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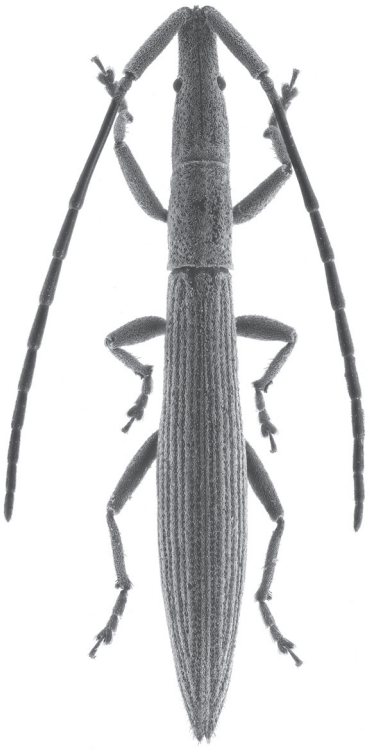

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Contribution to the knowledge of antlions of the genus *Euroleon* Esben-Petersen, 1918 (Neuroptera: Myrmeleontidae) with new records and synonymy

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Abstract. This work contains a taxonomic and bionomic information about the genus *Euroleon* Esben-Petersen, 1918 with two currently known species in the Caucasus and their distribution in Dagestan Republic, Russia. A small colony of larvae of the antlion *Euroleon parvus* Hölzel, 1972 was found in Dagestan near the permanent habitat of *Euroleon nostras* (Geoffroy in Fourcroy, 1785) on the territory of the Barkhan Sarykum, the part of Dagestan State Nature Reserve. The 2nd instar larva of *E. parvus* is described for the first time and habitat conditions of larvae of this species are characterized. An evolutionary scenario for the genus *Euroleon* is proposed. New synonyms are proposed: *Euroleon* Esben-Petersen, 1918 = *Myrmeleo* Blanchard, 1845, **syn. n.** (the type species *Formicaleo nostras* Geoffroy in Fourcroy, 1785 is designated here), but that senior synonym does not concord with *Euroleon* in terms of priority (Article 23.7.2 of the International Code of Zoological Nomenclature); *Euroleon nostras* (Geoffroy in Fourcroy, 1785) (ex *Formicaleo*) = *Myrmeleon formicarium* Linnaeus, 1767 sensu Blanchard, 1845, **syn. n.**; *Euroleon coreanus* Okamoto, 1926 = *Euroleon flavicorpus* Wang in Ao, Zhang, Abraham, Wang, 2009, **syn. n.**

Key words: taxonomy, new synonymy, Neuroptera, Myrmeleontidae, *Euroleon parvus*, Dagestan, Russia.

Вклад в познание муравьиных львов рода *Euroleon* Esben-Petersen, 1918 (Neuroptera: Myrmeleontidae) с новыми находками и синонимией

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Резюме. Небольшая колония личинок муравьиных львов *Euroleon parvus* Hölzel, 1972 была отмечена в Дагестане возле постоянного местообитания *Euroleon nostras* (Geoffroy in Fourcroy, 1785) на территории бархана Сарыкум – участка природного заповедника «Дагестанский». В работе приведена таксономическая информация о роде *Euroleon* Esben-Petersen, 1918 и двух ныне известных на Кавказе видах и об их биотопическом распределении в заповеднике. Впервые описана личинка второго возраста *E. parvus* и охарактеризованы условия обитания личинок этого вида. Предложен эволюционный сценарий, описывающий формирование видов рода *Euroleon*. Установлены синонимы: *Euroleon* Esben-Petersen, 1918 = *Myrmeleo* Blanchard, 1845, **syn. n.** (типовой вид *Formicaleo nostras* Geoffroy in Fourcroy, 1785, обозначен здесь), при этом новый старший синоним не конкурирует с *Euroleon* в отношении приоритета (статья 23.7.2 Международного кодекса зоологической номенклатуры); *Euroleon nostras* (Geoffroy in Fourcroy, 1785) (ex *Formicaleo*) = = *Myrmeleon formicarium* Linnaeus, 1767 sensu Blanchard, 1845, **syn. n.**, *Euroleon coreanus* Okamoto, 1926 = *Euroleon flavicorpus* Wang in Ao, Zhang, Abraham, Wang, 2009, **syn. n.**

Ключевые слова: таксономия, новые синонимы, Neuroptera, Myrmeleontidae, *Euroleon parvus*, Дагестан, Россия.

Introduction

The genus *Euroleon* Esben-Petersen, 1918 has not been revised in details. Some synonyms of this name were used as available at the end of the last century. At the same time, four species (imago and larvae) of the genus were redescribed [Krivokhatskiy, Zakharenko, 1994; Krivokhatsky, 1994a; Bao, Wang, 2006]. The only species *Euroleon nostras* (Fourcroy, 1785) is widespread in Europe and the Caucasus and is regularly collected and studied by entomologists. In 2019, we found the second species, *Euroleon parvus* Hölzel, 1972, in the Russian Caucasus (Dagestan), in a permanent habitat of *Euroleon nostras*. Both taxa, as well as the genus, require a taxonomic revision.

In this work, we determine the taxonomic position of *E. parvus*, present a key to species (larvae) of the genus *Euroleon*, describe the 2nd instar larva of *E. parvus*, clearly different from the previously known 3rd instar one, compare the ranges and habitats of both species in the Caucasus and propose a new synonymy in the genus *Euroleon*.

Ten species of antlions were listed for the vicinity of the Barkhan Sarykum in the Dagestan State Natural Reserve [Ilyina et al., 2014a; Khabiev et al., 2016]. In addition, four species out of ten are proposed for inclusion in the Red Books of Dagestan and the Russian Federation [Ilyina

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Figs 1–4. Habitats of *Euroleon* spp. in Dagestan, Russia.

1 – Narat-Tyube Ridge, south of the Barkhan Sarykum; 2 – the slope of the ravine on the Narat-Tyube Ridge, the location of the *Euroleon parvus* larval pits is shown by arrow; 3 – Barkhan Sarykum; 4 – typical *Euroleon nostras* larval habitat on the Barkhan Sarykum (white squares).

Рис. 1–4. Местообитания *Euroleon* spp. в Дагестане, Россия.

1 – хребет Нарат-Тюбе, южнее бархана Сарыкум; 2 – склон оврага на хребте Нарат-Тюбе, стрелкой показано расположение ямок личинок *Euroleon parvus*; 3 – бархан Сарыкум; 4 – типичное местообитание личинок *Euroleon nostras* на бархане Сарыкум (белые квадраты).

et al., 2014b]. *Euroleon parvus* is an additional species that require protection in Dagestan, but the state of its population needs to be monitored and the protected status of this species needs to be clarified.

Material and methods

Two larvae of the 2nd instar were collected by E.V. Ilyina April 3, 2019 on a slope of the Narat-Tyube Ridge (Republic of Dagestan, Russia); one female of *Euroleon parvus* was bred at the laboratory June 10, 2019 from a larva. The second 2nd instar larva was fixed in ethanol for a description. The remaining larvae were left to preserve the population. This local colony of *E. parvus* larvae was found among foothills (Fig. 1) on loamy sands in compactly arranged pits on a terraced slope (Fig. 2) 3 km away from the Barkhan Sarykum, where larvae of *E. nostras* inhabit in similar conditions (Fig. 3), but on loose sands (Fig. 4). The other species (larvae and adults) of the genus *Euroleon* were collected for this study by E.V. Ilyina in 1996–2020 in the territory of Dagestan. All material is deposited in the Zoological Institute of the Russian Academy of Sciences (ZIN, St Petersburg, Russia).

