

A KEY TO THE ITALIAN ODONATE LARVAE

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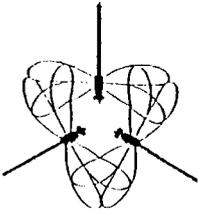
The correct spelling of the generic and family names is resp. Aeshna and Aeshnidae.

For technical reasons the Editors were unable to change the camera-ready manuscript.

The same applies to the incidental use of the term "nymph" instead of "larva".

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THE ITALIAN ODONATE LARVAE**

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## INTRODUCTION

The keys presented are based on the characters of Italian species for the sole purpose of species identification. Consequently, key divisions do not necessarily reflect taxonomic affinities between species. Genera have expressly not been incorporated because these sometimes include species that are somewhat dissimilar one from another. The following species are not included in the key:

Calopteryx xanthostoma (Charp., 1825), which was considered as a subspecies of C. splendens (Harris, 1782) until Dumont's work (1972), its distribution in Italy is limited to the Liguria Region. Recent finds are lacking. Larvae of Italian populations have not yet been described.

Coenagrion ornatum (Selys, 1850), which was gathered once in 1951 at one site only in the Apulia Region. Larvae of Italian population unknown.

Orthetrum nitidinerve (Selys, 1841), which was been found in Sicily and Sardinia only and is very rare. North African larvae have been described by Nielsen (1955) who did not absolutely ascribe them to said species. Other specimens recently gathered as larvae in Italy, have not yet been described.

Brachythemis leucosticta (Burm., 1839), in Italy only one adult captured in Sardinia and one spotting in Sicily.

Key-illustrating figures are all originals drawn from examples of Italian fauna except where otherwise specified.

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## KEY TO FAMILIES

( for larvae of all ages )

- 1 Abdomen terminating in three long tracheo-branchial thread-shaped lamellae, more or less flattened laterally (Fig. 1 a) (Zygoptera)..... 2
- Abdomen terminating in a pyramid formed by short, highly sclerotized appendages (Fig. 1 b)(Anisoptera)..... 9
- 2 Antennae with first segment approximately as long as remaining six segments all together (Figs. 2, 3)..... Calopterygidae
- Antennae with first segment shorter than some of remaining other segments (Fig. 1 a)..... 3
- 3 Prementum with short median cleft on distal margin (Figs. 7 a-e); distal margin of first palpal segment with a deep indentation, second segment with single row of long setae (Figs. 6 a-e).. Lestidae
- Prementum with no median cleft on distal margin (Fig. 11); distal margin of first palpal segment with two processes separated by shallow indentation, second segment with no long setae (Figs. 12 a, 14 a-d)..... 4
- 4 Wing sheaths present..... 5
- Wing sheaths not present ..... 6
- 5 Pronotum with tubercles (Fig. 10 a); first palpal segment with single row of long setae and more marginal row of shorter setae (Fig. 14 d).....Platycnemididae (Platycnemis pennipes)
- Pronotum with no tubercles (Fig. 10 b); first palpal segment with no marginal setae (Figs. 14 a-c)..... Coenagrionidae

- 6 Tarsi with at least two segments..... 7
- Tarsi with one segment only..... 8
- 7 Abdominal Segments 1 - 8 with dorsal tubercles.....  
 ..... Platycnemididae (Platycnemis pennipes)
- Abdominal Segments 1 - 8 with no dorsal tubercles.....  
 ..... Coenagrionidae
- 8 Head (frontal view) with two dorsal protuberances.....  
 ..... Platycnemididae (Platycnemis pennipes)
- Head (frontal view) with no dorsal protuberances.....  
 ..... Coenagrionidae
- 9 Prementum flat, palps do not cover upper labrum (Fig. 17 b).. 10
- Prementum concave, palps cover upper labrum (Fig. 17 a)..... 11
- 10 Antennae with 4 segments, the third one of which longer than  
 the others taken all together (Figs. 17 e & f).... Gomphidae
- Antennae with 4 or more segments, the third one of which shorter  
 than the others all together..... Aeschnidae
- 11 First palpal segment distal margin with a series of alternating  
 large and small teeth; bifid protuberance at centre of prementum  
 distal margin (Fig. 17 c).....Cordulegasteridae
- First palpal segment distal margin with a series of almost  
 identical crenations; non-bifid protuberance, if present, at  
 center of prementum distal margin (Fig. 17 g)..... 12
- 12 First palpal segment distal margin with deep and asymmetrical  
 crenations (Fig. 17 i); very long and thin legs having femurs  
 with few stiff setae (Fig. 29)..... Corduliidae
- First palpal segment distal margin with shallow and symmetrical  
 crenations (Fig. 17 h), or with deep and asymmetrical crenations  
 (Fig. 37 b) in which case there are short and stout legs having  
 femurs with numerous long, soft, hair-like setae (Fig. 33)...  
 ..... Libellulidae

## KEY TO SPECIES

( only to nymphs with posterior wing-sheaths)  
 (reaching the 2<sup>nd</sup> abdominal segment at least)

## Calopterygidae

- 1 Pronotum with long and pointed anterior processes; post-ocular lobes with long and pointed dorso-latéral processes (Figs. 3 a & d) ..... Calopteryx virgo (L.)
- Pronotum with shorter and less pointed anterior processes; post-ocular lobes with shorter and less pointed dorso-lateral processes (Figs. 3 b & c)..... 2
- 2 (Only for nymphs with dimensions within the values of Fig. 4) Sizes of prementum and lamellae that form points above the straight line are given in Fig. 4.....  
 ..... Calopteryx haemorrhoidalis (Vander Linden)
- Sizes of prementum and lamellae that form points below the straight line are given in Fig. 4.....  
 ..... Calopteryx splendens (Harris)

## Lestidae

- 1 Trapezoidal prementum (Fig. 7 a)..... 2
- Racket-shaped prementum ( Figs. 7 b - e)..... 4
- 2 Aboral branch distal margin of first palpal segment with a series of nearly equal, more or less regularly spaced, crenations (Fig. 6 a)..... Lestes viridis (Vander Linden)
- Aboral branch distal margin of first palpal segment with irregular crenations (Fig. 6 c)..... 3

- 3 First palpal segment aboral branch with a blunt tooth in latero-distal corner (Fig. 6 f).....  
 ..... Sympecma fusca (Vander Linden)
- First palpal segment aboral branch with pointed tooth in latero-distal corner (Fig. 6 g).....  
 ..... Sympecma paedisca (Brauer)
- 4 Prementum 4 - 5 times longer than its minimum width (Fig. 7 b).....  
 ..... Lestes macrostigma (Eversm.)
- Prementum 10 or more times longer than its minimum width (Figs. 7 c - e)..... 5
- 5 Caudal lamellae with almost parallel margins (Fig. 7 f).... 6
- Caudal lamellae with non parallel margins (Fig. 7 g)..... 7
- 6 Second palpal segment with three long setae (Fig. 6 b).....  
 ..... Lestes virens (Charp.)
- Second palpal segment with two long setae (Fig. 6 d).....  
 ..... Lestes sponsa (Hansem.)
- 7 (Only for nymphs with posterior wing-sheaths that cover 3<sup>rd</sup> abdominal segment at least) Prementum with two sets of 8 (rarely 7) long setae; prementum about 15 times longer than its minimum width (Fig. 7 d)..... Lestes barbarus (Fabr.)
- Prementum with two sets of 6 (rarely with a small 7th) long setae; prementum about 12 times longer than minimum width (Fig. 7 e) ..... Lestes dryas Kirby

#### Platycnemididae

Only one species present in Italy: Platycnemis pennipes (Pallas)

## Coenagrionidae

- 1 Eye ventral margin with no spine-shaped setae (Fig. 10.c)..2
- Eye ventral margin with spine-shaped setae (Fig. 10 d)....4
- 2 Prementum with 2 (rarely 4) long setae, and, between them, a variable number of small spine-shaped setae not aligned with the others (Figs. 11 a & 12 e)..... 3
- Prementum with more than 4 more-or-less long setae set in two rows, with no other setae between them (Fig. 12 d).....  
..... Pyrrhosoma nymphula (Sulzer)
- 3 Highly and irregularly convex post-ocular lobes (Fig. 10 f); distal margin of first palpal segment rounded upperly (Fig. 14 b)..... Ceriagrion tenellum (Villers)
- Post-ocular lobes slightly and uniformly convex (Fig. 10 e); distal margin of first palpal segment angled upwards (Fig. 14 a)..... Nehalennia speciosa (Charp.)
- 4 First abdominal segment ventral surface posterior margin with a row of spine-shaped setae (Figs. 13 b & d)..... 5 -
- First abdominal segment ventral surface posterior margin with no spine-shaped setae..... 7
- 5 Metasternum central area with no spine-shaped setae (Fig. 13 c)..... Erythromma viridulum (Charp.)
- Metasternum central area with group of spine-shaped setae (Fig. 13 b)..... 6
- 6 Some spine-shaped setae on mesothorax at insertion of 2<sup>nd</sup> pair of legs (Fig. 12 c)..... Erythromma najas (Hansem.)
- No spine-shaped setae on mesothorax at insertion of 2<sup>nd</sup> pair of legs..... Cercion lindeni (Selys)

- 7 Post-ocular lobes and occiput with small-spot colouring (Fig. 10 h)..... 8
- Post-ocular lobes and occiput, immaculate or with irregular colouring..... 9
- 8 Caudal lamellae with straight nodal line (Fig. 15 a).....  
..... Coenagrion hastulatum (Charp.)
- Caudal lamellae with undulated nodal line (Fig. 15 b).....  
..... Coenagrion puella (L.) and C. pulchellum (Vander Linden)
- 9 First palpal segment with small spine at base of most distal seta (Fig. 12 b)..... Enallagma cyathigerum (Charp.)
- No spine at base of aforesaid seta..... 10
- 10 Lateral carinae with spine-shaped setae no larger than other setae covering each abdominal segment (Fig. 16 e); dorsal surface of anterior femurs with numerous small spine-shaped setae (Fig. 13 e)..... Ischnura pumilio (Charp.)
- Lateral carinae with spine-shaped setae larger than those covering each abdominal segment, at least in the most caudal segments (Figs. 16 d & f); dorsal surface of anterior femurs with either a few small spine-shaped setae or with large and small spine-shaped setae together (Figs. 13 a,c,f & g).... 11
- 11 Lateral lamellae with a row of stout spine-shaped setae on ventral margin only (Fig. 16 b).....  
..... Coenagrion mercuriale (Charp.)
- Lateral lamellae with rows of large spine-shaped setae on ventral and dorsal margins, the dorsal row more often being sparser and shorter (Figs. 15 c, 16 a & c)..... 12

- 12 Anterior femur dorsal surfaces with few and relatively long, pointed spine-shaped setae (Fig. 13 f); unpigmented lamellae with main tracheation uniformly coloured.....  
 ..... Coenagrion scitulum (Rambur)
- Anterior femur dorsal surfaces with several long and short spine-shaped setae, the long ones sometimes being truncate (Figs. 13 a & c); lamellae with irregularly coloured tracheation..... 13
- 13 Short caudal lamellae, about 5 times longer than abdominal segment 10, highly pigmented (Fig. 16 a); legs and head with pointed and truncate setae.... Coenagrion caerulescens (Fonsc.)
- Long caudal lamellae, 7 or more times longer than abdominal segment 10, unpigmented but alternation of dark and light colouring of tracheation (Fig. 16 c); pointed setae on legs and head..... Ischnura elegans (Vander Linden) and I. genei (Rambur)

Species couples not differentiable with the key:

Coenagrion puella - C. pulchellum. Often cohabiting; C. pulchellum colour ranges from light to dark brown; caudal lamellae have rounded tip; ninth abdominal segment has lateral carinae with well-aligned row of spines; abdominal segment surface exhibits smaller spines than those on its hind margin; side profile of 9th abdominal segment dorsally ogival. C. puella colour may be yellow, brown or green; caudal lamellae with ogival tip, 9th abdominal segment with lateral carinae has set of poorly-aligned spines; side profile of 9th abdominal segment dorsally uniformly curved. These characters only refer to later instars and enable species to be differentiated but not absolutely.

Ischnura elegans - I. genei. Indistinguishable larvae, species do not always cohabit because I. genei is restricted to Sicily and Sardinia where I. elegans has not been found.

## Cordulegasteridae

- 1 Abdominal segments 8 and 9 with lateral spines (Fig 17 l)...  
 ..... Cordulegaster boltonii (Donovan)
- No lateral spines on abdominal segments 8 and 9 (Fig. 17 m).  
 ..... Cordulegaster bidentatus (Selys)

## Aeschnidae

- 1 Small eyes, in dorsal view occupying 1/3 of head lateral profile at most (Fig. 20 c); a blunt mid-dorsal spine on segment 9 (Fig. 21 c)..... Brachytron pratense (Müller)
- Large eyes, in dorsal view occupying more than 1/3 of head lateral profile (Figs. 20 a, b & d); no spines or other mid-dorsal processes on abdominal segments..... 2
- 2 Head lateral and posterior profiles, in dorsal view, form distinct angle (Fig. 20 d)..... Boyeria irene (Fonsc.)
- Lateral and posterior profiles of head that meet without forming an angle (Figs. 20 a & b)..... 3
- 3 Eyes, in dorsal view, longer than wide, ratio A/B less than 1 (see Fig. 20 a); outer profile of eyes with irregular curvature, bisection of internal angle of eye divides eye into two very dissimilar parts, the larger being the anterior one (Fig. 20 a); 6th abdominal segment with no lateral spines (Fig. 21 a)...4
- Eyes, in dorsal view, wider than long, ratio A/B more than 1 (see Fig. 20 d); outer profile of eyes with uniform curvature, bisection of internal angle of eye divides eye into two nearly equal parts (Fig. 20 d); segment 6 with lateral spines, sometimes only vestigial (Fig. 21 b)..... 6

- 4 Short prementum, length/width ratio less than 3/4; premental-postmental articulation posterior to coxae of 2<sup>nd</sup> pair of legs; presence of projection (lamella) on epiproct in males.....  
..... Hemianax ephippiger (Burm.)
- Long prementum, length/width ratio less than 3/4; premental-postmental articulation posterior to coxae of 2<sup>nd</sup> pair of legs; presence of projection (lamella) on epiproct in males..... 5
- 5 Male lamella, in dorsal view, approximately 1/2 length of cerci, narrower at distal apex than epiproct at same level (Fig. 22 h); ovipositor (in last instar) reaches 2/3 length of 9th abdominal segment..... Anax imperator (Leach)
- Male lamella, in dorsal view, about 1/3 length of cerci and wider, at distal apex, than epiproct at same level (Fig. 22 i); ovipositor (in last instar) reaches 1/2 length of 9th abdominal segment..... Anax parthenope (Selys)
- 6 Cerci longer than 1/2 of caudal pyramid (Fig. 22 g).....  
..... Aeschna isosceles (Müller)
- Cerci not longer than 1/2 of caudal pyramid..... 7
- 7 Supracoxal armature of prothorax pointed and long, ratio A/B less than 2.5 (Figs. 22 a, b & c)..... 8
- Supracoxal armature of prothorax blunt and short, ratio A/B more than 3 (Figs. 22 d, e & f).....10
- 8 Lateral spines of abdominal segment 9 long, reaching beyond 1/2 of segment 10, in ventral view ratio A/B less than 3.5 (Fig. 23 e); supracoxal armature of prothorax with long and pointed apices, curved and diverging (Fig. 22 c).....  
..... Aeschna grandis (L.)

