

**Antlions in Hungary: checklist and identification key  
(Neuroptera: Myrmeleontidae)**

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**Abstract** – This paper presents an updated and annotated checklist of Myrmeleontidae (Neuroptera) of Hungary. Currently 16 species with valid faunistical records are known; the presence of *Myrmeleon hyalinus* Olivier, 1811, ignored by most authors, is confirmed, and the omission of *Synclisis baetica* (Rambur, 1842) from the Hungarian checklist is verified. An illustrated identification key is given to the 16 species present and further 15 species might potentially occur in Hungary.

**Key words** – faunistics, voucher specimens, clarification

**Dedication** – This paper, my first scientific publication, is dedicated to Dr. Ottó Merkl, coleopterist, taxonomist, head of the Coleoptera Collection of the Hungarian Natural History Museum, who passed away this year. He was one of my exemplars, one who believed in me all the times, who always supported me, whom I could count on every times I needed and whom I learned from a lot about entomology, museology and countless of other things.

## INTRODUCTION

Antlions (Myrmeleontidae) are world-widely distributed neuropterans, with about 2000 described species. They reach their greatest diversity in warmer areas. Several recent works, following MACHADO *et al.* (2019), treat the owlflies (Ascalaphidae) as a subfamily of Myrmeleontidae; they are, however, excluded from the present work and the indication of subfamilies and tribes of Myrmeleontidae is omitted.

Comprehensive checklists and overviews focusing entirely or partly on the Hungarian antlion fauna report slightly different species composition occurring in Hungary (MOCSÁRY 1889, PONGRÁCZ 1914, STEINMANN 1963, STEINMANN 1967, ASPÖCK *et al.* 1980, SZIRÁKI *et al.* 1992, ÁBRAHÁM & PAPP 1994, ASPÖCK *et al.* 2001, STANGE 2004, SZIRÁKI 2007). Besides the growing knowledge on the family, the differences can be explained by different judgements

about some species which are represented by a single specimen collected outside from the known distribution area, and in the case of one species by the original misidentification. Occurrence of 16 species in Hungary is considered as confirmed in the present paper.

The first identification keys to adults and larvae of antlions of Hungary were published by BÍRÓ (1885*a, b*). A partial key was given by STEINMANN (1963), and the latest complete identification key for adults of all Hungarian species was compiled by STEINMANN (1967) as well; however, the latter key is outdated and it can easily be misleading. There are comprehensive and useful identification keys available for the antlions of Europe (ASPÖCK *et al.* 1980), Central Europe (GEPP & HÖLZEL 1989) or country-level areas (e.g., KRIVOKHATSKY 2011); however, these either have become more or less outdated by now in nomenclatural aspect or contain only a subset of the species occurring in Hungary. Further complications may arise due to the difficult access to the most comprehensive work (ASPÖCK *et al.* 1980), and due to the fact that these works were written either in German or Russian, which languages are nowadays less frequently known by the younger generations of amateur entomologists in Hungary. For these reasons, it is worth to compile an up to date, regional identification key for the Hungarian antlion fauna in English to facilitate further faunistical work in the country. For the same purpose, the identification key includes not only the species already known from Hungary, but also unrecorded species which are nevertheless expected to occur in the country.

The last guide to larvae of antlions of Hungary was given by BÍRÓ (1885*a*). Larvae are generally less known than adults. Recently, BADANO & PANTALEONI (2014) summarised the current knowledge of antlion larvae of Europe and provided a useful and well-illustrated larval identification key to almost all European species of which larvae are known. For this reason, the present work does not include key to the larvae. However, in the checklist below the annotations provide information whether the larva of the given species is known or not.

This paper aims to provide a confirmed and updated list of antlions known from Hungary, with the re-examination of the voucher specimens of the species represented by a single occurrence record in Hungary. Additionally, a list of the expected species is compiled, and an illustrated identification key to the adults of species present and might potentially occur in Hungary is given, based on literature and examination of specimens in the Hungarian Natural History Museum, Budapest (HNHM).

## MATERIAL AND METHODS

Nomenclature and order of the species in the checklist follow the latest world catalogue of antlions (STANGE 2004). Complete nomenclatural history and list of synonyms were provided in the latter work, therefore they are not repeated

here. Annotations are given to the checklist regarding nomenclature and determination. Label data of the voucher specimens is given verbatim with explanatory or complementary information in square brackets. All photos and post-image works were made by the author.

The identification key is based on previously published taxonomical or faunistical works and identification keys (HÖLZEL 1976, ASPÖCK *et al.* 1980, HÖLZEL 1987, GEPP & HÖLZEL 1989, ÁBRAHÁM & PAPP 1991, STANGE 2004, KRIVOKHATSKY 2011, BADANO *et al.* 2017, AKHTAR *et al.* 2018, DVOŘÁK & GEORGIEV 2018) and on the examination of specimens in the HNHM. Morphological terminology follows ASPÖCK *et al.* (1980), BREITKREUZ *et al.* (2017) and MACHADO & OSWALD (2020).

As natural expansion of southern species towards the north is getting more and more common in recent years in Europe (e.g., OTT 2001, KÁROLYI & RÉDEI 2017, PAULOVICS & VAS 2021), most probably driven by warming and drying climate, preferred by antlions, it is reasonable to include species in the identification key with considerable probability to appear in Hungary. Species of this category were included by the following biogeographical criteria: the species is either known from at least one country directly neighbouring Hungary or known from the Balkan Peninsula north of Greece (Greece not included); based on ASPÖCK *et al.* (2001), DEVETAK & JAKSIC (2003), JEDLIČKA *et al.* (2004), STANGE (2004), DEVETAK *et al.* (2013), DEVETAK & ZEQRIRI (2018) and DOBOSZ & POPOV (2018).

