

***Dinotrema kovali* sp. nov., a new species of the genus *Dinotrema* Foerster, 1863 from the cave of the Crimean Peninsula (Hymenoptera: Braconidae: Alysiiinae)**

***Dinotrema kovali* sp. nov. – новый вид рода *Dinotrema* Foerster, 1863 из пещеры Крымского полуострова (Hymenoptera: Braconidae: Alysiiinae)**

F.J. PERIS-FELIPO & S.A. BELOKOBYSKIJ\*

Ф.Х. ПЕРИС-ФЕЛИПО, С.А. БЕЛОКОБЫЛЬСКИЙ

F.J. Peris-Felipo, Bleichstrasse 15, Basel CH-4058, Switzerland. E-mail: peris.felipo@gmail.com

S.A. Belokobylskij, Zoological Institute, Russian Academy of Sciences, 1 Universitetskaya Emb., St Petersburg 199034, Russia; Museum and Institute of Zoology, Polish Academy of Sciences, Wilcza 64, Warszawa 00-679, Poland. E-mail: doryctes@gmail.com

A new species of the genus *Dinotrema* Foerster, 1863 with enlarged propodeal spiracles, *D. kovali* sp. nov. collected in the Mangupskaya I Cave on Baba-Dagh Mountain (Baba-Dagh Plateau) of the Bakhchisaray District of Crimean Peninsula, is described and illustrated. A new species is the most similar to the Western Palaearctic *D. erythropum* Foerster, 1863 and *D. stigmaticum* (Tobias, 1992). This is the first record of the genus *Dinotrema* in the caves of the Eastern Europe.

Описан новый вид из рода *Dinotrema* Foerster, 1863 с увеличенными пропodeальными дыхальцами – *D. kovali* sp. nov., собранный в пещере Мангупская-I на горе (плато) Баба-Даг Бахчисарайского района полуострова Крым. Новый вид наиболее близок к западно-палеарктическим *D. erythropum* Foerster, 1863 и *D. stigmaticum* (Tobias, 1992). Это первое указание рода *Dinotrema* для пещер Восточной Европы.

**Key words:** parasitoids, braconids, taxonomy, Eastern Europe, Crimea, Russia, Braconidae, Alysiiinae, *Dinotrema*, new species

**Ключевые слова:** паразитоиды, бракониды, таксономия, Восточная Европа, Крым, Россия, Braconidae, Alysiiinae, *Dinotrema*, новый вид

## INTRODUCTION

*Dinotrema* Foerster, 1863 is one of the largest genera of Alysiiinae with approximately 420 species described from the Afrotropical, Australasian, Nearctic, Neotropical, Oceanic, Oriental and Palaearctic regions (Yu et al., 2012; Peris-Felipo et al.,

2014; Peris-Felipo & Belokobylskij, 2016). Species of this genus are parasitoids of dipteran larvae predominantly belonging to the families Anthomyiidae, Phoridae and Platypezidae (Achterberg, 1988; Peris-Felipo & Belokobylskij, 2016).

Eleven species of braconids have been found in caves (Decu et al., 1998; Peris-Felipo et al., 2016; Vas & Kutasi, 2016) including two species of the genus *Dinotrema*, i.e.

\* Corresponding author.

*D. nervosum* (Haliday, 1833) and *D. cavernicola* Peris-Felipo, 2014 (Decu et al., 1998; Peris-Felipo et al., 2014, 2016). In this paper, one more species of this genus, *D. kovali* Belokobylskij et Peris-Felipo, **sp. nov.**, is described from a cave of the Crimean Peninsula. It belongs to the *Dinotrema* species group with the following character states: propodeum mainly smooth with complete median longitudinal carinae and with short subtransverse carinae emerging from median carina but far separated from propodeal edges (group III in Peris-Felipo et al., 2014). This is the first record of species of *Dinotrema* from the caves of the Eastern Europe.