- Lateral spines of abdominal segment 9 short, not reaching beyond 1/2 of segment 10, in ventral view ratio A/B more than 3.5 (Figs. 23 a & c);supracoxal armature of prothorax with apices shorter,less pointed, not curved (Figs. 22 b & c)..... 9
- 9 Prementum short and wide, in ventral view ratio L/A less than 3, 2.5 (Fig. 24 e)..... Aeschna juncea (L.)
- Prementum longer, in ventral view ratio L/A more than 2.5 (Fig. 24 a)..... Aeschna caerulea (Strom.)
- 10 Prementum short and wide, in ventral view ratio L/A less than averaging 2.5 (Fig. 24 b).....  
..... Aeschna affinis (Vander Linden)
- Prementum longer, in lateral view ratio L/A = 3 or more (Fig. 24 d)..... 11
- 11 Lateral spines of 9th abdominal segment are long and extended to posterior margin of 10th segment, in ventral view ratio A/B less than 3 (Fig. 23 b)..... Aeschna mixta (Latr.)
- Lateral spines of 9th abdominal segment are shorter, extending at most to approximately 1/2 of 10th segment, in ventral view ratio A/B more than 3 (Fig. 23 d).....  
..... Aeschna cyanea (Müller)

#### Gomphidae

- 1 Metatarsus with two segments.....  
..... Lindenia tetraphylla (Vander Linden)
- Metatarsus with three segments..... 2

- 2 Abdominal segments with no mid-dorsal spines (Fig 26 e)... 3
- Some abdominal segments at least with mid-dorsal spines  
Figs. 26 a & d)..... 4
- 3 Fossorial tooth, small and pointed, on tibia of anterior legs,  
much shorter than claws on same leg (Fig. 27 f).....  
..... Gomphus flavipes (Charp.)
- Fossorial tooth, large and blunt, on tibia of anterior legs,  
about as long as claws on same leg (Fig. 27 e).....  
..... Gomphus vulgatissimus (L.)
- 4 Antennal segment 4, long and scythe-shaped (Fig. 27 a).....  
..... Paragomphus genei (Selys)
- Antennal segment 4, very short and rounded (Figs. 27 b,  
c & d)..... 5
- 5 Prementum, narrow at joint with postmentum; in ventral view  
L/A ratio more than 2 (Fig. 28 c); lateral spines at least  
on abdominal segments 7, 8 & 9 (Fig. 26 g).....  
..... Onychogomphus forcipatus unguiculatus (Vander Linden)
- Prementum, wider at joint with postmentum, in ventral view  
L/A ratio less than 2 (Figs. 28 a & b); lateral spines on  
abdominal segment 7 not always present..... 6
- 6 Antennal segment 3, long and narrow, length/width ratio  
approximatively 3 (Fig. 27 b); lateral spines also on abdominal  
segment 7..... Ophiogomphus serpentinus (Charp.)
- Antennal segment 3 shorter and wider, length/width ratio  
approximatively 2 (Fig. 27 d); abdominal segment 7 with no  
lateral spines (Fig. 26 f)... Onychogomphus uncatus (Charp.)

## Corduliidae

- 1 9th abdominal segment lateral spines extend almost to apex of caudal pyramid (Fig. 31 g); two pointed protuberances on occiput, behind eyes (Fig. 30 a).....  
..... Epitheca bimaculata (Charp.)
- 9th abdominal segment lateral spines do not extend to apex of caudal pyramid or totally absent (Figs. 32 a & b); occiput with blunter or non existent protuberances (Fig. 30 b).... 2
- 2 9th abdominal segment with no lateral spines (Fig. 31 b).. 3
- 9th abdominal segment with lateral spines (Fig. 31 a)..... 4
- 3 Eiproct and paraprocts with curved and distinctly divergent apices (Figs 31 b & e).... Somatochlora arctica (Zetterstedt)
- Eiproct and paraprocts with non-curved and non-divergent apices (Figs. 31 c & f)..... Somatochlora alpestris (Selys)
- 4 Abdominal segments with no mid-dorsal spines, or at most, with vestigial spines on segments 5, 6 & 7 (Fig. 31 d).....  
..... Oxygastra curtisii (Dale)
- Abdominal segments with distinct mid-dorsal spine; also on segments 8 and 9 (Figs. 32 a & b)..... 5
- 5 9th abdominal segment with small mid-dorsal spines; in lateral view 1/5 as long as rest of dorsal profile of segment 9 (Fig. 32 a); a dark coloured stripe on head between eyes (Fig. 29)  
..... Cordulia aenea (L.)
- 9th abdominal segment with large mid-dorsal spine; in lateral view more than 1/4 as long as rest of dorsal profile of segment 9 (Fig. 32 b); different colouring of head..... 6

- 6 Occiput with no protuberances behind the eyes; mid-dorsal spine of 8th abdominal segment absent or vestigial.....  
 ..... Somatochlora flavomaculata (Vander Linden)
- Occiput with two protuberances behind eyes (Fig. 31 b); distinct mid-dorsal spine on 8th abdominal segment; in lateral view at least 1/5 as long as rest of dorsal profile of segment 8 (Figs. 32 b & e).....  
 ..... Somatochlora metallica (Vander Linden) and S. meridionalis (Nielsen)

Species couples not differentiable with the key:

Somatochlora metallica - S. meridionalis. Some authors do not recognize S. meridionalis as a distinct species, but as a subspecies of S. metallica. The larvae examined exhibit some differences and call for further study.

#### Libellulidae

- 1 Small eyes, that, in dorsal view, account for 1/3 of head lateral profile at most and, in frontal view, do not come into contact with labium (Figs. 17 n & p)..... 2
- Large eyes, that, in dorsal view, account for more than 1/3 of head lateral profile and, in frontal view, come into contact with labium (Figs. 17 o & q)..... 10
- 2 8th abdominal segment with mid-dorsal spine (Fig. 37 c)... 3
- 8th abdominal segment with no mid-dorsal spine (Fig. 37 d), sometimes with tufts of hair-like setae than resemble a spine..... 5

- 3 9th abdominal segment with mid-dorsal spine (Fig. 36 d).....  
 ..... Libellula fulva Müller
- 9th abdominal segment with no mid-dorsal spine.....
- 4 First palpal segment distal margin with shallow symmetrical  
 crenations (Fig. 37 a)..... Libellula quadrimaculata L.
- First palpal segment distal margin with deep asymmetrical  
 crenations (Fig. 37 b)..... Libellula depressa L.
- 5 Some abdominal segments with mid-dorsal spines (Fig. 36 b )  
 ..... 6
- All abdominal segments with no mid-dorsal spines (Fig. 36 c)  
 ..... 8
- 6 Lengthened epiproct, ratio B/A = 2.5 or more (Fig. 37 e)....  
 ..... Orthetrum trinacria (Selys)
- Shorter epiproct, ratio B/A = 2 or less..... 7
- 7 Lengthened epiproct, ratio B/A about 2.....  
 ..... Orthetrum cancellatum L.
- Shorter epiproct, ratio B/A less than 1.5 (Fig. 37 h).....  
 ..... Orthetrum coerulescens (Fabr.) and O. ramburi (Selys)
- 8 Lengthened epiproct, ratio B/A = 2 (Fig. 37 g).....  
 ..... Orthetrum albistylum (Selys)
- Shorter epiproct, ratio B/A less than 1.5 (Fig. 37 h)..... 9
- 9 First palpal segment with a row of maximum 4 long setae;  
 prementum with two sets of setae of which the two outermost  
 are distanced from the others and are much longer (Fig. 36 g)  
 ..... Orthetrum coerulescens (Fabr.) and O. ramburi (Selys)

- First palpal segment with a row of at least 5 long setae; prementum with two sets of setae of which the three outermost are longer but not distanced from the others (Fig. 36 f)....  
..... Orthetrum brunneum (Fonsc.)
- 10 Abdominal segments with no mid-dorsal spines (Figs. 39 a, f & g)..... 11
- Some abdominal segments with mid-dorsal spines (Figs. 39 b, c & d)..... 12
- 11 8th abdominal segment ventral surface posterior margin with no row of spine-shaped setae (Fig. 38 b); spotted colouring on dorsal surface of last abdominal segments (Fig. 39 f)....  
..... Sympetrum fonscolombi (Selys)
- 8th abdominal segment ventral surface posterior margin with row of spine-shaped setae (Fig. 38 a); uniform colouring on dorsal surface of last abdominal segments.....  
..... Crocothemis erythraea (Brullé)
- 12 9th abdominal segment with stout mid-dorsal spine (Fig. 39 d)  
..... Trithemis annulata (Pal de Beauvais)
- 9th abdominal segment with no mid-dorsal spine..... 13
- 13 8th abdominal segment ventral surface posterior margin with row of spine-shaped setae; eyes lengthened longitudinally, ratio A/B approximately 2 (Fig. 35 c).....  
..... Selysiothemis nigra (Vander Linden)
- 8th abdominal segment ventral surface posterior margin with no row of spine-shaped setae; eyes less lengthened longitudinally, ratio A/B less than 1.5 (Figs. 35 a & b)..14

- 14 7th abdominal segment with no mid-dorsal spine (Fig. 39 c)..  
 ..... Leucorrhinia dubia (Vander Linden)
- 7th abdominal segment with mid-dorsal spine..... 15
- 15 8th abdominal segment without mid-dorsal spine or with vestigial  
 mid-dorsal spine; abdominal segments 8 and 9 with very short  
 lateral spines, in dorsal view, those on 9 extending to base  
 of caudal pyramid at most (Figs. 40 d & l).....  
 ..... Sympetrum danae (Sulzer)
- 8th abdominal segment with large mid-dorsal spine; abdominal  
 segments 8 and 9 with short lateral spines, spines on 9  
 extending shortly beyond base of caudal pyramid (Fig. 40 h);  
 or: 8th abdominal segment with small mid-dorsal spine but  
 with long lateral spines on segments 8 and 9, those on 9  
 extending to or beyond 1/2 of caudal pyramid (Fig. 40 a)..16
- 16 9th abdominal segment lateral spines are short, not extending  
 midway of caudal pyramid; in dorsal view ratio A/B more than 2.5  
 (Figs. 40 e, h & i)..... 17
- 9th abdominal segment lateral spines are long, extending to  
 at least midway of caudal pyramid, in dorsal view ratio A/B  
 less than 2.5 (Figs. 40 a, b, c, f, g & m)..... 19
- 17 Abdomen ventral surface with dark marks (Fig. 38 c); in dorsal  
 view, tangent of anterior edge of external profile of eye is  
 bent backwards (Fig. 35 b).....  
 ..... Leucorrhinia pectoralis (Charp.)
- Abdomen ventral surface with no dark marks; in dorsal view  
 tangent of anterior edge of external profile of eye is nearly  
 perpendicular to longitudinal body axis (Fig. 35 a)..... 18

- 18 (Only for nymphs with posterior wing sheaths that extend beyond 2<sup>nd</sup> abdominal segment at least) 8th abdominal segment mid-dorsal spine very stocky and distinctly curved backwards, with a very wide base (Fig. 40 h).....  
 ..... Sympetrum pedemontanum (Allioni)
- 8th abdominal segment mid-dorsal spine is thin, not curved backwards and with narrow base (Fig. 40 e).....  
 ..... Sympetrum flaveolum (L.)
- 19 8th abdominal segment mid-dorsal spine which, in lateral view extends to or beyond midway of dorsal profile of 9th segment; in dorsal view, 8th abdominal segment lateral spines are arched and as long as lateral margin of 9th segment (lateral spines excluded) (Figs. 39 i & 40 f).....  
 ..... Sympetrum depressiusculum (Selys)
- 8th abdominal segment mid-dorsal spine which, in lateral view, does not extend midway of 9th segment dorsal profile (Figs. 40 a, b, c & g); in dorsal view, 8th abdominal segment lateral spines are not arched and extend midway of lateral margin of 9th segment at most (lateral spines excluded) (Figs. 39 g, h, l & 40 m)..... 20
- 20 (Only for nymphs with posterior wing sheaths that extend beyond the 4th abdominal segment at least). Abdominal segment 7 and 8 mid-dorsal spines are large and, in lateral view, extend beyond anterior margin of segments 8 and 9, respectively (Figs. 40 b & g); 8th segment lateral spines are short, in dorsal view they are less than 1/2 as long as those on segment 9 (Figs. 39 h & 40 m)..... 21

- Abdominal segment 7 and 8 mid-dorsal spines are small, and in lateral view, extend at most to anterior margin of segments 8 and 9, respectively (Figs. 40 a & c); 8th segment lateral spines are long, in dorsal view they are nearly 1/2 as long as those on segment 9 (Figs. 39 e & l)..... 22
- 21 (Only for last instar nymphs, with posterior wing sheaths that extend beyond segment 5 at least) Prementum with two sets of 12 - 14 setae of which outermost 8 - 9 are distinctly longer than the others; first palpal segment with a row of 9 - 11 long setae..... Sympetrum sanguineum (Müller)
- Prementum with two sets of 14 - 16 setae of which outermost 10 - 11 are distinctly longer than the others; first palpal segment with a row of 10 - 12 long setae.....  
..... Sympetrum vulgatum (L.)
- 22 (Only for last instars nymphs, with posterior wing sheaths that extend beyond segment 5 at least) Prementum with sets of 12 - 14 setae of which outermost 8 - 9 are distinctly longer than the others; first palpal segment with a row of 11 long setae..... Sympetrum meridionale (Selys)
- Prementum with two sets of 14-16 setae of which outermost 10 - 11 are distinctly longer than the others; first palpal segment with a row of 11-12 long setae.....  
..... Sympetrum striolatum (Charp.)

Species couples not differentiable with the key:

Orthetrum coerulescens - O. ramburi. Species attribution of adult specimens gathered in Italy is problematic, hence differentiation of larvae is not currently possible.

**F I G U R E S**

Fig. 1 - Schematic morphology of Odonata larvae.

Body in lateral view: a, Zygoptera; b, Anisoptera.

Labium in internal view: c, Anisoptera; d, Zygoptera.

Legenda: 1, prementum; 2, first segment of labial palpi;

3, antennae; 4, compound eye; 5, post-ocular lobes;

6, prothorax; 7, wing-sheaths; 8, 10th abdominal segment;

9, lateral caudal lamella; 10, central caudal lamella;

11, lateral carinae; 12, mid-dorsal spine; 13, caudal pyramid;

14, lateral spines; 15, postmentum; 16, adoral (or medial)

branch of first palpal segment; 17, aboral (or lateral) branch

of first palpal segment; 18, second palpal segment; 19, setae

of first palpal segment; 20, premental setae.

(adapted from FRANKE)

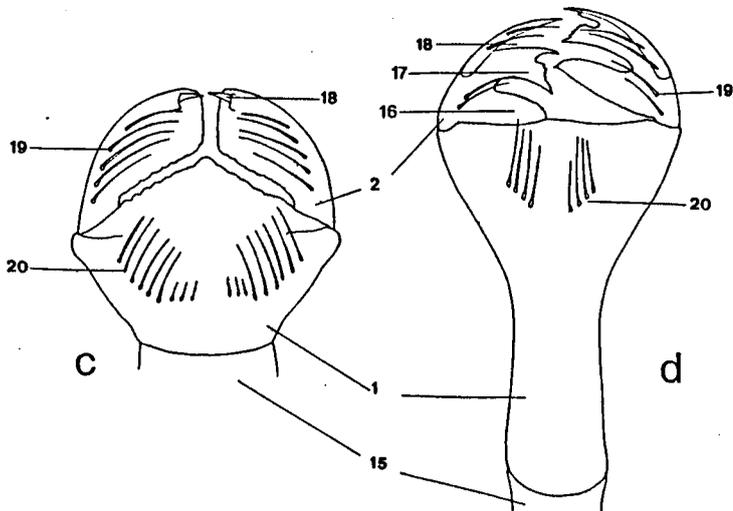
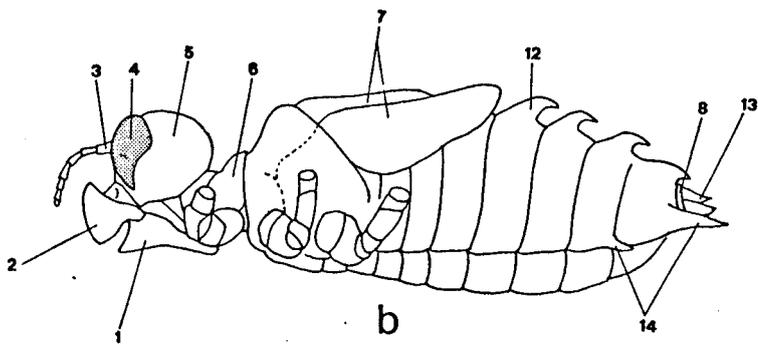
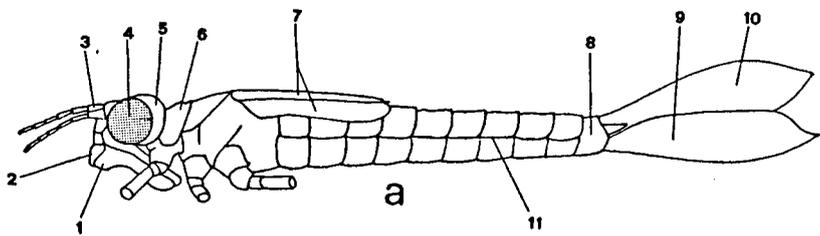


