



## A new species of *Miramella* Dovnar-Zapolskij (Orthoptera, Acrididae, Podismini) from Montenegro

John Mulder

Holhorstweg 4, 7341AC Beemte Broekland, the Netherlands.

✉ [contact@ecologis Chadviesbureau.nl](mailto:contact@ecologis Chadviesbureau.nl)

 <https://orcid.org/0000-0003-3746-1700>

**ABSTRACT.** In July 2022 several grasshoppers of the genus *Miramella* Dovnar-Zapolskij, 1932 were encountered on two localities in Montenegro. Voucher specimens were sampled. It became clear that these did not belong to the species *Miramella albanica* Mistshenko, 1952. They also deviated in morphology and habitat from *Miramella irena* (Fruhstorfer, 1921). After further investigation of external morphology and the male genitalia, confirmation was derived about its undescribed status of the specimens and the species is here formally described and illustrated as *Miramella demissa* sp. nov. The new species is known from a restricted area in southern Montenegro. It is adapted to particularly low elevations, quite aberrant for the genus. A key to both sexes is given for the species in the region.

**Received:**

25 February, 2023

**Accepted:**

16 May, 2023

**Published:**

26 May, 2023

**Subject Editor:**

Mohsen Mofidi Neyestanak

**Key words:** biogeography, taxonomy, the Balkans, Palaearctic, identification key

**Citation:** Mulder, J. (2023) A new species of *Miramella* Dovnar-Zapolskij (Orthoptera, Acrididae, Podismini) from Montenegro. *Journal of Insect Biodiversity and Systematics*, 9 (3), 535–547.

### INTRODUCTION

The genus *Miramella* Dovnar-Zapolskij, 1932 consists of black-marked greenish grasshoppers mainly living in meadows up to alpine heights. In Europe, they are typical of the Alps and surrounding mountainous areas. Harz (1973) has divided the genus into three subgenera of which only *Galvagniella* Harz, 1973 and *Kisella* Harz, 1973 occur in Europe. Some authors treat these taxa as genera after Galvagni (1986b). One species of *Galvagniella* and three species of *Kisella* were currently recognized (Cigliano et al., 2022). Italian researchers recognized *Miramella alpina subalpina* (Fischer, 1850) as a valid species (Massa et al., 2012; Rivalta, 2021). The taxonomic situation has been a bit messy in the past, but was stable for the last decades. Recently, a new species, *Miramella* (*Kisella*) *frinias* (Rivalta, 2021) from Italy was described.

In the western Balkans south of Slovenia, only two species were hitherto known. One is *Miramella* (*Galvagniella*) *albanica* Mistshenko, 1952, for which the occurrence in Montenegro is known. The second species is *Miramella* (*Kisella*) *irena* (Fruhstorfer, 1921), which is known from the Alps and from a few isolated localities further south in the countries neighboring Montenegro, e.g. Bosnia and Herzegovina, Kosovo and Albania. I found two populations of *Miramella* in the south of Montenegro. A peculiar tegmen length as well as a remarkable occurrence at sea level, unusual for the genus, drew the attention to investigate the case. Differences in male genitalia, hind femora, hind tibiae, pronota and tegmina are described here, leading to the recognition of a new species

**Corresponding author:** Mulder, J. E-mail: [contact@ecologis Chadviesbureau.nl](mailto:contact@ecologis Chadviesbureau.nl)

**Copyright** © 2023, John Mulder. This is an open access article distributed under the terms of the Creative Commons NonCommercial Attribution License (CC BY NC 4.0), which permits Share - copy and redistribute the material in any medium or format, and Adapt - remix, transform, and build upon the material, under the Attribution-NonCommercial terms.

## MATERIAL AND METHODS

Five voucher specimens, three females and two males, of the new species are collected and examined from two localities around Rumija Mountain in Montenegro. The specimens are kept dry-pinned in the author's private collection. The male holotype and a paratype of the opposite sex are subsequently incorporated in the collection of Naturalis Biodiversity Center, Leiden and bear a red type label. The other three paratypes remain in the author's collection. In addition, 397 specimens *Miramella albanica* were consulted from Naturalis and 9 specimens from the private collection of Rob Felix. An MBS-10 stereo microscope was used under magnifications up to 98x. Measurements (Table 1) of the preserved specimens are taken with a pair of Vernier calipers with a precision of 0.1 mm and with an ocular micrometer in the microscope. Geographic coordinates and elevation were derived from a handheld GPS.

The paired apical valves of the aedeagus, also known as copulatory stiletts are the genital structures traditionally considered of importance to define taxa of *Miramella* (Galvagni, 1986b; Nadig, 1989; Harz, 1973; Rivalta, 2021). This especially is true for the non-stridulating Melanoplinae, where the aedeagus probably is under strong selection and works as a mechanism of reproductive isolation (Gurney, 1977; Skareas & Hsiung, 1998). The apical parts of the aedeagus were uncovered after relaxing by inserting a perpendicular bend tip of an insect pin and pulling over and pushing aside the pallium. The terms used in the description of the genital characteristics are adopted from Roberts (1941), Dirsh (1956) and Rivalta (2021). Although the copulatory stiletts are in an upright position, the proximal and posterior parts are considered dorsal and ventral. The dorsal valves are weakly sclerotized and shrink during the drying process. They are evaluated in dry condition. In lateral aspect, only the left valves are depicted. Description of the wing morphology follows the terminology used by La Greca (1954) and Kevan (1957). Illustrations of the several features are presented, made by me with charcoal and occasionally with a pastel spot color. The phylogenetic species concept as outlined by Wheeler and Platnick (2000) is adhered, where a species is defined as the smallest aggregation of populations diagnosable by a unique combination of character states. The taxonomic nomenclature used follows the Orthoptera Species File (OSF) (Cigliano et al., 2022). The following acronyms are used for the name of depositories: **RMNH.INS**: Insect collection of Naturalis Biodiversity Center, Leiden, the Netherlands; **CJM**: Private collection of John Mulder.

## RESULTS

### *Taxonomic hierarchy*

**Class Insecta Linnaeus, 1758**

**Order Orthoptera Latreille, 1793**

**Suborder Caelifera Ander, 1939**

**Family Acrididae MacLeay, 1821**

**Subfamily Melanoplinae Scudder, 1897**

**Tribe Podismini Jacobson, 1905**

**Genus *Miramella* Dovnar-Zapolskij, 1932**

**Type species:** *Podisma solitaria* Ikonnikov, 1911, 16:263, by original designation.

***Miramella demissa* Mulder sp. nov. (Figs 1–6)**

<https://zoobank.org/urn:lsid:zoobank.org:act:57D4629C-FFBA-4860-96C7-22760AD475AA>

**Diagnosis.** External appearance is generally similar to other species of the genus. The new species can be distinguished from the parapatric congeners, *Miramella irena* and *M. albanica* by the unique shape of the male copulatory stiletts, color and shape of the tegmen, pattern of the pronotum, pattern and color of the hind femora and color of the hind tibia. Only submicropterous specimens of *Miramella demissa* sp. nov. are known. In both males and females, the tegmina do not overlap and barely touch each other.