Results and discussion

Genus *Euroleon* Esben-Petersen, 1918

= *Formicaleo* Geoffroy in Müller, 1764: XX (type species *Formicaleo nostras* Geoffroy, 1785): rejected name [International Commission..., 1994: 59].

= *Myrmeleo* Blanchard, 1845, **syn. n.** (type species *Formicaleo nostras* Geoffroy in Fourcroy, 1785, designated here according to Article 70.3 of the International Code of Zoological Nomenclature [1999]).

= *Teula* Navás, 1930 (type species *Teula sinica* Navás, 1930).

Type species: *Myrmeleon europaeus* McLachlan, 1873.

Taxonomic notes. Esben-Petersen [1918] focused his attention only on characteristics of wing venation in the original description of the genus *Euroleon*. A more detailed description of the external characters of the imago was made two years later by Navás [1920].

Leraut [1980] restored from the work of Agassiz [1842–1847] the oldest name of the genus *Formicaleo* Geoffroy in Müller, 1764 with the type species *Formicaleo nostras* Geoffroy in Fourcroy, 1785 [Geoffroy in Fourcroy, 1785], designated by Agassiz, but the International Commission of Zoological Nomenclature included the name *Formicaleo*

in the list of rejected names in favour of the name *Euroleon* Esben-Petersen, 1918 [Kerzhner, 1991].

At the same time, the original description of the genus by Geoffroy, *Formicaleo* Geoffroy, 1762 in the book "Histoire abregée des insectes qui se trouvent aux environs de Paris" [Geoffroy, 1762] was suppressed in favour of the name copied in Müller's list two years later, *Formicaleo* Geoffroy in Müller, 1764, or *Formicaleo* Müller, 1764. Later, Kerzhner [1991] found that *Formicaleo* Geoffroy, 1762 is not a synonym of any names of Linnaeus [1758], and he restored the date of the original description but suggested to include it in the list of rejected names in favour of the name *Euroleon* Esben-Petersen, 1918.

Different catalogues, including Oswald and Penny [1991: 38] indicated the name of the genus *Myrmeleo* with different authorship as "An incorrect subsequent spelling of *Myrmeleo*". However, we found the name *Myrmeleo* Blanchard, 1845 accompanied by a description and designation of the type species and its image, which makes this name available. Blanchard [1845: 303–304, tab. 15] designated as the type species, described and figured an antlion with spotted wings, which is not *Myrmeleon formicarius* Linnaeus, 1767, but *Euroleon nostras* (Geoffroy in Fourcroy, 1785): "Le type du genre Fourmilion (pl. 15, fig. 2) (*Myrmeleo formicarium*, Lin.) est long d'envviron quatre centimètres, noirâtre, avec quelques taches jaunâtres, et les ailes diaphanes, offrant quelques points ou taches noirâtres".

Thus, here we designated the type species of the genus *Myrmeleo* Blanchard, 1845 (according to Article 70.3 of the International Code of Zoological Nomenclature [1999]): *Formicaleo nostras* Geoffroy in Fourcroy, 1785, erroneously identified as *Myrmeleon formicarius* Linnaeus, 1767 in the original designation [Blanchard, 1845]. As a result, the following synonymy is proposed: *Euroleon* Esben-Petersen, 1918 = *Myrmeleo* Blanchard, 1845, **syn. n.**

The name *Myrmeleo* was previously and repeatedly used as a misspelling or junior synonym of the name *Myrmeleon* Linnaeus, 1767. The following information is indicated in the catalogue of generic names [Oswald, Penny, 1991: 38] among the synonyms of *Myrmeleon* Linnaeus, 1767: "++*MYRMELEO*; Pallas, 1771, 469. An incorrect subsequent spelling of *Myrmeleon*" (where "++" means unavailable name). Here we restore the type species of the genus *Myrmeleo* among the synonyms of *Euroleon nostras*: *Myrmeleo formicarium* Blanchard, 1845a: 303, pl. 15; Blanchard, 1845b: 96, pl. 103, nec Linnaeus.

Myrmeleon formicarius Linnaeus, 1767 as a name of the type species of the genus *Myrmeleon* in combination with the name *Myrmeleo* seems to have been used at least four times:

– *Myrmeleo formicarium* Linnaeus: Latreille, 1802: 30; Hagen, 1866: 434;

– *Myrmeleo formicarius* Linnaeus: Doflein, 1916: 7; Bierens de Haan, 1925: 658;

The name *Myrmeleo* was used in many other cases for other species of the genus *Myrmeleon*:

– *Myrmeleo frontalis* Burmeister: Handschin, 1936: 127;

– *Myrmeleo* (*Morter*) *hyalinus* Olivier: Mirmoayedi, 2006: 51;

– *Myrmeleo incertus* (Rambur): DuBois, 1899: 53;

– *Myrmeleo inconspicuus* (Rambur): DuBois, 1899: 53;

– *Myrmeleo incompletus* Banks, 1920: 331; Stange, 2004: 313 (syn.);

– *Myrmeleo uniseriatus* Gerstaecker: Handschin, 1936: 126 (available).

Pallas [1771] initially applied it as a misspelling of the genus *Myrmeleon* for a species from another tribe, Myrmecaelurini: *Myrmeleo trigrammus* Pallas, 1771 (recently *Myrmecaelurus* Costa, 1855).

Thus, the name *Myrmeleo* Blanchard, 1845, although is a senior synonym of *Euroleon* Esben-Petersen, 1918, doesn't concord with it in terms of priority, since even before Blanchard fixed the type species [1845] and up to the present day [Mirmoayedi, 2006], it was used for the combined group (Article 23.7.2 of the International Code of Zoological Nomenclature [1999]).

The genus *Euroleon* is included in the tribe Myrmeleontini Latreille, 1802 of the subfamily Myrmeleontinae. Four species were known in the Palaearctic [Zakharenko, Krivokhatsky, 1993; Krivokhatskiy, Zakharenko, 1994; Krivokhatsky, 2011; Krivokhatsky and al., 2015; Mirmoayedi and al., 2015]. The names listed as separate species, *Euroleon sjostedti* Navás, 1928 and *E. flavicorpus* Wang, 2009 [Ao et al., 2009] are junior synonyms of *Euroleon coreanus* Okamoto, 1926 which variability is well described [Krivokhatskiy, Zakharenko, 1994; Krivokhatsky, 2011]. According to the original description, the other synonym, *E. alienus* Navás, 1932 belongs to the large light forms of *E. coreanus* with small spots on the wing membrane, like the comparatively newly described *E. flavicorpus*. The type specimens of *E. flavicorpus* have weakly sclerotized sclerites in the male genitalia. Such weak sclerotization is usually associated with immature and juvenile individuals with incomplete melanization in the colour of wings and body, the same as in the type specimens of *E. alienus*. Thus, here we propose a new synonym: *Euroleon coreanus* Okamoto, 1926 = = *Euroleon flavicorpus* Wang in Ao, Zhang, Abraham, Wang, 2009, **syn. n.**

Composition of the genus in the European part of Russia. The only species *Euroleon nostras* (Geoffroy in Fourcroy, 1785) was known in European Russia (including the North Caucasus) [Krivokhatskiy, Zakharenko, 1994; Krivokhatsky, 2011]. A single population of *Euroleon parvus* is a new record for the fauna of Russia and Dagestan.

