

***Chrysis serena* Radoszkowski, 1891, a new synonym of *Ch. zonata* Dahlbom, 1854 (Hymenoptera, Chrysididae)**

***Chrysis serena* Radoszkowski, 1891 – НОВЫЙ СИНОНИМ *Ch. zonata* Dahlbom, 1854 (Hymenoptera, Chrysididae)**

P. ROSA

П. РОЗА

P. Rosa, Via Belvedere 8/d, 20881 Bernareggio (MB), Italy. E-mail: rosa@chrysis.net

Chrysis serena Radoszkowski, 1891 is synonymised with *Ch. zonata* Dahlbom, 1854. The new synonymy is discussed and the updated distribution of *Ch. zonata* in Russia is given.

Chrysis serena Radoszkowski, 1891 синонимизирован с *Ch. zonata* Dahlbom, 1854. Обсуждается новая синонимия и приведены новые сведения о распространении *Ch. zonata* в России.

Key words: cuckoo wasps, taxonomy, Chrysididae, Chrysidinae, *Chrysis*, new synonymy

Ключевые слова: осы-блестянки, таксономия, Chrysididae, Chrysidinae, *Chrysis*, новая синонимия

INTRODUCTION

After the publication of the checklist of the Russian Chrysididae (Rosa et al., 2017b), I examined additional material deposited in historical collections as well as recently collected one. In particular, a detailed examination of the Chrysididae collection housed at the Museum für Naturkunde, Berlin (Germany) resulted in discovery of new synonymies and some interesting nomenclatorial cases concerning Russian and Central Asian fauna.

One of the most interesting finding concerns a widespread Palearctic species largely known as *Chrysis pyrrhina* Dahlbom, 1845. This species has primarily a ponto-mediterranean distribution, and it is relatively common from western Mediterranean countries to Western Asia, across Caucasus, Anatolia, and Middle East. An additional specimen from China (Heilongjiang) is housed in Linsenmaier's collection (Linsenmaier, 1968; Rosa et al., 2014).

For a long time and with few exceptions, *Ch. pyrrhina* has been considered as variation, subspecies or even synonym of *Ch. viridula* Linnaeus, 1761 (e.g. Trautmann,

1927), *Ch. bidentata* Linnaeus, 1767 (e.g. du Buysson, 1896), *Ch. integra* Fabricius, 1787 (e.g. Mocsáry, 1889) or *Ch. cylindrica* Eversmann, 1858 (e.g. Linsenmaier, 1951), until Linsenmaier (1959) recognized its specific rank within the *Ch. viridula* group in a modern sense. Recently, Rosa & Vårdal (2015) discovered that the type of *Ch. pyrrhina*, housed at the Stockholm Museum, did not match Linsenmaier's (1959) interpretation; *Ch. serena* Radoszkowski, 1891 was found to be the first available name. The type of *Ch. serena* was checked in the Radoszkowski collection at the Invertebrate collections of the Institute of Systematics and Evolution of Animals in Krakow (Rosa et al., 2015).

Chrysis serena was considered by Linsenmaier (1968) as the eastern subspecies of *Ch. pyrrhina*, with coarser and denser punctuation on metasoma and greener colour. It is well known that in several West-Palearctic chrysidid species, from western to eastern countries, the punctuation becomes coarser, and coloration tends to become greener, up to completely green individuals (Linsenmaier, 1968). Both these variations are generally clinal, and hardly represent a ground for subspecies separation. A sister species of

Ch. serena is found in Central Asian countries, *Ch. aello* Semenov, 1954, with larger, foveate-reticulate punctures on metasoma (Rosa et al., 2017a). From further studies, *Ch. serena* proved in turn a synonym of *Ch. zonata* Dahlbom, 1854, as discussed below.

MATERIALS AND METHODS

Pictures were taken with a Nikon D-80 connected to a stereomicroscope Tegal SCZ and stacked with the software Combine ZP. The following abbreviations are used in the text: cat. – catalogue; desc. – description; distr. – distribution; ecol. – ecology; loc. – locality.

Types and other specimens have been examined in the following collections: Museum für Naturkunde der Humboldt-Universität (Berlin, Germany; MNHU); Invertebrate collections of the Institute of Systematics and Evolution of Animals, Polish Academy of Sciences (Kraków, Poland; ISEA-PAN); Natur-Museum (Luzern, Switzerland; NMLS); Zoological Institute of the Russian Academy of Sciences (St Petersburg, Russia; ZIN). Russian specimens have been also examined in the private collections of Mikhail Mokrousov (Nizhny Novgorod, Russia; MMC), Pavel Rudoiskatel (Ekaterinburg, Russia; PRC), Nikolaj Vinokurov (Mineralnye Vody, Russia; NVC) and Alexander Fateryga (T.I. Vyzemsky Karadag Scientific Station – Nature Reserve of RAS, Crimea; VKSS).