**Etymology.** *Demissa* is the nominative single female declension of the Latin adjective *demiss* (-a, us, -um) meaning 'low-lying/of low altitude/descended' and refers to its occurrence at relatively low altitudes, uncommon for representatives in the genus.

**Material examined. Holotype** ♂, MONTENEGRO, municipality of Bar, Velja Gorana; 41°59'29.0394"N, 19°15'41.0394"E; alt. ca. 90 m; 21.VII.2022; CJM 20220150, RMNH.INS.1622326, J. Mulder leg.; **Paratypes:** ♀, MONTENEGRO, municipality of Bar, Velja Gorana; 41°59'29.0394"N, 19°15'41.0394"E, alt. ca. 90 m; 21.VII.2022; CJM 20220151, RMNH.INS.1622327; 1♂, 2♀♀; MONTENEGRO, municipality of Ulcinj, Gornja Briska; 42°07'07.68"N, 19°13'08.2554"E; alt. ca. 470 m; 21.VII.2022, CJM 20220118, CJM 20220046, CJM 20220119; J. Mulder leg.

**Description — Male holotype. HABITUS.** Body 23.8 mm. General appearance in concordance with congeneric species. Overall color greenish with black markings alive (Fig. 1). **HEAD.** Extensive black markings dorsally. Flagellum of the antenna green with some orange-brown. **THORAX.** Pronotum length 5.2 mm, green with bold black markings on the dorso-lateral edge and along the midline. Paranota below black band mainly green (Figs 4A, 4D). **WINGS.** Tegmina semi-transparent greenish with some black veins, distal end on the third abdominal tergite. Hind wings smaller, approximately 80% of the tegmen length (Figs 4A, 4D). **LEGS.** Left hind femur length 11.9 mm. Hind femur length 4.4× as long as wide; knee almost completely shiny black besides the proximal border of the cover plate; almost complete black ring at 2/3 of the length, separated from the knee by a white ring of almost same size; just in front of the middle of the femur as seen from the coxa a black spot on the inner side (inner upper marginal area, inner medial area) and outer side (upper marginal area and the upper carinula); except black at the position of the femoral ring: outer lower marginal area whitish with a long black spot, medial area mainly yellowish green, lower outer faced carinula whitish (Fig. 5A); left hind tibia length 9.9 mm., outer side of hind tibia shiny black, distally light colored, two rows of 10 tibial spines on both hind legs whitish on the base and distal half black; fore and middle legs orange-green (Fig. 6A). **ABDOMEN.** Tergites green with two rows of black markings. Sternites light green. **GENITALIA.** Left and right dorsal valves of the aedeagus not connected, touching over almost their entire length, less sclerotized and partly transparent, upright, conical, weakly triangular at base in cross section, slightly bend in ventral direction, dorsal concavity especially visible as a groove near the tip; ventral valves well sclerotized, apical parts divergent, tips in an angle of 60 degrees (Figs 2A, 3A).

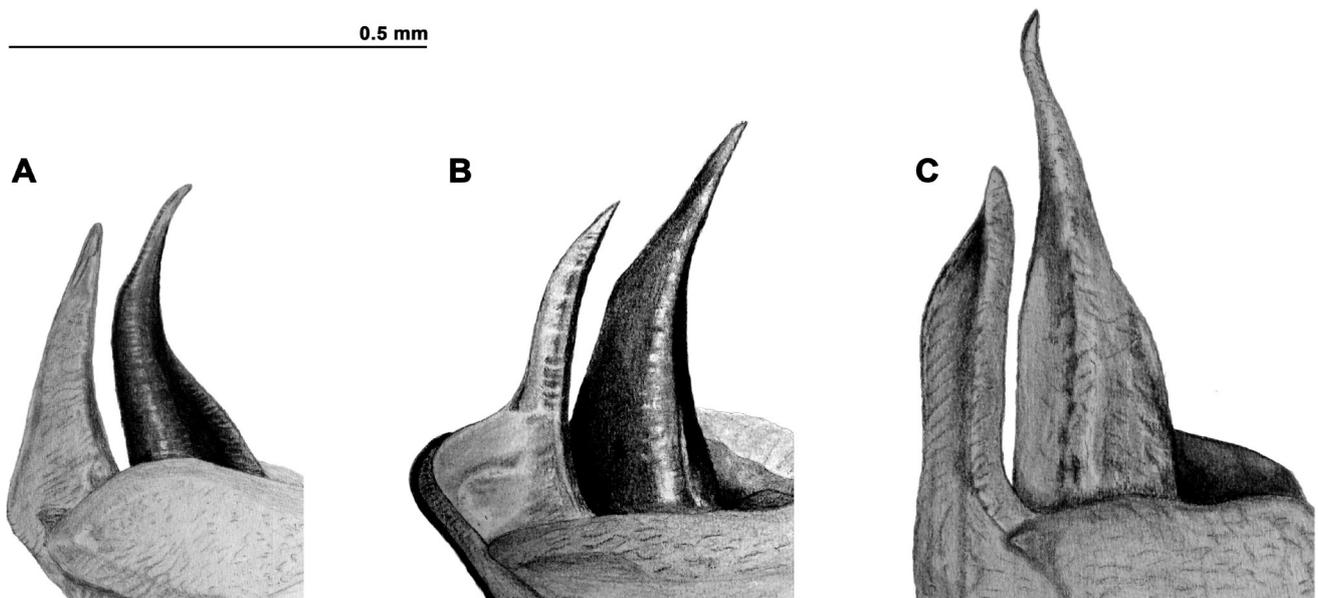
**Variations.** in males ( $n=2$  for genitalia,  $n=5$  for color or morphological characteristics): No obvious differences were seen between the males, except the paratype being overall a bit smaller (length 21.8 mm) and a deviant number of 12 spines in outer row of right tibia and in the specimen from Virpazar the tegmen does not reach the third tergite.