## ANNOTATED LIST OF ANTLIONS OF HUNGARY

### *Palpares Rambur, 1842*

*Palpares libelluloides* (Linnaeus, 1764)

(Fig. 1)

*Material examined* – Hungary: Mecsek hgs., Hidasi völgy [Mecsek Mt., Hidasi valley, Baranya county], 1957.VI.16, [leg.] Móczár L., male.

*Remarks* – STEINMANN (1963) and subsequent authors (e.g., SZIRÁKI *et al.* 1992) included this species in the lists of the Hungarian antlion fauna. The single voucher specimen referred to by STEINMANN (1963) is deposited in the HNHM (NH 157) (its collecting data given above), and was found in the collection, therefore the identifications of H. Steinmann and Gy. Sziráki (the latter provided the specimen with his identification label, date unknown) are confirmed. This species is known by this single, verified occurrence record in Hungary. Identification of larva: BADANO & PANTALEONI (2014).



Fig. 1. *Palpares libelluloides* (Linnaeus, 1764) voucher specimen (photo by Viktória Szőke)

***Dendroleon* Brauer, 1866**

*Dendroleon pantherinus* (Fabricius, 1787)

*Remarks* – Identification of larva: BADANO & PANTALEONI (2014).

***Creoleon* Tillyard, 1918**

*Creoleon plumbeus* (Olivier, 1811)

*Remarks* – Referred to as *Creagris plumbeus* by BÍRÓ (1885a, b), MOCSÁRY (1889) and PONGRÁCZ (1914). Older Hungarian records of *Creoleon lugdunense* (Villers, 1789) (e.g., STEINMANN 1963, 1967) pertain to this species (ÁBRAHÁM & PAPP 1994, ASPÖCK *et al.* 2001). Both species are valid, only *Creoleon plumbeus* occurs in Hungary, while *Creoleon lugdunense* is a more southern species. Although the larva is known (WILLMANN 1977, KRIVOKHATSKY 2011), BADANO & PANTALEONI (2014) did not include it in their key, as they found that contemporary information did not allow its reliable separation from *Creoleon lugdunense*.

***Deutoleon* Navás, 1927**  
***Deutoleon lineatus* (Fabricius, 1798)**  
(Fig. 2)

*Material examined* – Hungary: Kelebia [Bács-Kiskun county], 1962.VII.21, fénycsapda [light trap], [female].

*Remarks* – Referred to as *Formicaleon lineatus* Fabricius, 1798 by STEINMANN (1963, 1967). STEINMANN (1963) and subsequent authors (e.g., SZIRÁKI *et al.* 1992) included this species in the lists of the Hungarian antlion fauna. The single voucher specimen referred to by STEINMANN (1963) is deposited in the HNHM (NH 277) (its collecting data given above), and was found in the collection according to the taxonomic order, however without a pinned identification label, therefore the original identification of H. Steinmann is confirmed. This species is known by a single, verified occurrence record from Hungary. Larva unknown.



**Fig. 2.** *Deutoleon lineatus* (Fabricius, 1798) voucher specimen (photo by Viktória Szöke)

***Distoleon* Banks, 1910**  
***Distoleon tetragrammicus* (Fabricius, 1798)**

*Remarks* – Referred to as *Formicaleo tetragrammicus* by BÍRÓ (1885a, b), MOCSÁRY (1889) and PONGRÁCZ (1914), as *Formicaleon tetragrammicus* by STEINMANN (1963, 1967). Identification of larva: BADANO & PANTALEONI (2014).

***Macronemurus* Costa, 1855**  
*Macronemurus bilineatus* Brauer, 1868  
 (Fig. 3)

*Material examined* – Hungary: Debrecen, Nagyerdő [Hajdú-Bihar county], 1937.VI.9, [leg. J.] Sători, [female].

*Remarks* – STEINMANN (1963) and subsequent authors (e.g., SZIRÁKI *et al.* 1992) included this species in the lists of the Hungarian antlion fauna. The single voucher specimen referred to by STEINMANN (1963) is deposited in the HNHM (NH 326) (its collecting data given above). On its original collecting data label there is a misidentification (probably by the collector) as *Megistopus flavicornis* (Rossi, 1790). The identification of H. Steinmann and Gy. Sziráki as *Macronemurus bilineatus* (the latter provided the specimen with his identification label in 1990) are confirmed. This species is known by a single, verified occurrence record from Hungary. Larva unknown.



**Fig. 3.** *Macronemurus bilineatus* Brauer, 1868 voucher specimen (photo by Viktória Szőke)

***Megistopus* Rambur, 1842**  
*Megistopus flavicornis* (Rossi, 1790)

*Remarks* – Identification of larva: BADANO & PANTALEONI (2014).

***Neuroleon* Navás, 1909***Neuroleon nemausiensis* (Borkhausen, 1791)

*Remarks* – Identification of larva: BADANO & PANTALEONI (2014).

***Myrmecaelurus* Costa, 1855***Myrmecaelurus trigrammus* (Pallas, 1771)

*Remarks* – Identification of larva: BADANO & PANTALEONI (2014).

*Myrmecaelurus punctulatus* (Steven in Fischer v. Waldheim, 1822)

*Remarks* – Referred to as *Myrmecaelurus (Nohoveus) zigan* Aspöck, Aspöck, Hölzel, 1980 by ASPÖCK *et al.* (1980); as *Myrmecaelurus zigan* by GEPP & HÖLZEL (1989) and SZIRÁKI *et al.* (1992); as *Nohoveus punctulatus* by ASPÖCK *et al.* (2001); as *Nohoveus zigan* by KRIVOKHATSKY (2011). The species name *zigan* was proposed as a replacement name by ASPÖCK *et al.* (1980); the replacement was subsequently considered as unnecessary by some authors (ASPÖCK *et al.* 2001, STANGE 2004), but this view was debated by others (see e.g., KRIVOKHATSKY 2011); in this paper the nomenclature of STANGE (2004) is followed. Larva known (ÁBRAHÁM & PAPP 1990, KRIVOKHATSKY 2011), identification of larva: BADANO & PANTALEONI (2014) (as *Nohoveus zigan*).

