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MUSCULATURE OF MALE GENITALIA OF ANTLIONS (NEUROPTERA, MYRMELEONTIDAE): FIRST RESULTS OF STUDY

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The male genitalia of species of antlions studied [*Myrmecaelurus trigrammus* (PALL.), *Creoleon plumbeus* (OL.)] consist of evident morpho-functional structures: pregenital, ejaculatory and copulatory complexes. The latter can be divided into the aedeagal and proctal subcomplexes. Sclerites and muscles of each complex are described.

Key words: antlions, male genitalia, musculature

MATERIAL AND METHODS

The present study was carried out on two species of antlions, *Myrmecaelurus trigrammus* (PALLAS, 1781), and *Creoleon plumbeus* (OLIVIER, 1811). Living specimens of both species were collected in the Kazantip Cape, Crimea, Ukraine, 25–28.07.1994 (V. KRIVOKHATSKY coll.) and preserved in 70% alcohol. The abdomens of 10–12 specimens of each species were dissected using microknifes and pins under the binocular microscope MBS-10 (LOMO, Russia). The drawings are schematic as the different parts of genitalia were viewed from a different angles and from a number of dissected specimens.

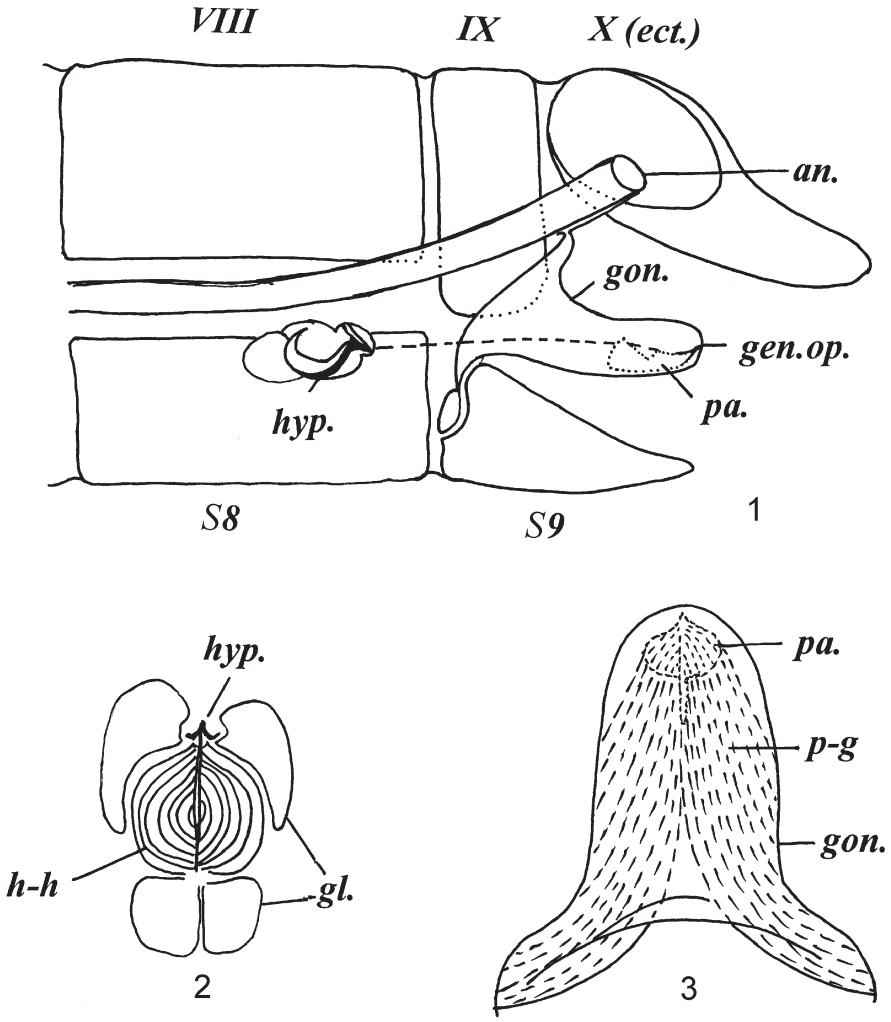
The terminology of sclerites in the male genitalia of antlions is given after TJEDER (1954, 1956), ACKER (1960), ASPÖCK *et al*. (1980); the different names for the same parts of genitalia of lacewings are used with contributions from the names known for other insect orders (SHVANVITSH 1949). The enumeration of muscles elaborated for well investigated taxa of insects, such as Diptera (OVTSHINNIKOVA 1989, 2000) and Lepidoptera (KUZNETZOV & STEKOLNIKOV 1984), is not used in the present preliminary report. Additional data from other taxa of antlions are needed for the correct enumeration in future.