TAXONOMIC PART

Order **HYMENOPTERA**

Family **CHRYSIDIDAE**

Subfamily **CHRYSIDINAE**

Tribe **CHRYSIDINI**

Chrysis zonata zonata Dahlbom, 1854

Chrysis zonata Dahlbom, 1854: 244 [syntypes (males); Asia Minor (no loc.): Berlin ?]; Mocsáry, 1892: 416 [cat.; Turkey (no loc.)];

Dalla Torre, 1892: 109 [cat.; Asia Minor (no loc.)]; Kimsey & Bohart, 1991: 480 [cat.; Turkey (no loc.)]; Strumia & Yıldırım, 2008: 78 [cat.; Turkey (no loc.)].

Chrysis pyrrhina: Eversmann, 1858: 558 [cat.; descr., Orenburg Prov., Saratov Prov., Ural]; Radoszkowsky, 1866: 11 [cat.; Saratov, Orenburg]; Kirchner, 1867: 209 [cat.; Saratov]; Radoszkowski, 1889: 20 [descr.; Orenburg; tab. IV (Figs 42A–42I)].

Chrysis (Tetrachrysis) zonata: Mocsáry, 1889: 410 [cat., descr., distr.; Asia Minor (no loc.)]; Mocsáry, 1890: 67 [cat.; Asia Minor (no loc.)].

Chrysis serena Radoszkowski, 1891 (**syn. nov.**): 194 [holotype (male); Iran (not Turkmenistan): Sarakhs (Kraków) (examined) (*Ch. viridula* group)]; Rosa et al., 2015: 55 [cat., typ.; Iran], 56 [Pl. 38]; Rosa et al., 2017b: 138 [cat.; European Part: Centre, East, South, North Caucasus, Crimea, Ural].

Chrysis (quadridentatae) zonata: du Buysson in André, 1895: 617 [descr.; Asia Minor (no loc.)].

Chrysis (Chrysis) pyrrhina: Linsenmaier, 1959: 130 [key], 133 [descr.; Transcaspi], 190 [cat.], 203 [Fig. 311], 211 [Fig. 558]; Linsenmaier, 1968: 82 [descr.; Southern Russia]; Linsenmaier, 1969: 364 [distr.; Southern Russia]; Schmidt, 1977: 119 [distr.; Southern Russia].

Chrysis (Chrysis) zonata: Schmidt, 1977: 119 [cat., Turkey (no loc.)].

Chrysis pyrrhina: Nikol'skaya, 1978: 69 [key; South of the USSR European part]; Buganin et al., 2000: 149 [cat.; Ulyanovsk Prov.: Novospassky Distr.: Vasil'evka Vill.]; Vinokurov, 2006b: 21 [cat., ecol.; central Caucasus and Ciscaucasus]; Brustilo, 2008: 30 [cat.; Crimea: Opuksky Natural Reserve]; Vinokurov, 2009: 206 [cat., ecol.; Stavropol Terr.]; Brustilo, 2013: 1106 [cat., ecol.; Stavropol Terr.: env. Mineralnye Vody]; Brustilo, 2014: 1150 [biogeogr.; Stavropol Terr.: Mineralnye Vody].

Chrysis viridula pyrrhina: Vinokurov, 2004: 34 [cat.; Stavropol Terr.: Mineralnye Vody]; Vinokurov, 2005: 90 [cat., ecol.; central Caucasus and Ciscaucasus]; Shibaev, 2006: 93 [cat.; Penza Prov.: Middle Volga]; Vinokurov, 2006a: 19, 20 [cat., ecol.; Stavropol Terr.: Mineralnye Vody].

Chrysis pyrrhina siciliaca: Vinokurov, 2006a: 19, 21 [cat., ecol.; Stavropol Terr.: Mineralnye

Vody]; Vinokurov, 2006b: 21 [cat., ecol.; central Caucasus and Ciscaucasus]; Vinokurov, 2009: 206 [cat., ecol.; Stavropol Terr.]; Vinokurov, 2013: 1106 [cat., ecol.; Stavropol Terr.: env. Mineralnye Vody]; Vinokurov, 2014: 1051 [biogeogr.; Stavropol Terr.: Mineralnye Vody].