***Euroleon* Esben-Petersen, 1918***Euroleon nostras* (Geoffroy in Fourcroy, 1785)

*Remarks* – Referred to as *Myrmeleon europaeus* McLachlan, 1873 by BÍRÓ (1885a, b), MOCSÁRY (1889) and PONGRÁCZ (1914). Identification of larva: BADANO & PANTALEONI (2014).

***Myrmeleon* Linnaeus, 1767***Myrmeleon formicarius* Linnaeus, 1767

*Remarks* – Identification of larva: BADANO & PANTALEONI (2014).

*Myrmeleon inconspicuus* Rambur, 1842

*Remarks* – Referred to as *Myrmeleon erberi* Brauer, 1868 by BÍRÓ (1885a, b), MOCSÁRY (1889) and PONGRÁCZ (1914); as *Myrmeleon (Morter) inconspicuus* by ASPÖCK *et al.* (1980). Identification of larva: BADANO & PANTALEONI (2014).

*Myrmeleon bore* (Tjeder, 1941)

*Remarks* – Referred to as *Myrmeleon (Morter) bore* by ASPÖCK *et al.* (1980). Identification of larva: BADANO & PANTALEONI (2014).

*Myrmeleon hyalinus* Olivier, 1811 ssp. *distinguendus* Rambur, 1842  
(Fig. 4)

*Material examined* – Hungary: Kelebia [Bács-Kiskun county], 1962.VII.18, fénycsapda [light trap], [female].

*Remarks* – Referred to as *Morter hyalinus* by STEINMANN (1963, 1967); as *Myrmeleon (Morter) hyalinus* by ASPÖCK *et al.* (1980); as *Myrmeleon hyalinus distinguendus* by ASPÖCK *et al.* (2001) and STANGE (2004). The occurrence of *Myrmeleon hyalinus distinguendus* in Hungary was controversial. Although STEINMANN (1963, 1967) reported the occurrence of the species in Hungary, emphasizing that the voucher specimen was apparently freshly emerged, neither SZIRÁKI *et al.* (1992) nor ASPÖCK *et al.* (2001) treated this species as part of the Hungarian fauna. ÁBRAHÁM & PAPP (1994) mentioned a previous Hungarian record, however, they claimed that it is a Mediterranean species not occurring in Hungary. Nevertheless, STANGE (2004) listed *Myrmeleon hyalinus distinguendus* from Hungary, referring to STEINMANN (1963). The specimen referred to by STEINMANN (1963) is deposited in the HNHM (NH 325) (its collecting data given above) and was re-examined in course of the present study. The identification of Gy. Sziráki (label from 1990) is agreed here, and further specified as ssp. *distinguendus* according to HÖLZEL (1987). Although only a single voucher specimen is known, there is no reason to question its authenticity or suspect mislabelling. Therefore it is considered as a valid faunistical record of this species in Hungary, similarly to *Palpares libelluloides*, *Deutoleon lineatus* and *Macronemurus bilineatus*, even if it is uncertain whether stable populations of these species exist within the boundaries of the country, or the voucher specimens were occasional immigrants. Identification of larva: BADANO & PANTALEONI (2014).





**Fig. 4.** *Myrmeleon hyalinus* Olivier, 1811 ssp. *distinguendus* Rambur, 1842 voucher specimen (photo by Viktória Szöke)

***Acanthaclisis* Rambur, 1842**

*Acanthaclisis occitanica* (Villers, 1789)

*Remarks* – Identification of larva: BADANO & PANTALEONI (2014).

ANNOTATED LIST OF THE EXPECTED ANTLION SPECIES  
IN HUNGARY

***Nemoleon* Navás, 1909**

*Nemoleon poecilopterus* (Stein, 1863)

*Remarks* – This mainly Mediterranean and West Asian species is known from the Balkan Peninsula, including a direct neighbour country of Hungary (Croatia). Larva unknown.

***Creoleon* Tillyard, 1918**

*Creoleon lugdunense* (Villers, 1789)

*Remarks* – This mainly Mediterranean and North African species is known from the Balkan Peninsula, including a direct neighbour country of Hungary (Croatia). Identification of larva: BADANO & PANTALEONI (2014).

***Delfimeus* Navás, 1912**  
*Delfimeus irroratus* (Olivier, 1811)

*Remarks* – This mainly Mediterranean and West Asian species is known from the Balkan Peninsula, including a direct neighbour country of Hungary (Croatia). Larva unknown.

***Gymnocnemis* Schneider, 1845**  
*Gymnocnemis variegata* (Schneider, 1845)

*Remarks* – This mainly Mediterranean, North African, West and Central Asian species is known from the Balkan Peninsula, as well as from several direct neighbour countries of Hungary (Croatia, Romania, Slovenia and Ukraine). Identification of larva: BADANO & PANTALEONI (2014).

***Macronemurus* Costa, 1855**  
*Macronemurus appendiculatus* (Latreille, 1807)

*Remarks* – This mainly Mediterranean, North African and West Asian species is known from the Balkan Peninsula, as well as from direct neighbour countries of Hungary (Croatia, Slovakia and Slovenia). Identification of larva: BADANO & PANTALEONI (2014).

***Nedroledon* Navás, 1914**  
*Nedroledon anatolicus* Navás, 1914

*Remarks* – This mainly Mediterranean and West Asian species is known from the Balkan Peninsula, and from a direct neighbour country of Hungary (Romania). STANGE (2004), referring NAVÁS (1932), erroneously listed this species from Hungary; the specimen which NAVÁS (1932) referred to as *Pteroleon longiventris* Navás, 1932, now a junior synonym of *Nedroledon anatolicus*, was collected in Orșova, Romania. Larva unknown.