RESULTS

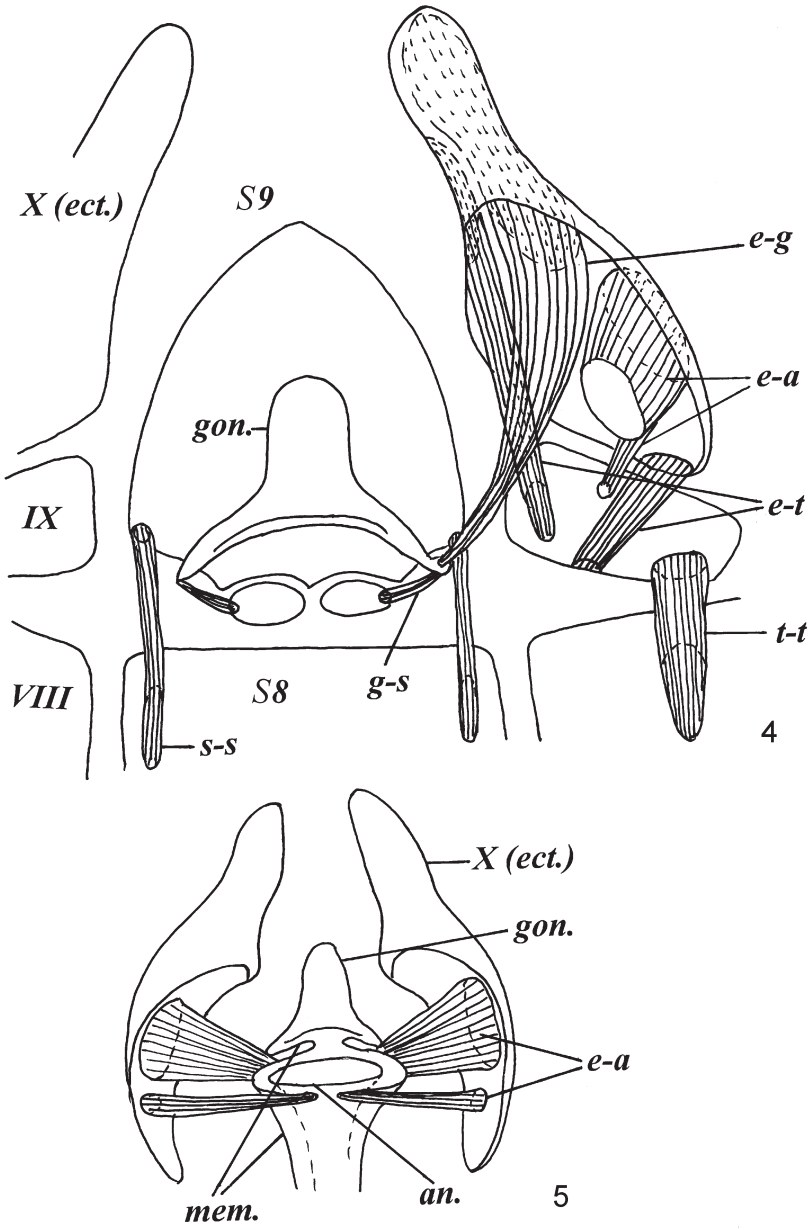
There are three well distinguished functional complexes of genital sclerites and their muscles in the tip of the abdomen in both species (Figs 1, 5): pregenital, ejaculatory, and copulatory. The latter can be divided into two subcomplexes: aedeagal and proctal.