## MATERIAL AND METHODS

Mangupskaya I Cave is located at the base of the southern slope of Baba-Dagh Mountain (or Baba-Dagh Plateau), Bakhchisaray District, the Crimean Peninsula (Russia), with entrance height about 560 m. Baba-Dagh Mountain is a part of the Inner Ridge of the Crimean Mountains. It is a natural karst cave in limestone, the main rock of mountain. Mangupskaya I is a horizontal, corridor-type cave with only a single additional branch (Fig. 1). The total length of both cave branches is 230 m, with a total area of 450 m<sup>2</sup> and volume of 1050 m<sup>3</sup> (Dublyansky & Lomaev, 1980). The tem-

perature in this cave ranges from 10.8 to 11.8° C (A. Koval, pers. comm.).

Four Barber traps (Barber, 1931) with recent modifications (Makarov & Koval, 1996) were placed in the deep parts of the cave at distances between 80 and 120 m from the entrance. Polypropylene glycol mixed with beer was the main liquid component for fixation and attraction of insects in these traps. The traps (plastic jars) were buried in the cave floor and covered from above by stones with gaps about 1.0–2.0 mm between the stone and the top of the jar. The localities of the trap installations are characterized with the same microclimatic conditions, i.e. high (almost 100%) humidity, almost constant temperature, and complete absence of light. These traps were run continuously in the studied cave for two years (2013 to 2015).

For the terminology of the morphological features and sculpture, measurements and wing venation nomenclature, see Peris-Felipo et al. (2014) and van Achterberg (1993). The material was imaged using a Digital Keyence® VHX-2000 and the Adobe Photoshop® imaging system. The types of described species are deposited in the Entomological Collection at University of Valencia (Valencia, Spain; ENV) and the Zoological Institute of the Russian Academy of Sciences (St Petersburg, Russia; ZISP).



**Fig. 1.** Plan of Mangupskaya I Cave (red spots indicate trap locations): **A**, lateral view; **B**, dorsal view.

## TAXONOMIC PART

Tribe **ALYSIINI** Leach, 1815

Genus *Dinotrema* Foerster, 1863

*Diagnosis.* Mandibles small, simple, tridentate. Paraclypeal fovea short, not nearly reaching ventral edge of eyes. Mesoscutum with or without mesoscutal pit; notauli present only in anterior part of mesoscutum; precoxal sulcus always present; propodeum smooth or usually with different types of sculpture and sometimes with longitudinal or transverse carinae. Fore wing radial (marginal) cell never shortened; vein *cuqu1* (2-SR) always present and more or less distinctly sclerotized; veins recurrent (*m-cu*) and nervulus (*cu-a*) always post-furcal; brachial (first subdiscal) cell always closed postero-apically by brachial (*CU1a*) vein. Metasoma more or less distinctly compressed laterally. Ovipositor sheaths usually shorter than metasoma.

*Hosts.* Dipterous larvae from the families Anthomyiidae, Phoridae and Platypezidae.

*Dinotrema kovali* Belokobylskij  
et Peris-Felipo, **sp. nov.**  
(Figs 2, 3)

*Holotype.* Female, **Russia**, "Crimea, Bakhchisaray Distr., steep of Baba-Dagh Plateau (Mangup-Kale Gorodishche), Mangupskaya I Cave (= MK-1 Cave), traps, 7.V.2013–11.V.2015, A.G. Koval leg." (ZISP).

*Paratypes:* 7 females, same data as for holotype (ZISP, ENV).

*Description. Female* (holotype).