***Neuroleon* Navás, 1909**  
*Neuroleon microstenus* (McLachlan, 1898)

*Remarks* – This mainly Mediterranean, North African and West Asian species is known from the Balkan Peninsula, as well as from direct neighbour

countries of Hungary (Croatia, Romania and Ukraine). Identification of larva: BADANO & PANTALEONI (2014).

*Neuroleon egenus* (Navás, 1914)

*Remarks* – This mainly Mediterranean, North African and West Asian species is known from the Balkan Peninsula, including a direct neighbour country of Hungary (Croatia). Identification of larva: BADANO & PANTALEONI (2014).

*Neuroleon assimilis* (Navás, 1914)

*Remarks* – This mainly Mediterranean and West Asian species is known from the Balkan Peninsula north of Greece, however, not from any of the direct neighbour countries of Hungary. Identification of larva: BADANO & PANTALEONI (2014).

*Neuroleon tenellus* (Klug in Ehrenberg, 1834)

*Remarks* – This mainly Mediterranean, North and East African, West and Central Asian species is known from the Balkan Peninsula north of Greece, however, not from any of the direct neighbour countries of Hungary. Larva unknown.

*Neuroleon arenarius* (Navás, 1904)

*Remarks* – This mainly Mediterranean and North African species is known from the Balkan Peninsula north of Greece, however, not from any of the direct neighbour countries of Hungary. Identification of larva: BADANO & PANTALEONI (2014).

***Cueta* Navás, 1911**

*Cueta lineosa* (Rambur, 1842)

*Remarks* – This mainly Mediterranean, North and East African, West and Central Asian species is known from the Balkan Peninsula north of Greece, however, not from any of the direct neighbour countries of Hungary. Identification of larva: BADANO & PANTALEONI (2014).

***Myrmeleon* Linnaeus, 1767**  
*Myrmeleon immanis* Walker, 1853

*Remarks* – This mainly West and Central Asian species is known from direct neighbour countries of Hungary (Romania, Ukraine). Larva known (KRIVOKHATSKY 2011); BADANO & PANTALEONI (2014) did not key this species, however they discussed the difference between the larvae of *Myrmeleon inconspicuus* and *Myrmeleon immanis*.

*Myrmeleon noacki* Ohm, 1965

*Remarks* – This mainly Mediterranean and West Asian species is known from the Balkan Peninsula north of Greece, however, not from any of the direct neighbour countries of Hungary. Larva unknown.

***Synclisis* Navás, 1919**  
*Synclisis baetica* (Rambur, 1842)

*Remarks* – STEINMANN (1963) reported the occurrence of this species in Hungary as *Acanthaclisis baetica* Rambur, 1842, and emphasized its similarity with *Acanthaclisis occitanica* (Villers, 1789). Neither SZIRÁKI *et al.* (1992) nor ÁBRAHÁM & PAPP (1994) treated this species as part of the Hungarian fauna, and the latter publication stated that the Hungarian record was based on misidentification. ASPÖCK *et al.* (1980, 2001) and STANGE (2004) nevertheless listed this species from Hungary, referring to STEINMANN (1963). The specimen referred to by STEINMANN (1963) is deposited in the HNHN (NH 171), however without original identification label of Steinmann; its collecting data: [Hungary], Sziget-Csép [Szigetcsép, Pest county, date unknown], [male] (Fig. 5). Later Gy. Sziráki re-identified this specimen as *Acanthaclisis occitanica* and noted on a pinned label that earlier it was placed in the collection under *Acanthaclisis baetica* (see middle label on Fig. 5, in Hungarian). I agree with the identification of Gy. Sziráki, therefore the record of STEINMANN (1963) was based on a misidentification. Although in lack of voucher specimen *Synclisis baetica* is omitted from the checklist of Hungary, this mainly Mediterranean, North and West African and West Asian species might likely occur in Hungary, as it is known from the Balkan Peninsula and two direct neighbour countries (Romania, Ukraine). Identification of larva: BADANO & PANTALEONI (2014).



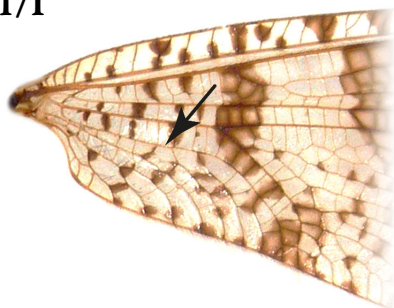
**Fig. 5.** *Acanthaclisis occitanica* (Villers, 1789) specimen from Szigetcsép, originally misidentified as the voucher specimen of *Synclisis baetica* (Rambur, 1842) (photo by Viktória Szöke)

## IDENTIFICATION KEYS

The identification keys below include embedded photographic illustrations, the figures refer to the couplet directly above of them. The number of each figure consists of the respective number of the couplet (Arabic numeral) combined with the respective half of the couplet (Roman numeral), occasional alphabetic letters indicate further parts within the given couplet. Supporting but not necessarily diagnostic characters are given in parentheses. Genera and species not yet recorded from but expected to occur in Hungary are given in square brackets.

### Identification of genera

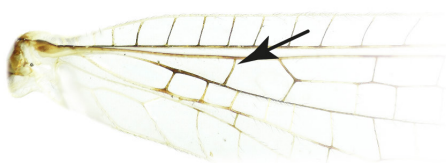
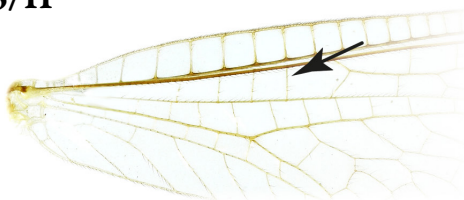
- 1 *CuP* of fore wing long, not merged with *1A*, reaching posterior edge of wing in several branches (1/I); wings wide, with distinct, very large, dark patches; fore wing usually longer than 55 mm, rarely only 50 mm ..... *Palpares*
- *CuP* of fore wing short, departs from *CuA* at wing base then almost immediately merges with *1A*, forming *CuP+1A* (1/II); wings narrower, entirely without dark patches or spots, or with small dark spots and/or relatively small dark patches; fore wing length usually less than 55 mm (except in *Acanthaclisis* and *Synclisis* up to 60 mm) ..... 2

