

## KEY TO THE LARVAE OF EUROPEAN *ORTHETRUM* NEWMAN (ANISOPTERA: LIBELLULIDAE)

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Based on laboratory reared material, a descriptive key is presented of the ultimate instar larvae (exuviae) of 8 spp., viz. *albistylum* (Sel.), *anceps* (Schneider), *brunneum* (Fonsc.), *cancellatum* (L.), *chrysostigma* (Burm.), *coerulescens* (Fabr.), *nitidinerve* (Sel.) and *trinacria* (Sel.). The previous descriptions are critically discussed, and some additional structural features for species separation are stated.

### INTRODUCTION

Current available keys to the European *Orthetrum* larvae are either regional or selective: GARDNER, 1954 (UK.); CONCI & NIELSEN, 1956 (Italy); FRANKE, 1979 (Central Europe); CARCHINI, 1983 (Italy); BELLMAN 1987 (Central Europe); CONESA GARCIA 1990 (Spain).

ASKEW (1988) draws together a selection of published larval keys, but excludes *O. trinacria* and *O. anceps*. CONCI & NIELSEN (1956) figure detailed illustrations, including a much copied atypical labium of *O. coerulescens* (p. 265 fig. 149 and explained p. 266 note [1]). CARCHINI (1983) does not appear to separate *O. anceps* and *O. coerulescens*, particularly with respect to the presence or absence of dorsal abdominal spines (cf. BUTLER, 1992). KUMAR (1971) states that *O. brunneum* has large dorsal abdominal spines – certainly not the case in European individuals of this species, although this is a feature on which FRANKE (1979) is also unclear – and BELYSHEV (1973) describes it as having no lateral spines.

*O. nitidinerve* has been described as either having no lateral spines (CONESA GARCIA, 1990), or lateral spines only on segment 8 (NIELSEN, 1955), larvae and exuviae examined have shown these details so far to be incorrect (BUTLER, 1992).

With these current omissions and contradictions in mind, a first attempt is made to produce a key to the larvae of the relatively few but problematic European species of this genus.

#### MATERIAL AND METHODS

Larvae of all eight species were reared in UK. Adults were obtained from all except for *O. trinacria*, larvae of which died at F-1. The distinctive exuviae of this species were obtained from a site where it was flying in numbers. Material was pinned, cleaned and set with the labium extended, but not flattened. It was then examined using x40 magnification.

*O. albistylum* (Sel., 1848). – Brenne, France, 13-VIII-1989; – Aliakamon River, Thessaloniki, Greece, 28-VII-1992. – [11 larvae, 3 exuviae].

*O. brunneum* (Fonsc., 1837). – River Verdoule, Quissac, France, 10-VIII-1989; – Aliakamon Delta, Thessaloniki, Greece, 21-VIII-1990; – El Burgo, Andalucia, Spain, 20-VIII-1991. – [12 larvae, 14 exuviae].

*O. cancellatum* (L., 1758). – Brenne, France, 13-VIII-1989; – Aliakamon Delta, Thessaloniki, Greece, 21-VIII-1990; – Adra, Spain, 27-VIII-1991; – Henlow, Bedfordshire, UK, 29-VI-1979. – [22 larvae, 41 exuviae].

*O. chryso stigma* (Burm., 1839). – El Burgo, Andalucia, Spain, 20-VII-1991, 25-IX-1992, J. Mason). – [9 larvae, 10 exuviae].

*O. coerulescens* (Fab., 1798). – Albufera, Majorca, Spain, 28-VIII-1987; – Cramer Gutter, Shropshire, UK, 13-VIII-1991; – New Forest, Hants, UK, 1-VIII-1982. – [29 larvae, 56 exuviae].

*O. nitidinerve* (Sel., 1841). – Churriana, Malaga, Spain, 20-IV-1990, 21-VII-1991. – [3 larvae, 3 exuviae].

*O. anceps* (Schneider, 1845). – Stavros, Thessaloniki, Greece; 10-VIII-1990, 4-VIII-1992; – Petres River Gorge, Rethymnon, Crete, Greece, 6-IV-1991, R.G. Kemp). – [12 larvae, 10 exuviae].