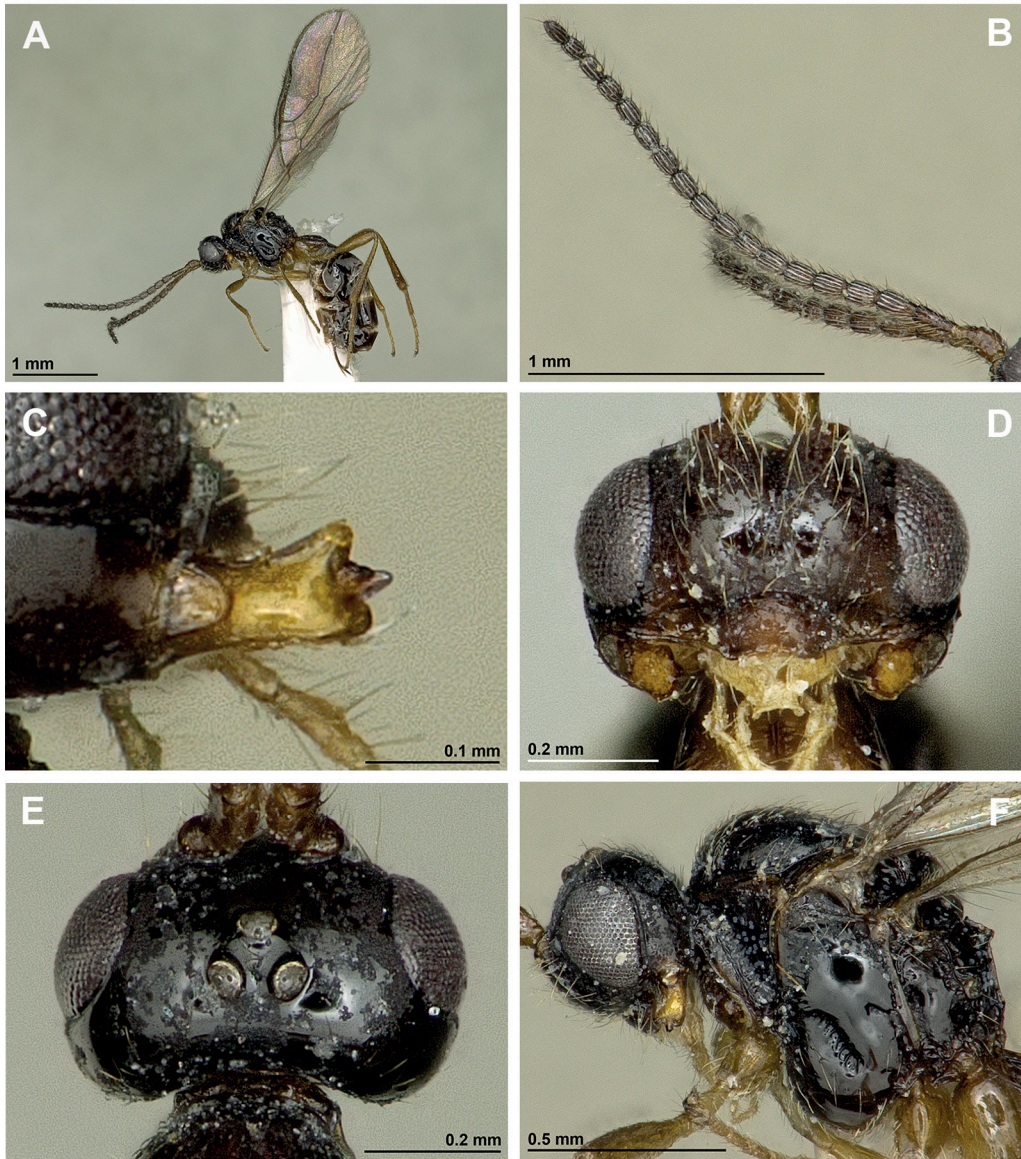
Head. In dorsal view, 1.6 times as wide as median length, 1.4 times as wide as mesoscutum, smooth, with temple rounded behind eye. Eye in lateral view 1.4 times higher than wide and 1.5 times as wide as temple medially. POL 0.8 times OD; OOL 2.5 times OD. Face 1.7 times as wide as high, completely covered by numerous setae; inner margins of eyes subparallel. Clypeus 2.1 times as wide as high, slightly curved on ventral margin. Paraclypeal fovea short, reaching halfway distance between clypeus and eye. Mandible

3-dentate, widened towards apex, 1.3 times as long as its maximum width. Upper tooth rather wide, rounded apically, weakly shorter than middle tooth and weakly longer than lower tooth; middle tooth weakly longer than upper tooth, wide basally and pointed apically; lower tooth short, wide, subrounded. Antennae with 19 antennomeres, distinctly shorter than body. Scape 1.9 times as long as pedicel. First flagellomere 2.4 times as long as its apical width, 1.1 times as long as second flagellomere. Second flagellomere 1.8 times as long as its maximum width; third to 16th flagellomeres 1.3–1.5 times, and 17th (apical) flagellomere 1.9 times as long as wide.