**1/I****1/II**

- 2 Hind margin of fore wing with distinct, conspicuous half eye marking (2/I) (presectoral area of hind wing with one crossvein; pronotum almost twice as long as wide) ..... *Dendroleon*  
 – Hind margin of fore wing without half eye marking ..... 3

**2/I**

- 3 Presectoral area of hind wing with 1–3 crossveins (3/I) ..... 4  
 – Presectoral area of hind wing with more than 3 crossveins (3/II) ..... 13

**3/I****3/II**

- 4 Following combination of characters present: *Rs* of fore wing originating at or distal to cubital fork; *2A* of fore wing strongly bent before merging with *3A* (4/Ia); legs long and slender; tarsal claws folding against a brush of robust setae on fifth tarsomere (4/Ib) ..... 5  
 – Not the same character combination as above ..... 7

4/Ia

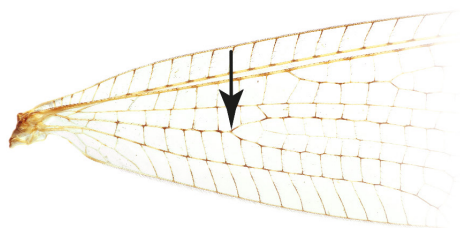


4/Ib

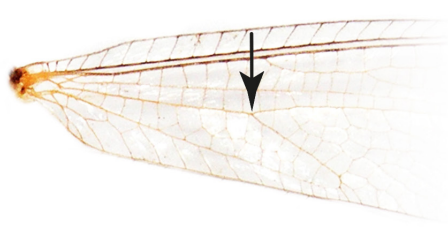


- 5 Mesonotum covered with erect, robust setae; fore leg much longer than middle and hind legs, fore femur distinctly elongated ..... [Gymnocnemis]
- Mesonotum without erect, robust setae; fore leg about as long as middle and hind legs ..... 6
- 6 First tarsomere as long as or slightly shorter than second tarsomere in all legs; fore wing only with a rounded dark spot at about the distal endings of the posterior branch of CuA and CuP+1A ..... Megistopus
- First tarsomere longer, about as long as combined lengths of second and third tarsomeres in all legs; fore wing with a few dark spots, including a drop-shaped dark spot at about the distal endings of the posterior branch of CuA and the CuP+1A ..... [Nedroledon]
- 7 Branches of CuA of fore wing about parallel to each other; cubital fork narrow (7/I) ...
- ..... Creoleon
- Branches of CuA of fore wing distinctly divergent; cubital fork wide (7/II) ..... 8

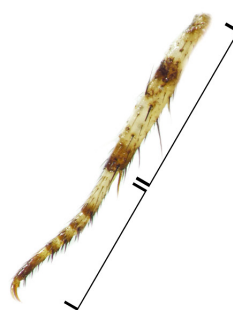
7/I



7/II



- 8 Presectoral area of hind wing with 2 crossveins ..... Deutoleon
- Presectoral area of hind wing with 1 crossvein ..... 9
- 9 Tarsi distinctly longer than tibiae in all legs (9/I) ..... [Nemoleon]
- Tarsi not longer than tibiae in all legs (usually distinctly shorter or at most equal) (9/II) ...
- ..... 10

**9/I****9/II**

- 10 *CuP* of fore wing short, departs from *CuA* then almost immediately merges with *1A*, therefore appears as a short crossvein (10/I) ..... 11
- *CuP* of fore wing longer, departs from *CuA* then runs parallel with *1A* for a distinct section before merging with it (10/II) ..... 12

**10/I****10/II**

- 11 Tibial spurs distinctly longer than the first tarsomere in all legs (11/I) ..... *Macronemurus*
- Tibial spurs distinctly shorter than the first tarsomere in all legs (usually shorter than half length of first tarsomere) (11/II) ..... [*Delfimeus*]

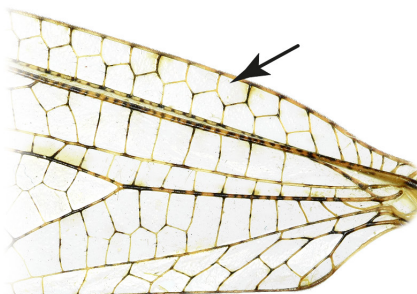
**11/I****11/II**

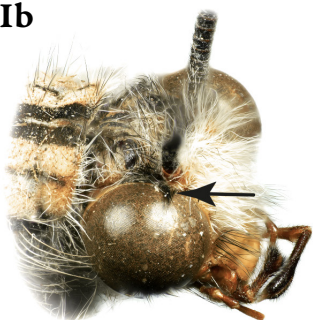


- 12 Tibial spurs reaching apex of third tarsomere in fore and middle legs (12/I), in hind leg tibial spurs reaching apex of second tarsomere, but not apex of third tarsomere; fore wing longer than 30 mm; fore and hind wings with distinct dark spots ..... *Distoleon*
- Tibial spurs not reaching apex of third tarsomere of fore and middle legs (12/II), in hind leg tibial spurs not reaching apex of second tarsomere; fore wing 25 mm or shorter; hind wing without dark spots, fore wing at most with weak spots ..... *Neuroleon*

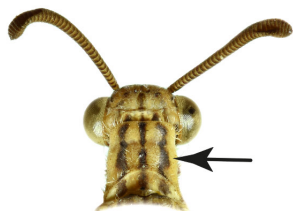
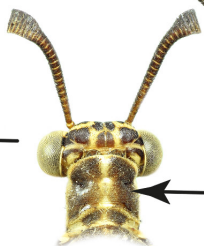
**12/I****12/II**