Fig. 2 - Calopterygidae habitus (Calopteryx splendens)

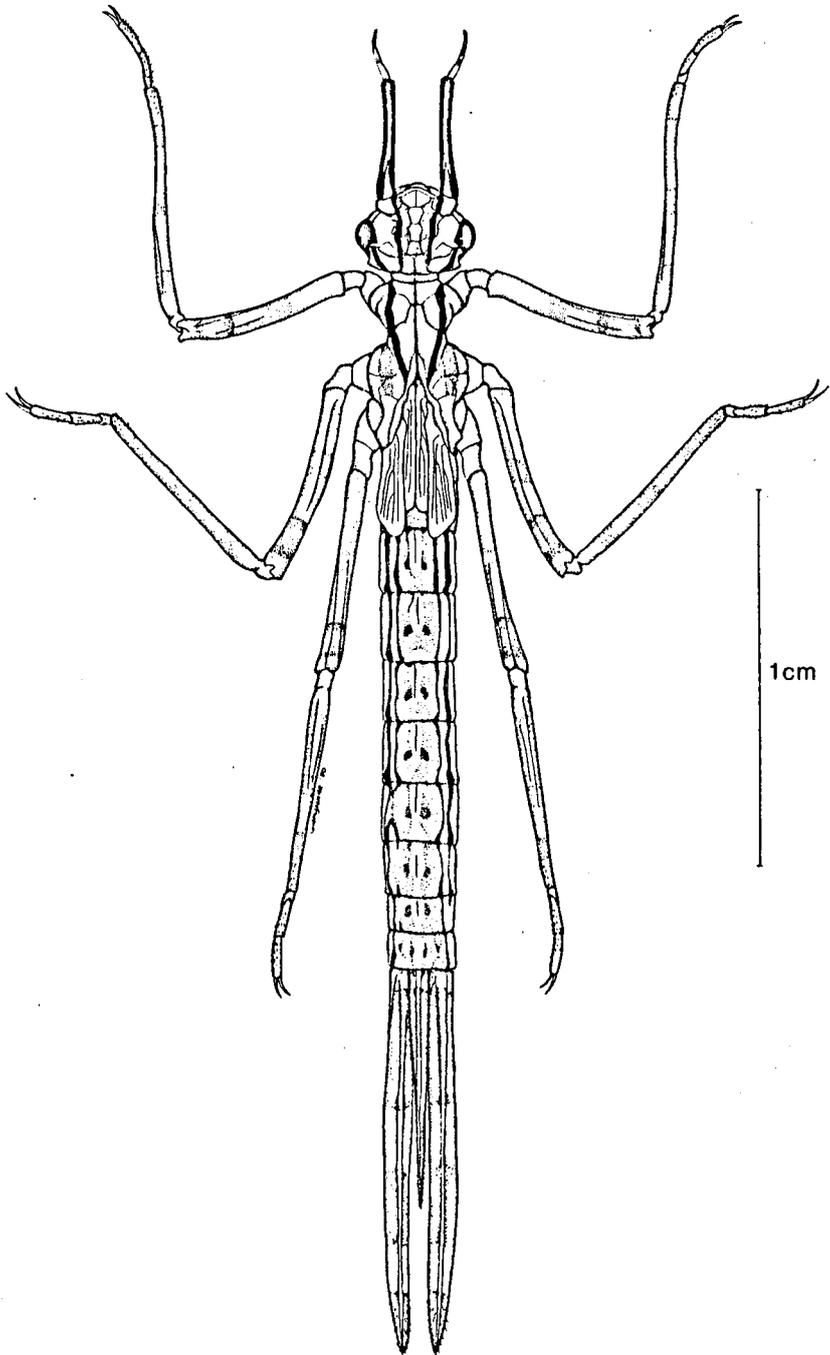
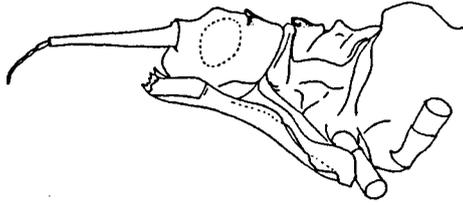
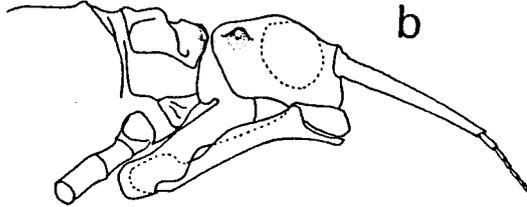


Fig. 3 - Head and prothorax in lateral and dorsal views:  
a,d, Calopteryx virgo; b,c, Calopteryx splendens

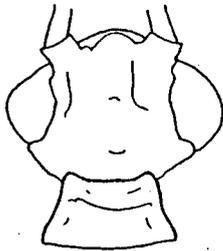
a



b



c



d

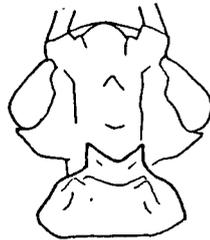


Fig. 4 - Size separation between Calopteryx splendens and C. haemorrhoidalis. Determination examples:

Specimen A (prementum length 4.0 mm, lateral lamella length 8.0 mm) = C. haemorrhoidalis.

Specimen B (prementum length 4.5 mm, lateral lamella length 10.5 mm) = C. splendens.

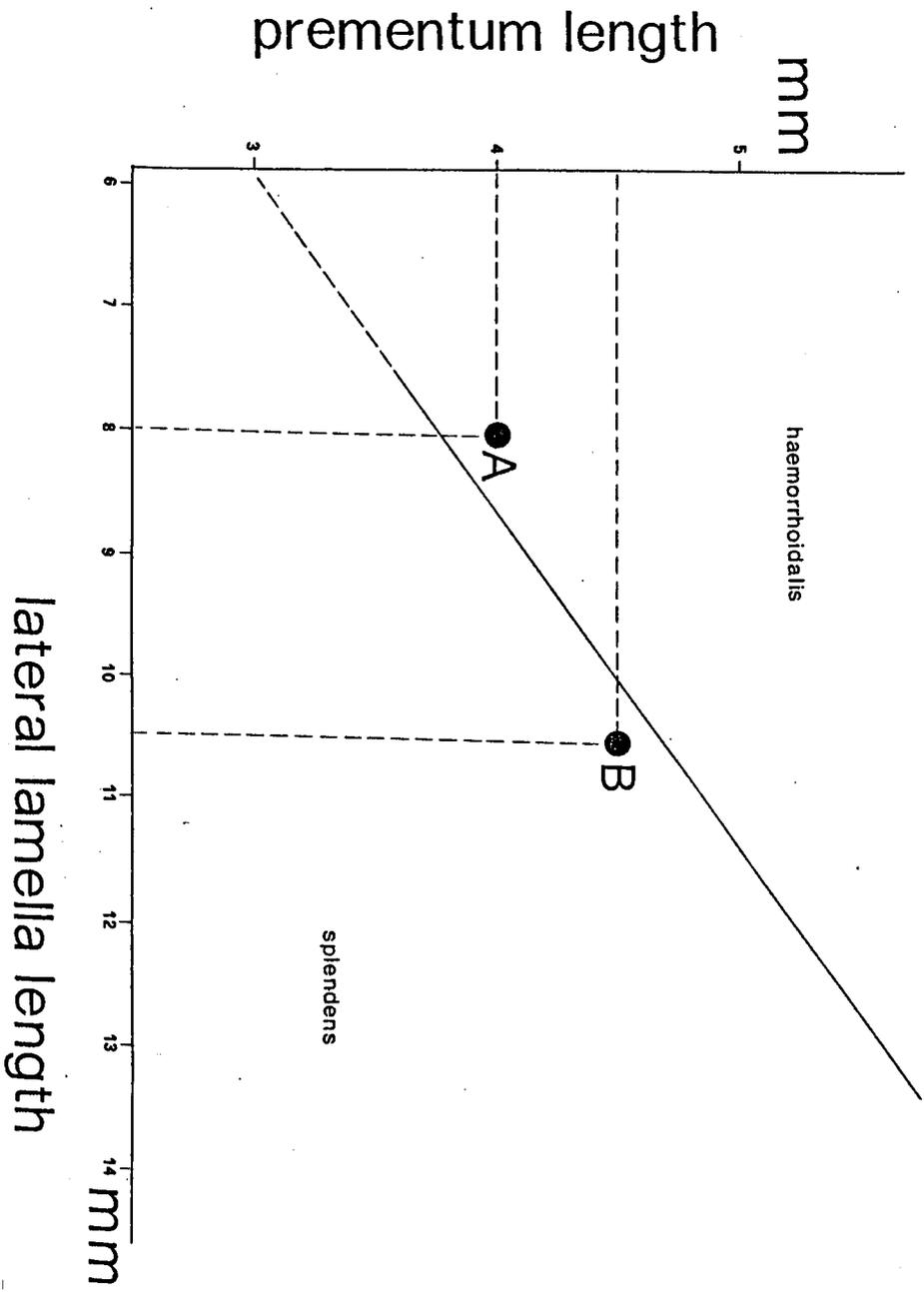
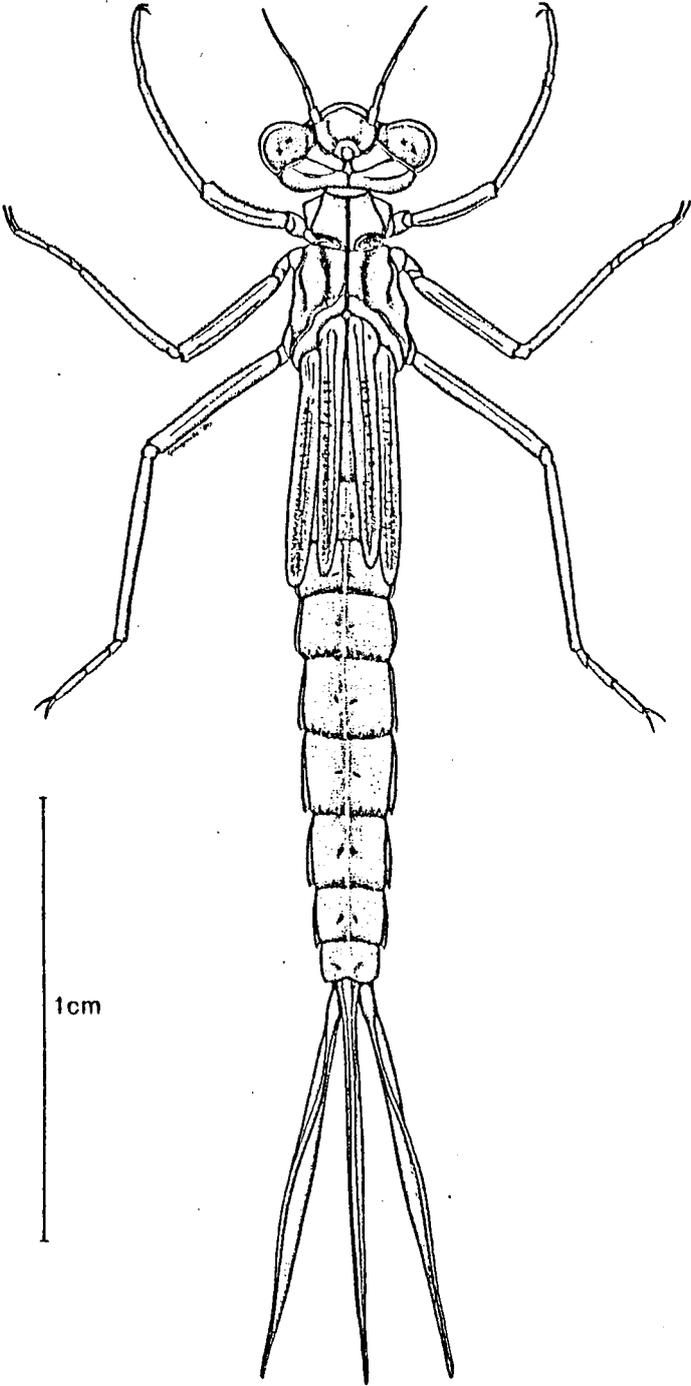


Fig. 5 - Lestidae habitus (Lestes barbarus)



1cm

Fig. 6 - Lestidae palpi: a, Lestes viridis; b, L. virens;  
c, Sympecma sp; d, L. sponsa; e, L. barbarus.  
Aboral branch of first palpal segment: f, S. fusca; g, S.  
paedisca. (f,g, adapted from CONCI - NIELSEN)

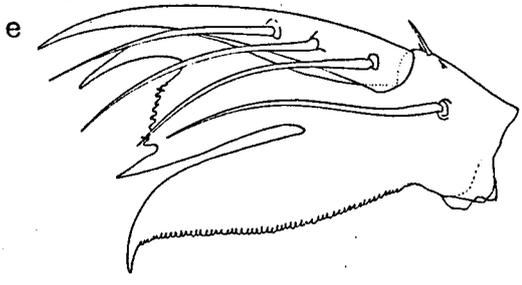
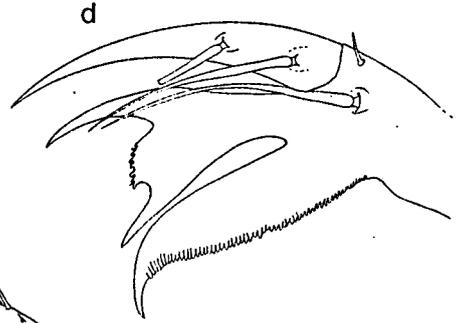
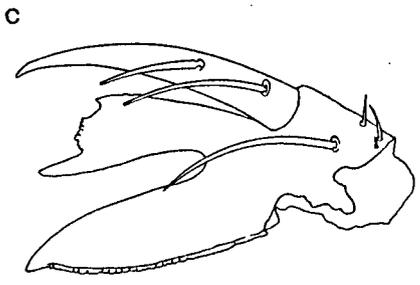
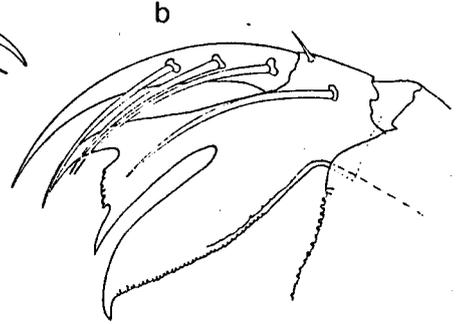
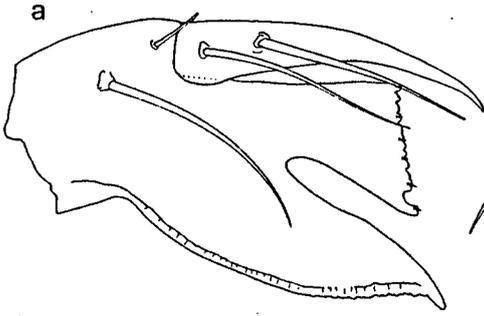


Fig. 7 - Labium , ventral view: a, Lestes viridis; b, L. macrostigma; c, L. dryas. Prementum internal view: d, L. barbarus; e, L. dryas. Lateral lamella: f, L. sponsa; g, L. dryas.