Euroleon nostras (Geoffroy in Fourcroy, 1785)
(Fig. 5)

Formicaleo nostras Geoffroy in Fourcroy, 1785: 360; Leraut, 1980: 240; Makarkin, 1984: 38.

Myrmeleon formicarium Fab[ricius] (*sic*): Latreille, 1810: 435 (as the type species of *Myrmeleon*).

Myrmeleon formicarium auctorum, nec Linnaeus, 1767: 914; Olivier, 1811: 122; Blanchard, 1845: 303, pl. 15, fig. 2; Blanchard in Cuvier, 1845: 96, pl. 103; Hagen, 1866: 439.

Myrmecoleon formicarius (Linnaeus): Burmeister, 1839: 996 (with reference to Geoffroy); Oswald, Penny, 1991: 38 (as the incorrect original spelling of the generic name).

Myrmeleo formicarium: Blanchard in Cuvier, 1845: 96, pl. 103 nec Linnaeus, 1767 (as the type species of *Myrmeleo*).

Myrmeleon europeus McLachlan, 1873: 137 (as the proposed name for *M. formicaleo*).

Myrmeleon formicarium auct., nec Linnaeus, 1767: Brauer, 1876: 278 (as = *Myrmeleon europaeum* McL.); Kis et al., 1970: 327 (synonym of *Euroleon nostras*); Leraut, 1980: 240 (as *F. nostras* = = *M. formicarium* sensu Olivier, 1811).

Myrmeleon europaeus McLachlan: Redtenbacher, 1883: 295; Redtenbacher, 1884: 361.

Myrmeleon nostras (Fourcroy): Brauer, 1885: 26; Navás, 1904: 25 (as *formicarius* auct. *europæus* McLachlan).

Myrmeleon formicaleo (Linnaeus, 1758): Albarda, 1889: 295.

Euroleon europaeus (McLachlan): Esben-Petersen, 1918: 126 (as the type species of *Euroleon*); Tjeder, 1940: 120.

Euroleon nostras (Geoffroy in Fourcroy): Navás, 1920: 28; Navás, 1930: 5; Hölzel, 1972: 36; Krivokhatsky, 1993: 87; Zakharenko, Krivokhatsky, 1993: 70; Krivokhatsky, 1994a: 55; Krivokhatskiy, Zakharenko, 1994: 693; Aspöck et al., 2001: 266; Popov, 2002: 276; Stange, 2004: 302; Krivokhatsky et al., 2014: 172; Michel et al., 2017: 108 (DNA); Kerimova, Krivokhatsky, 2018: 61; Krivokhatsky, 2019: 148; Hajiesmailian et al., 2020: 154; Krivokhatsky et al., 2020: 270.

Euroleon nostras (Fourcroy): Lestage, 1922: 114; Auber, 1954: 12; Gepp, 1986: 9.

Material. In addition to 200 males, females and larvae from the Caucasus deposited in ZIN, we studied more than 30 specimens newly collected over the past three years mainly from Dagestan by E.V. Ilyina which were also transferred in ZIN.

Distribution. Morocco, Spain, France, Germany, Sweden, Switzerland, Austria, Italy, Albania, Romania, Serbia, Hungary, Poland, Bulgaria, Czech Republic, Slovenia, Slovakia, Moldova, Ukraine, Western Russia, Georgia, Armenia, Azerbaijan, Turkey. West-Palaearctic nemoral species.

Bionomics. *Euroleon nostras* is recorded in Dagestan as a common species [Ilyina, Krivokhatsky, 2012; Ilyina et al., 2014a]. Its larvae build pits on terraced slopes, under overhanging eaves, and on roadsides, preferring dusty substrates, and adults willingly fly to the light. In the Caucasus, this species occupies the Euxine zoogeographical province, from which populations spread to the surrounding provinces along forested slopes and plantings, often concentrating in caves and grottoes for setting up larval settlements. In the north of the range, *E. nostras* often inhabits ecotones at the junction of open sands and forest biotopes, forming mixed settlements with antlions of the genus *Myrmeleon* [Krivokhatsky, 2011; Krivokhatsky et al., 2014].

Taxonomic notes. Leraut [1980] listed "*formicarium* sensu Olivier, 1811" within the list of junior synonyms of *Formicaleo nostras* Geoffroy in Fourcroy, 1785, but the Olivier's description [1811] and Oliver's citations mixed two Linnaean species: unpainted species *Myrmeleon formicarius* and the other spotted species with current name *Euroleon nostras*.

Therefore, we avoid citing synonyms of *E. nostras* listed under the name *Myrmeleon formicarium* by Olivier [1811] and accepted by a number of his followers, including those cited in Hagen [1866], except for the cases with a detailed description and a correct image.

The first such work with the correct description was, in our opinion, the publication of Blanchard [1845b: pl. 103, fig. 1]. As a result, a new synonymy is proposed: *Euroleon nostras* (Geoffroy in Fourcroy, 1785) (ex *Formicaleo*) = = *Myrmeleon formicarium* Linnaeus, 1767 sensu Blanchard, 1845b, **syn. n.**

It is necessary to note, that the image (Fig. 6) in the next publication of Blanchard in Cuvier [1845: pl. 103, fig. 1] is the copy of the image from the earlier work of Blanchard [1845: pl. 15, fig. 2]. In the first work, Blanchard described *Myrmeleo* Blanchard in Cuvier, 1845, which is synonymized here with the genus *Euroleon*.

Euroleon parvus Hölzel, 1972
(Figs 7–9)

Euroleon parvus Hölzel, 1972: 36; Krivokhatsky, 1993: 88; Krivokhatsky, 1994a: 56; Krivokhatsky, 1994b: 496; Krivokhatskiy, Zakharenko, 1994: 695; Mirmoayedi et al., 1999: 55; Stange, 2004: 304; Bao, Wang, 2006: 55; Ao et al., 2009: 55; Hajiesmailian et al., 2020: 154; Krivokhatsky et al., 2020: 270.

Material. Russia: 1♀ from the 2nd instar larva (ZIN), Dagestan, Kumtorkala Distr., Narat-Tyube Ridge, 42.996919° N / 47.212787° E, the larva was collected 3.04.2019, the female was bred 10.06.2019 (E.V. Ilyina). Tajikistan: 1♂, 2♀ (ZIN), Khorog, botanical garden, 1–4.09.1984 (V. Mikhailov); 2♂, 1♀ (ZIN), Zeravshan Mts., Savron near Novabad, 6.07.1994, 3–7.07.1995 (V. Mikhailov).

In addition 30 males, females and larvae previously reported [Krivokhatsky, 1993, 1994a; Krivokhatskiy, Zakharenko, 1994] are deposited in the ZIN collection. Above we presented unpublished material from Russia and Tajikistan.