Chrysis pyrrhina rhodesiaca: Vinokurov, 2006a: 19 [cat., ecol.; Stavropol Terr.: Mineralnye Vody]; Vinokurov, 2006b: 21 [cat., ecol.; central Caucasus and Ciscaucasus]; Vinokurov, 2009: 206 [cat., ecol.; Stavropol Terr.]; Vinokurov, 2013: 1106 [cat., ecol.; Stavropol Terr.: env. Mineralnye Vody].

Material examined. **Russia.** European part [Astrakhan Prov., Enotaevsk Distr., env. Volzhskiy (MMC); Volgograd Prov., Sarepta (ZIN); Dagestan Rep., Derbent Distr., Kamyshshay River Valley (MMC); Stavropol Terr., Stavropol (ZIN); Crimea: Arabatskaya Strelka (VKSS); Evpatoria (ZIN); Kerch (ZIN); Feodosia Distr., Barakol Lake (VKSS); Mukhalatka (ZIN); Sevastopol (ZIN); Staryi Krim (ZIN); Sudak (ZIN); Tarkhankut (VKSS)]; Ural [Chelyabinsk Prov. (PRC); Orenburg Prov. (PRC)]. **Azerbaijan.** Elisavetpol [= Ganja] (ZIN).

Distribution. Russia: Penza, Saratov, Ulyanovsk and Volgograd Provinces; Dagestan Rep.; Stavropol Terr.; Crimea; Chelyabinsk and Orenburg Provinces. Palearctic: from the Western Europe to Middle East, Western Asia and China (Heilongjiang) (Rosa et al., 2014). It is one of the commonest cuckoo wasps found in East Mediterranean countries and Middle East.

DISCUSSION

In MNHU, there are some chrysidids considered as possible Dahlbom's (1854) types by Bischoff (handwritten labels) and Kimsey & Bohart (1991). Among them, *Chrysis aestiva* Dahlbom, 1854, *Ch. angulata* Dahlbom, 1854, and *Ch. zonata* Dahlbom, 1854 were originating from Loew's collection (Dahlbom, 1854). I already unsuccessfully searched for Loew's collection in the museums of Copenhagen, London, Lund, Stockholm, and Vienna, where Loew's specimens are supposedly housed (Rosa et al., 2017c). However, a few specimens from

Loew's collection (e.g. the paralectotypes of *Ch. manicata* Dahlbom, 1854 and other non-type specimens) are currently deposited in MNHU. Kimsey & Bohart (1991) indicated the syntype series of *Ch. zonata* as housed in Berlin, but not as directly examined. The repository of the remaining species described by Dahlbom (1854) upon Loew's materials (*Ch. impar* Dahlbom, 1854, *Ch. transversa* Dahlbom, 1854, *Ch. uniformis* Dahlbom, 1854, *Ch. verna* Dahlbom, 1854 and *Ch. viridana* Dahlbom, 1854) remains unknown.

Dahlbom (1854) described *Ch. zonata* based on specimens collected in Asia Minor, giving no precise locality. Nothing is said about the number of studied specimens, yet they were at least two, since the length is reported as "1½–1¾" decimal lines. The specimen deposited at MNHU and identified as *Ch. zonata* Dahlbom (Bischoff, 1910) was collected at Brussa [currently Bursa, Marmara Region, Turkey] by Thirk. No other specimens of *Ch. zonata* from Asia Minor are currently deposited in MNHU.

The reported specimen is likely one of the syntypes of *Ch. zonata*, because Dahlbom (1854) examined other material collected by Thirk at Brussa, as in the case of *Ch. aurifrons* Dahlbom, 1854 [currently *Chrysuria ignifrons* (Brullé, 1833), see Bischoff, 1910]. *Chrysis aurifrons* was described on a syntype series including Thirk's specimen (listed as "*Chrysis aurifrons* Klug Mus. Berlin"), labelled as "Type" by Bischoff (currently a paralectotype). This case shows that Dahlbom (1854) did not report precise localities even when specimens were properly labelled, as already observed in other cases (Rosa & Xu, 2015).

I do not designate the specimen of *Ch. zonata* in MNHU as the lectotype, waiting for the finding of Loew's collection and the rest of the syntype series. However, this specimen must be taken into account in case of a neotype designation.

Chrysis zonata has been considered an unknown taxon so far, merely listed in catalogues, without inclusion in keys or species

group (Mocsáry, 1889, 1890, 1892; Dalla Torre, 1892; du Buysson in André, 1895; Schmidt, 1977; Kimssey & Bohart, 1991; Strumia & Yıldırım, 2008). Linsenmaier (1959, 1968) did not even cite it in his revisions of the European and West-Palaearctic fauna.