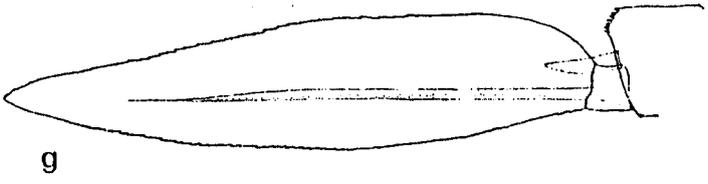
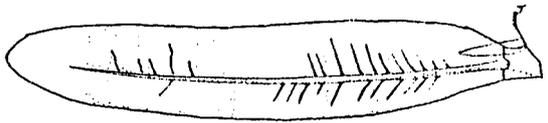
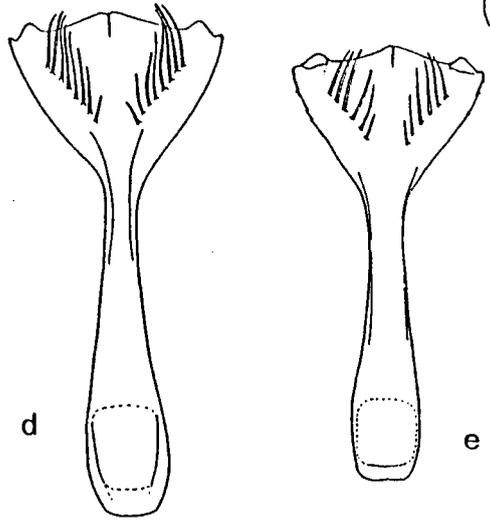
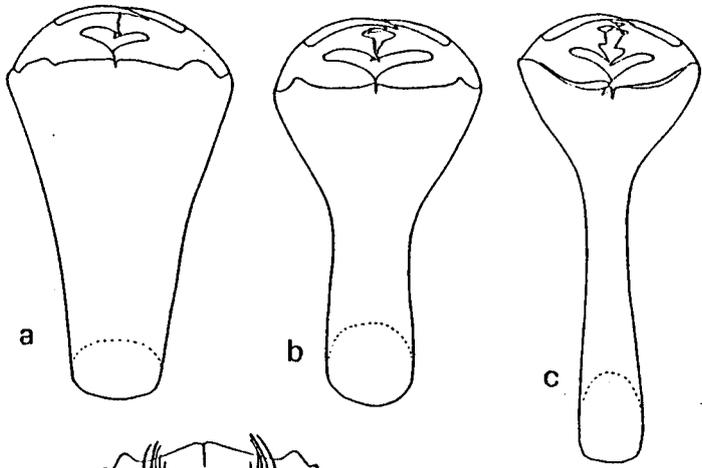


Fig. 8 - Platycnemididae habitus (Platycnemis pennipes).

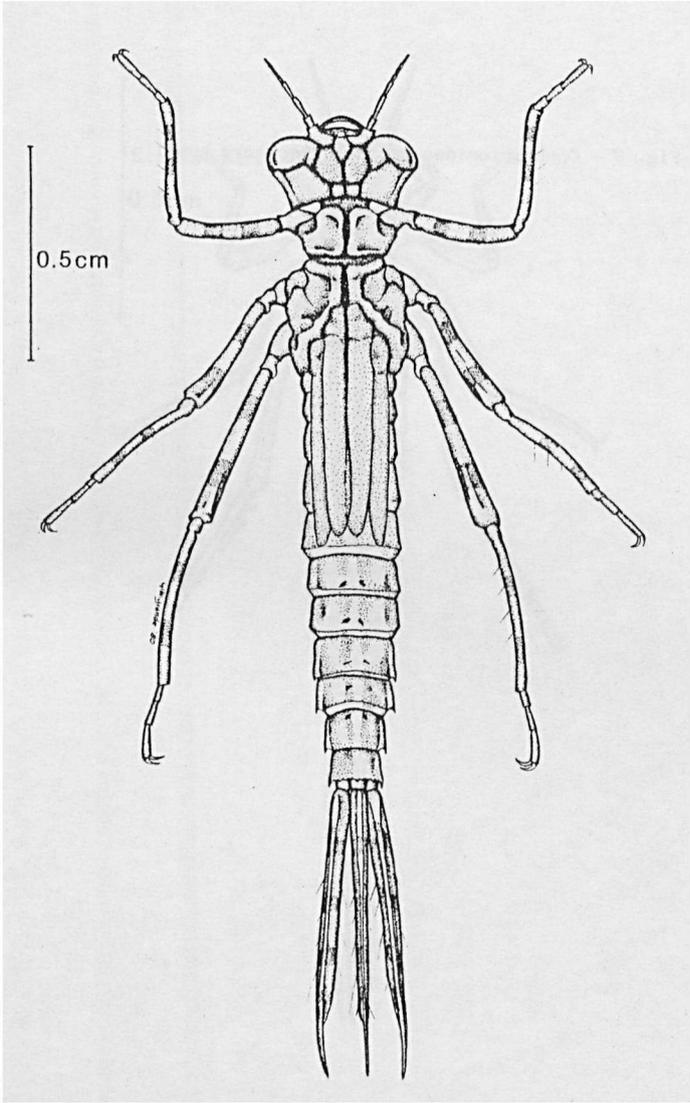


Fig. 9 - Coenagrionidae habitus (Ischnura pumilio)

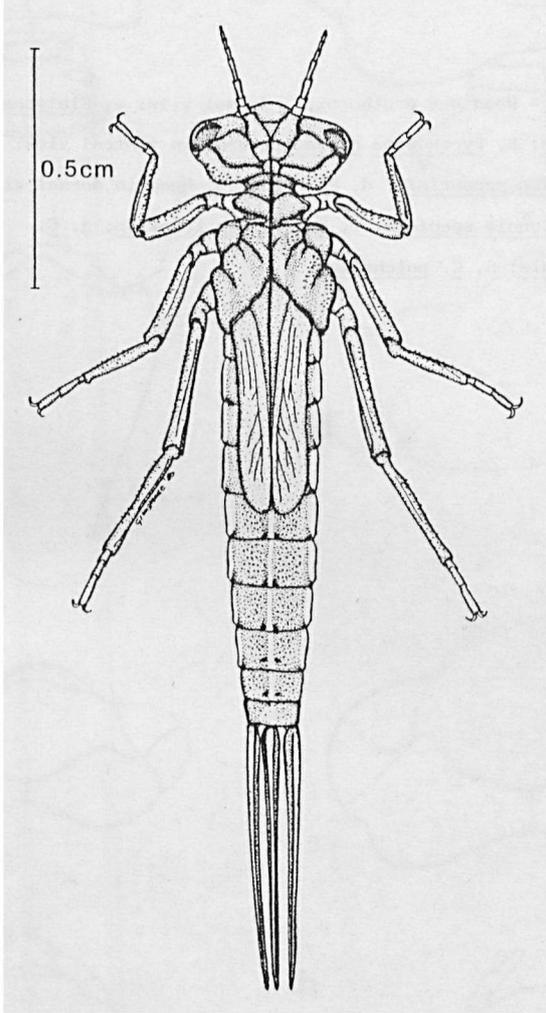
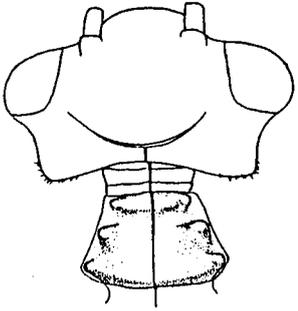
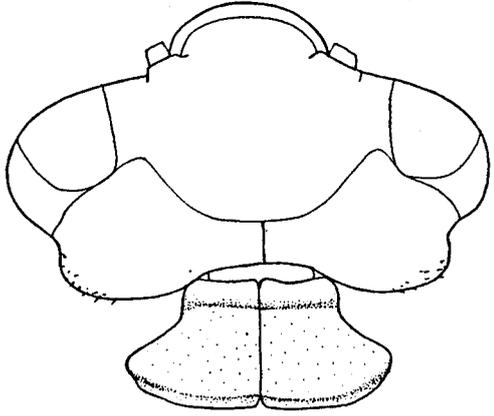


Fig. 10 - Head and prothorax, dorsal view: a, Platycnemis pennipes; b, Pyrrhosoma nymphula. Head in ventral view: c, Coenagrion mercuriale; d, P. nymphula. Head in dorsal view: e, Nehalennia speciosa; f, Ceriagrion tenellum; g, C. mercuriale; h, C. pulchellum.

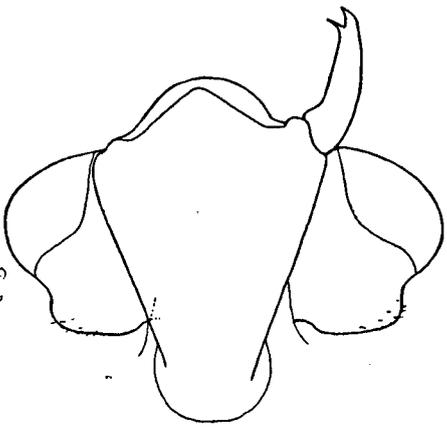
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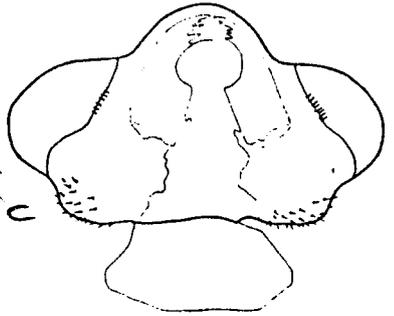
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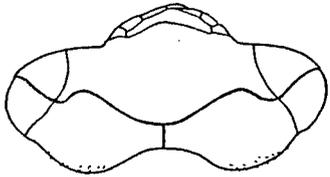
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d



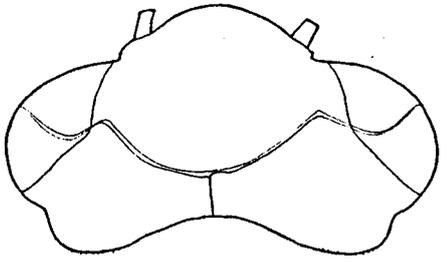
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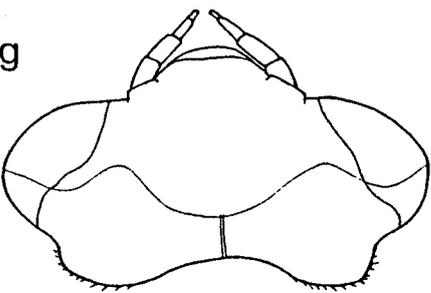
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f



g



h

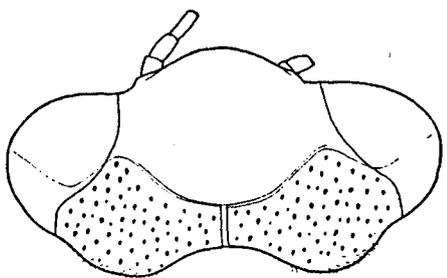
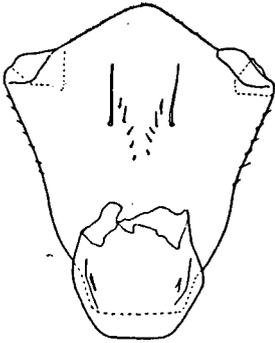
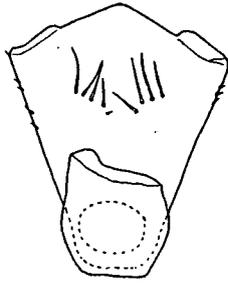


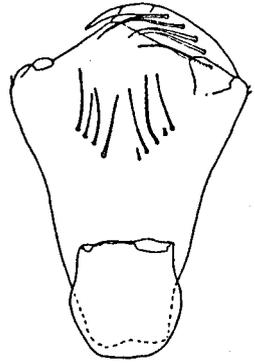
Fig. 11 - Prementum, internal view: a, Ceriagrion tenellum;  
b, Coenagrion caerulescens; c, Coenagrion pulchellum.



a



b



c

Fig. 12 - Palpi: a, Pyrrhosoma nymphula; b, Enallagma cyathigerum. Insertion of legs: c, Erythromma najas. Prementum, internal view: d, P. nymphula; e, Nehalennia speciosa.

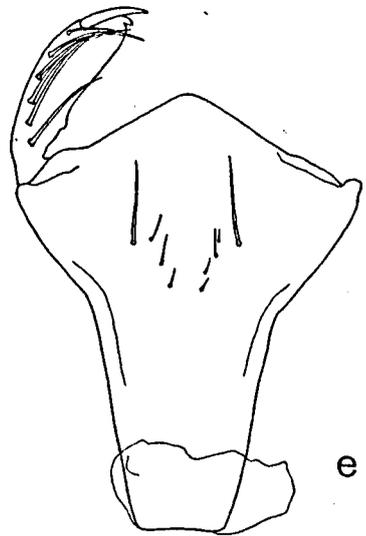
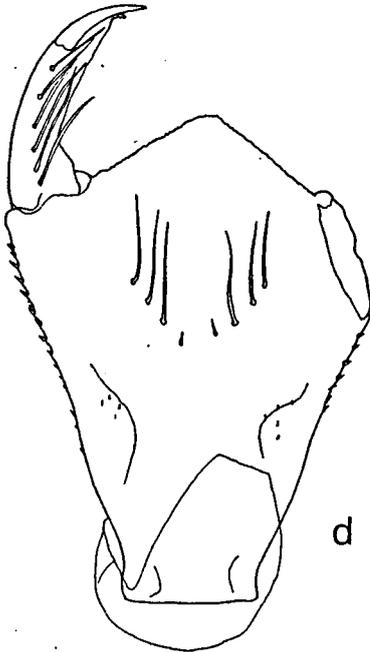
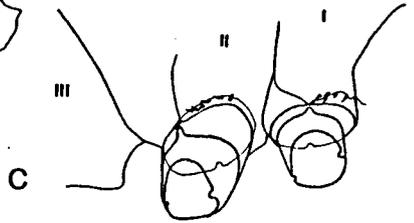
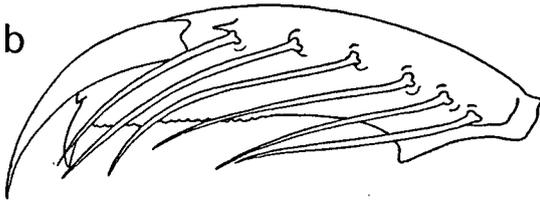
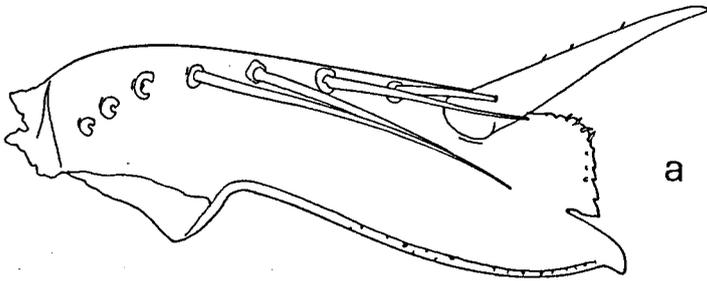


Fig. 13 - Dorsal surface of first pair of femurs:

a, Coenagrion caerulelescens; c, Ischnura elegans; e, Ischnura pumilio; f, C. scitulum; g, C. mercuriale.

Metasternum and ventral surface of first abdominal segment:

b, Erythromma najas; d, E. viridulum

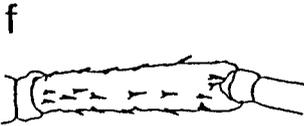
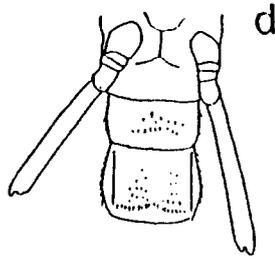
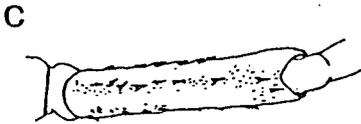
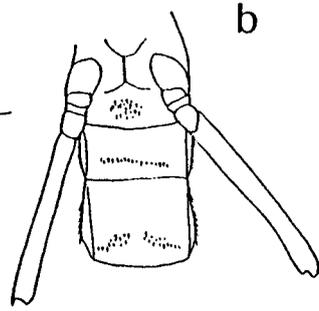
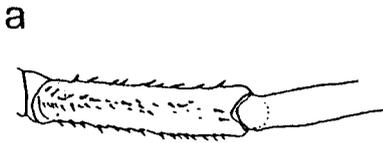


Fig. 14 - Palpi: a, Nehalennia speciosa; b, Ceriagrion tenellum; c, Ischnura elegans; d, Platycnemis pennipes.  
Prementum, internal view: e, Coenagrion mercuriale;  
f, P. pennipes.