**Table 1.** Morphometrical data for the type specimens of *Miramella demissa* sp. nov.

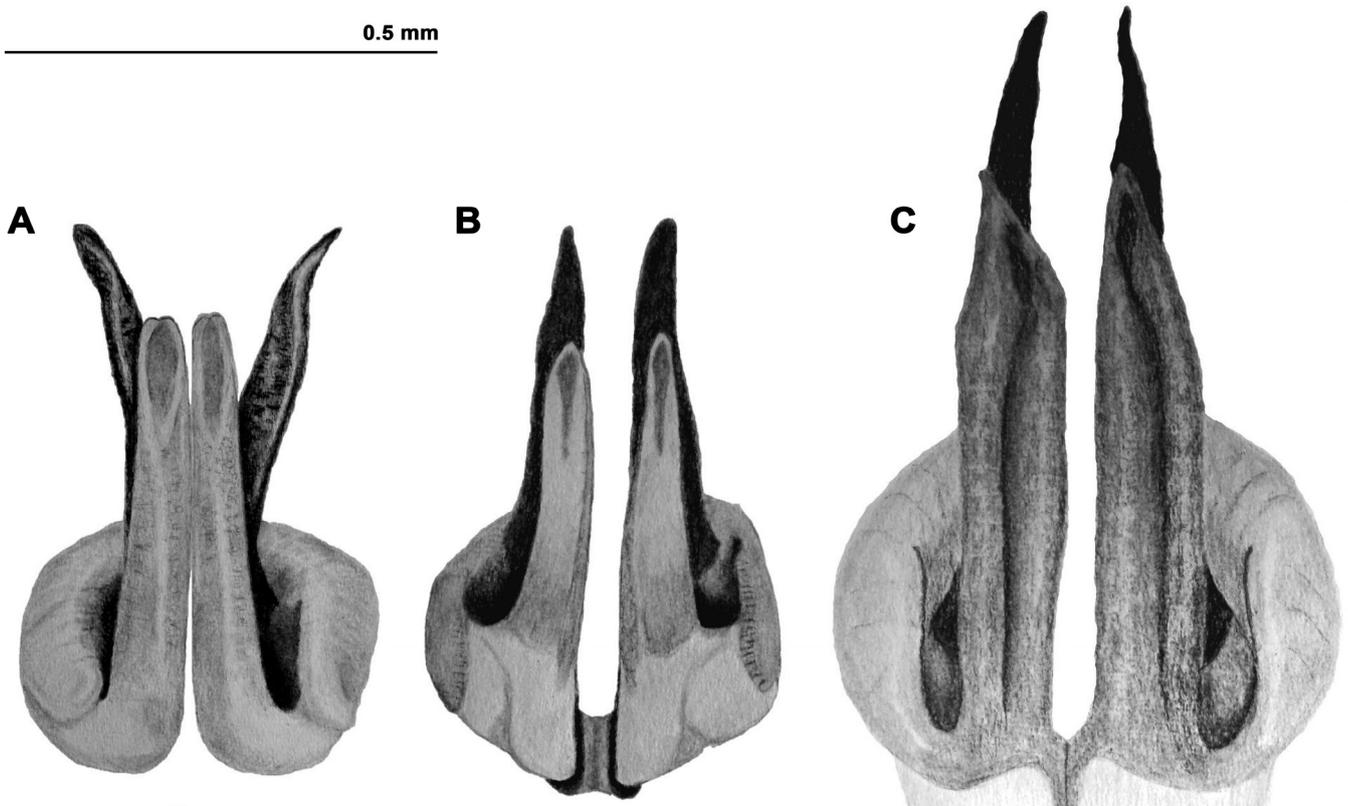
Type specimens	Measurements (mm)			
	Body	Femur	Tibia	Pronotum
RMNH.INS.1622326 (holotype ♂)	23.8	11.9	9.9	5.2
CJM 20220046 (paratype ♂)	21.8	10.4	8.6	4.2
RMNH.INS.1622327 (paratype ♀)	26.3	15.2	12.5	5.9
CJM 20220119 (paratype ♀)	26.3	15.3	13.1	6.2
CJM 20220118 (paratype ♀)	26.9	14.0	12.5	6.0



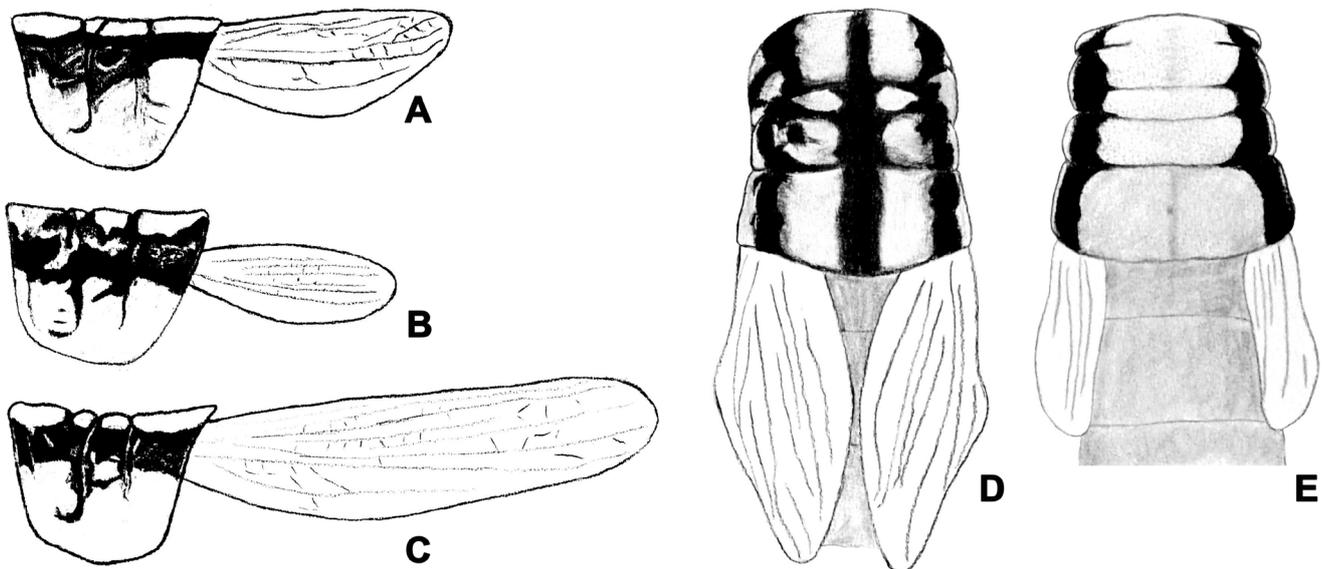
**Figure 1.** Habitus of *Miramella demissa* sp. nov.; male specimen from Virpazar (Courtesy of Laslo Horvat).



**Figure 2.** Male genitalia. Lateral aspect (left side) of the aedeagus. **A.** *Miramella demissa* sp. nov. (holotype); **B.** *Miramella albanica* Mistshenko, 1952, **C.** *Miramella irena* (Fruhstorfer, 1921).



**Figure 3.** Male genitalia, dorsal aspect of the aedeagus. **A.** *Miramella demissa* sp. nov. (holotype); **B.** *Miramella albanica* Mistshenko, 1952; **C.** *Miramella irena* (Fruhstorfer, 1921).