The Berlines specimen of *Chrysis zonata* (Figs 1A, 2), a male, is clearly conspecific with *Ch. serena* (= *Ch. pyrrhina* sensu Linsenmaier). After the examination of this specimen, I re-examined the original Dahlbom's (1854) description under a new light. Based on his accurate diagnosis, I can state that *Ch. zonata* is the senior synonym of *Ch. serena*. Both the Berlines specimen and the description given by Dahlbom (1854) agree to perfection with the male of *Ch. serena*. The most important characters are: the unusual coloration of this species in the *Ch. viridula* species-group (Fig. 1A, 1B) (head and mesosoma green; mesoscutum with darker median lobe; first metasomal tergum green at base and golden red distally, the second one entirely red, and the third, entirely blue; flagellum ventrally lightened) (in Dahlbom's (1854) original description "*Caput viride; [...]* antennae me-

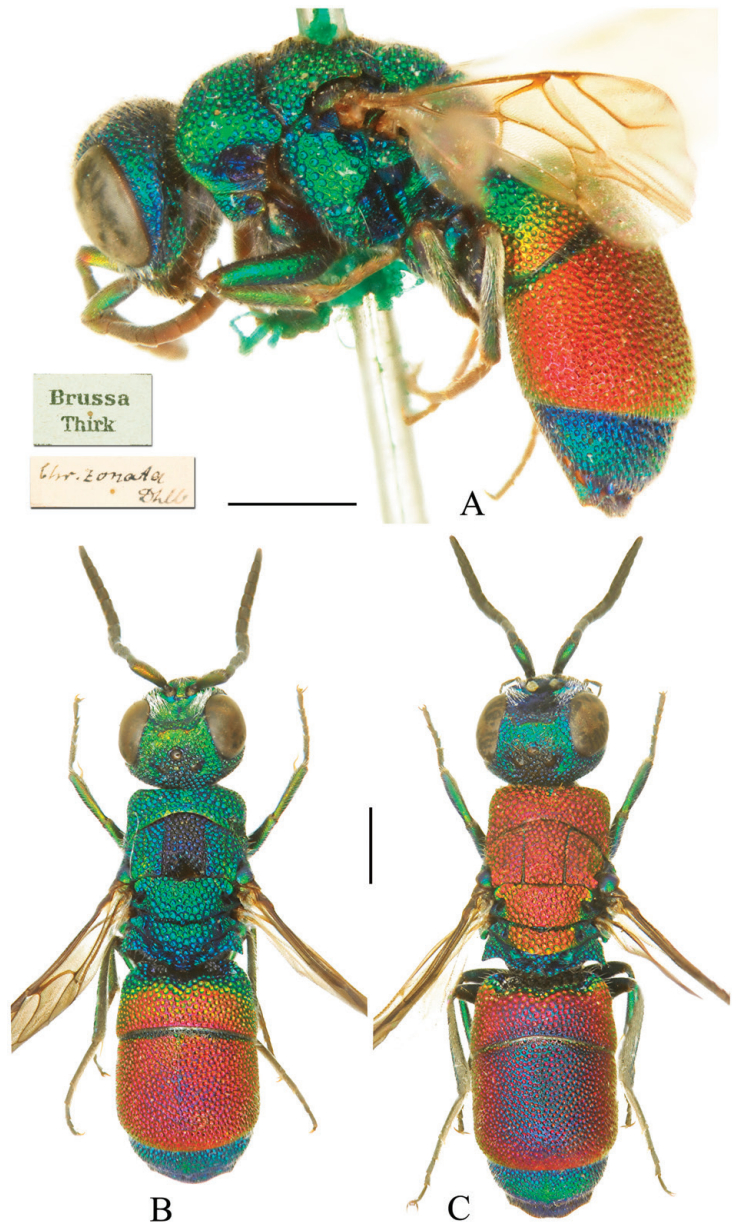


Fig. 1. *Chrysis zonata* Dahlbom, 1854: A, male (possible syntype, lateral view) and its labels; B, male, dorsal view, Crimea; C, female, dorsal view, Crimea. Scale bars 1.0 mm.

diocres basi virides, flagellum laete brunne-sens. [...]. Thorax viridis: dorsuli area media et metanoto segmento postico leviter viridi-irrorato, cyaneis. [...] Abdomen: segmentum 1: mum cyaneo-viride: margine apicali aurato; segmentum 2: dum igneo-aureum: margi-