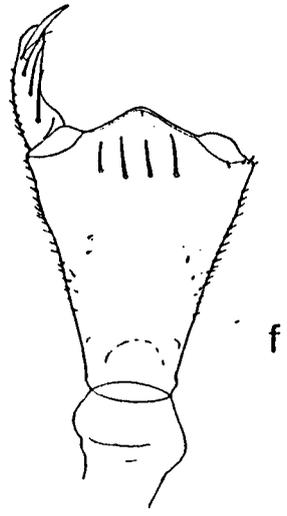
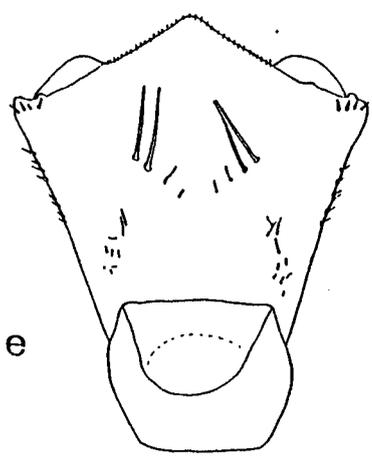
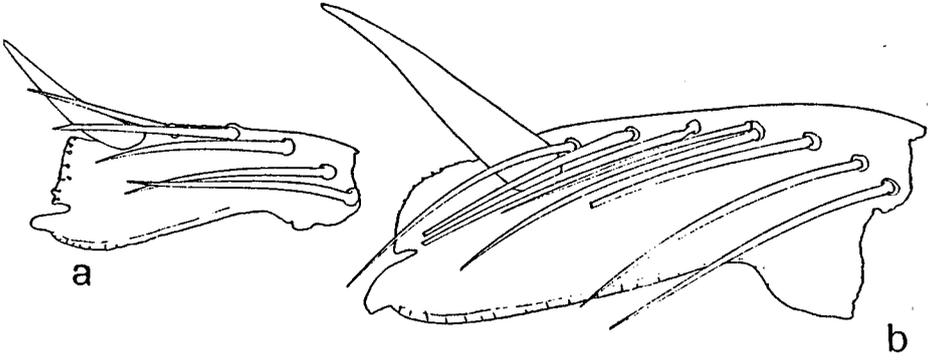
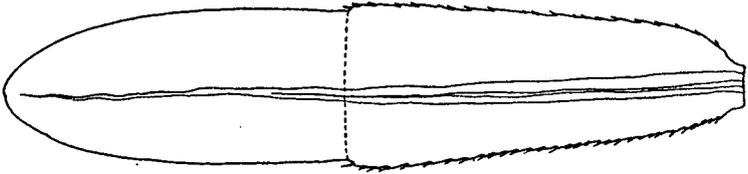
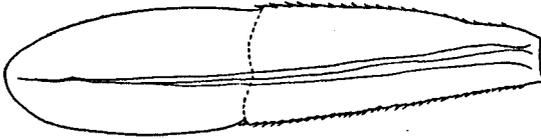


Fig. 15 - Lateral lamellae nodal line (schematic);  
a, Coenagrion hastulatum; b, C. pulchellum; c, C. scitulum.

a



b



c

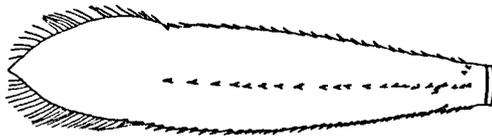


Fig. 16 - Lateral lamellae: a, Coenagrion caerulescens;

b, C. mercuriale; c, Ischnura elegans.

Last abdominal segments, ventral view: d, I. elegans;

e, I. pumilio; f, C. caerulescens.

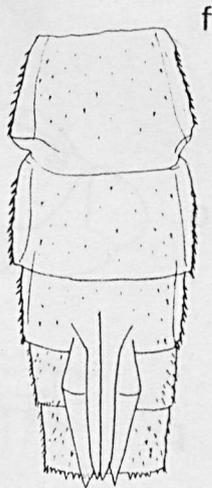
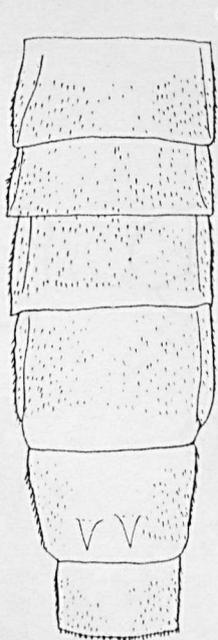
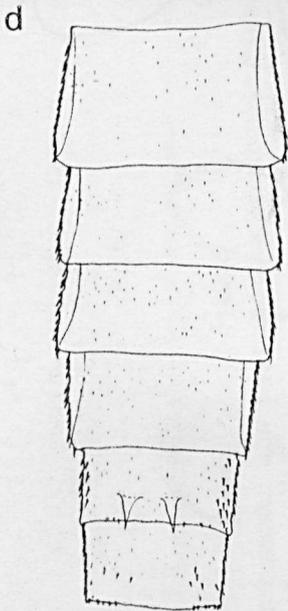
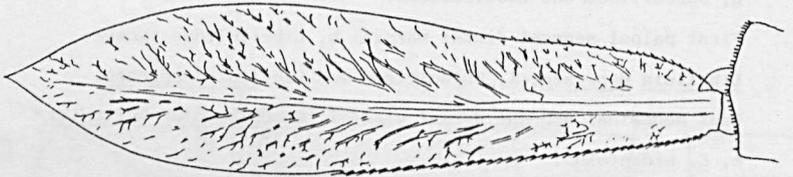
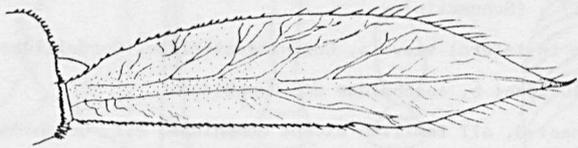
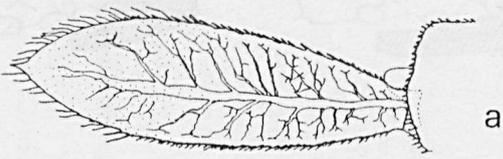


Fig. 17 - (Schematic).

Labium in lateral view: a, Cordulegasteridae, Corduliidae and Libellulidae; b, Aeschnidae and Gomphidae.

Antennae: d, all families except Gomphidae; e,f, Gomphidae.

Concave labium, internal view: c, Cordulegasteridae; g, Corduliidae and Libellulidae.

First palpal segment distal margin: h, Libellulidae except Libellula depressa; i, Corduliidae and Libellula depressa.

Last abdominal segment, dorsal view: l, Cordulegaster boltonii; m, C. bidentatus.

Head dorsal and frontal views: o,q, Libellulidae except Libellula and Orthetrum; n,p, Libellula and Orthetrum

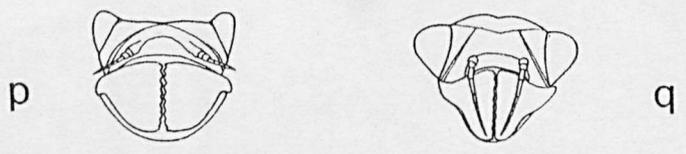
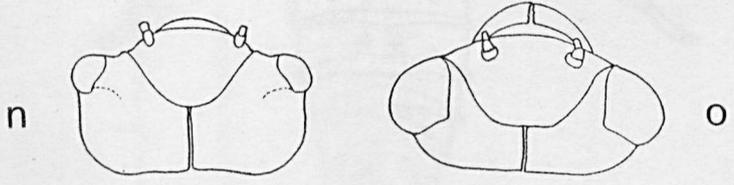
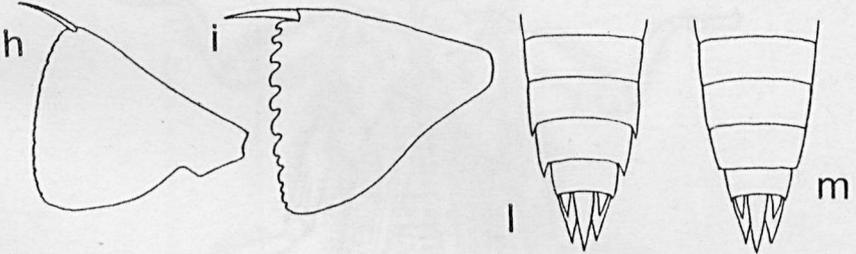
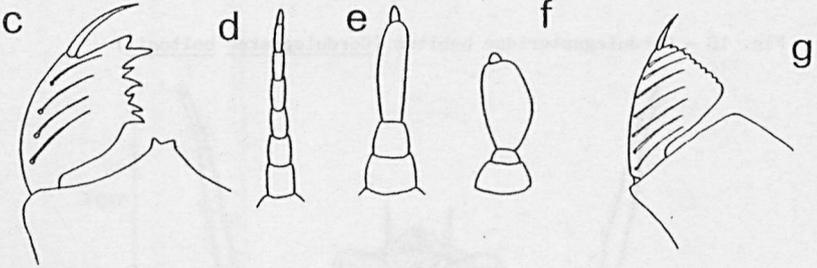
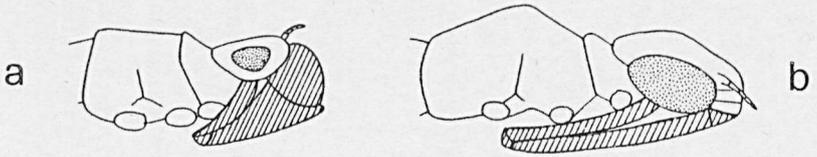


Fig. 18 - Cordulegasteridae habitus (Cordulegaster boltonii)

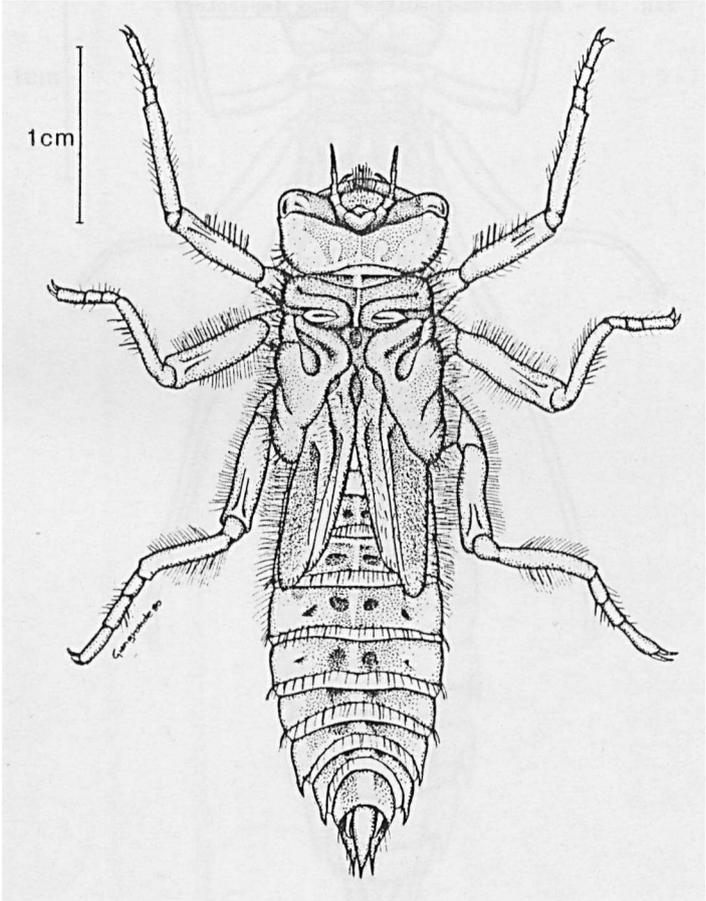


Fig. 19 - Aeschnidae habitus (Anax imperator)

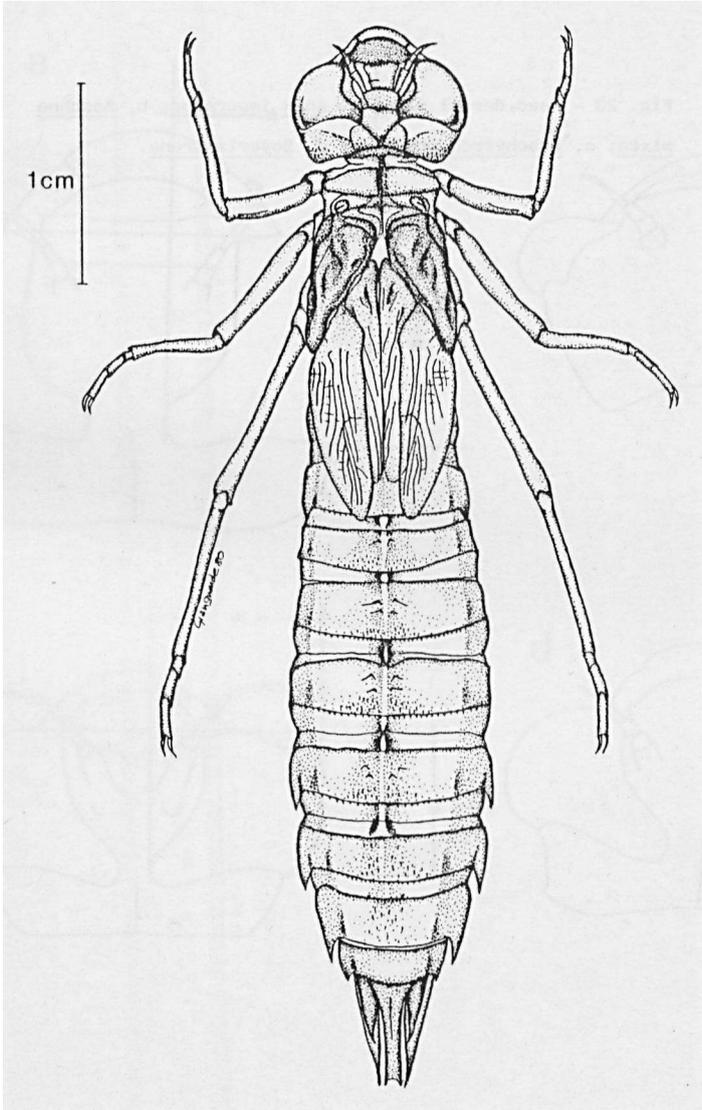


Fig. 20 - Head, dorsal view: a, Anax imperator; b, Aeschna mixta; c, Brachytron pratense; d, Boyeria irene.

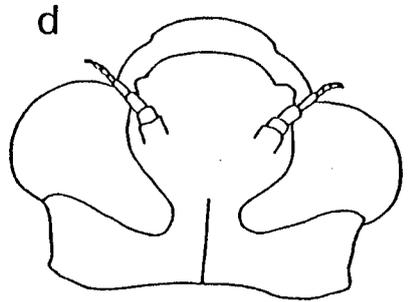
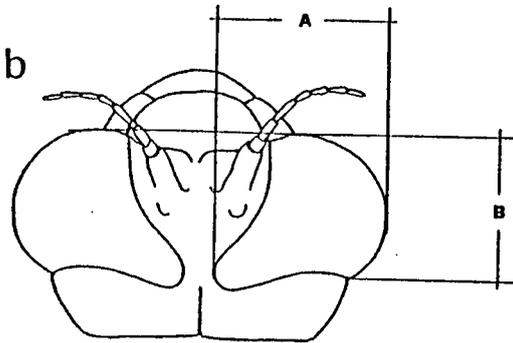
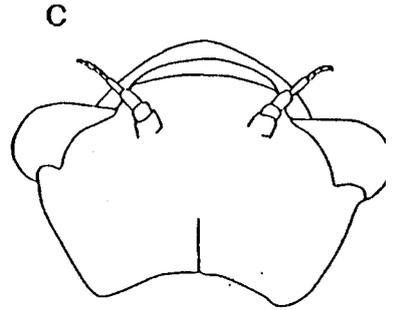
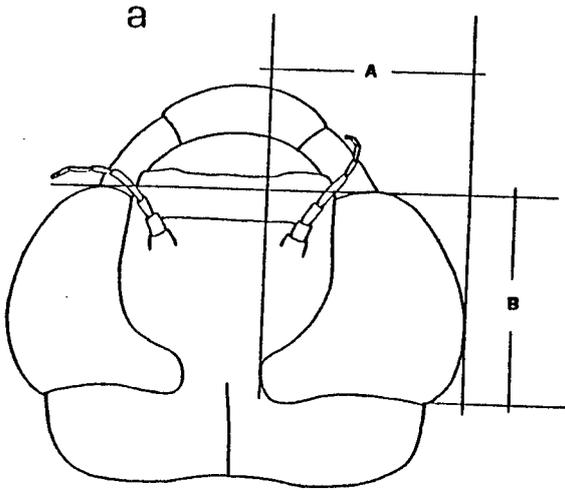


Fig. 21 - 6th abdominal segment lateral margin, ventral  
view: a, Anax imperator; b, Aeschna juncea.