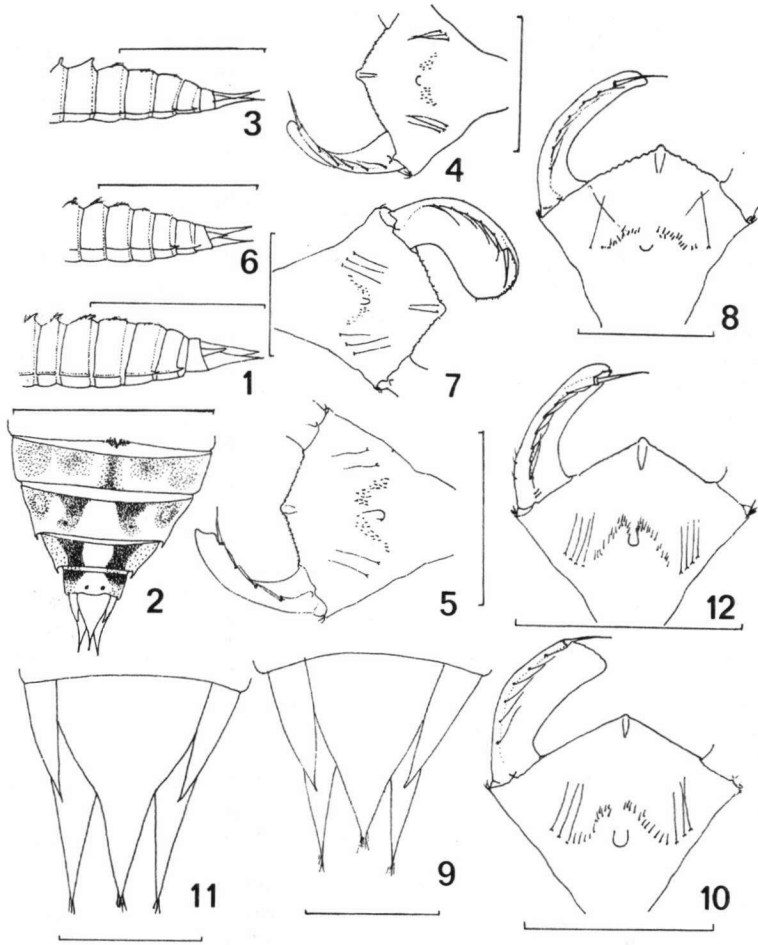
*O. trinacria* (Sel. 1841). – Adra, Spain, 27-VIII-1991. – [3 larvae, 20 exuviae].

Although the number and distribution of labial and mental setae are important specific characteristics, a few individuals show slight variations in this respect, therefore other features have been used as primary separation characters where possible. Also short descriptions have been added in order to reinforce identification.

Maximum/minimum published lengths are given, however the overlapping of related species and the tendency of both larvae and exuviae to telescope reduces the value of precise measurement as an identification feature. Finally the need to prepare specimens in order to check the presence or absence of abdominal spines (BUTLER, 1992), cannot be overstressed.

#### DESCRIPTIVE KEY

- 1 Some abdominal segments with dorsal spines ..... 2  
No dorsal abdominal spines ..... 4
- 2 Final instars smaller than 23 mm. Dorsal spines on segments 4-7, labial palps with 3 (rarely 4) setae (Fig. 5) ..... *coerulescens*  
(Dorsal spines often hidden by dirt and surrounding setae. Mid to dark brown, epiproct relatively short, length 16-20 mm).
- Final instars larger than 23 mm ..... 3
- 3 Dorsal spines on segments 6,5 and 4 (Fig. 1). Ratio length/width of epiproct  $\approx 2$  ..... *cancellatum*  
(Paired spots noticeable on the dorsal abdominal surface of clean larvae and exuviae (Fig. 2);



Figs 1-12. Structural features of the European *Orthetrum* larvae: (1-2) *cancellatum* (L.); - (3-4) *trinacria* (Sel.); - (5) *coeruleascens* (Fab.); - (6-7) *albistylum* (Sel.); - (8) *nitidinerve* (Sel.); - (9-10) *brunneum* (Fonsc.); - (11-12) *chrysostigma* (Burm.). - [Figs 1, 3, 6: abdomen, lateral view, scale bar 10 mm; - Fig. 2: abdomen, dorsal view, scale bar 7 mm; - Figs 4-5, 7-8, 10, 12: labia, dorsal view, scale bar 3 mm; - Figs 9, 11: anal appendages, dorsal view, scale bar 1 mm].

on segments 9 and 10 of live larvae there is a pale area contained within the spots, labial palps with 8 setae, length 23-28 mm).