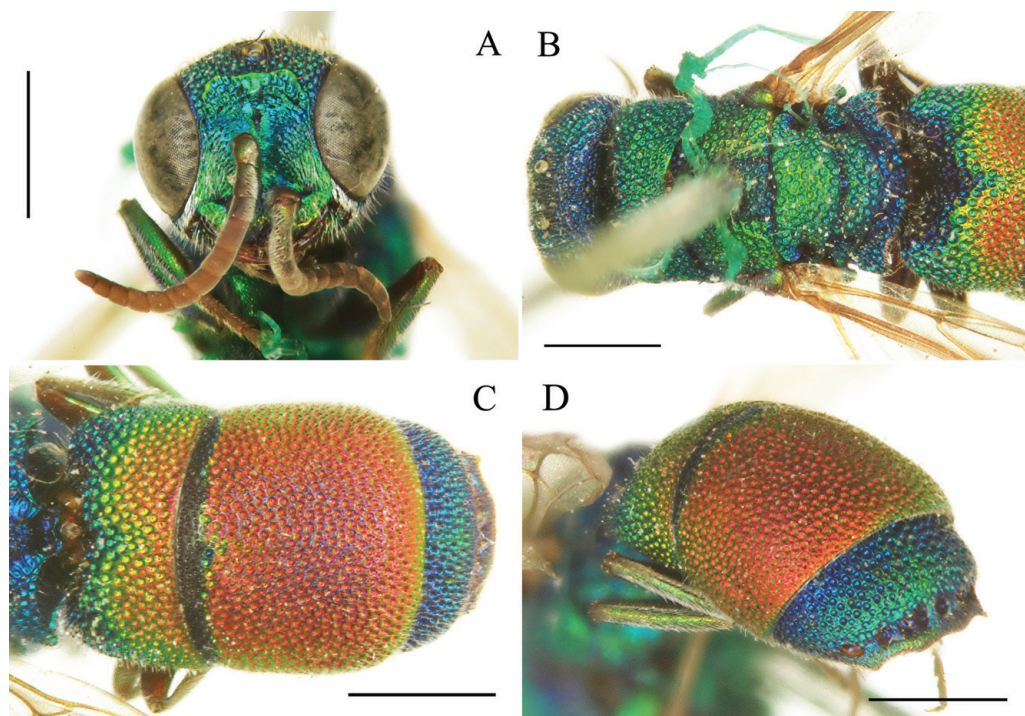


Fig. 2. *Chrysis zonata* Dahlbom, 1854, male, possible syntype: A, head, frontal view; B, head and mesosoma, dorsal view; C, metasoma, dorsal view; D, metasoma, posterolateral view. Scale bars 1.0 mm.

ne basali tenuiter nigro-aeneo; segraentum 3:tium viride: fascia basali violacea. Venter planiusculus, viridi-cjaneo- et nigro-pictus"); the sculpture of the face, with scapal basin finely and transversally microridged (Fig. 2A) ("cavitas facialis subangusta rectangularis profunda, medio subtiliter canaliculata, lateribus et superne punctulato-coriacea"); the head with raised, inverted U-shaped transversal frontal carina (Fig. 2A) ("superne transverse marginata: margine utrinque ramulum brevem longitudinalem deorsum versum emittente"); the metasomal punctation, with dense, foveate and subreticulate punctures (Fig. 2C) ("Corpus confertim punctatum subcoriaceum punctis permediocribus"); the shape of the third metasomal tergum, with two short lateral teeth, and the two medial ones reduced to slight undulations (Fig. 2D) (from Dahlbom's (1854) key "Abdominis segmenti dorsalis 3:tii dentes apicales: intermedii brevissimi obsoletissimi, externi breves distincti"). The female shares

similar habitus, yet is chromatically dimorphic (Fig. 1C), with metallic red mesosoma, similarly to other species in the *Ch. viridula* group. From the latter ones, it can be easily recognized for the metallic blue tegulae, instead of non-metallic brown as in other species (Fig. 1C).

The combination of small dimensions, 6.0–7.0 mm (*vs.* 9.0–11.0 mm in *Ch. integra*, *Ch. erythromelas* Dahlbom, 1845 and *Ch. gogorzae* Lichtenstein, 1879), the body coloration and the foveate subreticulate punctures of the metasoma make this species easily recognizable within the *Ch. viridula* species-group. Only *Ch. aello* Semenov et Nikol'skaya, 1954, from Tajikistan, is closely related to *Ch. zonata* (see Plate 5 in Rosa et al., 2017a) and shares similar habitus and genital capsule. I consider *Ch. aello* as a separate species for the shape of the transversal frontal carina more M-shaped, the colour of the first tergum almost fully green, the extremely large foveate-reticulate body

punctures, and the shape of the last tergum with larger pits of the pit-row and widely separate median teeth on apical margin. However, molecular studies are needed to evaluate the relationship between these two taxa and the other subspecies of *Ch. zonata* (see below). The colouration and the shape of the apical teeth on the last tergum, as described by Dahlbom (1854), exclude *Ch. zonata* from the *Ch. splendidula* species-group because members of this group share fully metallic red first tergum and acute median teeth on the last tergum.