Mesosoma. In lateral view 1.1 times as long as high. Mesoscutum (in dorsal view) as long as its maximum width, with numerous setae arranged along tracks of notauli. Notauli present on vertical anterior surface and mostly absent on horizontal surface of mesoscutum. Mesoscutal pit present, oval. Prescutellar depression smooth, with distinct median and without lateral carinae. Precoxal sulcus present, crenulated, not reaching anterior and posterior margins of mesopleuron. Posterior mesopleural furrow crenulated, narrow dorsally and wide ventrally. Propodeum mainly smooth with complete median longitudinal carinae and with short subtransverse carinae emerging from median carina but far separated from propodeal edges. Propodeal spiracle large, its diameter 0.5 times as wide as distance from spiracle to anterior margin of propodeum.

Wings. Length of fore wing 2.8 times its maximum width. Radial (marginal) cell ending at apex of wing, 4.2 times as long as its maximum width. Vein *r2* (3-SR) 2.4 times as long as vein *cuqu1* (2-SR); vein *r3* (SR1) 2.4 times as long as vein *r2* (3-SR). Brachial (first subdiscal) cell closed distally, 3.7 times as long as its maximum width. Hind wing 7.5 times as long as its maximum width.

Legs. Hind femur 3.8 times as long as maximum width. Hind tibia slightly widened apically, 9.3 times as long as its maxi-



**Fig. 2.** *Dinotrema kovali* sp. nov. (female, holotype). **A**, habitus, lateral view; **B**, antenna; **C**, mandible; **D**, face, front view; **E**, head, dorsal view; **F**, head and mesosoma, lateral view.

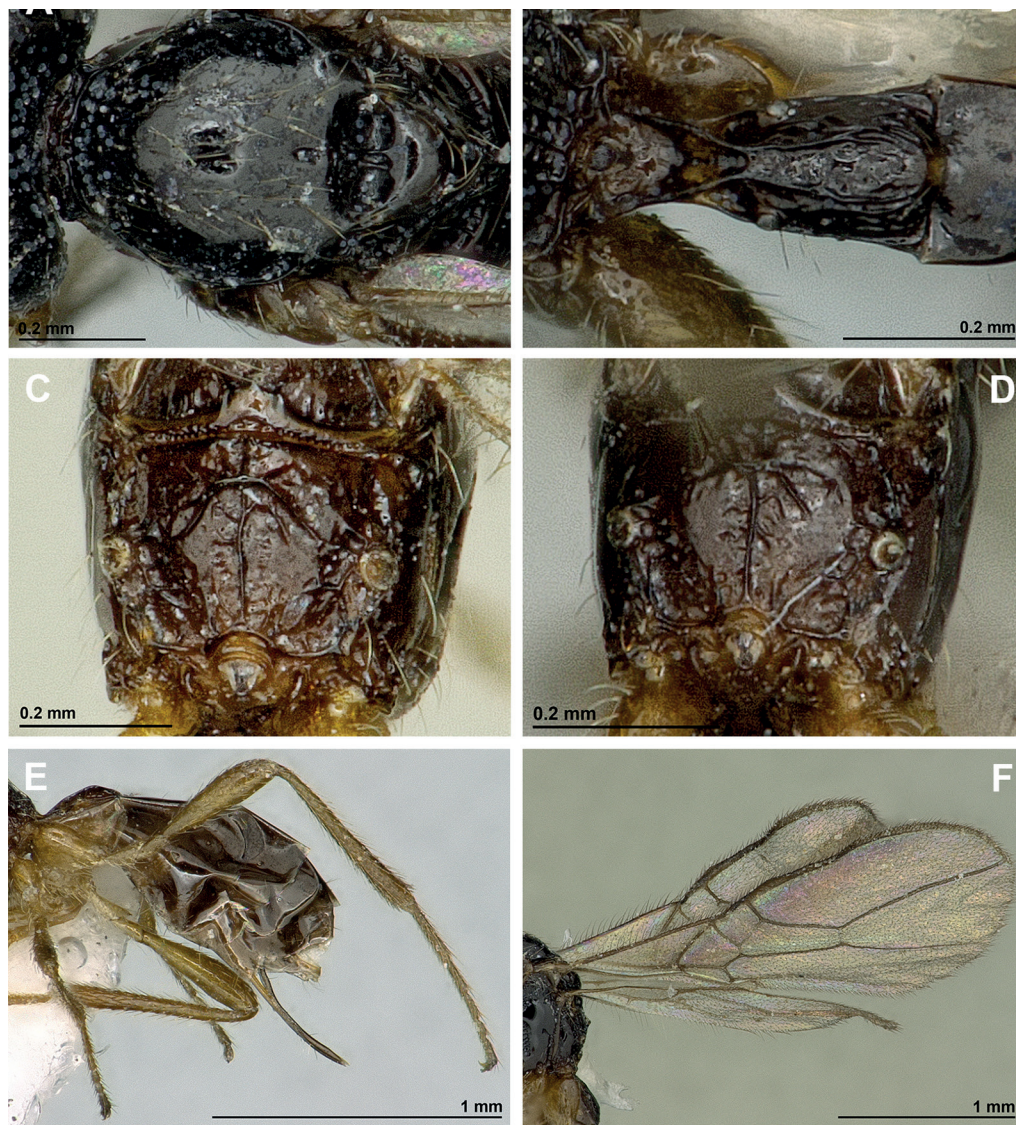
num subapical width and 1.1 times as long as hind tarsus. First segment of hind tarsus 1.7 times as long as second segment.