Distribution. Russia (Dagestan), Kazakhstan, Iran, Turkmenistan, Uzbekistan, Tajikistan, Afghanistan, China (Gansu Province). Turano-Gobian, preferably mountain species. *Euroleon parvus* was listed for Turkmenistan, in Kyuren Dag and Kopet Dag, as an abundant species [Krivokhatsky, 1994b]. The species is recorded for the fauna of Russia and the Caucasus for the first time.

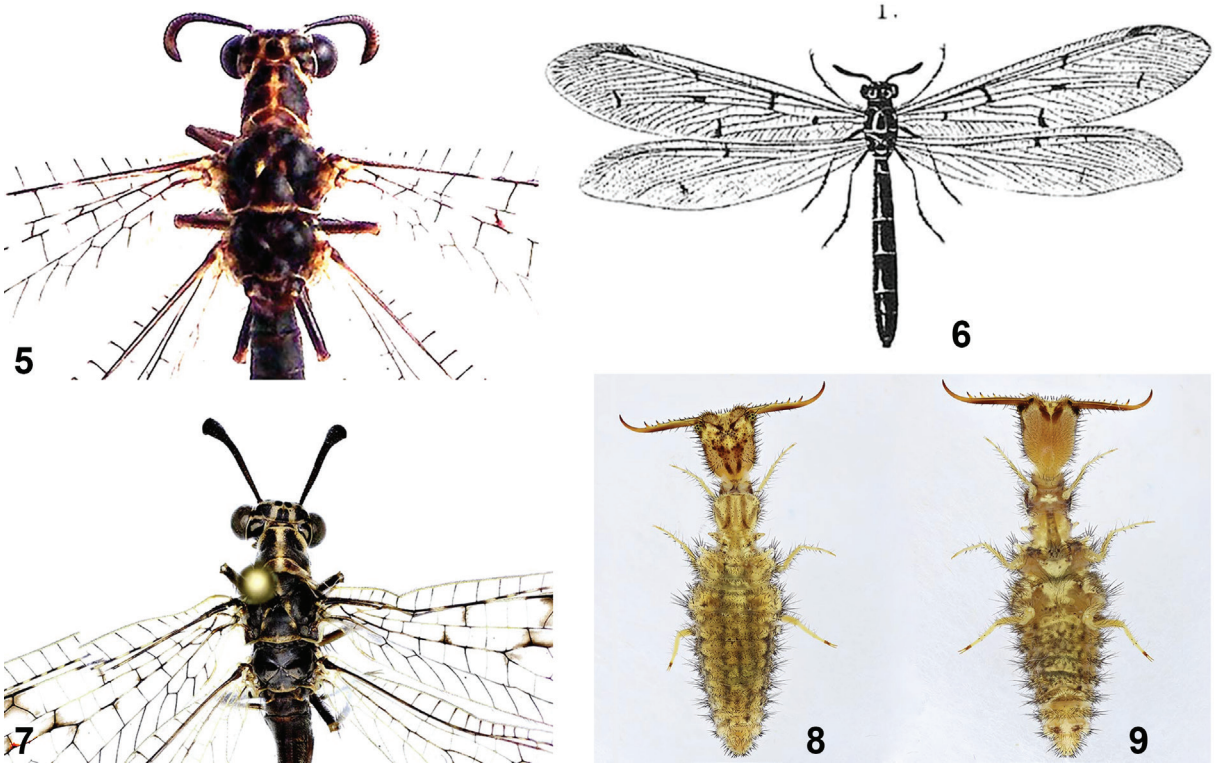
The new locality of the species belongs to the north of the Kura-Araks zoogeographic province within the Iran-Turanian subregion of the Sethian Desert region according to the accepted zoogeographic scheme [Krivokhatsky, Emeljanov, 2000].

Previously, *E. parvus* was bred from larvae collected in Kopet Dag (Turkmenistan) [Krivokhatsky, 1993]; some of the collected larvae were described by Krivokhatsky [1994b].

Notes on morphological characteristics of adults. The lack of colour images makes it difficult to distinguish *E. parvus* from *E. nostras* despite the qualitative original description [Hölzel, 1972] and a comparative redescription of the first species [Krivokhatskiy, Zakharenko, 1994]. A colour image of the pronotum was published by Chinese authors [Bao, Wang, 2006], and photographs of habitus dorsally and genitalia were made for Iranian populations [Hajiesmailian et al., 2020]. In this work, we present a photo of the pronotal and head pattern dorsally of the westernmost population of *E. parvus* from the North Caucasus (Fig. 7), in comparison with the population of *E. nostras* from the nearest habitat (Fig. 5).

Morphological characteristics of the 3rd instar larvae. The key to the 3rd instar larvae of the genus *Euroleon* has been published only in Russian [Krivokhatsky, 1994a], therefore, below (after *E. parvus* characteristics) we give its English equivalent.

The larval stages of *Euroleon parvus* were described based on characters of the 3rd instar larvae in



Figs 5–9. Species of the genus *Euroleon*.

5 – *Euroleon nostras* (Barkhan Sarykum), head and pronotum; 6 – original figure of *Myrmeleon formicarium* Linnaeus, 1767 sensu Blanchard [1845a: pl. 103, fig. 1]; 7–9 – *Euroleon parvus* (Narat-Tyube Ridge): 7 – imago, head and pronotum; 8–9 – 2nd instar larva: 8 – dorsal view, 9 – ventral view.

Рис. 5–9. Виды рода *Euroleon*.

5 –*Euroleon nostras* (бархан Сарыкум), голова и переднеспинка; 6 – оригинальное изображение *Myrmeleon formicarium* Linnaeus, 1767 sensu Blanchard [1845a: pl. 103, fig. 1]; 7–9 – *Euroleon parvus* (хребет Нарат-Тюбе): 7 – имаго, голова и переднеспинка; 8–9 – личинка второго возраста: 8 – вид сверху, 9 – вид снизу.

comparison with larvae of other species of the genus [Krivokhatsky, 1994a]. However the 2nd instar larva showed significant morphological differences from the 3rd instar ones illustrated in Figs 8 and 9. We note that in our description we use the scheme proposed for the description of antlion larvae of the European fauna [Badano, Pantaleoni, 2014].

Description of the 2nd instar larva of *Euroleon parvus*. General colouration yellow with dark markings, ventral side with large dark shadows; dorsal side of the head capsule with anterior pair of spots and V-shaped brown figure, ventral side of head completely pale except pair of dark markings; mandibles pale brown, lateral sides of the head with dark shadows. Head rectangular, slightly longer than wide. Mandibles three-teeth, with gradually increasing teeth from central to upper ones; mandibles slightly longer than head capsule; interdental mandibular setae (5)(1)(1), setae absent above the apical tooth; inner border of mandibles with a sparse row of strong bristles, longest at base; dorsal side of mandibles with few short, isolated setae at base; ventral side with sparse and short setae located on the inner side of maxillae (inner maxillary bristles), lateral side with long setae. Antenna with rounded white scapus (3 times as long as wide), dark brown handle, and with thin flagellum of pedicel; antennae not reaching the first tooth of the mandible. Labial palpi four-segmented, pale. Mesothoracic spiracles conical, not longer than white mesothoracic setiferous processes. Legs yellow. Body covered with black hair-like setae.

