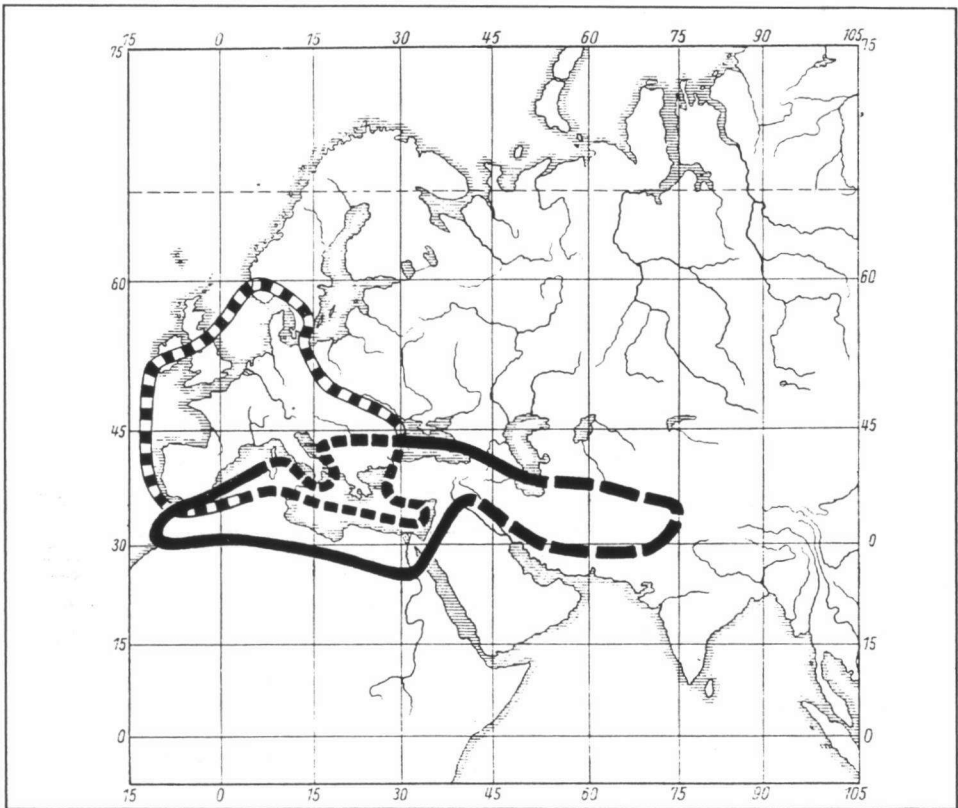


Fig. 1: Distribution of *O. coerulescens* (dotted line) and *O. anceps* (continuous line) after BARTENEV (1930). Intermediate forms were recorded by KLINGENBERG (1994) in the overlapping ranges in Sicily.

The anterior lamina of the accessory genitalia (Fig. 3a) shows features intermediate between *O. coerulescens* and *O. anceps* and is very similarly shaped to those of the males of the intermediate population from Sicily (Fig. 3d). Typical *O. coerulescens* males have an anterior lamina projecting nearly at right angles to the ventral surface of the abdomen and at its apex slightly inflated and rounded (Fig. 3b); whereas typical *O. anceps* males in profile have a more pointed and triangular anterior lamina (Fig. 3c).

## Discussion

For more than 100 years the taxonomic relationship between *Orthetrum coerulescens* (Fabricius, 1798) and *O. anceps* (Schneider, 1845) has been under discussion (e.g. BARTENEV, 1930; LIEFTINCK, 1966; BUCCIARELLI, 1971; DUMONT, 1977a; CARFI et al., 1980). This is due to the similarity of the females and the fact that intermediate males exist (e.g. BARTENEV, 1930; DUMONT, 1977a, b; MAUERSBERGER, 1994; KLINGENBERG, 1994).