**Metasoma.** First tergite weakly widened towards apex, 2.3 times as long as its apical width, distinctly rugose-striate in apical 0.7. Ovipositor 1.6 times as long as first tergite, 0.4 times as long as metasoma, about as long as hind femur.

**Colour.** Body, antenna and pterostigma dark brown to almost black. Mandible and legs brownish yellow. Wings hyaline.

**Length.** Body 2.8 mm; fore wing 2.6 mm; hind wing 1.6 mm.

**Variation.** Body length 2.7–2.9 mm; fore wing length 2.5–2.7 mm; hind wing length 1.5–1.6 mm. Antenna with 18–19 antennomeres. Radial (marginal) cell 4.2–4.4 times



**Fig. 3.** *Dinotrema kovali* sp. nov. (A–C, E, F, female, holotype; D, female, paratype). **A**, mesonotum, dorsal view; **B**, first metasomal tergite; **C**, **D**, propodeum, dorsal view; **E**, hind leg, metasoma and ovipositor; **F**, fore and hind wings.

as long as its maximum width. Propodeum with different arrangements of subtransverse carinae but these carinae never reach lateral sides of propodeum. Hind femur 3.8–3.9 times as long as its maximum width.

*Male.* Unknown.

*Etymology.* Named in honour of the collector of this new species, Russian ento-

mologist and biospeleologist Dr Alexandr G. Koval (St Petersburg, Russia).

*Comparative diagnosis.* This new species is similar to *D. erythropum* Foerster, 1863 and *D. stigmaticum* (Tobias, 1992) on the base of the type of propodeum sculpture and enlarged propodeal spiracles. The new species differs from *D. erythropum* in having

the head in dorsal view 1.6 times as wide as long (about 2.0 times in *D. erythropum*), eye in lateral view 1.5 times as wide as temple medially (1.1–1.2 times in *D. erythropum*), POL 0.8 times OD (1.2 times in *D. erythropum*), face 1.7 times as wide as high (1.9–2.0 times in *D. erythropum*), mesoscutal pit oval (distinctly elongated in *D. erythropum*), and the first metasomal tergite 2.3 times as long as its apical width (1.7 times in *D. erythropum*). On the other hand, *D. kovali* **sp. nov.** differs from *D. stigmaticum* in having the head in dorsal view 1.6 times as wide as long (about 2.0 times in *D. stigmaticum*), eye in lateral view 1.5 times as wide as temple medially (1.1–1.2 times in *D. stigmaticum*), POL 0.8 times OD (1.5 times in *D. stigmaticum*), OOL 2.5 times OD (3.2 times in *D. stigmaticum*), middle mandibular tooth short (long in *D. stigmaticum*), hind femur 3.8–3.9 times as long as its maximum width (4.6 times in *D. stigmaticum*), and the first metasomal tergite 2.3 times as long as its apical width (2.0 times in *D. stigmaticum*).

