J Insect Biodivers Syst 05(1): 69–78

ISSN: 2423-8112

OPEN ACCESS

JOURNAL OF INSECT BIODIVERSITY AND SYSTEMATICS

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Research Article

http://jibs.modares.ac.ir

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Occurrence of the genus *Erigorgus* Forster (Hym., Ichneumonidae, Anomaloninae) in Eastern part of Iran with key to species

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ABSTRACT. Iranian species of the genus *Erigorgus* Forster, 1869 are taxonomically reviewed. The sampling was done using Malaise traps in Eastern provinces of Iran. Two species, *Erigorgus cerinops* (Gravenhorst, 1829) and *Erigorgus fibulator* (Gravenhorst, 1829) are reviewed, of which the second species represents occurrence of this genus in East of Iran. A brief diagnosis based on the reliable morphological characters, as well as an illustrated key to Iranian species are provided. The geographical distribution of the recorded species in the Palaearctic regions is also discussed.

Key words: *Erigorgus*, Gravenhorstiini, Palaearctic, Parasitoid, South Khorasan

Received: *12 March, 2019*

Accepted: *05 May, 2019*

Published: *15 May, 2019*

Subject Editor: *Ali Asghar Talebi*

Citation: Zardouei Heydari, M., Rakhshani, E. & Mokhtari, A. (2019) Occurrence of the genus *Erigorgus* Forster (Hym., Ichneumonidae, Anomaloninae) in Eastern part of Iran with key to species. *Journal of Insect Biodiversity and Systematics*, 5 (1), 69–78.

Introduction

Ichneumonidae, as one of the largest families of Hymenoptera, include 44 recognized subfamilies, 1 601 genera and 25 292 described species (Townes, 1969; Yu et al., 2016). The subfamily Anomaloninae with 46 genera and 742 described species worldwide, and 210 species in the Palaearctic region (Yu et al., 2016) is known as one of the relatively diverse taxa within Ichneumonidae (Townes, 1971; Gauld, 1976; Dasch, 1984). Adults of Anomaloninae are usually can be easily recognized by the combination of distinctive morphological features as follows: loss of fore wing vein r-m, a narrow pterostigma, propodeum coarsely reticulate sculptured, metasoma slender and laterally compressed (Gauld, 1978).

Anomaloninae of Iran have recently been investigated by various authors (Mojeni & Sedivy, 2001; Masnadi-Yazdinejad & Jussila, 2009; Zarepour et al., 2009; Klopfstein & Baur, 2011; Nikdel & Diller, 2011; Hooshyar et al., 2012). Barahoei et al. (2012a) published a checklist of Ichneumonidae (Hymenoptera: Ichneumonoidea) of Iran, in which they listed four genera and 11 species of Anomaloninae, categorized within two tribes. Record of the fifth genus represented by *Agrypon canaliculatum* (Ratzeburg, 1844) (Nikdel & Diller, 2011) was not mentioned in the above mentioned checklist. The genus *Erigorgus* has recently been recorded from north of Iran (Hooshyar & Vafaei-Shoushtari, 2013).

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The Eastern area of Iran has received least attentions and very poorly studied. Only two genera including *Anomalon* Panzer and *Barylypa* Förster represented by five species are recorded from this large area (Masnadi-Yazdinejad & Jussila, 2009; Barahoei et al., 2012b, 2013, 2015). Here, we recorded the genus *Erigorgus* from East of Iran (South Khorasan Province), for the first time. An illustrated key to the known species in Iran is also presented.

Material and methods

The Ichneumonid specimens were captured by Malaise traps installed in various ecosystems of South Khorasan province during 2015–2016. The collected specimens were preserved in Ethanol 75%, they were then treated according to AXA protocol (Achterberg, 2009): two days in a mixture of Xylene (40%) and ethanol (60%) for, one day in Amyl acetate, then properly dried on a piece of blotter paper. Dried specimens were glued on the triangular card and labeled. External morphology was studied under a Nikon™ SZM645 stereomicroscope. There was a single specimen run to the genus *Erigorgus* Forster, 1869, which identified using the keys compiled by Gauld & Mitchell (1977). The specimen was also compared with the identified materials, deposited in the ZSM (Zoologisches Staatsammlung, Münchhausenstrasse 21, D-81247 München, Germany).