- 13 Costal area of fore wing with two rows of cells ..... 14
- Costal area of fore wing with only one row of cells ..... 15
- 14 In costal area of fore wing, cells of anterior row are smaller than cells of posterior row (14/Ia); frons with fringes of long black hairs between inner eye margin and antennal socket (14/Ib); hind femur with long sensory hair ..... *Acanthaclisis*
- In costal area of fore wing, cells of anterior and posterior rows are equal in size (at least in proximal half of wing) (14/IIa); frons without fringes of long black hairs between inner eye margin and antennal socket (14/IIb); hind femur without long sensory hair ..... [*Synclisis*]

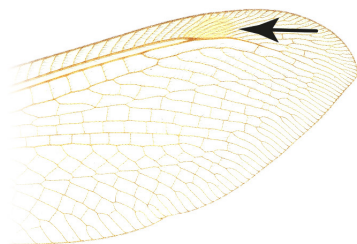
**14/Ia****14/IIa**

**14/Ib****14/IIb**

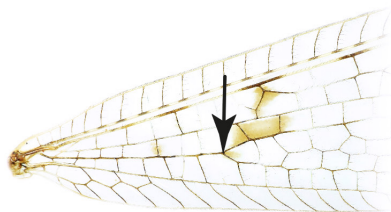
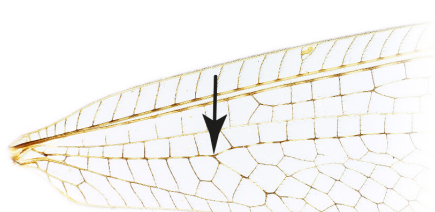
- 15 Presectoral area of hind wing with 6–12 (usually with 7–8) crossveins; pronotum with 3 dark longitudinal stripes on light background (15/I) ..... [Cueta]  
 – Presectoral area of hind wing with 4–5 crossveins (rarely with 6 on one or both wings); pronotum different (e.g., 15/IIa–c) ..... 16

**15/I****15/IIa****15/IIb****15/IIc**

- 16 Pterostigma yellow (16/Ia); sixth and seventh abdominal segments of males with conspicuous hair fringes (16/Ib) ..... *Myrmecaelurus*  
 – Pterostigma not yellow; males without abdominal hair fringes ..... 17

**16/Ia****16/Ib**

- 17 Cubital fork of fore wing narrow, branches of *CuA* more or less parallel to each other (17/I); fore wing membrane with dark spots, particularly between *R* and *Rs* ..... *Euroleon*
- Cubital fork of fore wing much wider, branches of *CuA* distinctly divergent (17/II); fore and hind wing membranes without dark spots ..... *Myrmeleon*

**17/I****17/II**

### Identification of species

#### *Palpares*

One species in Hungary: *Palpares libelluloides*. See genus-level key for diagnostic characters.

#### *Dendroleon*

One species in Hungary: *Dendroleon pantherinus*. See genus-level key for diagnostic characters.

#### *Nemoleon*

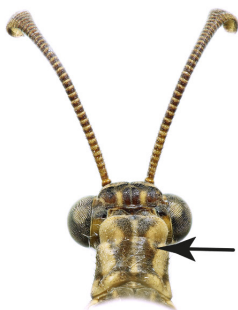
Unknown from Hungary. *Nemoleon poecilopterus* might potentially occur. See genus-level key for diagnostic characters.

#### *Creoleon*

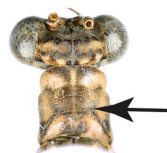
One species in Hungary: *Creoleon plumbeus*. A further species, *Creoleon lugdunense* might potentially occur.

- 1 Pronotum: median longitudinal light stripe well developed, submedian longitudinal dark patches with anterolaterally pointed branches at about middle (1/I); wing membranes without dark spots, wing veins faintly spotted; male: abdomen distinctly longer than wings ..... *Creoleon plumbeus*
- Pronotum: median longitudinal light stripe usually less contrasting, submedian longitudinal dark patches with anteriorly pointed branches originated from strongly behind middle, close to apical margin (1/II); wing membranes with small, indistinct spots, wing veins with more contrasting spots; male: abdomen not or only slightly longer than wings ..... [ *Creoleon lugdunense* ]

1/I



1/II



### *Delfimeus*

Unknown from Hungary. *Delfimeus irroratus* might potentially occur. See genus-level key for diagnostic characters.

### *Deutoleon*

One species in Hungary: *Deutoleon lineatus*. See genus-level key for diagnostic characters.

### *Distoleon*

One species in Hungary: *Distoleon tetragrammicus*. See genus-level key for diagnostic characters.

### *Gymnocnemis*

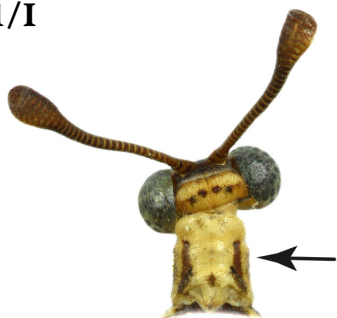
Unknown from Hungary. *Gymnocnemis variegata* might potentially occur. See genus-level key for diagnostic characters.

*Macronemurus*

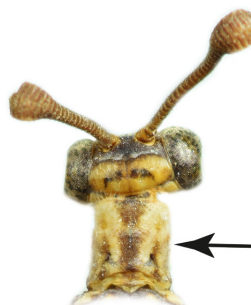
One species in Hungary: *Macronemurus bilineatus*. A further species, *Macronemurus appendiculatus* might potentially occur.

- 1 Median dark patch of pronotum short, developed only apically, submedian dark longitudinal patches long, wide and straight (1/I); dark-light pattern of wing veins contrasting ..... *Macronemurus bilineatus*
- Median dark patch of pronotum long and wide, submedian dark longitudinal patches long, narrow and bent outwards (1/II); dark-light pattern of wing veins inconspicuous ..... [*Macronemurus appendiculatus*]

1/I



1/II

*Megistopus*

One species in Hungary: *Megistopus flavicornis*. See genus-level key for diagnostic characters.