**Figure 4.** Pronotum plus wing. Left: lateral view; Right: dorsal view. **A.** *Miramella demissa* sp. nov. ♀; **B.** *Miramella albanica* Mistshenko, 1952 ♀ from Kolašin, Montenegro; **C.** *Miramella irena* (Fruhstorfer, 1921) ♂ (modified after Baur & Coray, 2004). **D.** *Miramella demissa* sp. nov. ♀; **E.** *Miramella albanica* ♀.

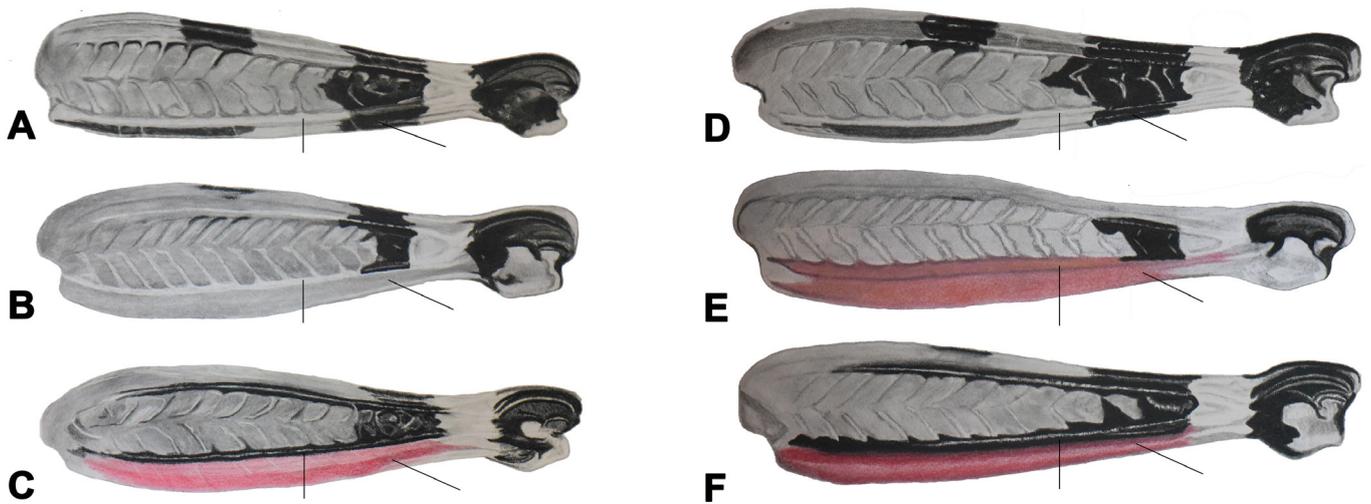
**Description — Female paratypes (n=3). HABITUS.** Body length 26.3–26.9 mm; characters largely same as holotype, but larger. **THORAX.** Pronotum length 5.9–6.2 mm, green with bold black markings on the dorso-lateral edge and along the midline. **LEGS.** Left hind femora length 14.0–15.3 mm, hind femora

relatively longer than in male, length-width ratio 4.9; coloration same as in males; left hind tibia length 12.5–13.1 mm, outer side tibia black in proximal half; outer side of hind tibia shiny black, distally light colored, two rows of 10 tibial spines on both hind legs (11 in right outer row in one female); tibia whitish on the base and distal half black (Fig 5D); fore and middle legs orange-green. **GENITALIA.** Only the ovipositor valves were shortly investigated. No apparent differences compared to *M. albanica* were noticed. There are no outstanding characteristic features.

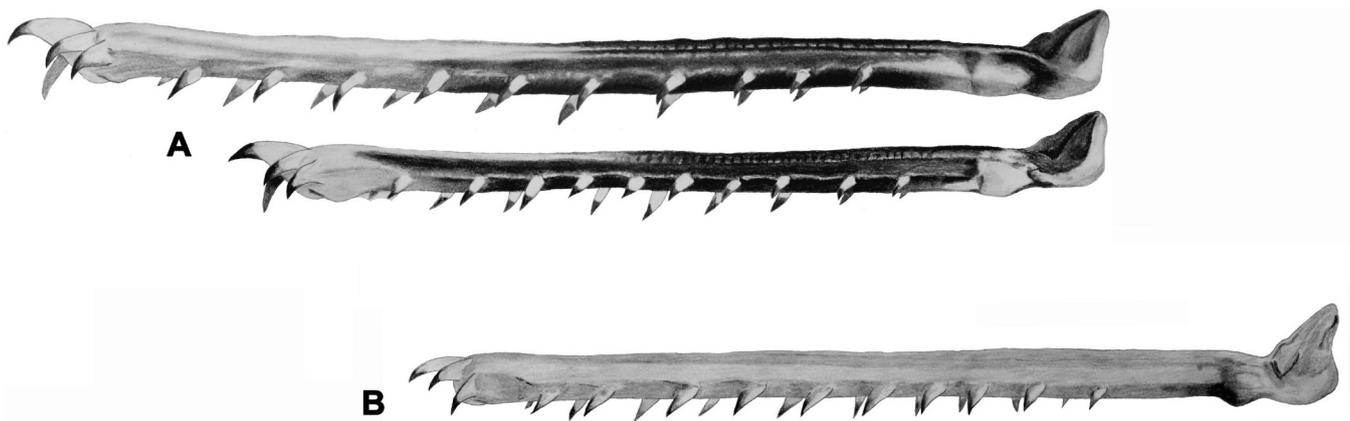
**Differential diagnosis.** Only few European congeneric species exist, of which only *M. albanica* and *M. irena* are known to occur in this part of the Balkans. The new species is compared to these two species. The noticed differences are well beyond intraspecific variation. *Miramella demissa* **sp. nov.** can be distinguished from *M. irena* and *M. albanica* by the following characters:

**GENITALIA.** The male genitalia of *Miramella irena* differ considerably from both other species. The apical parts of the aedeagus are much bigger. The dorsal valves are straight and on the dorso-lateral side there is a large and deep longitudinal convexity or groove on almost the full length in dried condition. The dorsal edge of the dorsal valves proceeds far and straight downwards without bulbous base (Figs 2C, 3C). Only *M. demissa* **sp. nov.** and *M. albanica* are further compared. In *Miramella demissa* **sp. nov.** the upper half of the ventral valves bend laterally outward in both males available. Between the slender tips there is an angle of about 60 degrees, while the ventral valves of *M. albanica* are more or less straight in dorsal view in all specimens checked ( $n=15$ ). In the specimen depicted by Galvagni (1986b) an angle of 35 degrees is seen. The dorsal valves are characterized by a pair of non-connected but closely placed conical tubes. Its cross section is more or less angular with round edges, becoming sharper during the drying process. In lateral aspect, the ventral side is convex to flat at the top and slightly convex in dried condition. Its dorsal side is slightly convex ending with a longitudinal groove near the top. In *M. albanica*, the dorsal valves are much shorter, thinner and are placed widely apart on a broad basis or slope, thus starting on a higher level than the ventral valves. In lateral view a clear concave or angular shape between the base and the slender upper part can be seen in the dorsal edge ( $n=17$ ). The bases of dorsal valves in *M. albanica* show a, sometimes dorsally protruding, well-sclerotized connective tissue. This concavity and connecting tissue were already depicted in the images drawn by Galvagni (1986a). This structure is missing in both males of *M. demissa* **sp. nov.** and in some cases the structure runs down in the shape of a crest on the sheet of the aedeagus (Figs 2A, 3A).