Posterior margin of sternite VIII covered with hair-like setae and has two well distinct dark spots; abdominal sternite IX with submedial row of four digging setae and with two short rastra each bearing four digging setae of which external pair is longest.

Comparative characteristics. Two symmetric pairs of scapular-prominent digging setae in the submedial row of anal sternites characterizes the 3rd instar larvae of all species of the genus [Krivokhatsky, 1994a], but it is absent in the 2nd instar larva we studied. We believe that these modified flat digging setae were transformed after moulting from four pointed digging setae of this series of the 2nd instar larva of *E. parvus*. The mandible chaetotaxy of the 2nd instar larva is also underdeveloped in comparison with the 3rd instar larva: the field of internal maxillary bristles does not reach the basal mandibular tooth, and the additional bristles are absent above the apical tooth. The anal opening is presented as a narrow slit and is not visible in the 2nd instar larvae; only after the moulting it transforms into a retractable telescopic tube of the silk-separating gland.

Metamorphosis. Larvae of both species pass through three age stages of development during the warm season. In the natural and laboratory conditions both species pupate by the end of summer, and adults usually fly out from cocoons in July – August. Both species of the genus *Euroleon* are characterized by the facultative larval diapause. Some autumn larvae of *E. parvus* diapause and require cold reactivation after which they complete the development [Krivokhatsky, 1993].

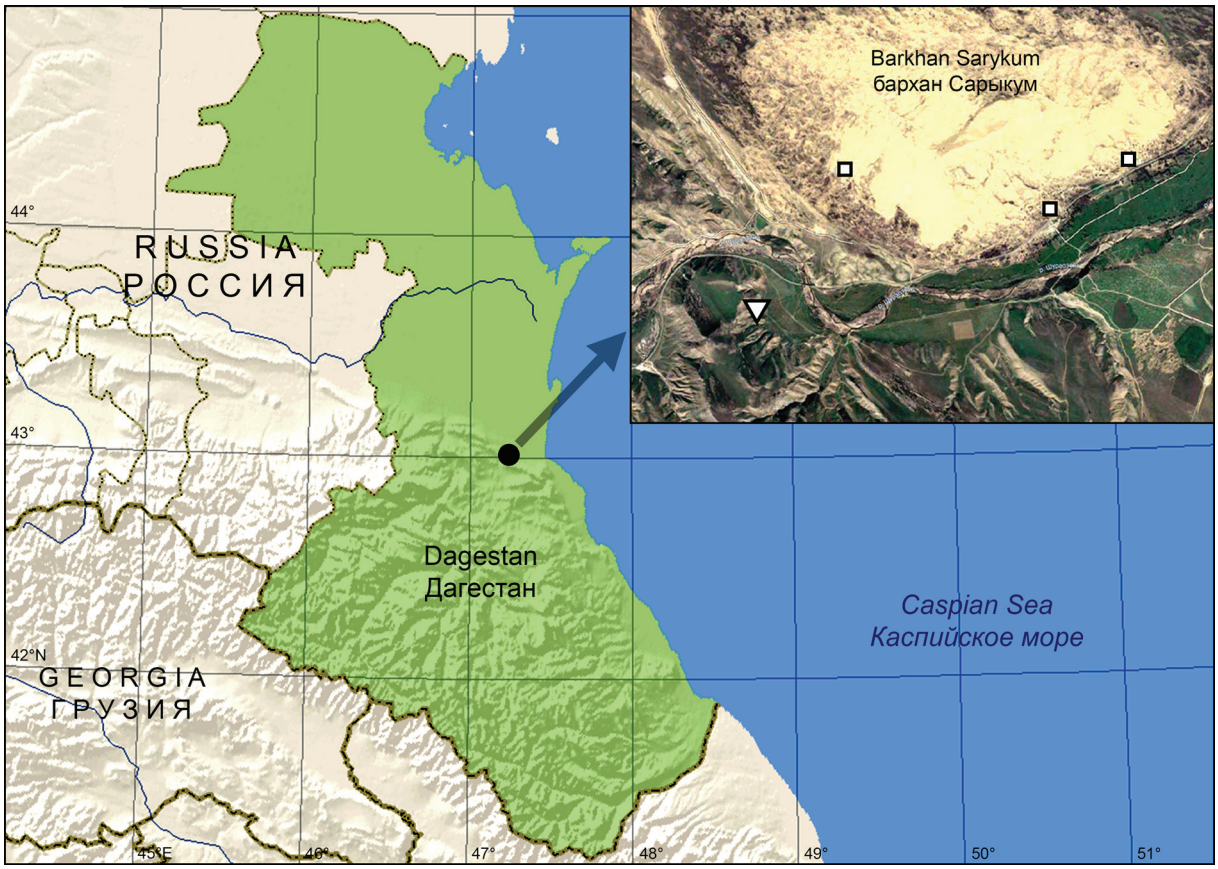


Fig. 10. Spatial distribution of larvae of antlions of the genus *Euroleon* on the Barkhan Sarykum in 2018–2021: squares – *E. nostras*, triangle – *E. parvus*.
Рис. 10. Пространственное распределение личинок муравьиных львов рода *Euroleon* на бархане Сарыкум в 2018–2021 годах: квадраты – *E. nostras*, треугольник – *E. parvus*.

As other species distributed in the southern parts of their range (including Dagestan) some individuals of *E. nostras* haven't a time to develop during one summer season, as evidenced by the presence of both large and small individuals collected from the same area [Krivokhatsky, 2011].

Bionomics. *Euroleon parvus* constituting a small colony of larvae near the well-known habitat of *E. nostras* at the Barkhan Sarykum is a new record for the Republic of Dagestan of Russia.

Larvae of both species occur in different, albeit neighbouring landscapes, but in similar biotopic conditions in the area of Barkhan Sarykum (Fig. 10). *Euroleon parvus* is a more xerophilic species and inhabits the southern exhibitions of the slope of Narat-Tyube Ridge (Figs 1, 2), while *E. nostras* adheres to mesophytic plant communities and shady places around the Barkhan Sarykum (Figs 3, 4). Microhabitat preferences of both species are quite obvious, and so far the only known colony of Turanian-origin *E. parvus* within the continuous range of the West Palaearctic nemoral *E. nostras* is associated with the rarity of this species in the Caucasus.

The described landscape-biotopic disunity indicates zoogeographic fidelity of these two species: *E. nostras* belongs to the Euxine type in its continuous European-Mediterranean range, and *E. parvus* to the Kura-Araks exclave, separated from the main Turano-Gobian range.

Key to species of the genus *Euroleon* on larvae

1. At least one of mandibles has only one seta above apical tooth 2
– Two, sometimes three setae above apical tooth on mandibles 3
2. The mandibles short and wide (5.35 times longer than their width), and on their upper side of inner maxillary bristles usually reaching third tooth. Europe .... *E. nostras*
– The mandibles narrower (5.8 times longer than their width); inner maxillary bristles usually not reaching second tooth. Central Asia, the Caucasus .... *E. parvus*
3. The length and the width of the mandibles are approximately the same as in the previous two species, inner mandibular bristles usually reach the third tooth. Central and Eastern Asia ..... *E. coreanus*
– The mandibles long (1.4 times longer than the length of the head) and narrow (6.8 times longer than their width), inner mandibular bristles always extending beyond the third tooth of mandibles. Central and Eastern Asia ..... *E. polyspilus* (Gerstaecker, 1885)

Notes on the phylogeny and the origin

In conclusion, it is necessary to express considerations about the distribution of species of the genus *Euroleon* and describe possible ways of forming such ranges.