Ejaculatory complex

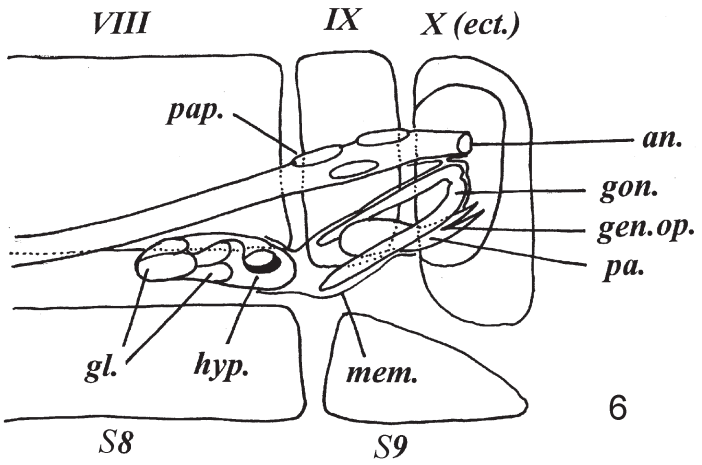
Ejaculatory complex consists of the ejaculatory apodeme (*hyp*. – hypandrium internum or sternite 10) with strong muscles *h–h* (Figs 2, 7), which pump

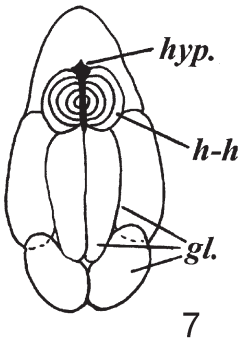


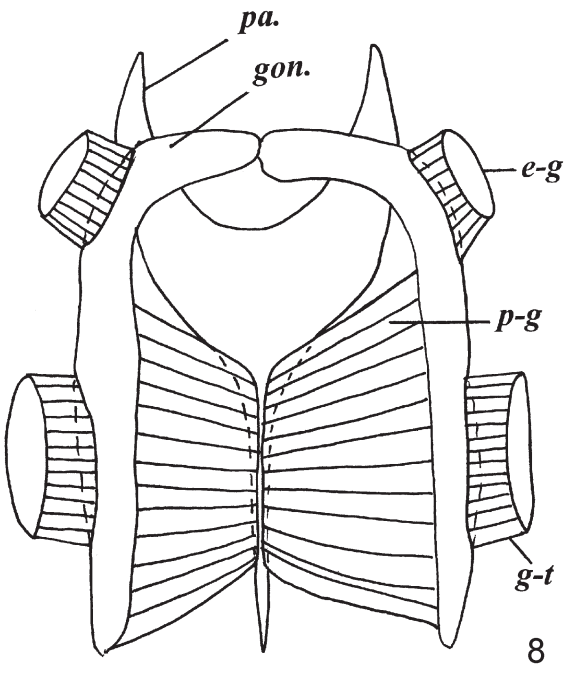
Figs 1–3. Internal male genitalia structures of *Myrmecaelurus trigrammus*: 1 = general structure of internal genitalia, lateral view; 2 = ejaculatory complex, dorsal view; 3 = aedeagal subcomplex, dorsal view. Explanations: VIII = eight abdominal tergite, IX = ninth abdominal tergite, X (ect.) = tenth abdominal tergite (ectoproct); an. = anus; gen. op. = genital opening; gl. = glands; gon. = gonarcus; hyp. = hypandrium internum; h–h = muscle hypandrium–hypandrium; pa. = paramere; p–g = muscle paramere–gonarcus; S8 = eight sternite; S9 = ninth sternite