**HIND FEMORA.** Coloration is different in several aspects (see Fig. 5), from which the most obvious characters are in the lower marginal area and adjacent lower carinula of the outer face and the coloration of the knee. In all males and females of *M. demissa* **sp. nov.** checked ( $n=8$ ) the outer upper and lower marginal area and upper and lower carinula are black at the location of the complete femoral ring. The lower outer marginal area is whitish with black in a variable extent. Reddish color is absent in all specimens checked ( $n=8$ : 5♂♂, 3♀♀). In male *M. albanica* this lower marginal area is whitish, the lower carinula whitish with black at the location of the incomplete femoral band only at the dorsal part ( $n=212$  out of 214). In female *M. albanica* practically in 100% of the specimens checked, the lower marginal area as well as the lower carinula are pink-red ( $n=214$  out of 215), with black of the partial band sometimes entering the dorsal half of the lower carinula. In *M. irena* the lower marginal area is consistently red in both sexes and the lower (and upper) carinula are black. The most distal femoral black ring in *M. demissa* **sp. nov.** is almost complete (sometimes missing in inner lower marginal area), in *M. albanica*, this band is usually less broad longitudinally and only covers the dorsal part up to halfway on the lower carinula. An exemption of the latter state has been found twice (2 males from Bosnia-Herzegovina) among 429 specimens checked. In females this black band can be very faint, small or even largely missing ( $n=215$ ). In *M. irena*, due to the black lower carinula and red lower marginal area, black coloration is present dorsally and absent at the lower outer marginal areas, nevertheless it is often absent at the upper marginal area. A second, partial femoral band just in front of the middle of the femur as seen from the coxa is present in *M. demissa* **sp. nov.** on the inner face, running over the dorsal carina. It includes the outer upper marginal area and upper carinula, sometimes even on a small part of the medial area.



**Figure 5.** Coloration of the outer side of the left hind femur. Arrows indicating the most prominent differences. Left: males, right: females. **A., D.** *Miramella demissa* sp. nov.; **B., E.** *Miramella albanica* Mistshenko, 1952; **C., F.** *Miramella irena* (Fruhstorfer, 1921).



**Figure 6.** Variarion in color pattern of the left tibia. **A.** *Miramella demissa* sp. nov. (upper: female, lower: male holotype); **B.** *Miramella albanica* Mistshenko, 1952 female from Kolašin, Montenegro.

In dorsal view, next to the black knee, the femur shows two distinct black bands. This character is variable in *M. irena*, but often the black coloration is missing at the outer upper marginal area. In *M. albanica*, the second band is often absent or rudimentary on the outer side (especially in females) and on the inner side it is present dorsally down to and including the upper carinula. The femoral part of the knee in *M. demissa* sp. nov. is largely (80–90%) shiny black, only leaving out the outer edge of the external ventral genicular lobe, opposed to partly black in *M. albanica*, leaving out a large part (55–90%) of the external ventral genicular lobe and usually also the dorsal rim, often even the whole dorsal side ( $n=429$ ). Black coloration on the knee in *M. irena* is variable and often absent from parts of the dorsal side and significant parts of the ventral lobe.

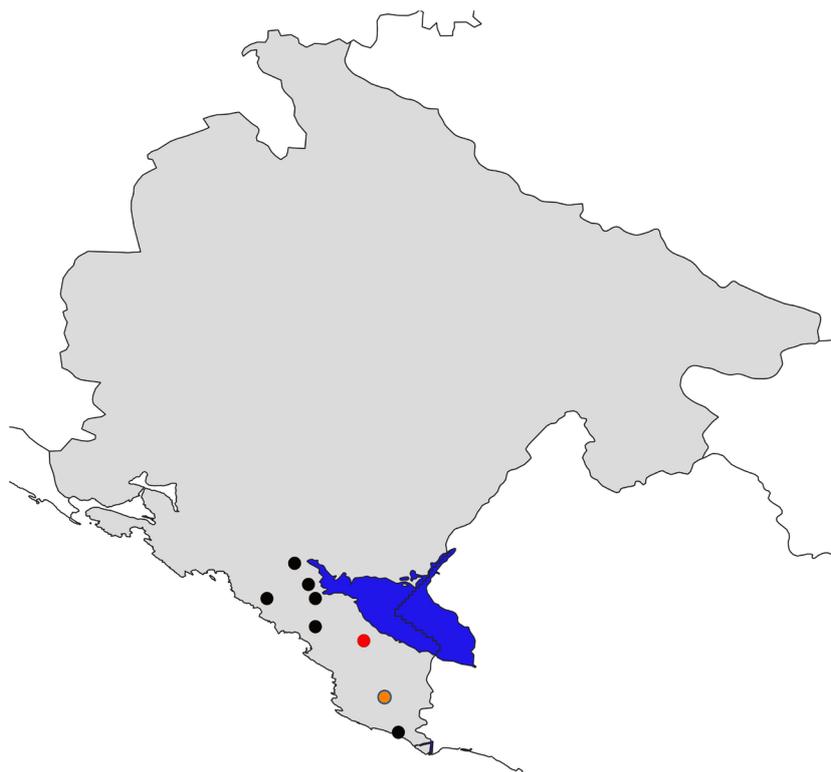
**HIND TIBIA.** In *M. demissa* sp. nov. the outer side of the tibia is largely black colored in both sexes, becoming pink-whitish distally in all specimens checked ( $n=8$ ). In *M. albanica*, the tibia is light colored (pink-beige to orangish) in all checked specimens ( $n=429$ ). Sometimes there is a small dark part present dorso-proximally (Fig. 6). In *M. irena*, this character shows more variation and the tibia are often largely black.

**PRONOTUM.** In all females of *M. demissa* **sp. nov.** checked in this respect ( $n=3$ ) a bold black midline is present on the pronotum. A midline is rare in female *M. albanica* (5 out of 212). All males of *M. demissa* **sp. nov.** show a bold black midline ( $n=5$ ). In *M. albanica*, 86% of the males ( $n=96$ ) showed this state, but it strongly depends on the population. In all 12 males evaluated from Hajla, Kosovo no midline was present (Fig. 4). A pronotal midline is common in *M. irena*.