Last abdominal segments, dorsal view: c, Brachytron pratense.

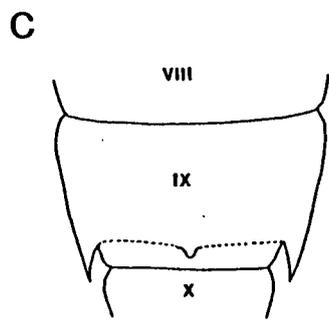
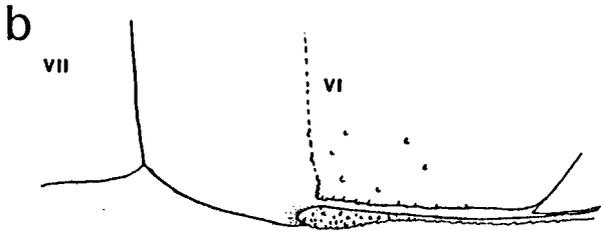
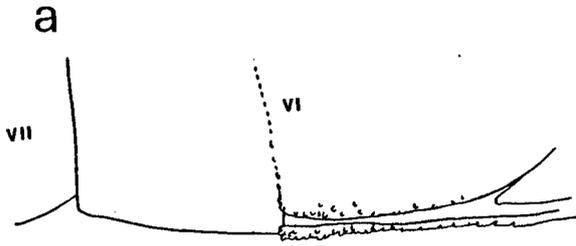
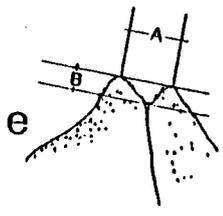
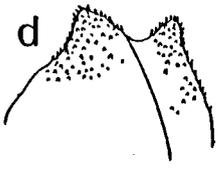
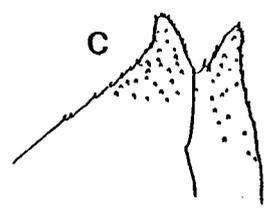
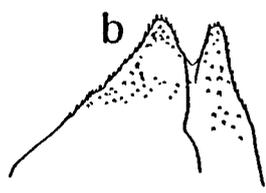
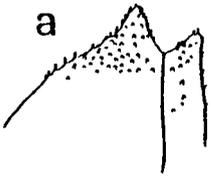


Fig. 22 - Prothoracical supracoxal armature, dorsal view:

a, Aeschna caerulea; b, A. juncea; c, A. grandis; d, A. cyanea; e, A. mixta; f, A. affinis.

Caudal pyramid, dorsal view: g, A. isosceles; h, Anax imperator; i, Anax parthenope.



head  
→

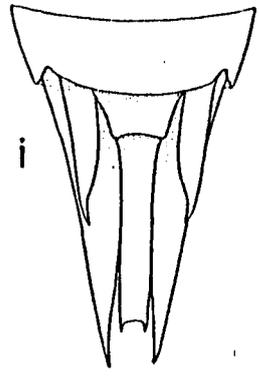
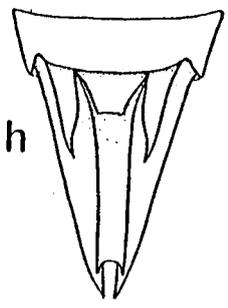
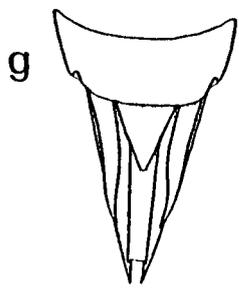


Fig. 23 - Last abdominal segments, ventral view: a, Aeschna juncea; b, A. mixta; c, A. caerulea; d, A. cyanea; e, A. grandis.

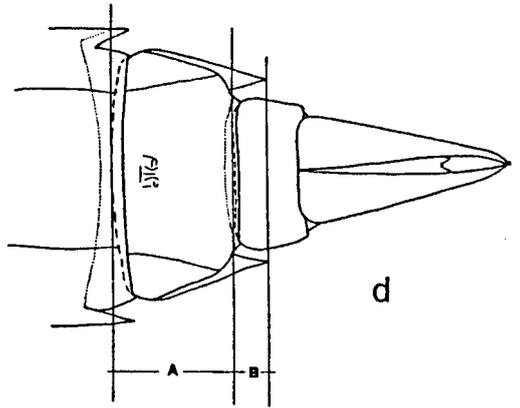
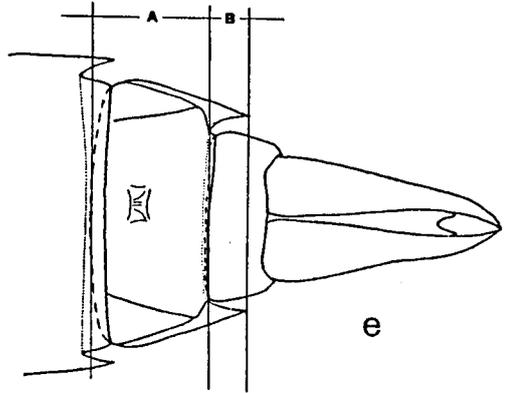
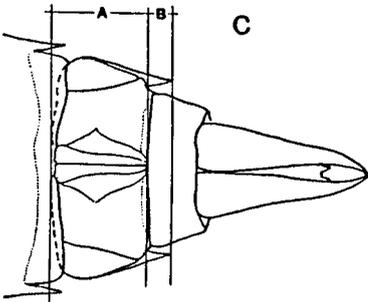
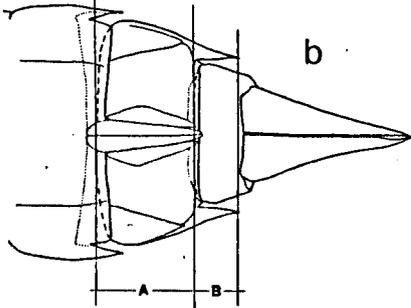
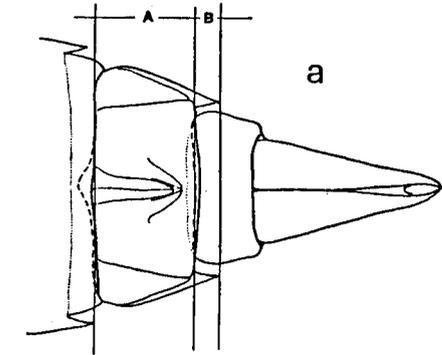
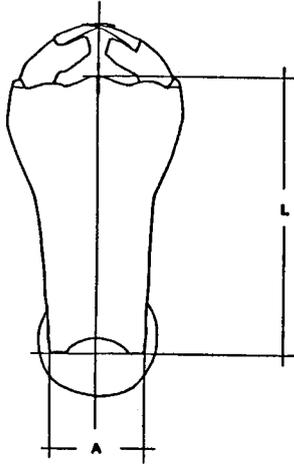
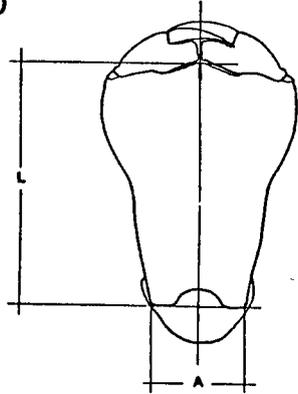


Fig. 24 -Labium, ventral view: a, Aeschna caerulea;  
b, A. affinis; c, A. juncea; d, A. mixta.

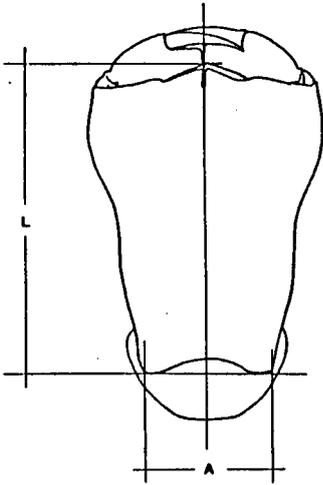
a



b



c



d

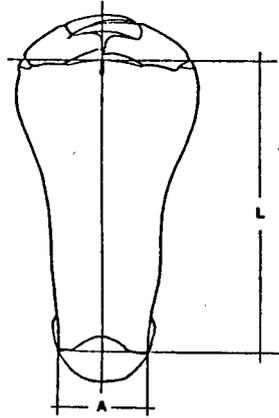


Fig. 25 - Gomphidae habitus (Onychogomphus forcipatus)

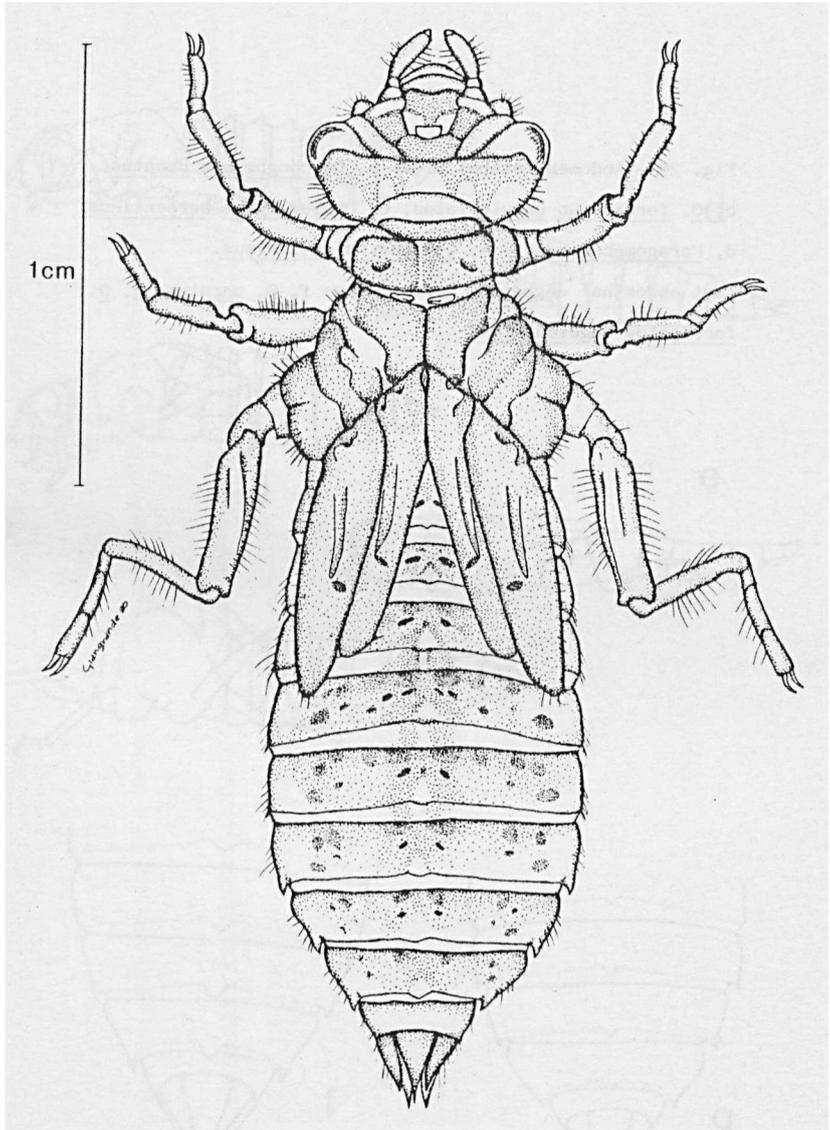


Fig. 26 - Abdomen, lateral view: a, Onychogomphus uncatus;  
b, O. forcipatus unguiculatus; c, Ophiogomphus serpentinus;  
d, Paragomphus genei; e, Gomphus vulgatissimus.  
Last abdominal segments, dorsal view: f, O. uncatus; g, O.  
forcipatus unguiculatus.

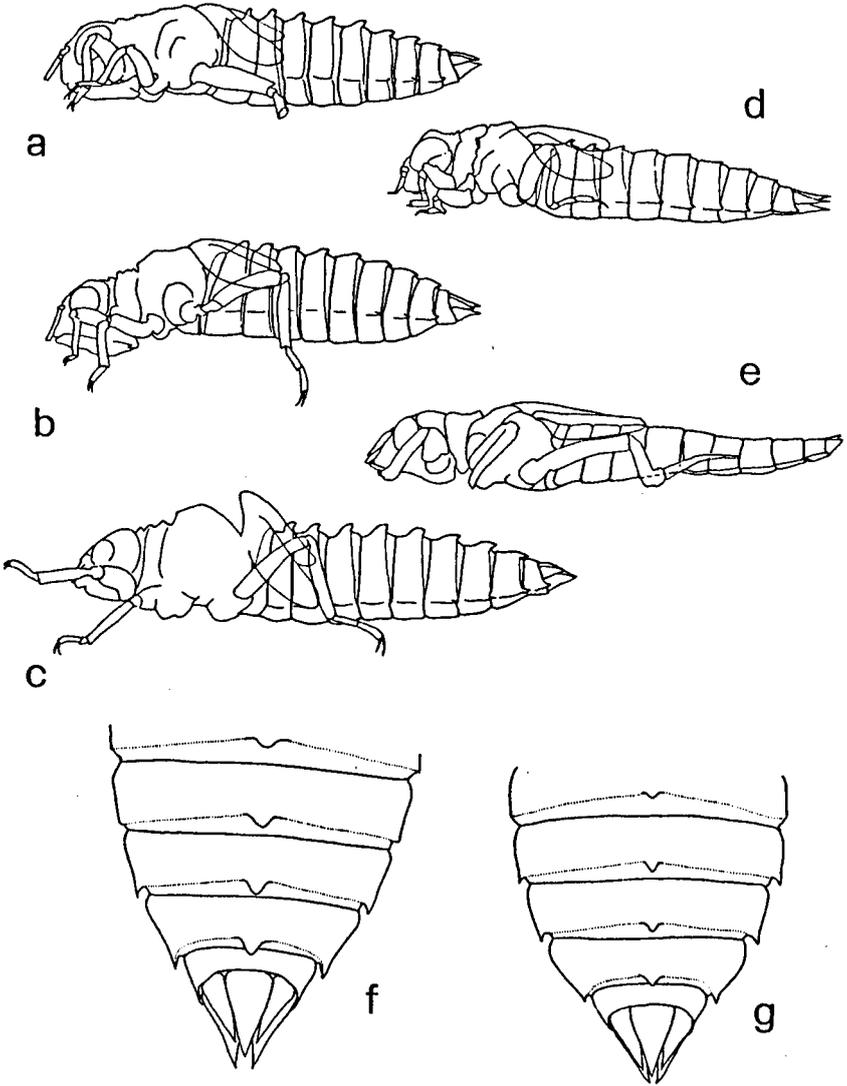


Fig. 27 - Antennae: a, Paragomphus genei; b, Ophiogomphus serpentinus; c, Onychogomphus forcipatus unguiculatus; d, O. uncatus. Anterior leg tibia: e, Gomphus vulgatissimus; f, G. flavipes.