## DISCUSSION

Recently, two new, subterranean species belonging to the subfamily Alysini were named, i.e. *Dinotrema cavernicola* Peris-Felipo, 2014 and *Aspilota ajara* Peris-Felipo, 2016 (Peris-Felipo et al., 2014; Peris-Felipo & Belokobylskij, 2016). However perhaps the most braconid taxa were collected in such caves, galleries or chasms accidentally when they searched here habitations of their hosts (Peris-Felipo et al., 2016). Need to underline that the host range of the taxa from the tribe Alysini (Alysiinae) includes sarcophagous, necrophagous and parasitoid flies of the families Calliphoridae, Muscidae, Sarcophagidae and Phoridae, which are common and important elements of typical cave fauna. We suggest that these flies may have stable parasitoid faunas in these peculiar subterranean conditions. Further investigations of cave faunas in different parts of the earth are recommended in order to improve our knowledge of cave parasitoid

taxonomy and biology, both of which remain largely unknown.

## ACKNOWLEDGEMENTS

We are very thankful to Dr Alexander G. Koval (St Petersburg, Russia) for providing valuable material for study, Isabelle Zuecker and Matthias Borer (Naturhistorisches Museum Basel, Switzerland) for their kindness and help during our use of their photosystem, Dr Michael J. Sharkey (Lexington, USA) and Dr Andrey I. Khalaim (St Petersburg, Russia) for their useful comments of the first draft of the manuscript. The present work was supported for the second author by grants from the Russian Foundation for Basic Research (project No. 15-29-02466) and Russian State Research Project No. 01201351189.

## REFERENCES

- Achterberg C. van.** 1988. The genera of the *Aspilota*-group and some descriptions of fungicolous Alysini from the Netherlands (Hymenoptera: Braconidae: Alysiinae). *Zoologische Verhandelingen*, **247**: 1–88.
- Achterberg C. van.** 1993. Illustrated key to the subfamilies of the Braconidae (Hymenoptera: Ichneumonoidea). *Zoologische Verhandelingen Leiden*, **283**: 1–189.
- Barber H.S.** 1931. Traps for cave-inhabiting insects. *Journal of the Elisha Mitchell Scientific Society*, **46**: 259–266.
- Decu V., Casale A., Scaramozzino P.L., Lopez F. & Tinaut A.** 1998. Hymenoptera. In: **Juberthie Ch., Decu V.** (Eds.) *Encyclopaedia biospeologica*, **2**: 1015–1024. Moulis: [Laboratoire Souterrain], Bucarest: Académie Roumanie.
- Dublyansky V.N. & Lomaev A.A.** 1980. *Karst caves of the Ukraine*. Kiev: Naukova Dumka, 180 pp. (In Russian).
- Makarov K.V. & Koval A.G.** 1996. Contribution to the biology of the ground beetle *Lae-mostenus tauricus* (Dejean, 1828) (Coleoptera, Carabidae) from Kizil-Koba Cave in the Crimea. *Entomological Review*, **75**(7): 30–37.
- Peris-Felipo F.J. & Belokobylskij S.A.** 2016. Avispas parasitoides de la familia Braconidae en ambientes subterráneos. *Actas Congreso de Espeleología “EspeleoMeeting Ciudad de Villacarrillo”*: 45–48. Villacarrillo (Jaén).

- Peris-Felipo F.J., Belokobylskij S.A. & Jiménez-Peydró R.** 2014. Revision of the Western Palaearctic species of the genus *Dinotrema* Foerster, 1862 (Hymenoptera, Braconidae, Alysiniinae). *Zootaxa*, **3885**(1): 1–483.
- Peris-Felipo F.J., García-Becerra R. & Belokobylskij S.A.** 2016. *Aspilota ajara* sp. n. (Hymenoptera, Braconidae, Alysiniinae), the first species of the genus *Aspilota* Foerster from caves. *Journal of Hymenoptera Research*, **52**: 153–162.
- Vas Z. & Kutasi C.** 2016. Hymenoptera from caves of Bakony Mountains, Hungary – an overlooked taxon in hypogean research. *Subterranean Biology*, **19**: 31–39.
- Yu D.S., van Achterberg C. & Horstman K.** 2012. *Taxapad 2012, Ichneumonoidea 2011*. Database on flash-drive. Ottawa, Ontario, Canada.

Received 10 March 2017 / Accepted 26 April 2017

Scientific editor: A.I. Khalaim