CONCLUSIONS

The nomenclature of this species is not yet fixed. For a long time, under the name *Ch. pyrrhina*, it was considered a variation or subspecies of *Ch. viridula* or of other species of this group. *Chysis pyrrhina* was finally given full specific rank by Linsenmaier (1959) until Rosa & Vårdal (2015) discovered that the type of *Ch. pyrrhina* is the male of *Ch. erythromelas* and proposed the name *Ch. serena* for *Ch. pyrrhina* sensu Linsenmaier (1959). Since the name *Ch. serena* is not yet in prevailing usage, we herewith propose to use the first available name for this species, namely *Ch. zonata* Dahlbom, 1854 = *Ch. serena* Radoszkowski, 1891, **syn. nov.** (= *Ch. pyrrhina* sensu Linsenmaier, 1959).

At present, five subspecies of *Ch. zonata* are known: *Ch. z. zonata*; *Ch. z. cypriana* Enslin, 1950 (replacement name for *Ch. bidentata* var. *cypria* du Buysson, 1898, from Cyprus and Palestine); *Ch. z. siciliaca* Linsenmaier, 1959 (from Sicily); *Ch. z. rhodesiaca* Linsenmaier, 1959 (from Rhodes); *Ch. z. aurinotata* Linsenmaier, 1968 (from northern Africa). Interestingly, males of *Ch. z. cypriana* and *Ch. z. siciliaca*, unlike the remaining subspecies, share with most other species of the group the same red mesosoma colouration of females. *Chysis z. rhodesiaca* is recognizable for the extremely large foveate punctures of metasoma. Finally *Ch. z. aurinotata* is recognizable for the fine

punctuation of metasoma and the reddish reflections on female vertex.

ACKNOWLEDGEMENTS

I sincerely thank Sergey Belokobylskij (St Petersburg, Russia), Marco Bernasconi (Luzern, Switzerland) and Michael Ohl (Berlin, Germany) for the access to museum collections to examine type material. I also thank Alexander Fateryga (T.I. Vyazemsky Karadag Scientific Station – Nature Reserve of RAS, Crimea), Mikhail Mokrousov (Nizhny Novgorod, Russia), Pavel Rudoiskatel (Ekaterinburg, Russia) and Nikolaj Vinokurov (Mineralnye Vody, Russia) for the loan of their Russian specimens. Finally, I thank Maurizio Pavesi (Museo di Storia Naturale, Milan, Italy), Arkady Lelej (Vladivostok, Russia) and Juho Paukkunen (Helsinki, Finland) for critical reading of the manuscript and valuable suggestions.

REFERENCES

- Bischoff H.** 1910. Die Chrysididen des Königlichen Zoologischen Museums zu Berlin. *Mitteilungen aus dem Zoologischen Museum in Berlin*, 4: 426–493.
- Brustilo E.V.** 2008. Chrysidids (Hymenoptera, Chrysididae) of the Opukskiy Reserve. *Modern problems in natural sciences (Material of III All-Ukrainian Student Scientific Conference)*: 30–31. Nizhyn. [In Russian].
- Buganin S.I., Isaev A. & Kharisov M.A.** 2000. Results and prospects of studying the fauna of the superfamily Chryridoidea in the Ulyanovsk Province. *Insects and arachnids of the Ulyanovsk region*, 9: 145–150. Ulyanovsk. [In Russian].
- Dahlbom A.G.** 1854. *Hymenoptera Europaea praecipue borealia, formis typicis nonnullis specierum generumve exoticorum aut extraneorum propter nexum systematicum associatis, per familias, genera, species et varietates disposita atque descripta*. 2. *Chysis* in sensu Linnæano. Berlin: Friedrich Nicolai. xxiv + 412 p. + 12 pl. DOI: <http://dx.doi.org/10.5962/bhl.title.15890>
- Dalla Torre C.G.** 1892. *Catalogus hymenopterorum 6. Chrysididae (Tubulifera)*. Lipsiae: Wilhelm Engelmann. ix + 118 pp. DOI: <http://dx.doi.org/10.5962/bhl.title.10348>
- Du Buysson R.** du 1891–1896. Les Chrysidés. In: **André E.** (Ed.). *Species des Hyménoptères*