- Dorsal spines on segments 4 and 5 only (Fig. 3). Epiproct lengthened, ratio length/width at least 2,5 ..... *trinacria*  
(No abdominal spotting as above, but noticeable darkening both dorsally and ventrally on last three segments, labial palps with 5 setae (Fig. 4), length 23-30 mm).
- 4 Labial palps with 5 or less setae ..... 5

- Labial palps with more than 5 setae ..... 6
- 5 Long epiproct, ratio  $l/w \simeq 2$ . Total length  $> 20$  mm ..... *albistylum*  
(Large larva similar to *O. cancellatum*, but with less pronounced abdominal spotting and mid-dorsal clumps of setae, and no spines (Fig. 6). Segments 8, 9 and 10 with dark brown suffusion dorsally and ventrally. Labial palps with 5 setae (rarely 6) (Fig. 7), length 23 mm).
- Short epiproct, ratio  $< 2$ . Total length  $< 20$  mm ..... *anceps*  
(Close in appearance to *O. coerulescens*, but without dorsal spines and generally a lighter brown colour when cleaned, labial palps with 3 setae, (see also Fig. 5), length 16-18 mm).
- 6 Prementum with single long outer setae ..... *nitidinerve*  
(Mid brown appearance, few markings and little coloration. Labial palps with 6 setae, (Fig. 8), length 20-22 mm).
- Prementum with several long outer setae ..... 7
- 7 Prementum with 3 long setae. Total length  $\simeq 20$  mm ..... *brunneum*  
(Variable in coloration and size. Epiproct almost equilateral in dorsal view (Fig. 9), labial palps with 6 (rarely 7) setae, (Fig. 10), length 18-22 mm).  
Prementum with 4+ long setae. Total length  $< 20$  mm ..... *chrysostigma*  
(Mid to dark brown in colour. Epiproct with more slender isoscelid appearance (Fig. 11), labial palps with 7 (rarely 8) setae, (Fig. 12), 18-19 mm).

## DISCUSSION

All eight species occur in both still and running water bodies. In Europe, *O. cancellatum* appears to inhabit the widest range of habitats, including lakes, ponds, gravel pits, marshes, peat bogs, ditches, streams and slow flowing large rivers. *O. coerulescens* inhabits all but the larger lakes and rivers. *O. nitidinerve* has been recorded up to an altitude of 2300 m. (ASKEW, 1988), whilst *O. brunneum* is deemed a lowland species (ROBERT, 1958). Larvae are almost always found concealed in mud, the presence or absence of vegetation does not appear to be significant. Exuviae are commonly found on vertical emergent vegetation at the margins of water bodies, mostly at heights ranging from 10 - 90 cm above the ground.

### MORPHOLOGICAL FEATURES

**O v e r a l l l e n g t h** (interspecific overlaps reduce this as a valuable feature, but three main groups can be discerned). - (1) *albistylum*, *trinacria*, *cancellatum*:  $> 22$  mm; - (2) *brunneum*, *chrysostigma*, *nitidinerve*: 18-22 mm; - (3) *coerulescens*, *anceps*: 16-20 mm.

**A b d o m e n**. - Dorsal spots can be seen in clean specimens of *albistylum*, *brunneum* and *anceps*, less so in *chrysostigma* and *coerulescens*. The boldest marking is in *cancellatum*. Markings can be enhanced by wetting dirty specimens of larvae and exuviae.

**A n a l a p p e n d a g e s**. - These are noticeably long in *albistylum*, *cancellatum* and *trinacria*. The overall shape of the epiproct also seems to be a reasonable separation feature between *chrysostigma* and *brunneum*.

**Lateral spines.** — These are present on segments 8 and 9 in all European species, but particularly hard to detect without care in *brunneum* and *nitidinerve* (cf. BELYSHEV, 1973; CONESA GARCIA, 1990).

**Dorsal spines.** — These are present only in *cancellatum*, *coerulescens* and *trinacria*. In other species, particularly in *albistylum* and *anceps*, the combination of dorsal protuberances and clumps of setae give the impression of spines in both larvae and exuviae. Careful cleaning and observation are therefore vital to specific identification.

**Labium.** — The number and distribution of labial setae, although variable in a small percentage of individuals, is most important in the separation of *brunneum* and *chrysostigma* and will help to reinforce identification in other species.

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