Figs 4–5. Internal male genitalia structures of *Myrmecaelurus trigrammus*: 4 = musculature of pregenital and copulative complexes, dorsal view; 5 = proctal subcomplex, dorsal view. Explanations: e–a = muscle ectoproct–anus; e–g = muscle ectoproct–gonarcus; e–t = muscle ectoproct–ninth tergite; g–s = muscle gonarcus–ninth sternite; mem. = membrane; t–t = eight tergite – ninth tergite; others as as in Figs 1–3







Figs 6–8. Internal male genitalia of *Creoleon plumbeus*: 6 = general structure of internal genitalia, lateral view; 7 = ejaculatory complex, dorsal view; 8 = aedeagal subcomplex, dorsal view; Explanation: p–g = paramere–gonarcus; others as in Figs 1–3 and 4–5

sperm to the aedeagal subcomplex. The ejaculatory apodeme has no muscles connected with other sclerites. This complex is very compact and includes also two or more pairs of different sexual glands (*gl.*). The sickle-like plate of the hypandrium internum is present in both species. This plate is membranous and slightly reddish coloured in fresh alcohol preparations. It is invisible on preparations after boiling in KOH (potassium hydroxide) solution and was not found previously in *M. trigrammus* or in *C. plumbeus*. Some time ago the presence or absence of the hypandrium internum was estimated by me as the diagnostic feature in the generic