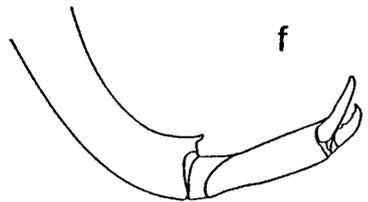
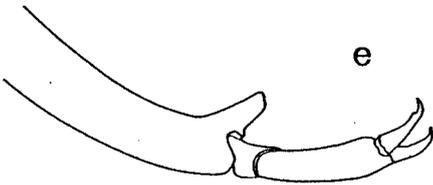
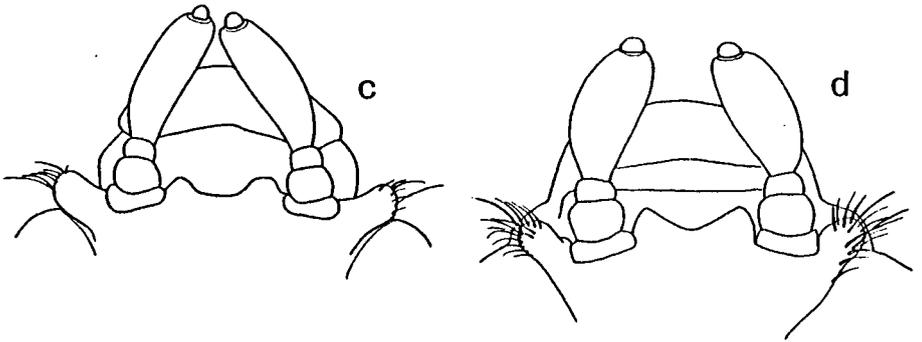
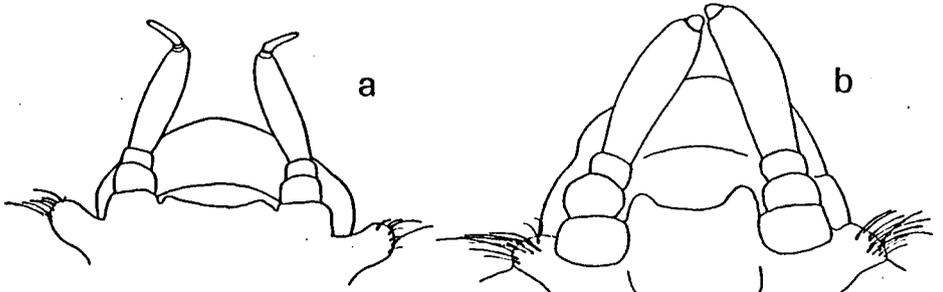


Fig. 28 - Prementum, ventral view: a, Ophiogomphus serpentinus;  
b, Onychogomphus uncatus; c, Onychogomphus forcipatus  
unguiculatus.

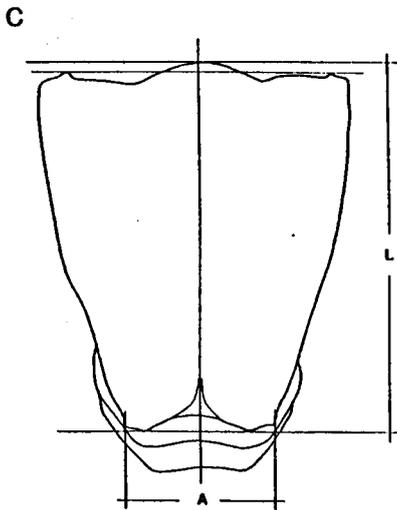
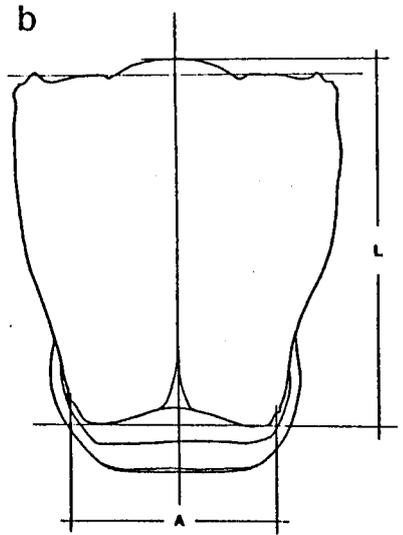
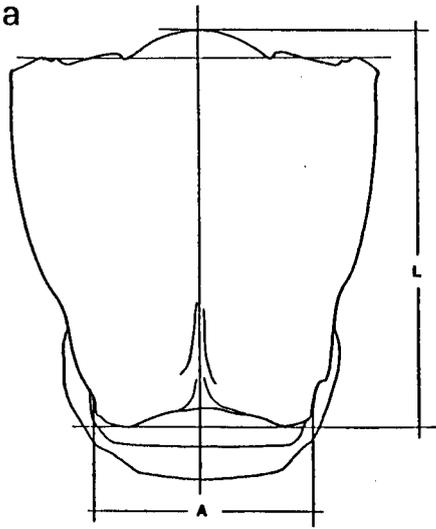


Fig. 29 - Corduliidae habitus (Cordulia aenea)

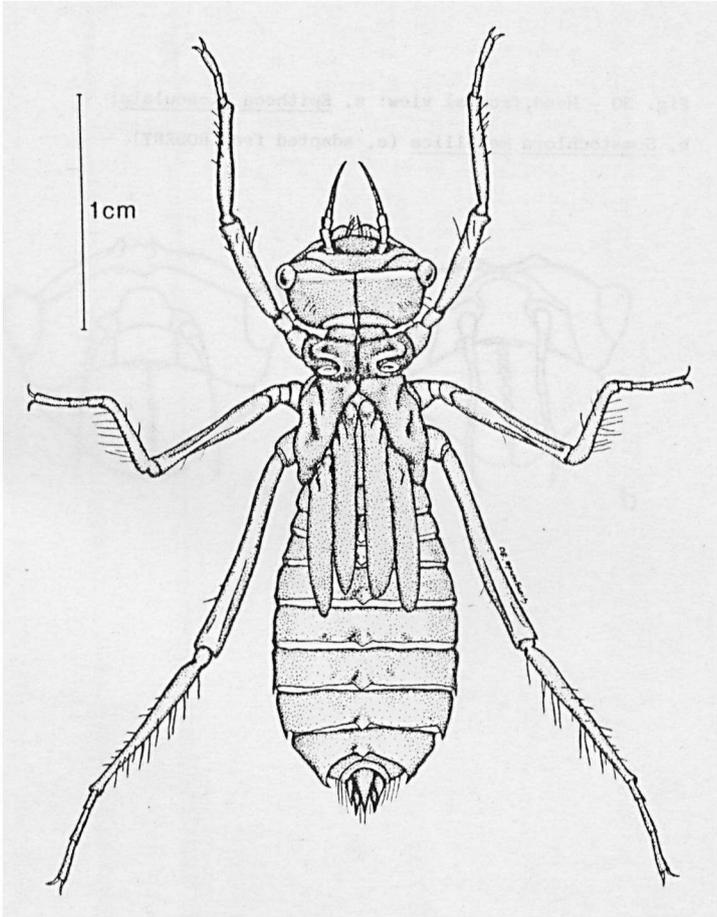
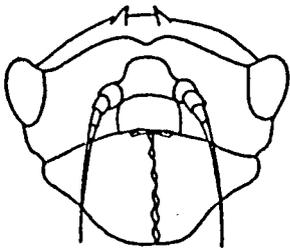
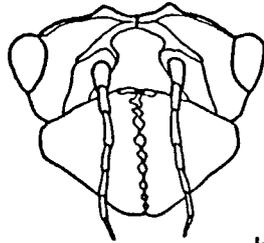


Fig. 30 - Head, frontal view: a, Epitheca bimaculata;  
b, Somatochlora metallica (a, adapted from ROBERT)



a



b

Fig. 31 - Last abdominal segments, dorsal and lateral views:  
a,d, Oxygastra curtisii; b,e, Somatochlora arctica;  
c,f, S. alpestris; g, Epithea bimaculata (g, adapted from  
ROBERT).

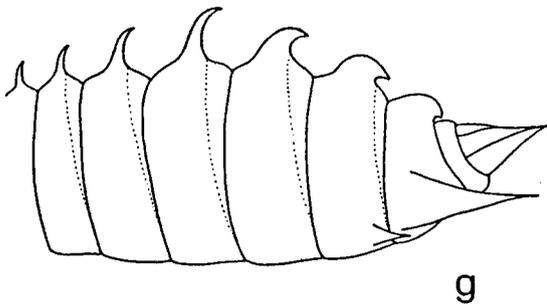
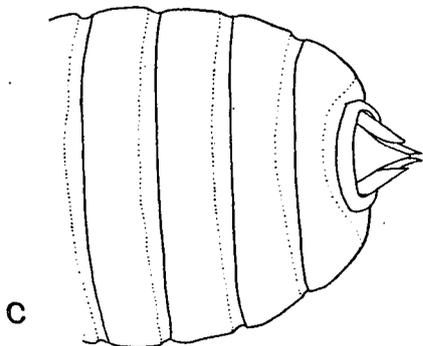
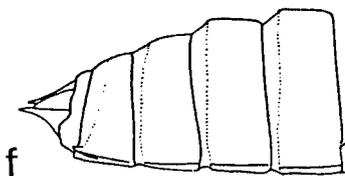
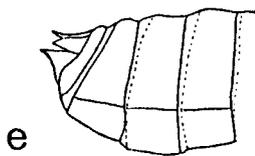
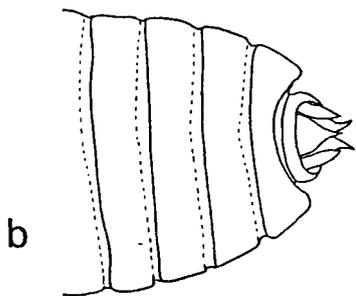
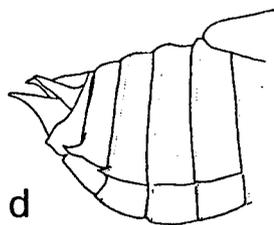
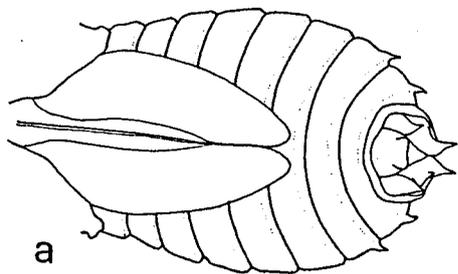


Fig. 32 - Last abdominal segments, lateral and dorsal views:  
a,d, Cordulia aenea; b,c, Somatochlora metallica.

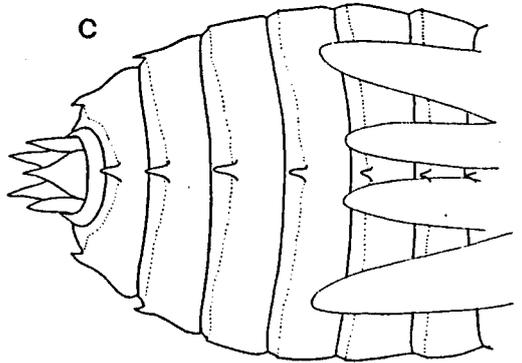
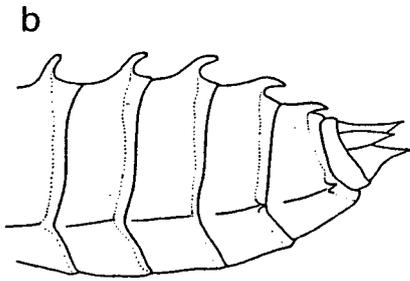
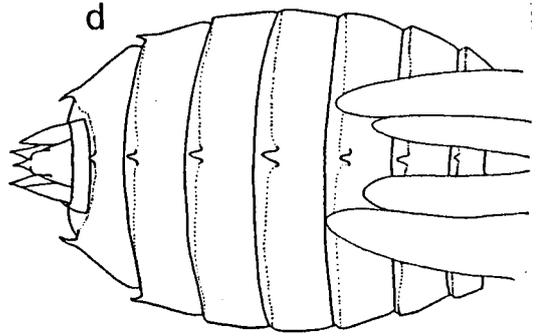
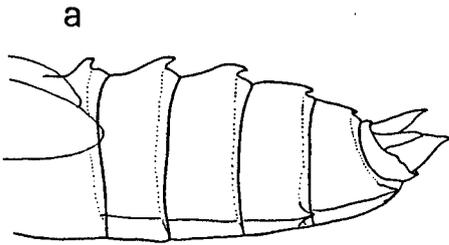
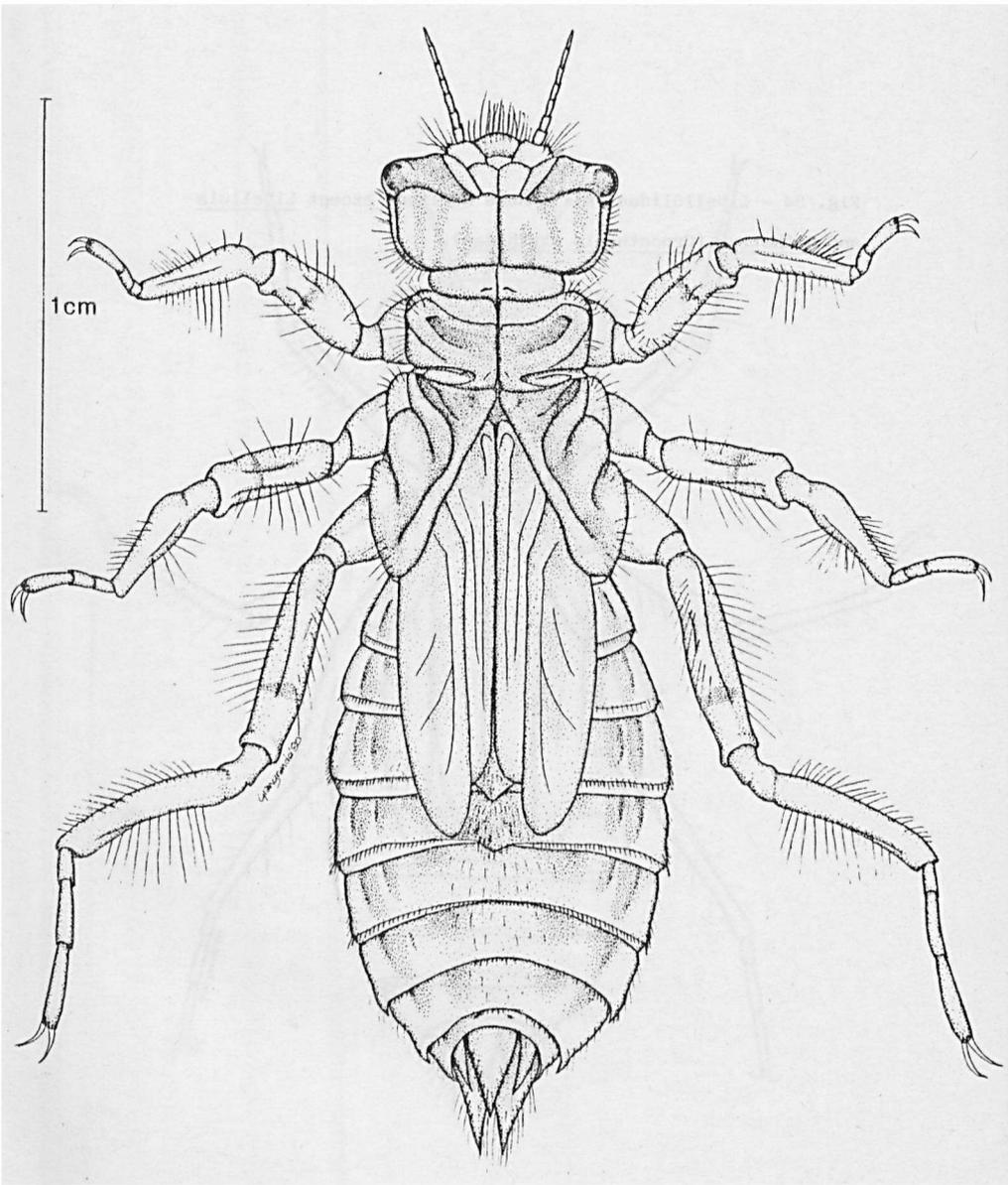


Fig. 33 - Libellulidae: Orthetrum and Libellula habitus  
(Orthetrum cancellatum)



1cm

Fig. 34 - Libellulidae: all genera habitus, except Libellula  
and Orthetrum (Crocothemis erythraea).