Antlions with signs of the parallel branches of the cubital (medial) forks in both pairs of wings appeared repeatedly in the course of evolution [Krivokhatskiy, Zakharenko, 1994]. Mentioned characters in extant Myrmeleontinae of the Palaearctic (*Euroleon*) and Australian (*Callistoleon* Banks, 1910) faunas are parallelisms, which are also found in genera of other subfamilies of antlions (*Creoleon* Tillyard, 1918, *Dimarella* Banks, 1913, *Obus* Navás, 1912, *Pseudoformicaleo* Weele, 1909).

Relationships between earlier species in the genus *Euroleon* are of particular interest. Unfortunately, some information on the structure of its DNA fragments and phylogenetic relationships with the other groups of Myrmeleontidae was published only for *E. nostras* [Michel et al., 2017; Vasilikopoulos et al., 2020]. There are no fossils to examine. Therefore, morphological characters of imago and larvae were used to clarify the phylogenetic relationships and to reconstruct the evolutionary scenario [Krivokhatsky, 1993].

The range of the genus is characterized as Palaearctic [Krivokhatskiy, Zakharenko, 1994; Badano, Pantaleoni, 2014]. Thereby, we recognize Eurasia as a territory of its speciation.

Due to the closest morphological similarity of the imago *Euroleon nostras* and *E. coreanus*, their appearance is proposed to be considered as deriving from a hypothetical shared Paleogene ancestor, probably living on the crumbling banks of the eastern coast of the digressive Eastern Paratethys in the Eocene-Oligocene. The eastern branch *coreanus – polyspilus* is characterized by longer mandibles with powerful arms in the larvae possibly formed during the formation of arid elevations in the Oligocene. Sympatric speciation of this branch (apparently in the Miocene) led to deep morphological transformations of the basal *E. coreanus* and progressive *E. polyspilus*, which associated, among other things, with the reproductive isolation: males of *E. polyspilus* are easy distinguished by enlarged axillary plates, which are involved in sex communication.

The origin of the western branch *nostras – parvus* was discussed earlier [Krivokhatsky et al., 2020], where we assume the existence of a barrier between north parts of the ranges of *E. nostras* and *E. parvus* in the Pliocen. As a result, we assume that the refugium of *E. parvus* in Dagestan is connected with the Iran-Gobian species not through the northern coast of the Akchagilian (currently Caspian) Sea, but from the south, along the Kura-Araks zoogeographic province of the Iran-Turan biogeographic region. Thus, further additional records of *E. parvus* should be expected in Transcaucasia and Anatolia.

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References

Agassiz J.L.R. 1842–1847. Nomenclator zoologicus: continens nomina systematica generum animalium tam viventium quam fossilium, secundum ordinem alphabeticum disposita, adjectis auctoribus, libris, in quibus reperiuntur, anno editionis, etymologia et familiis, ad quas pertinent, in singulis classibus. Fasciculus. Part 1–3. Soloduri: Jent et Gassmann. iv + 8 p., 4 p. + x + 1135 p. DOI: 10.5962/bhl.title.49761

Albarda H. 1889. Catalogue raisonné et synonymique des Nevroptères, observés dans les Pays-Bas et dans les Pays limitrophes. *Tijdschrift voor Entomologie*. 32: 211–376.

Ao W., Zhang X., Ábrahám L., Wang X. 2009. A new species of the antlion genus *Euroleon* Esben-Petersen from China (Neuroptera: Myrmeleontidae). *Zootaxa*. 2303(1): 53–56. DOI: 10.11646/zootaxa.2303.1.3

Aspöck H., Hölzel H., Aspöck U. 2001. Kommentierter Katalog der Neuropterida (Insecta: Raphidioptera, Megaloptera, Neuroptera) der Westpaläarktis. *Denisia*. 2: 1–606.

Auber J. 1954. Presence de l'Euroleon nostras Fourcroy à St. Maur (Seine). *L'Entomologiste*. 10: 12.

Badano D., Pantaleoni R.A. 2014. The larvae of European Myrmeleontidae (Neuroptera) *Zootaxa*. 3762(1): 1–71. DOI: 10.11646/zootaxa.3762.1.1

Banks N. 1920. New neuropteroid insects. *Bulletin of the Museum of Comparative Zoology*. 64(3): 299–362. DOI: 10.5962/bhl.title.28705

Bao R., Wang X.L. 2006. A review of the species of *Euroleon* from China (Neuroptera: Myrmeleontidae). *Zootaxa*. 1375(1): 51–57. DOI: 10.11646/zootaxa.1375.1.3

Bierens de Haan J.A. 1925. Reflex und Instinkt bei dem Ameisenlöwen. *Biologisches Zentralblatt*. 44: 657–667.

Blanchard C.É. 1845a. Les Névroptères, Lin. *In*: Histoire des insectes, traitant de leurs noeurs et de leurs métamorphoses en général et comprenant une nouvelle classification fondée sur leurs rapports naturels. Paris: Firmin Didot Frères: 274–312.

Blanchard C.É. 1845b. Des Formilions. *In*: Cuvier G. Le Régne animal distribué d'apres son organization, four server de base a l'histoire naturelle des animaux, et d'introduction a l'anatomie compare, par Georges Cuvier. Edition accompaggnée de planches graves, representant les typesde tous les genres, les caracters distinctifs des divers groups et les modifications de structure sur lesquelles repose cette classification; par une reunion disciples de Cuvier, MM, Andonin, Blanchard, Deshayes, Alcide D'Orbigny, Doyère, Dugés, Duvernoy, Laurillard, Milae Edwards, Roulin et Valencieunes. Paris: Fortin, Masson et C^{ie}, Libraires, Successeurs de Crochard, Place de l'Ecole-de-medecine, N.I. Imprimé chez Paul Renouard: 96, 97, Pl. 103, fig. 1.

Brauer F. 1876. Die Neuropteren Europas und insbesondere Oesterreichs mit Rücksicht auf ihre geographische Verbreitung. *In*: Festschrift zur Feier des fünfundzwanzigjährigen Bestehen Kaiserlich-Koniglichen Zoologisch-Botanischen Gesellschaft, Wien. Wien: Verlag Braumüller: 265–300.

Brauer F. 1885. Neuroptera des Gebietes von Hernstein in Niederösterreich und der Weiteren Umgebung. *In:* Beck G. Fauna von Hernstein in Niederösterreich. Theil II. Halfband II. Wien: Selbstverlas Verfassers: 18–28.

Burmeister H.C.C. 1839. Handbuch der Entomologie. Zweiter Band. Besondere Entomologie. Zweite Abtheilung. Kaukerfe. Gymnognatha. (Zweite Hälfte; vulgo Neuroptera). Berlin: Theodor Christian Friedrich Enslin. xii + 757–1050 p.