*Nedroledon*

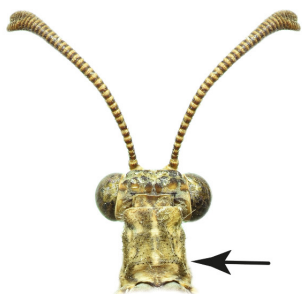
Unknown from Hungary. *Nedroledon anatolicus* might potentially occur. See genus-level key for diagnostic characters.

*Neuroleon*

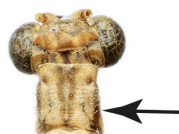
One species in Hungary: *Neuroleon nemausiensis*. Further species, *Neuroleon microstenus*, *Neuroleon egenus*, *Neuroleon assimilis*, *Neuroleon tenellus* and *Neuroleon arenarius* might potentially occur.

- 1 Pronotum with narrow and light median stripe, dark longitudinal submedian patches wide, however laterally without distinct pairs of dark spots, rather with different patterns of longitudinal, dark patches (1/I); in radial area of fore wing not all junctures between crossveins and *R* dark-coloured ..... 2
- Pronotum with narrow and light median stripe, dark longitudinal submedian patches and lateral to submedian patches two pairs of dark, blurred spots (1/II); in radial area of fore wing usually all junctures dark-coloured between crossveins and *R* (rarely a few junctures not darkened) ..... 5

1/I

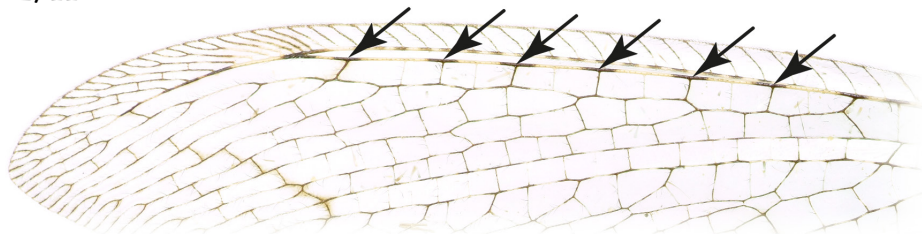


1/II

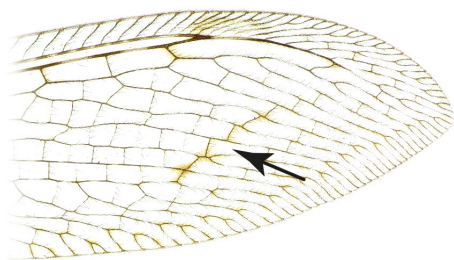


- 2 In radial area of fore wing at most 4 junctures dark-coloured between crossveins and *R*; fore wing spotted, more conspicuously proximal to pterostigma, at about rhagma and at about distal endings of posterior branch of *CuA* and *CuP+1A*; pronotum with less contrasting dark-light patterns, therefore appearing predominantly dark ..... [*Neuroleon egenus*]
- In radial area of fore wing at least 5 junctures dark-coloured between crossveins and *R* (2/II); fore wing with inconspicuous spots; pronotum with more contrasting dark-light patterns .... 3

2/II



- 3 Fore wing with a distinct, darkened, oblique stepped line from rhagma towards apex (3/I) ... 4
- Oblique stepped line between rhagma and apex not continuous, darkened parts less distinct and scattered along the line, in addition the line shorter, extending only about the length of 2–3 crossveins (3/II) ..... [*Neuroleon microstenus*]

**3/I****3/II**

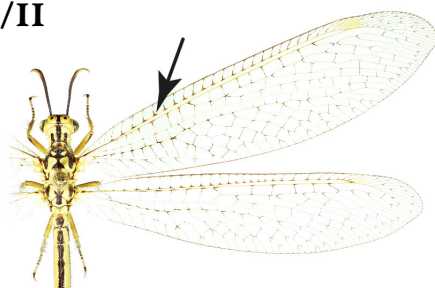
- 4 Tibial spurs of fore and middle legs almost as long as the combined length of first, second and third tarsomeres (not reaching the apex of third tarsomere) .....*Neuroleon nemausiensis*
- Tibial spurs of fore and middle legs about as long as or slightly shorter than the combined length of first and second tarsomeres ..... [*Neuroleon assimilis*]
- 5 Fore wing shorter than 20 mm; tibial spurs of fore and middle legs not reaching the apex of second tarsomere, tibial spurs of hind leg not reaching the apex of first tarsomere ..... [*Neuroleon tenellus*]
- Fore wing longer than 20 mm; tibial spurs of fore and middle legs reaching the apex of second tarsomere, tibial spurs of hind leg reaching the apex of first tarsomere ..... [*Neuroleon arenarius*]

### *Myrmecaelurus*

Two species in Hungary: *Myrmecaelurus trigrammus* and *Myrmecaelurus punctulatus*.

- 1 Wing veins yellowish brown; wing membranes yellowish; veins and membranes without dark sections or spots (1/I) ..... *Myrmecaelurus trigrammus*
- Wing veins not uniformly coloured, with dark sections; fore wing membrane in the costal area with a number of yellow and brown, shadow-like darkenings around bases of crossveins, on hind wing membrane the shadow-like darkenings inconspicuous (1/II) ..... *Myrmecaelurus punctulatus*



**1/I****1/II*****Cueta***

Unknown from Hungary. *Cueta lineosa* might potentially occur. See genus-level key for diagnostic characters.

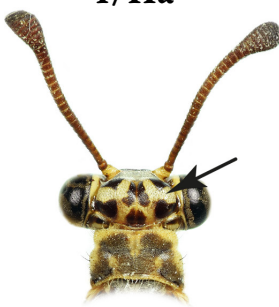
***Euroleon***

One species in Hungary: *Euroleon nostras*. See genus-level key for diagnostic characters.