- d'Europe & d'Algérie*, **6**: 1–758 + 64 unnumbered pages + pl. 1–32 [1–88 (1891); 89–208 (1892); 209–272 (1893); 273–400 (1894); 401–624 (1895); 625–758 + 64 unnumbered pages + pl. 1–32 (1896)]. Paris: Bouffaut Frères.
- Eversmann E.** 1858. Fauna Hymenopterologica Volgo-Uralensis. Continuatio. Familia Chrysidarum. *Bulletin de la Société Imperiale des Naturalistes de Moscou*, **30**, 1857: 544–567.
- Kimsey L.S. & Bohart R.M.** 1991. *The Chrysidid Wasps of the World*. 1990. New York: Oxford Press. 652 p.
- Kirchner L.** 1867. *Catalogus Hymenopterorum Europae*. Vindobonae [=Vienna]: propriis Expensis Societatis Zoologico-Botanicæ. 285 p.
- Linsenmaier W.** 1951. Die europäischen Chrysididen (Hymenoptera). Versuch einer natürlichen Ordnung mit Diagnosen. *Mitteilungen der Schweizerischen Entomologischen Gesellschaft*, **24**(1): 1–110.
- Linsenmaier W.** 1959. Revision der Familie Chrysididae (Hymenoptera) mit besonderer Berücksichtigung der europäischen Spezies. *Mitteilungen der Schweizerischen Entomologischen Gesellschaft*, **32**(1): 1–232.
- Linsenmaier W.** 1968. Revision der Familie Chrysididae (Hymenoptera). Zweiter Nachtrag. *Mitteilungen der Schweizerischen Entomologischen Gesellschaft*, **41**(1–4): 1–144.
- Linsenmaier W.** 1969. The chrysidid wasps of Palestine (Hym., Chrysididae). A faunistic catalogue with descriptions of new species and forms. *Israel Journal of Entomology*, **4**: 343–375.
- Mocsáry A.** 1889. *Monographia Chrysididarum Orbis Terrarum Universi*. Budapest: Hungarian Academy of Science. 643 pp.
- Mocsáry A.** (1889) 1890. Catalogus Chrysididarum Europae et confinium. *Természetráji Füzetek*, **12**(2–3): 57–71.
- Mocsáry A.** 1892. Additamentum secundum ad monographiam Chrysididarum orbis terrarum universi. *Természetráji Füzetek*, **15**(4): 213–240.
- Nikol'skaya M.N.** 1978. Chrysidoida. In: **Medvedev G.S.** (Ed.). *Opredelitel' Nasekomykh Evropyiskoy Chasti SSSR* [Key to the insects of the European part of the USSR], **3**(1): 58–71. Leningrad: Nauka. (In Russian).
- Radoszkowski O.** 1866. Enumération des espèces de Chrysidides de Russie. *Horae Societatis Entomologicae Rossicae*, **3**: 295–310.
- Radoszkowski O.** (1888) 1889. Révision des armures copulatrices des mâles de la tribu des Chrysidides. *Horae Societatis Entomologicae Rossicae*, **23**(1–2): 3–40, pls 1–6.
- Radoszkowski O.** 1891. Descriptions de Chrysidides nouvelles. *Revue d'Entomologie*, **10**: 183–198.
- Rosa P., Belokobylskij S.A. & Zaytseva L.A.** 2017a. The Chrysididae types described by Semenov and deposited at the Zoological Institute of the Russian Academy of Sciences, Saint Petersburg (Insecta, Hymenoptera). *Proceedings of the Zoological Institute RAS*, Supplement 5: 1–266.
- Rosa P., Lelej A.S., Belokobylskij S.A., Loktionov V.M. & Zaytseva L.A.** 2017b. Family Chrysididae. In: **Lelej A.S., Proshchalykin M.Yu. & Loktionov V.M.** (Eds). *Annotated catalogue of the Hymenoptera of Russia. Volume 1. Symphyta and Apocrita: Aculeata. Proceedings of the Zoological Institute RAS*, Supplement 6: 126–144.
- Rosa P., Pavesi, M., Soon, V. & Niehuis, O.** 2017c. *Pseudochrysis* Semenov, 1891 is the valid genus name for a group of cuckoo wasps frequently referred to as *Pseudospinolia* Linsenmaier, 1951 (Hymenoptera, Chrysididae). *Deutsche Entomologische Zeitschrift*, **64**(1): 69–75. DOI: <http://doi.org/10.3897/dez.64.13005>
- Rosa P. & Vårdal H.** 2015. An annotated catalogue of the types of Chrysididae (Hymenoptera) at the Swedish Museum of Natural History, Stockholm, with brief historical notes. *ZooKeys*, **495**: 79–132. DOI: <http://dx.doi.org/10.3897/zookeys.495.9356>
- Rosa P., Wei N-S. & Xu Z-f.** 2014. An annotated checklist of the chrysidid wasps (Hymenoptera, Chrysididae) from China. *ZooKeys*, **455**: 1–128. DOI: <http://dx.doi.org/10.3897/zookeys.455.6557>
- Rosa P., Wiśniowski B. & Xu Z-f.** 2015. Annotated type catalogue of the Chrysididae (Insecta, Hymenoptera) deposited in the collection of Radoszkowski in the Polish Academy of Sciences, Kraków. *ZooKeys*, **486**: 1–100. DOI: <http://dx.doi.org/10.3897/zookeys.486.8753>
- Rosa P. & Xu Z-f.** 2015. Annotated type catalogue of the Chrysididae (Insecta, Hymenoptera) deposited in the collection of Maximilian Spinola (1780–1857), Turin. *ZooKeys*, **471**: 1–96.
- Schmidt J.** 1977. Die Chrysididen der Türkei, insbesondere Anatoliens (Hymenoptera: Chrysididae). *Linzer biologische Beiträge*, **9**(1): 91–129.