**TEGMINA.** The submicropterous tegmina of *M. demissa* **sp. nov.** are much more wing-like than the slender and scale-like (squamipterous) winglets of *M. albanica* and almost touch each other. The tegmina are very short in comparison with the longer-winged *M. irena*, in which considerable variation can also occur within and between populations. The visible part of the tegmina behind the pronotum is -2 to +8% longer than pronotum midline length ( $n=6$ ) compared to about -10% in *M. albanica* and 60–110% in *M. irena*. The tegmina reach the hind border of the second or somewhere on the third tergite in *M. demissa* **sp. nov.** In *M. albanica*, they just reach up to the hind border of the first tergite or onto the second tergite and are slender and slightly orientated downwards. In *M. irena*, they reach until the fourth tergite or much further and touch or overlap each other (Fig. 4). The tegmina of *M. demissa* **sp. nov.** are greenish and semi-transparent with a whitish venation, however some veins are black. In both other species the tegmina are brownish and not transparent. The inner border is light colored in all three species, but less conspicuous in *M. demissa* **sp. nov.**

**Distribution.** *Miramella demissa* **sp. nov.** was found at two localities, 15 km far from each other. Next to these localities several other records were found. I reckon those records to *M. demissa* too, based on high probability. Some were accompanied by images confirming the specific characters. After my findings, Slobodan Ivković kindly pointed me to an observation by Nikolay Skobelev of presumably the same taxon some weeks prior to mine with an image on iNaturalist (<https://inaturalist.org/observations/123325958>) on June 25, 2022 from Gluhi Do, municipality of Bar (42°12'58.32"N, 18°59'46.68"E), alt. ca. 620 m. On the Russian travelers website Forum Vinsky a Ukrainian man under the pseudonym aoz1961 placed a record with an image of this species (<https://forum.awd.ru/viewtopic.php?f=1101&t=392608>) from Poseljani, Cetinje municipality 42°18'28.4394"N, 19°03'5.76"E, alt. ca. 20 m, in 2020. Although this is not a scientific source, it provides a magnificent in situ image and one of the few distribution points. Also, a record from Virpazar (42°14'52.7994"N, 19°05'14.9994"E) in 2017 by Slobodan Ivkovic and Laslo Horvat at ca. 5 m asl. with an image on the website Orthoptera Species File (Cigliano et al., 2022) under *Miramella albanica* should be attributed to the new species. In Ivković et al. (2020) this location is described as Virpazar 'reedy shore of Orahovštica river'. In the same publication, a second locality from 2012 was given by Godinje 'macchia brook at the village' with altitude 30 m and location 42°13'15.5994"N, 19°06'43.1994"E. The *Miramella albanica* record of Pavićević et al. (2006) from 'Velika beach and its rural hinterland of Štoj' in Ulcinj municipality most likely belongs to the new species too. Much older records from Sutorman, Bar municipality, of *Miramella alpina* and *M. albanica* by respectively Burr (1906) and Us (1968) can safely be assigned to *M. demissa* **sp. nov.** too. The eight localities are visualized in a map in Figure 7. The known distribution area is still small. It consists of the flanks of Rumija Mountain between the sea and Skadar Lake. The species can be considered as endemic for Montenegro, but as the border is within some kilometers, the existence of nearby Albanian localities cannot be excluded.

**Ecology.** Species within the *Miramella* group usually inhabit mountains at higher regions up to arctic altitudes (Chintauan-Marquier et al., 2013). *Miramella irena* occurs mainly in altitudes between 1.000 and 2.000 m, but is known up to 2400 m and even at sea level in Friuli, Italy. In addition, *M. albanica* occurs at altitudes of 1.000–2.000 m asl in Montenegro. The records of *M. demissa* **sp. nov.** on the other hand are known from lowland, from sea level up to about 600 m asl and close to the coast. The type locality is characterized by exuberant lowland vegetation with grasses, herbs and bushes. Orthoptera species found at this locality were *Arachnocephalus vestitus* Costa, 1855, *Tylopsis lilifolia* (Fabricius, 1794), *Leptophyes laticauda* (Fridvaldszky, 1868), *Poecilimon jonicus* (Fieber, 1853), *Tettigonia viridissima* (Linnaeus, 1758), *Decticus albifrons* (Fabricius, 1775), *Pezotettix giornae* (Rossi, 1794), *Calliptamus italicus* (Linnaeus, 1758), *Anacridium aegyptium* (Linnaeus, 1764), *Oedipoda caerulescens* (Linnaeus, 1758) and *Aiolopus strepens* (Latreille, 1804).



**Figure 7.** Map of Montenegro showing *Miramella demissa* sp. nov. records. **Orange:** type locality, **Red:** second locality. **Black:** additional sources. **Blue:** Skadar Lake.

At the second locality the animals lived in a relatively shadow-rich situation within the edge of a chestnut forest. Other Orthoptera species found around this locality were *Vichetia oblongicollis* (Brunner von Wattenwyl, 1882), *Eupholidoptera schmidti* (Fieber, 1861), *Pholidoptera dalmatica* (Krauss, 1879), *Pholidoptera femorata* (Fieber, 1853), *Pachytrachis gracilis* (Brunner von Wattenwyl, 1861), *Chorthippus dorsatus* (Zetterstedt, 1821) and *Pseudochorthippus parallelus* (Zetterstedt, 1821).

**Key to the species occurring in Montenegro and surrounding countries**

- 1 Male. .... 2
- Female. .... 4
- 2 Femoral outer carinulas black over a considerable length; femoral outer lower marginal area red. Tegmen usually brachypterous, touching medially or overlapping and reaching until fourth tergite or up to the end of abdomen, but length variable, normally much longer than pronotum length. .... *M. irena* (Fruhstorfer, 1921)
- Black on the femoral outer lower carinulas, if present, then mainly at the position of the femoral band; femoral outer lower marginal area not red. Wings not much (up to 15%) longer than pronotum length, reaching at most second or third tergite. .... 3
- 3 Copulatory stilets with bases of dorsal valves connected by a sclerotized structure, ventral valves straight in dorsal view. Tegmina squamipterous, reaching first or second tergite. Femoral outer lower marginal area without black; femoral outer lower carinula in most cases only black at dorsal part at the position of the femoral band. Hind tibia without substantial black. Femoral part of the knee with less black. .... *M. albanica* Mistshenko, 1952
- Copulatory stilets with bases of dorsal valves not connected, tips of ventral valves diverging in lateral direction. Submicropterous species, tegmen reaching end of second or third tergite. Femoral outer lower marginal area black at the position of femoral ring. Outer side of hind tibia and the femoral part of the knee largely black. .... *M. demissa* sp. nov. Mulder, 2023