***Myrmeleon***

Four species in Hungary: *Myrmeleon formicarius*, *Myrmeleon inconspicuus*, *Myrmeleon bore* and *Myrmeleon hyalinus distinguendus*. Further species, *Myrmeleon immanis* and *Myrmeleon noacki* might potentially occur.

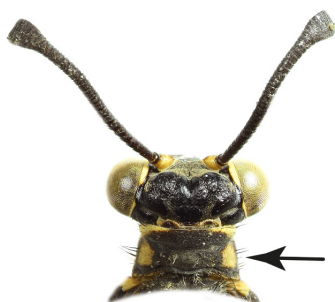
- 1 Vertex unicolourous black or dark brown (note that the differences in surface sculpture of vertex might cause apparent colouration differences in certain light conditions) (1/I); males with or without pilula axillaris on hind wing ..... 2
- Vertex yellow with dark spots (1/IIa); males always with pilula axillaris on hind wing (1/IIb) ..... 4

**1/I****1/IIa****1/IIb**

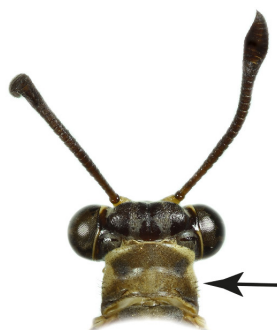


- 2 Larger species, fore wing longer than 30 mm; pronotum dark, laterally with light yellowish longitudinal patches reaching from anterior margin to distinctly behind mid-length of pronotum, patches posteriorly widening, sometimes the widened posterior part separated from the anterior part (2/I); males without pilula axillaris ..... *Myrmeleon formicarius*
- Smaller species, fore wing shorter than 30 mm; light lateral longitudinal patches of predominantly dark pronotum either similar but with a distinct median light stripe, or usually shorter, reaching only about mid-length of pronotum, however sometimes longer, posteriorly elongated (2/II); males with or without pilula axillaris on hind wing ..... 3

2/I

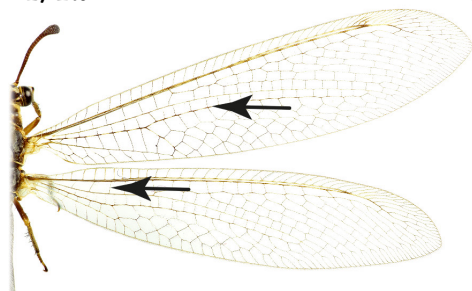


2/II

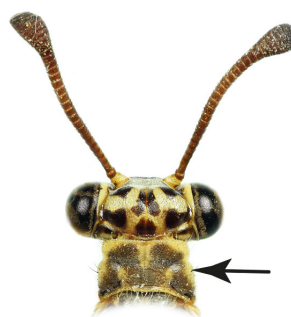


- 3 Pronotum dark, laterally with light yellowish longitudinal patches reaching from anterior margin usually to about mid-length of pronotum, however sometimes posteriorly elongated, patches relatively narrow (figure 2/II in above couplet); males with pilula axillaris on hind wing ..... *Myrmeleon bore*
- Pronotum dark, laterally with light yellowish longitudinal patches reaching from anterior margin distinctly behind mid-length of pronotum, patches moderately wide, posteriorly slightly widening, and with a distinct, relatively narrow median light stripe; males without pilula axillaris on hind wing ..... [*Myrmeleon noacki*]
- 4 All veins, including the crossveins, of both wings are bicoloured, blackish brown with light sections (4/Ia); pronotum extensively dark, with a more or less conspicuous yellowish anterior margin and median stripe, and with a pair of yellowish spots (4/Ib) ..... *Myrmeleon inconspicuus*
- Crossveins of both wings are unicolourous; pronotum with different pattern ..... 5

4/Ia

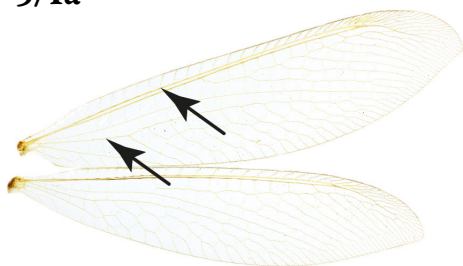


4/Ib



- 5 Wing veins light yellow, except *R* and *Sc* sometimes with a few, inconspicuous dark sections, fore wing *CuA* without dark sections (5/Ia); pronotum either with a brown star-shaped pattern on yellowish background, which sometimes fragmented to separate spots (5/Ib), or more extensively darkened, with yellowish lateral patches curved into posteriomedian direction at about anterior margin, and with yellowish spots about the middle of pronotum (5/Ic) ..... *Myrmeleon hyalinus distinguendus*
- Longitudinal wing veins, at least *Sc* and *R*, distinctly darker than other wing veins, with dark sections, fore wing *CuA* with dark sections, other veins light yellow (5/II); pronotum with a wide, brown, irregular patch in the middle, within its anterior half a median and a pair of submedian paler longitudinal stripes ..... [*Myrmeleon immanis*]

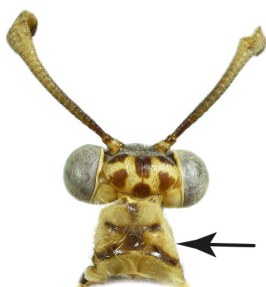
5/Ia



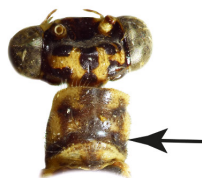
5/II



5/Ib



5/Ic



### *Acanthaclisis*

One species in Hungary: *Acanthaclisis occitanica*. See genus-level key for diagnostic characters.

### *Synclisis*

Unknown from Hungary. *Synclisis baetica* might potentially occur. See genus-level key for diagnostic characters.

\*

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