- Shibaev S.V.** 2006. Materials to the fauna of gold wasps (Hymenoptera, Chrysididae) of the territory of the Middle Volga. *Abstracts of the Symposium of CIS on Hymenoptera. Moscow, 26–29 September 2006*: 93. (In Russian).
- Strumia F. & Yıldırım E.** 2008. Contribution to the knowledge of Chrysididae fauna of Turkey (Hymenoptera, Aculeata). *Frustula Entomologica*, **30**(63): 55–92.
- Trautmann W.** 1927. *Die Goldwespen Europas*. Weimar: Uschman. 194 pp.
- Vinokurov N.B.** 2004. Chrysidid wasps (Hymenoptera, Chrysididae) in specially protected eco-resort region of Caucasian Mineral Waters. *Actual Problems of Preserving the Stability of Living Systems. Materials VIII International Scientific Ecological Conference. Belgorod, 27–29 September 2004*: 33–34. Belgorod. (In Russian).
- Vinokurov N.B.** 2005. Fauna of cuckoo wasps (Hymenoptera, Chrysididae) in xylophilous insect communities in the central Caucasus and Ciscaucasus. *Proceedings of the International Conference of Nalchik KBNC RAN*, **1**: 89–90. (In Russian).
- Vinokurov N.B.** 2006a. Daily activity and seasonal dynamics of flight in cuckoo wasps (Hymenoptera, Chrysididae) in Central Ciscaucasia. *Problems of Ecology of Mountain Territories: Collection of Scientific Papers*: 19–21. Moscow. (In Russian).
- Vinokurov N.B.** 2006b. Fauna of chrysidid wasps (Hymenoptera, Chrysididae) of mountain and hill landscapes of Central Caucasus and Ciscaucasus. *Simposium of Hymenopterous Insects from CIS Countries. Programs and Conference Abstracts, Moscow, 26–29 September 2006*: 21. Moscow. (In Russian).
- Vinokurov N.B.** 2009. Cuckoo wasps (Hymenoptera, Chrysididae) in steppe biocenoses of the Middle Kama region (North Caucasus). *Steppes of Northern Eurasia: Materials V International Symposium*, **1**: 206–208. Orenburg. (In Russian).
- Vinokurov N.B.** 2013. Peculiarities in the ecology of cuckoo wasps (Hymenoptera, Chrysididae) in soil biocenoses from the northern macroslope of the Central Caucasus. *Proceedings of the Samara Scientific Center of the Russian Academy of Sciences*, **15** (3): 1105–1109. (In Russian).
- Vinokurov N.B.** 2014. The zoogeographical analysis of the cuckoo-wasps subfamily Chrysidinae (Hymenoptera, Chrysididae) in the Caucasus Mineralnye Vody region (Central Caucasus). *Proceedings of the Samara Scientific Center of the Russian Academy of Sciences*, **16**(4): 1149–1152. (In Russian).

Received 15 March 2018 / Accepted 10 April 2018

Scientific editor: S.A. Belokobylskij