- 4 Femoral outer carinulas black over a considerable length. Tegmen usually brachypterous, touching medially or overlapping and reaching until fourth tergite or up to the end of abdomen, but length variable, normally much longer than pronotum length. .... *M. irena* (Fruhstorfer, 1921)
- Black on the femoral outer carinulas, if present, then mainly at the position of femoral bands. Tegmina not much (up to 8%) longer than pronotum length reaching at most second or third tergite. .... 5
- 5 Femoral outer lower carinula and marginal area red. Tegmen squamipterous, reaching end of first or second tergite. Hind tibia without substantial black. Femoral part of the knee with less black. ....
- ..... *M. albanica* Mistshenko, 1952
- Femoral outer lower carinula and marginal area not red, with black at the position of femoral ring. Submicropterous species, tegmen reaching end of second or third tergite. Outer side of hind tibia largely black. Femoral part of the knee almost entirely black. .... *M. demissa* sp. nov. Mulder, 2023

## DISCUSSION

As all *Miramella* miss a stridulation apparatus, song comparison is not possible. In GenBank, only material of *Miramella alpina* is available, so I refrained from attempts to investigate the DNA. Within the genus *Miramella* several synonyms exist for *M. albanica* and *M. irena*. No type material has been studied, but images and descriptions of *M. bosnica* Miksic, 1969, *M. kisi* Harz, 1973, *M. leisleri* Ramme, 1931, *M. serbica* Cejchan, 1961, *M. concii* Galvagni, 1953 and *M. caprai* Galvagni, 1953 were checked. The observed morphology leaves no doubt about the separate identity of *M. demissa* sp. nov., not covered by those synonyms. Characters important for species delimitation such as the shape of the male genitalia, size, color and shape of the tegmina, coloration of the hind femur and hind tibia and the pronotum are evaluated. For identification, most of these characters can operate on their own with a very high success rate. The shape of the aedeagus of both males *M. demissa* sp. nov. is different from the genitalia checked from 17 males of *M. albanica* originating from Bosnia and Herzegovina, Kosovo and Montenegro, but resembles *M. albanica* more than *M. irena*. Tentatively, a place in the subgenus *Galvagniella* can be assumed. Molecular data would aid the placement. The appearance of the aedeagus is a useful character to delimitate the species. But, the valves of the aedeagus are less than one mm in size and are hidden by the pallium. In the field, the wings can serve as a first indicative visible clue. Some species demonstrate a lot of variation of wing types, especially *M. irena* (Galvagni, 1954). This makes wing morphology within *Miramella* a tricky subject (Nadig, 1989). Despite relatively low numbers of individuals available for *M. demissa* sp. nov. ( $n=8$  specimens,  $n=5$  populations), their tegmina all show the same color and shape and extend onto the third tergite. Variation in wing morphology is extremely small *M. albanica*, e.g. the wings are squamipterous and extending at most until the (beginning of the) second tergite in all cases from several populations and three countries ( $n=429$ ). Thus, in females, in absence of male genitalia, wing morphology can be supportive in identification next to other characters. Members of the genus *Miramella* are particularly found at higher elevations. The discovery of a new taxon adapted to a distinctively low elevation at sea level makes this find of particular interest.

*Miramella demissa* sp. nov. has hitherto been confounded with *M. albanica* and even *M. alpina*. Tentatively, the all *Miramella* records from the municipalities of Ulcinj, Bar and Cetinj are considered to belong to *M. demissa* sp. nov. and no sympatry is expected due to the physical distance to other species, including differences in altitudinal preferences. In Albania, near the Kosovo border, *M. irena* is recorded in 2015 by G. Puskás from ‘Pashtrik Mts, above village Lushaj’ at around 940 m asl (Cigliano 2022). A broken Facebook link to a post from Ornela Çuçi, still containing an image, refers to a record from ‘ZhurPrizren’. The Kosovar settlements Zhur and Prizren are close to the Albanian border and at ca. 400 m asl., but nearby slopes are already 900 m. Specimens from both localities perfectly match with *M. irena*, despite the localities being quite separate from its main distribution and located not far from *M. demissa* sp. nov., ca. 87 km. Despite the small distribution area, the conservation status can be seen as of least concern. Its natural habitat is unlikely to be significantly disturbed, due to the low density of human settlements in its range. There is a clear need for more material in order to study the intraspecific variation.

## AUTHOR'S CONTRIBUTION

The author confirms his contribution in the whole processing steps in the research, preparation and revising the manuscript. He read and approved the final version of the manuscript.

## FUNDING

This research received no specific grant from any funding agencies.

## AVAILABILITY OF DATA AND MATERIAL

The specimens listed in this study are deposited in the private collection of John Mulder and in the Insect collection of Naturalis Biodiversity Center, Leiden, the Netherlands and are available from the curator, upon reasonable request.

## ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

## CONSENT FOR PUBLICATION

Not applicable.

## CONFLICT OF INTERESTS

The author declares that there is no conflict of interest regarding the publication of this paper.

## ACKNOWLEDGMENTS

Luc Willemse and Naturalis Biodiversity Center are thanked for the possibility to consult the museum collection and accepting the holotype. I appreciate Rob Felix who willingly lend his specimens of *Miramella albanica*. Slobodan Ivković is thanked for pointing to the iNaturalist observation and Laslo Horvat for the image from the Virpazar specimen.

## REFERENCES

- Baur, H. & Coray, A. (2004) The status of some taxa related to *Miramella irena* (Fruhstorfer) and the type of *Kisella Harz* (Caelifera: Acrididae: Melanoplinae). *Revue Suisse de Zoologie*, 111 (3), 631–642.  
<https://doi.org/10.5962/bhl.part.80257>
- Burr, M. (1906) On a few Orthoptera collected in Southern Dalmatia and Montenegro in 1900. *The Entomologist*, 39, 169–172.
- Chintauan-Marquier, I.C., Amédégnato, C., Nichols, R.A., Pompanon, F., Grandcolas, P. & Desutter-Grandcolas, L. (2013) Inside the Melanoplinae: New molecular evidence for the evolutionary history of the Eurasian Podismini (Orthoptera: Acrididae). *Molecular Phylogenetics and Evolution*, 71, 224–233.  
<https://doi.org/10.1016/j.ympev.2013.09.009>
- Cigliano, M.M., Braun, H., Eades, D.C. & Otte, D. (2022) Orthoptera Species File. Version 5.0/5.0. Available from: <http://orthoptera.speciesfile.org> [Accessed 3 Nov. 2022]
- Dirsh, V.M. (1956) The phallic complex in Acridoidea (Orthoptera) in relation to taxonomy. *The Transactions of the Royal Entomological Society of London*, 108 (7), 223–356. <https://doi.org/10.1111/j.1365-2311.1956.tb02270.x>
- Dovnar-Zapolski, D.P. (1932) Zur Kenntnis der paläarktischen Podismini (Orthoptera, Acridodea) (Vorläufige Mitteilung). *Proceedings of the Zoological Institute, USSR Academy of Sciences*, pp. 253–268. [Russian with German summary]
- Fruhstorfer, H. (1921) Die Orthopteren der Schweiz und der Nachbarländer auf geographischer sowie oekologischer Grundlage mit Berücksichtigung der fossilen Arten. *Archiv für Naturgeschichte*, 5, 1–262.
- Galvagni, A. (1954) Studio ecologico-sistemático sugli Ortoteroidi di un'alta valle alpina (Val di Genova - Trentino). *Studi Trentini di Scienze Naturale*, 31, 61–102.