Doflein F. 1916. Der Ameisenlöwe. Eine biologische, tierpsychologische und reflexbiologische Untersuchung. Jena: G. Fischer Verlag. 138 p.

DuBois E.R. 1899. Notes sur l'habitat des Pseudo-Névroptères et Névroptères de la Gironde. *Feuille des Jeunes Naturalistes*. 29: 50–53.

Esben-Petersen P. 1918. Help-notes towards the determination and the classification of the European Myrmeleonidae. *Entomologiske Meddelelser*. 12: 97–127.

Geoffroy É.L. 1762. Histoire abregée des insectes qui se trouvent aux environs de Paris; dans laquelle ces animaux sont rangés suivant un ordre méthodique. Vol. 2. Paris: Durand. 690 p.

Geoffroy E.L. 1764. (new taxa). *In:* Müller O.F. Fauna insectorum Fridrichsdalina sive methodica descriptio insectorum agri fridrichsdalensis cum characteribus genericis et specificis, nominibus trivialibus, locis natalibus, iconibus allegatis, novisve pluribus speciebus additis. Hafniae et Lipsiae: Officina libraria Io. Frid. Gleditschii. xxiv + 96 p.

Geoffroy E.L. 1785. (new taxa). *In:* Fourcroy A.F. de. Entomologia parisiensis; sive Catalogus Insectorum quae in Agro Parisiensi reperiuntur; secundum methodum Geoffraeanam in sectiones, genera and species distributus: cui addita sunt nomina trivalia and fere trecentae novae species. Pt. 2. Parisiis: Serpentineis: 233–544.

Gepp J. 1986. Die Neuropteren Liechtensteins – eine faunistische Übersicht. *Naturkundliche Forschung in Fürstentem Liechtenstein*. 6: 1–28.

Hagen H.A. 1866. Hemerobidarum Synopsis synonymica. *Stettiner Entomologische Zeitung*. 27: 369–462.

Hajiesmailian A., Shoushtari R.V., Mozaffarian F, Ebrahimi E. 2020. Tribe Myrmeleontini (Neuroptera: Planipennia: Myrmeleontidae) in Iran. *Zootaxa*. 4751(1): 153–160. DOI: 10.11646/zootaxa.4751.1.9

Handschin E. 1936. Neuropteren von Timor und Rote. *Verhandlungen der Naturforschenden Gesellschaft in Basel*. 47: 125–135.

Hölzel H. 1972. Die Neuropteren Vorderasiens. IV. Myrmeleonidae. *Beiträge zur Naturkundlichen Forschung in Südwestdeutschland, Beiheft*. 37: 3–103.

Ilyina E.V., Khabiev G.N., Krivokhatsky V.A. 2014a. Myrmeleontoid lacewings (Neuroptera: Myrmeleontidae, Ascalaphidae) of Sarykum and its environs. *In*: Trudy gosudarstvennogo prirodnogo zapovednika "Dagestanskiy". Vyp. 5 [Proceedings of the State Natural Reserve "Dagestanskiy". Iss. 5]. Makhachkala: Alef: 32–36 (in Russian).

Ilyina E.V., Krivokhatsky V.A. 2012. To the fauna of antlions (Neuroptera: Myrmeleontidae) of Daghestan. *Caucasian Entomological Bulletin.* 8(1): 159–160 (in Russian). DOI: 10.23885/1814-3326-2012-8-1-159-160

Ilyina E.V., Poltavsky A.N., Tikhonov V.V., Vinokurov N.B., Khabiev G.N. 2014b. Trudy gosudarstvennogo prirodnogo zapovednika "Dagestanskiy". Vyp. 7. Redkie bespozvonochnye zhivotnye zapovednika "Dagestanskiy" [Proceedings of the State Natural Reserve "Dagestanskiy". Iss. 7. Rare invertebrates of the "Dagestanskiy" Reserve]. Makhachkala: Alef. 238 p. (in Russian).

International Commission on Zoological Nomenclature. 1994. Opinion 1754. *Histoire abrégée des insectes qui se trouvent aux environs de Paris* (Geoffroy, 1762): some generic names conserved (Crustacea, Insecta). *Bulletin of Zoological Nomenclature*. 51(1): 58–70.

International Commission on Zoological Nomenclature. 1999. International Code of Zoological Nomenclature. Fourth edition. London: International Trust for Zoological Nomenclature. xxix + 306 p.

Kerimova I.G., Krivokhatsky V.A. 2018. Current composition of the fauna of antlions (Neuroptera: Myrmeleontidae) of Azerbaijan. *Caucasian Entomological Bulletin.* 14(1): 55–66 (in Russian). DOI: 10.23885/1814-3326-2018-14-1-55-66

Kerzhner I.M. 1991. Case 2292. *Histoire abrégée des insectes qui se trouvent aux environs de Paris* (Geoffroy, 1762): proposed conservation of some generic names (Crustacea and Insecta). *Bulletin of Zoological Nomenclature*. 48(2): 107–134.

Khabiev G.N., Ilyina E.V., Krivokhatsky V.A. 2016. A new antlion species for the section "Sarykum Barkhans". *In*: Trudy gosudarstvennogo prirodnogo zapovednika "Dagestanskiy". Vyp. 11 [Proceedings of the State Natural Reserve "Daghestanskiy". Iss. 11]. Makhachkala: Alef: 49–51 (in Russian).

Kis B., Nagler C., Mândru C. 1970. Fauna Republicii Socialiste România Vol. 8. Part 6. Insecta: Neuroptera (Planipennia). Bucuresti: Academia Republicii Socialiste România. 1 + 345 p.

Krivokhatsky V.A. 1993. On the development of the Palaearctic ant-lions (Neuroptera, Myrmeleontidae) under the laboratory conditions. *Izvestiya Khar'kovskogo entomologicheskogo obshchestva*. 1(2): 84–91 (in Russian).

Krivokhatsky V.A. 1994a. Antlions larvae of the genus *Euroleon* E.-P. (Neuroptera, Myrmeleontidae). *Izvestiya Khar'kovskogo entomologicheskogo obshchestva.* 2(1): 49–61.

Krivokhatsky V.A. 1994b. Ant-lions (Neuroptera, Myrmeleontidae) in Turkmenistan. *In*: Biogeography and Ecology of Turkmenistan. Dordrecht: Kluwer Academic Publishers: 495–498.

Krivokhatsky V.A. 2011. Murav'inye l'vy (Neuroptera: Myrmeleontidae) Rossii [Antlions (Neuroptera: Myrmeleontidae) of Russia]. St Petersburg – Moscow: KMK Scientific Press Ltd. 334 p.