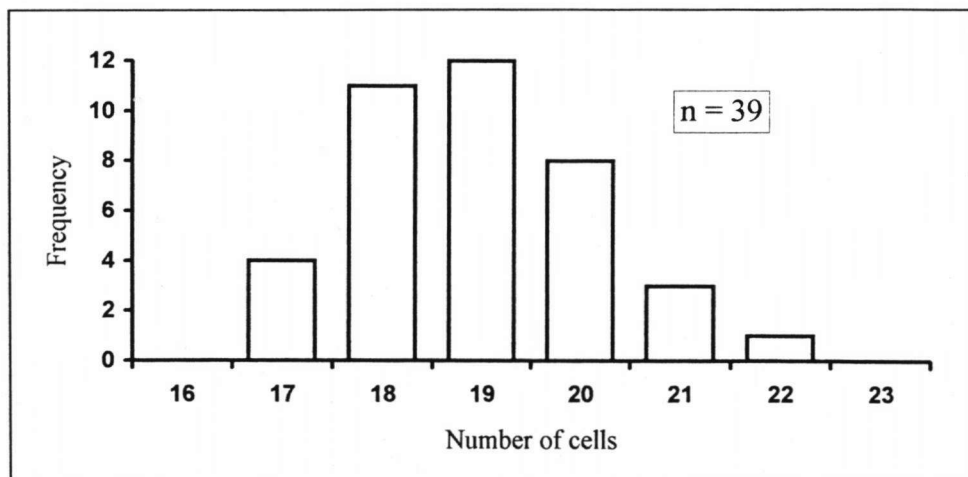


Fig. 2: The number of cells between the veins  $M_3$  and  $M_4$  in the left forewing of the males from Sicily (KLINGENBERG, 1994).

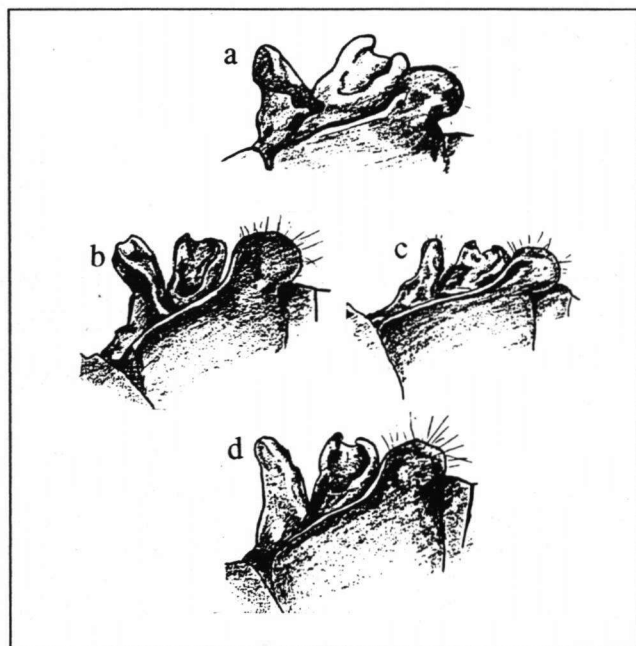


Fig. 3: Accessory genitalia of males of the *Orthetrum coerulescens* complex in lateral view. (a) Intermediate from Malaga. (b) Typical *O. coerulescens* from the Crau, southern France. (c) Typical *O. anceps* from Sardinia. (d) Intermediate from Sicily.

MAUERSBERGER (1994) examined several museum collections from all over Europe, and concluded that transition forms can be found in the morphological features which are used to differentiate between *O. coerulescens* and *O. anceps*. He, however, only described typical *O. coerulescens* males from the Iberian Peninsula (comp. Fig. 3b). KLINGENBERG (1994) showed, after comparative field and molecular genetic analyses within and between seven populations in Germany, France, Italy and North Africa, that intermediate males, which possess a great variation capacity, mainly occur in Sicily. BILEK (1967) pointed out that transitional features within one population can also be seen in Greece.

Table I: Measurements of the intermediate male from Malaga, southern Spain (leg. A. Martens), and of intermediate males from Sicily (KLINGENBERG, 1994). All measurements are in mm.

	Spanish intermediate male	Intermediate males from Sicily			
		mean	min.	max.	n
abdominal length	28,85	26,79	24,30	28,85	80
forewing length	31,65	30,05	27,50	32,40	80
pterostigma length	3,85	3,36	3,06	3,60	40

Until now, there have been no records of intermediate males between *O. coerulescens* and *O. anceps* occurring in the Iberian Peninsula. On the other hand, it is not unlikely that gene flow between African *anceps* and Iberian *coerulescens* may occur and intermediate populations on both sides of the Straits of Gibraltar exist. Our main reason for concluding that the male from Malaga is an intermediate between *O. coerulescens* and *O. anceps*, is the form of the anterior lamina (Fig. 3a). It is not possible at this stage to conclude whether intermediates are products of a divergence process, which leads to two (or even more) separate species, or a result of hybridisation between well established species. However, the fact that intermediates exist may require a re-assessment of whether *Orthetrum coerulescens* and *O. anceps* are two good species. MAUERSBERGER (1994) and KLINGENBERG (1994) therefore suggested to treat them as subspecies.

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