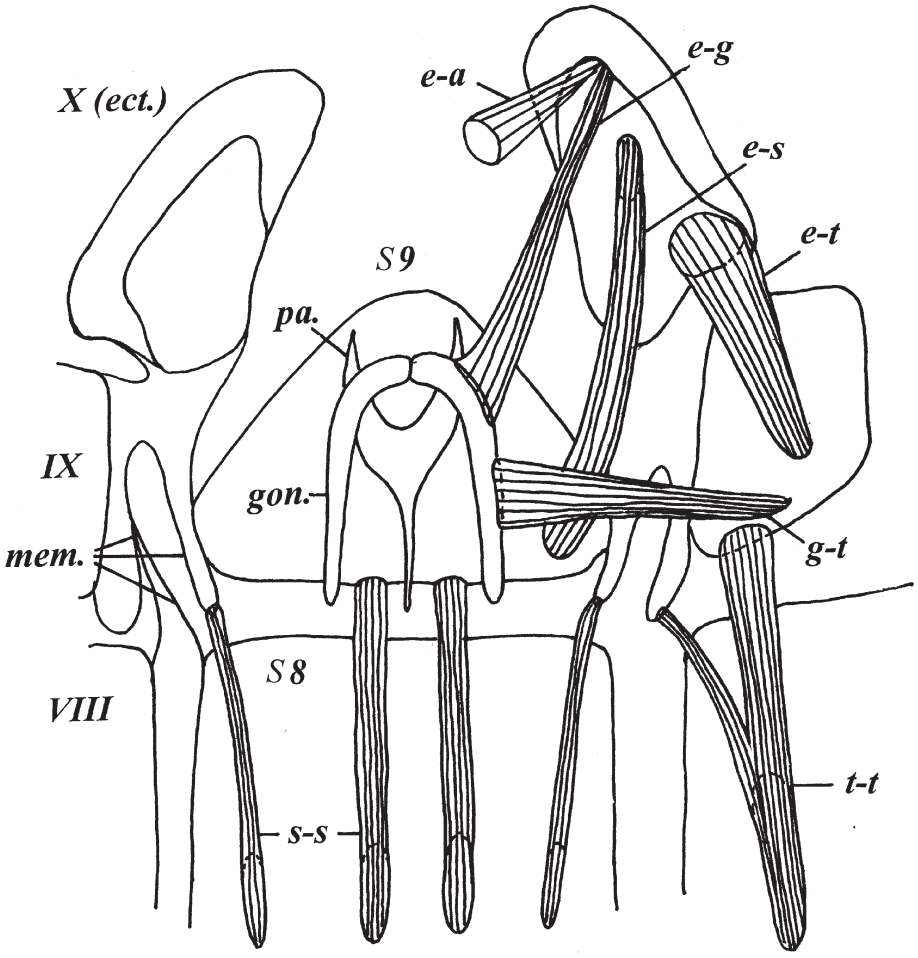


Fig. 9. *Creoleon plumbeus:* musculature of pregenital and copulative complexes, dorsal view. Explanations: e–s = muscle ectoproct–ninth sternite; s–s = muscles eight sternite–ninth sternite; others as in Figs 1–3 and 4–5

level in Myrmecaelurinae (KRIVOKHATSKY 1992); moreover it was not found in all taxa with nemoleontine type of male genitalia. It now seems, that the hypandrium internum should be found in genitalia of almost all species of Myrmeleontidae, as they should have a structure with ejaculatory function.

Pregenital complex

Pregenital complex supports inner genitalia (aedeagal complex) within the abdomen by means of tergal (*t–t*) and sternal (*s–s*) muscle pairs (Figs 4, 9) connecting tergites VIII and IX and sternites 8 and 9 by the same manner as in previous abdominal segments. In that complex some differences between the species were found. While in *M. trigrammus* its muscles are simple (Fig. 5), in *C. plumbeus* (Fig. 9) they are splitt. Sternal muscles in *C. plumbeus* are splitt into the two distinctive pairs, one of which runs from the middle of sternite 8 to the basal edge of sternite 9, and the other one from the middle of sternite 8 (some laterally) to the wide membrane close to the lateral corners of sternite 9. Tergal muscles in *C. plumbeus* are bifurcated; the stronger branch attaches to the basal part of tergite IX, and the smaller one to the same membrane, but close to the basal corner of tergite IX.

Copulative complex

Copulative complex functions as the aedeagus (copulatory and sperm-pump functions) and prohibitor of defecation during copulation.

Aedeagal subcomplex – The aedeagal subcomplex in both species (Figs 1, 6) consists of gonarcus (*gon.,* coxopodite 9) and paramere (*pa.,* coxopodite 10). These sclerites connect with each other by means of strong muscles *p–g* (Figs 3, 8), which move the paramere into the gonarcus. Other muscles responsible for the movement of gonarcus differ considerably in two species. *C. plumbeus* (Figs 8, 9) has more simple construction with gonarcus supplied by one pair of protractors of gonarcus *e–g* (from gonarcus to ectoproct) and one pair of retractors *g–t* (from gonarcus to tergite IX). Protractors of gonarcus *e-g* in *M. trigrammus* (Fig. 4) are also well defined, but retraction is carried out by the muscles *g-s* running from the corners of gonarcus to the basal plates of sternite 9. Some other muscles (*e–a*) take part in the movement of gonarcus too, but their primary function seems to be different.

Proctal subcomplex – Proctal subcomplex has the role to block the anus during copulation, and consists of muscles *e–a* compressing the integument of anus when aedeagal complex is protracted (Fig. 5). In *M. trigrammus* (Figs 4, 5) there are two pairs of *e–a*. Both are responsible for the opening of ectoprocts and for

compressing the anus during copulation. More strong pair of *e–a* runs from the gonarcus and attaches to the integument of anus close to the gonarcal membrane. It takes part in pulling out the gonarcus. More slender pair of *e–a* attaches to the anus from above. The latter was found in *C. plumbeus* (Fig. 9), where the strong pair was not found. It seems that the blocking function is realized from below by *e–g* muscles which press the arc of gonarcus to the integument of anus. The muscles of the proctal complex, which function to block the anus during copulation, also take a definite part in the process of defecation at other times.

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