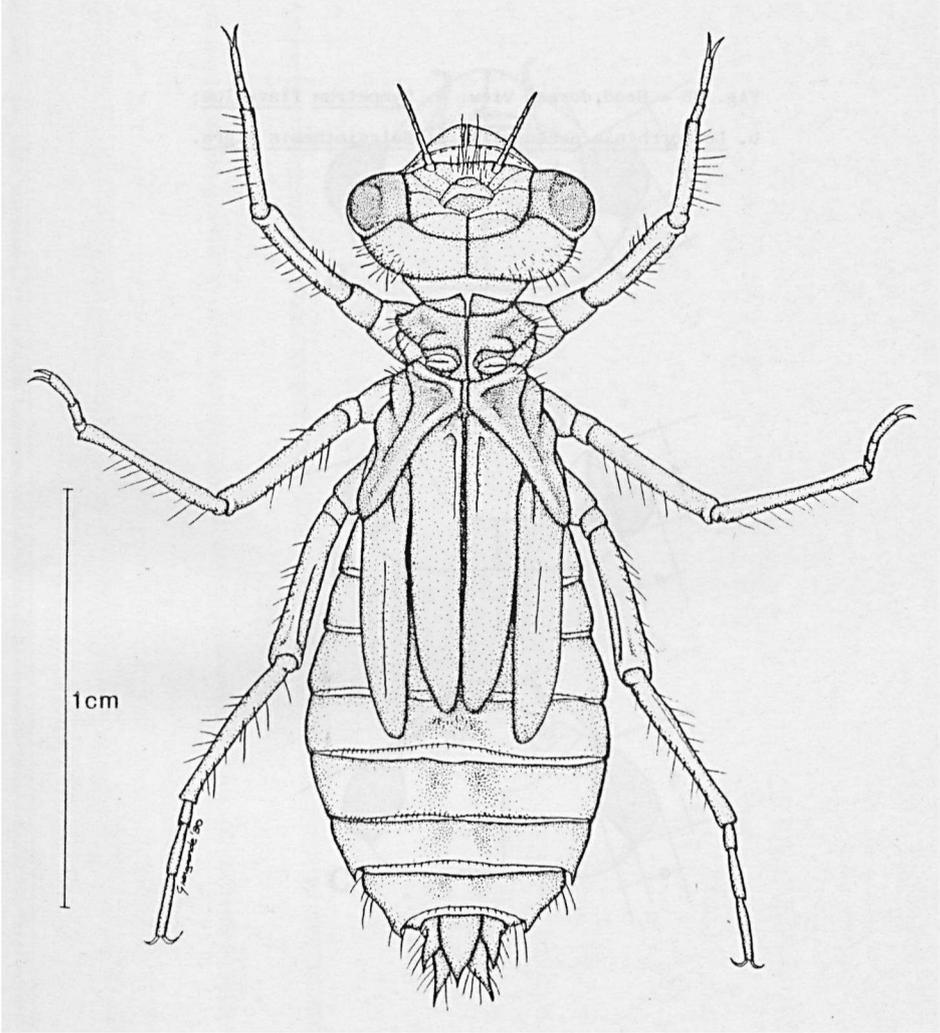


Fig. 35 - Head, dorsal view: a, Sympetrum flaveolum;  
b, Leucorrhinia pectoralis; c, Selysiothemis nigra.

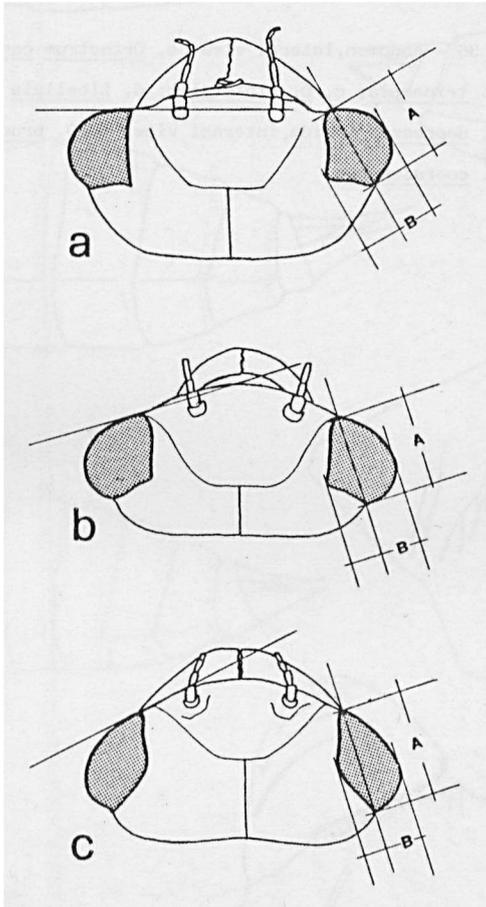
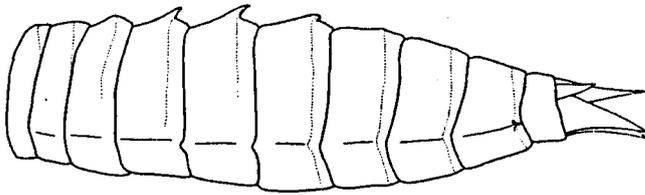
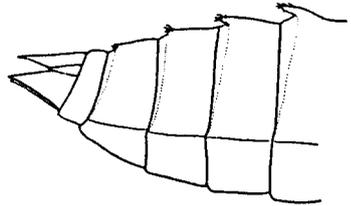


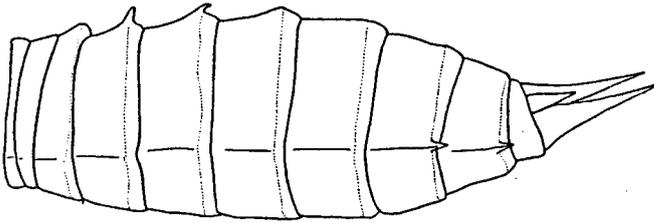
Fig. 36 - Abdomen, lateral view: a, Orthetrum cancellatum;  
b, O. trinacria; c, O. albistylum; d, Libellula fulva;  
e, L. depressa. Labium, internal view: f, O. brunneum;  
g, O. coerulescens.



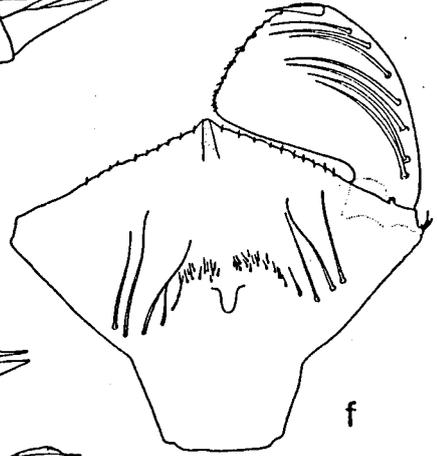
a



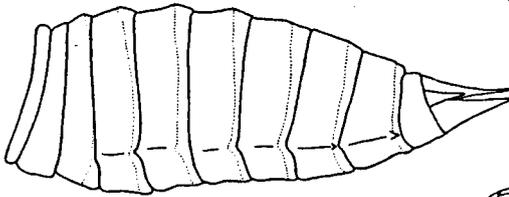
e



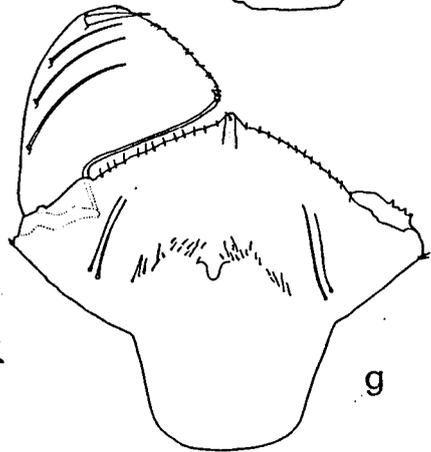
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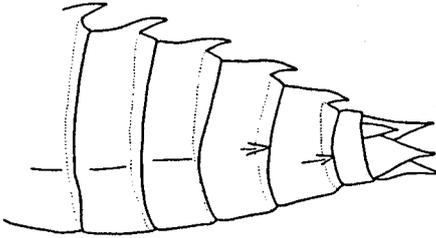
f



c



g



d

Fig. 37 - Palpi, frontal view: a, Libellula quadrimaculata;  
b, L. depressa. Last abdominal segments, dorsal view (schematic):  
c, Libellula; d, Orthetrum. Caudal pyramid, dorsal view:  
e, O. trinacria; f, O. cancellatum; g, O. albistylum;  
h, O. coerulescens.

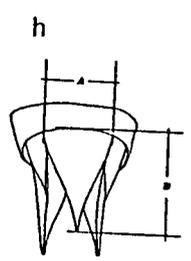
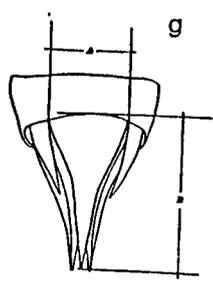
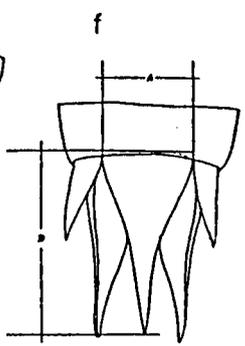
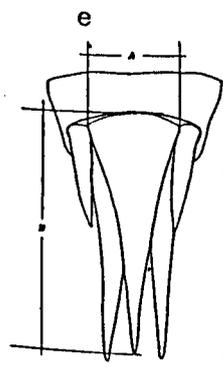
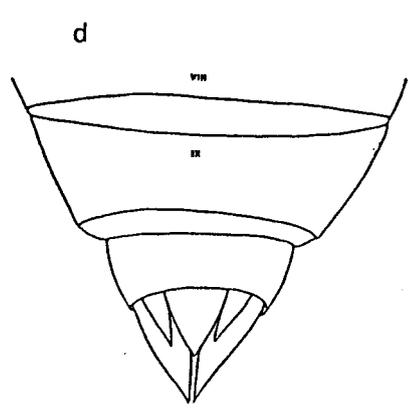
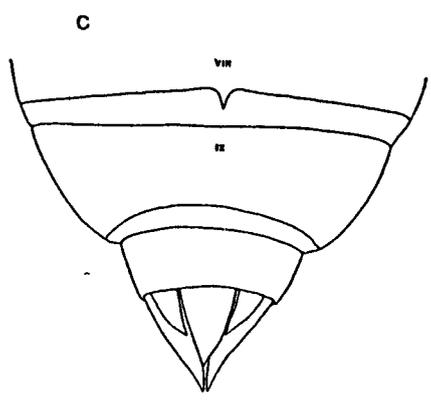
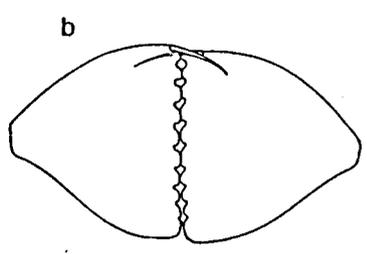
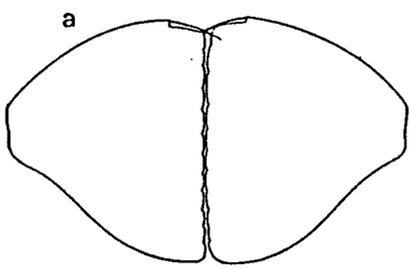


Fig. 38 - Abdominal segments, ventral view: a, Crocothemis erythraea; b, Sympetrum fonscolombi; c, Leucorrhinia pectoralis.

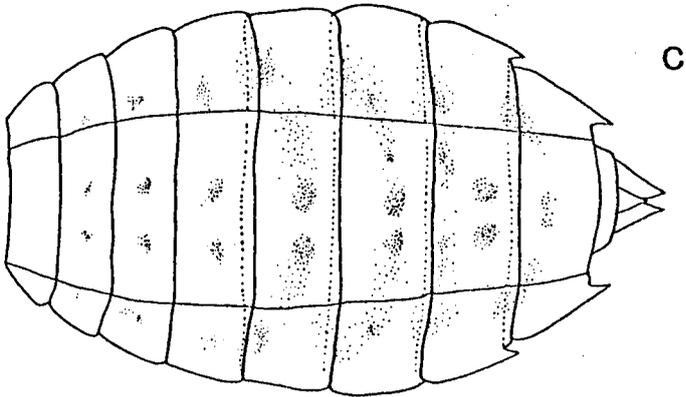
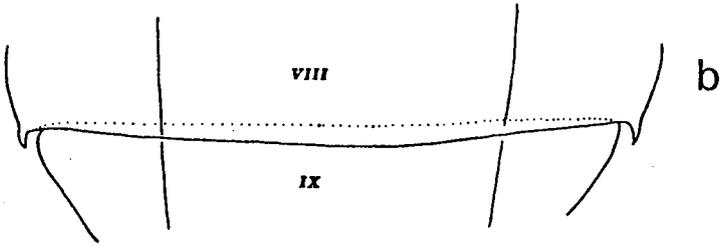
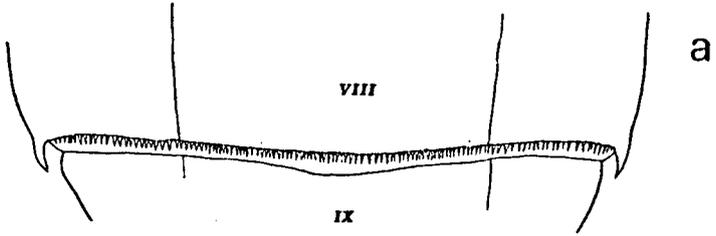


Fig. 39 - Last abdominal segments, dorsal and lateral views:  
a, f, Sympetrum fonscolombi; b, S. flaveolum; c, Leucorrhinia dubia; d, Trithemis annulata; e, S. striolatum; g, Crocothemis erythraea; h, S. vulgatum; i, S. depressiusculum; l, S. meridionale (c, specimen from Sweden).

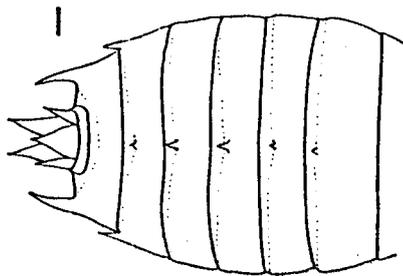
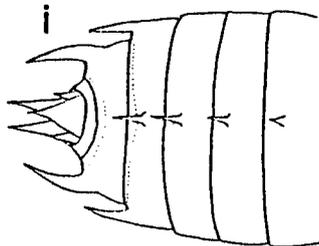
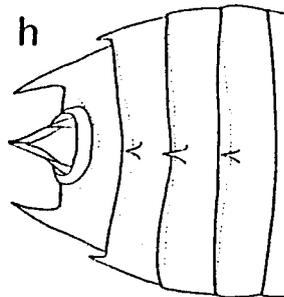
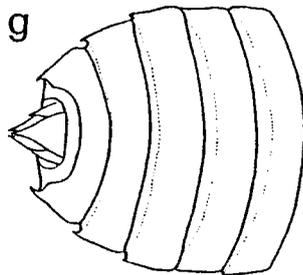
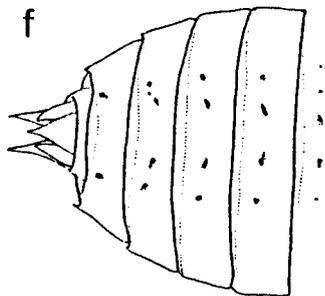
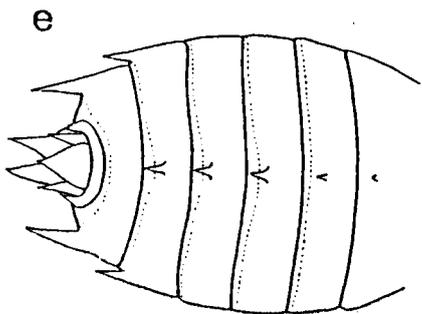
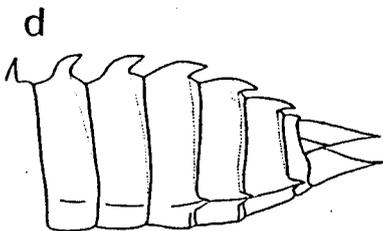
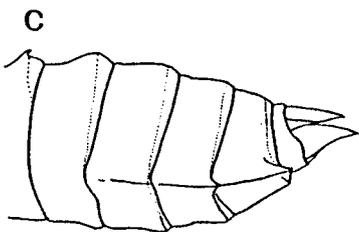
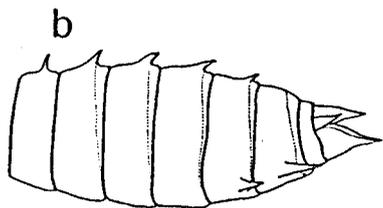
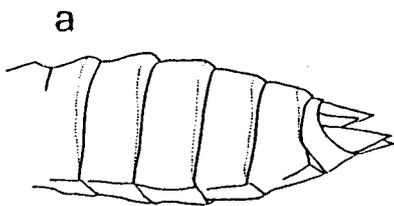


Fig. 40 - Last abdominal segments, dorsal and lateral views:  
a, Sympetrum meridionale; b,m, S. sanguineum; c, S. striolatum;  
d,l, S. danae; e,i, S. flaveolum; f, S. depressiusculum;  
g, S. vulgatum; h, S. pedemontanum.