- Galvagni, A. (1986a) La situazione del Genere *Miramella* Dovnar-Zapolskij, 1933, nelle Regioni Balcanica e Carpatica. *Studi Trentini di Scienze Naturale*, 62, 13–42.
- Galvagni, A. (1986b) Attuale struttura sistematica del genere *Miramella* Dovnar-Zapolskij, 1933, e proposta per una sua scomposizione in più generi. *Atti dell'Accademia Roveretana degli Agiati*, ser. VI, 25B, 67–84.
- Galvagni, A. (1987) The genus *Miramella* Dovnar-Zapolskij, 1933, in the Balkan and Carpathian regions. In: Baccetti, B. (ed) *Evolutionary Biology of Orthopteroid Insects*. Ellis Horwood Ltd., Chichester, pp. 208–218.
- Gurney, A.B. (1977) Taxonomic status of the genus *Melanoplus*, with special reference to the montanus species-group. *Revista de la Sociedad Entomologica Argentina*, 36 (1–4), 85–87.
- Harz, K. (1973) Orthopterologische Beiträge 13. *Atalanta*, 4 (4), 403–407.
- Ivković, S., Horvat, L., Felix, R., Szövényi, G. & Puskás, G. (2020) Orthoptera of Montenegro: new faunistic data with new records for the country. *Annales de la Société Entomologique de France* (N.S.), 56 (2), 1–20. <https://doi.org/10.1080/00379271.2019.1704875>
- Kevan, D.K. (1957) A study of the genus *Chrotogonus* Audinet-Serville, 1839 (Orthoptera: Acridoidea). IV. Wing polymorphism, technical designations and preliminary synonymy. *Tijdschrift voor Entomologie*, 100 (1), 43–60.
- La Greca, M. (1954) Riduzione e scomparsa delle ali negli Insetti Pterigoti. *Archivio Zoologico Italiano*, 39, 361–440.
- Massa, B., Fontana, P., Buzetti, F.M., Kleukers, R. & Odé, B. (2012) *Orthoptera. Fauna d'Italia*, Vol. 48. Calderini, Bologna. 536 p.
- Mistshenko, L.L. (1952) *Locusts and grasshoppers, Catantopinae. Fauna of USSR, Orthoptera* 4 (2). USSR Academy of Sciences Publ., Moscow-Leningrad. 610 p. [in Russian, English translation by Israel programm for Scientific Translations, Jerusalem, 1965].
- Nadig, A. (1989) Die in den Alpen, im Jura, in den Vogesen und im Schwarzwald lebenden Arten und Unterarten von *Miramella* Dovnar-Zap. (Orthoptera, Catantopidae) auf grund populations analytischer Untersuchungen. *Atti dell'Accademia Roveretana Degli Agiati*, ser. VI, 28B, 101–264.
- Pavićević, D., Nikčević, J., Zatezalo, A., Ćetković, A. (2006) Orthopteroid fauna of hygrophile habitats in the coastal area of Montenegro. In: Pešić, V. & Hadziablahovic, S. (eds) *II International Symposium of Ecologist of The Republic of Montenegro*, 20–25 September 2006. Institute for Biodiversity and Ecology, Kotor, Montenegro, pp. 40–41.
- Rivalta, E. (2021) A new species of *Kisella* Harz, 1973 from the Tuscan-Emilian Apennines National Park in Italy (Insecta: Orthoptera: Acrididae: Podismini). *Quaderno di Studi e Notizie di Storia Naturale della Romagna*, 53, 37–50.
- Roberts, H.R. (1941) A comparative study of the subfamilies of the Acrididae (Orthoptera) primarily on the bases of their phallic structures. *Proceedings of the Academy of Natural Sciences of Philadelphia*, 93, 201–246.
- Skareas, S.D. & Hsiung, C.C. (1998) The internal, male genitalia of selected genera of Melanoplinae (Orthoptera, Acrididae). *Journal of Orthoptera Research*, 8, 125–145. <https://doi.org/10.2307/3503436>
- Us, P.A. (1968) Beitrag zur Kenntnis der Orthopteren-Fauna (Saltatoria) von Montenegro (Orthoptera: Saltatoria). *Beiträge zur Entomologie*, 18 (5/6), 643–662.
- Wheeler, Q.D. & Platnick, N.I. (2000) The phylogenetic species concept (sensu Wheeler and Platnick). In: Wheeler, Q.D. & Meier, R. (eds) *Species Concepts and Phylogenetic Theory: A Debate*. Columbia University Press, New York, NY., pp. 55–69.

## گونه جدید از ملخ‌های جنس *Miramella* Dohnar-Zapolskij (Orthoptera, Acrididae, Podismini) از مونت‌نگرو

جان مولدر\*

خیابان هلهورست‌وگ ۴، بیمته بروکلند، هلند

\* پست الکترونیک نویسنده مسئول مکاتبه: [contact@ecologischadviesbureau.nl](mailto:contact@ecologischadviesbureau.nl)

| تاریخ دریافت: ۰۶ اسفند ۱۴۰۱ | تاریخ پذیرش: ۲۶ اردیبهشت ۱۴۰۲ | تاریخ انتشار: ۰۵ خرداد ۱۴۰۲ |

**چکیده:** در ماه جولای سال ۲۰۲۲ نمونه‌های فراوانی از ملخ‌های جنس *Miramella* Dohnar-Zapolskij, 1932 در دو منطقه از مونت‌نگرو یافت و تعدادی از آنها به عنوان نمونه مرجع جمع‌آوری شدند. بر اساس بررسی انجام شده، مشخص گردید که این نمونه‌ها با گونه *Miramella albanica* Mistshenko, 1952 متفاوت هستند. ریخت‌شناسی و زیستگاه این گونه با گونه *Miramella irena* (Fruhstorfer, 1921) نیز تفاوت داشت. بررسی ریخت‌شناسی خارجی و جنیتالیایی حشره نر مشخص کرد این نمونه‌ها متعلق به یک گونه توصیف نشده هستند که در این مقاله با نام *Miramella demissa* **sp. nov.** توصیف گردید. گونه جدید در یک ناحیه محدود در جنوب مونت‌نگرو پراکنش داشته و بر خلاف سایر گونه‌ها، برای زندگی در مناطق کم‌ارتفاع سازگاری یافته است. در این مقاله کلید شناسایی حشرات نر و ماده گونه‌های جنس *Miramella* در این منطقه ارائه شد.

**واژگان کلیدی:** زیست‌جغرافیا، تاکسونومی، بالکان، پارلئارکتیک، کلید شناسایی