Krivokhatsky V.A. 2019. On variability of two Arabian myrmeleontoid lacewings (Neuroptera: Myrmeleontidae, Ascalaphidae). *Entomological Review.* 99(1): 78–81. DOI: 10.1134/S0013873819010111

Krivokhatsky V.A., Kerimova I.G., Anikin V.V., Astakhov D.M., Astakhova A.S., Ilyina E.V., Plotnikov I.S., Samartseva J.V. 2020. Antlions (Neuroptera, Myrmeleontidae) along the North Caspian shore; distributional analysis and zoogeographical division of Caspian coast of Russia. *Biodiversitas*. 21(1): 258–281. DOI: 10.13057/biodiv/d210134

Krivokhatsky V.A., Dobosz R., Khabiev G.N. 2015. Antlions and owlflies (Neuroptera: Myrmeleontidae, Ascalaphidae) of Kyrgyzstan. *Entomological Review*. 95(9): 1212–1224. DOI: 10.1134/S0013873815090092

Krivokhatsky V.A., Emeljanov A.F. 2000. Use of general zoogeographical subdivisions in particular zoogeographical researches for the example of the Palaearctic antlions fauna (Neuroptera, Myrmeleontidae). *Entomological Review*. 80(9): 1042–1056.

Krivokhatsky V.A., Shapoval N.A., Shapoval A.P. 2014. Antlions (Neuroptera, Myrmeleontidae) from ornithological traps on the Curonian Spit: a three-species community containing a new species. *Entomological Review*. 94(4): 605–612. DOI: 10.1134/S0013873814040137

Krivokhatskiy V.A., Zakharenko A.V. 1994. Antlions of genera *Euroleon* Esben-Petersen, 1918 and *Kirghizoleon* gen. n. (Neuroptera, Myrmeleontidae) of the Palaearctic Region. *Entomologicheskoe obozrenie*. 73(3): 690–699 (in Russian).

Latreille P.A. 1802. Histoire naturelle, générale et particulière des crustacés et des insectes. Ouvrage faisant suite à l'histoire naturelle générale et particulière, composée par Leclerc de Buffon, et rédigée par C.S. Sonnini, membre de plusieurs sociétés savantes. Familles naturelles des genres. Tome troixième. Paris: F. Dufart: xii + 13–467 + [1] p.

Latreille P.A. 1810. Considérations générales sur l'ordre naturel des animaux composant les classes des crustacés, des arachnides, et des insectes; avec un tableau méthodique de leurs genres, disposés en familles. Paris: E. Schoell. 444 p.

Leraut P. 1980. Liste des Planipennes de France [Neuroptera]. *Bulletin de la Société Entomologique de France.* 85: 237–253.

Lestage J.A. 1922. Les trois Myrmeleonides de la faune belge. *Bulletin et Annales de la Société [Royale] Entomologique de Belgique.* 4: 114–115.

Linnaeus C. 1758. Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis. Tomus I. Ed. Decima, Reformata. Holmiae: Laurentii Salvii. [5] + 6–823 + [1] p.

Linnaeus C. 1767. Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis. Tom i. Pars ii. Editio duodecima reformata. Holmiae: Laurentii Salvii. 533–1327 + [37] p.

Makarkin V.N. 1984. The ant lions (Neuroptera, Myrmeleontidae) of the Far East. *In*: Systematika nasekomykh Dal'nego Vostoka [Systematics of insects of the Far East]. Vladivostok: Academy of Sciences of the USSR: 38–40 (in Russian).

McLachlan R. 1873. Notes sur les Myrméléonides décrits par M. le Dr. Rambur. *Annales de la Société Entomologique de Belgique.* 16: 127–141.

Michel B., Clamens A.-L., Bérthoux O., Kergoat G.J., Condamine F.L. 2017. A first higher-level time-calibrated phylogeny of antlions (Neuroptera: Myrmeleontidae). *Molecular Phylogenetics and Evolution*. 107: 103–116. DOI: 10.1016/j.ympev.2016.10.014

Mirmoayedi A. 2006. New research of some of Iranian antlions (Insecta, Neuropterida, Neuroptera, Myrmeleontidae). *Iranian Journal of Animal Biosystematics.* 2(1): 47–55.

Mirmoayedi A., Krivokhatsky V.A., Dobosz R. 2015. Annotated check-list of the antlions of Iran (Neuroptera, Myrmeleontidae). *Acta entomologica silesiana*. 23: 1–16.

Mirmoayedi A., Zakharenko A.V., Krivokhatsky V.A., Yassayie A. 1998. To the fauna of lacewings (Insecta, Neuroptera) of the Golestan National Park and the Kermanshah Province (Iran). *Izvestiya Khar'kovskogo entomologicheskogo obshchestva*. 6(2): 53–56 (in Russian).

Navás L. 1904. Notas neuropterológicas. V. Myrmeleonidos de España. *Butlletí de la Institució Catalana d'Història Natural.* 1(4): 6–10, 19–25.

Navás L. 1920. Sur des Névroptères nouveaux ou critiques. Première [I] série. *Annales de la Société Scientifique de Bruxelles*. 39(2): 27–37.

Navás L. 1930. Insectos del Museo de París. 5.a série. *Brotéria. Série zoologica*. 26: 5–24.

Olivier M. 1811. Myrmeleon. *In:* Encyclopédie méthodique. Histoire naturelle des animaux. T. 8. Paris: Chez Panckoucke, Imprimeur-Libraire, hôtel de Thou, rue des Poitevins: 115–128.

Oswald J.D., Penny N.D. 1991. Genus-group names of the Neuroptera, Megaloptera and Raphidioptera of the World. *Occasional Papers of the California Academy of Sciences.* 147: 1–94. DOI: 10.5962/bhl.part.3428

Pallas P.S. 1771. Reise durch verschiedene Provinzen des russischen Reichs. Erster Theil. St. Petersburg: Kayserliche Akademie der Wissenschaften. [10] + 3–504 p., 11 pls.

Popov A. 2002. Zoogeographical analysis of Neuroptera in Bulgaria. *Acta Zoologica Academiae Scientiarum Hungaricae*. 48(Suppl. 2): 271–280.

Redtenbacher J. 1883. Zur Kenntnis der Myrmeleoniden-Larven. *Wiener Entomologische Zeitung*. 2: 289–296.

Redtenbacher J. 1884. Übersicht der Myrmeleoniden-Larven. *Denkschriften, Akademie der Wissenschaften Wien, Mathematische-Naturwissenschaftliche Klasse*. 48: 335–368.

Stange L.A. 2004. Memoirs of the American Entomological Institute. Vol. 74. A systematic catalog, bibliography and classification of the world antlions (Insecta: Neuroptera: Myrmeleontidae). Gainesville, FL: American Entomological Institute Press. 565 p.

Tjeder B. 1940. Catalogus insectorum Sueciae. I. Neuroptera et Mecoptera. *Opuscula Entomologica*. 5: 117–121.

Vasilikopoulos A., Misof B., Meusemann K., Lieberz D., Flouri T., Beutel R.G., Niehuis O., Wappler T., Rust J., Peters R.S., Donath A., Podsiadlowski L., Mayer Ch., Bartel D., Böhm A., Liu Sh., Kapli P., Greve C., Jepson J.E., Liu X., Zhou X., Aspöck H., Aspöck U. 2020. Correction to: An integrative phylogenomic approach to elucidate the evolutionary history and divergence times of Neuropterida (Insecta: Holometabola). *BMS Evolutionary Biology*. 20: 133. DOI: 10.1186/s12862-020-01695-4

Zakharenko A.V., Krivokhatsky V.A. 1993. Neuroptera from the European part of the former USSR. *Izvestiya Khar'kovskogo entomologicheskogo obshchestva*. 1(2): 34–83 (in Russian).

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