Morphological terminology is mostly that of Townes (1969). Wing veins and wing cell nomenclature are based on Goulet & Huber (1993) and Gauld (1991), respectively. Photographs of the external morphological characters were captured using a Canon™ EOS 700D Digital Camera, attached to Hund™ Wetzlar stereomicroscope. A series of 15–20 (dependent on the size of shooting part) multi-focused captured photos were combined into a single in-focus image using Zerene Stacker *version* 1.04. Data about geographical distribution of the newly recorded species were compiled from Yu et al. (2016). The specimen was deposited in the collection of Department of Plant Protection, University of Zabol, Iran (DPPZ).

Results

Two species of the genus *Erigorgus*, were examined, of which *Erigorgus fibulator* is new to the Eastern fauna of Iran.

Key to the species of the genus *Erigorgus* in Iran

1. Clypeus with strongly developed median tooth (Fig. 2B); mesoscutum densely punctate (punctures separated from each other by usually equal or less than a puncture diameter) (Fig. 2E); hind tibia black and yellow, hind tarsi entirely yellow. …...***Erigorgus cerinops*** **(Gravenhorst, 1829)**

-. Clypeus with slightly developed median tooth (Fig. 4B); mesoscutum sparsely punctate (punctures separated from each other by usually more than a puncture diameter) (Fig. 4E); hind tibia and tarsi entirely black. …….....
…..***Erigorgus fibulator*** **(Gravenhorst, 1829)**

Taxonomic account

Family Ichneumonidae Latreille, 1802

Subfamily Anomaloninae Viereck, 1918

Tribe Gravenhorstini Enderlein, 1912

Genus *Erigorgus* Förster, 1869

Type species: *Anomalon fibulator* Gravenhorst, 1829: 681, Vratislaviae, by subsequent designation of Schnee (1989).

Diagnosis: Adults of *Erigorgus* species can be recognized by the combination of the following morphological features: The lower mandibular tooth much smaller than the upper one; notaulus completely absent; forewing with Rs vein opposite or proximal to 2m-cu; metasomal tergite II in profile more than twice as long as its high, posteriorly; length of the third metasomal tergite longer than its height in lateral view (Fig. 1).

***Erigorgus cerinops* (Gravenhorst, 1829)**

Anomalon cerinops Gravenhorst, 1829: 658, Vratislaviae. Holotype — lost.

Material examined: 1♀ (ZSM), Monêtier-les-Bains (45°00'00"N; 06°31'00"E; 2455m), 11.VIII.1982, Det: H. Schnee (1984).

Distribution in Iran: Mazandaran province (Hooshyar & Vafaei-Shoushtari, 2013).

General distribution: Eastern Palaearctic [Kazakhstan, Kyrgyzstan and Russia Far East], and Western Palaearctic [Belgium, Bulgaria, Czech Republic, Finland, France, Germany, Greece, Hungary, Iran, Ireland, Latvia, Morocco, Netherland, Norway, Poland, Romania, Russia, Spain, Sweden, Switzerland, Tunisia, Turkey and United Kingdom].

Morphological characters. (Female). Body length 8 mm; fore wing 5 mm (Fig. 1); temple widened, not constricted behind eyes in lateral view, as wide as eye in the middle; temple in lower half densely pubescent and distinctly narrower than upper half in lateral view (Fig. 2A); frons strongly rugose with a short longitudinal carina between antennal sockets; face narrowed downward, lower margin of face with dense long pubescence (Fig. 2B); clypeus with strongly developed median tooth; malar space (cheek) about 0.3× as long as basal width of mandible; inner margins of eyes strongly convergent (Fig. 2B); ocellus diameter shorter than the distance between lateral ocellus and eye (Fig. 2C); pronotum densely punctate and rugose; mesosternum with dense pubescence; mesopleurum densely punctate and rugose (Fig. 2D); mesoscutum (Fig. 2E) densely punctate (punctures separated from each other by usually equal or less than a puncture diameter) and shiny; fore wing with *Rs* vein proximal to 2m-cu; ovipositor 0.3x hind tibia (Fig. 2F); propodeum strongly rugose with dense pubescence in lateral parts (Fig. 2G).

Figure 1. *Erigorgus cerinops* (Gravenhorst, 1829) – Female, General habitus, lateral view.

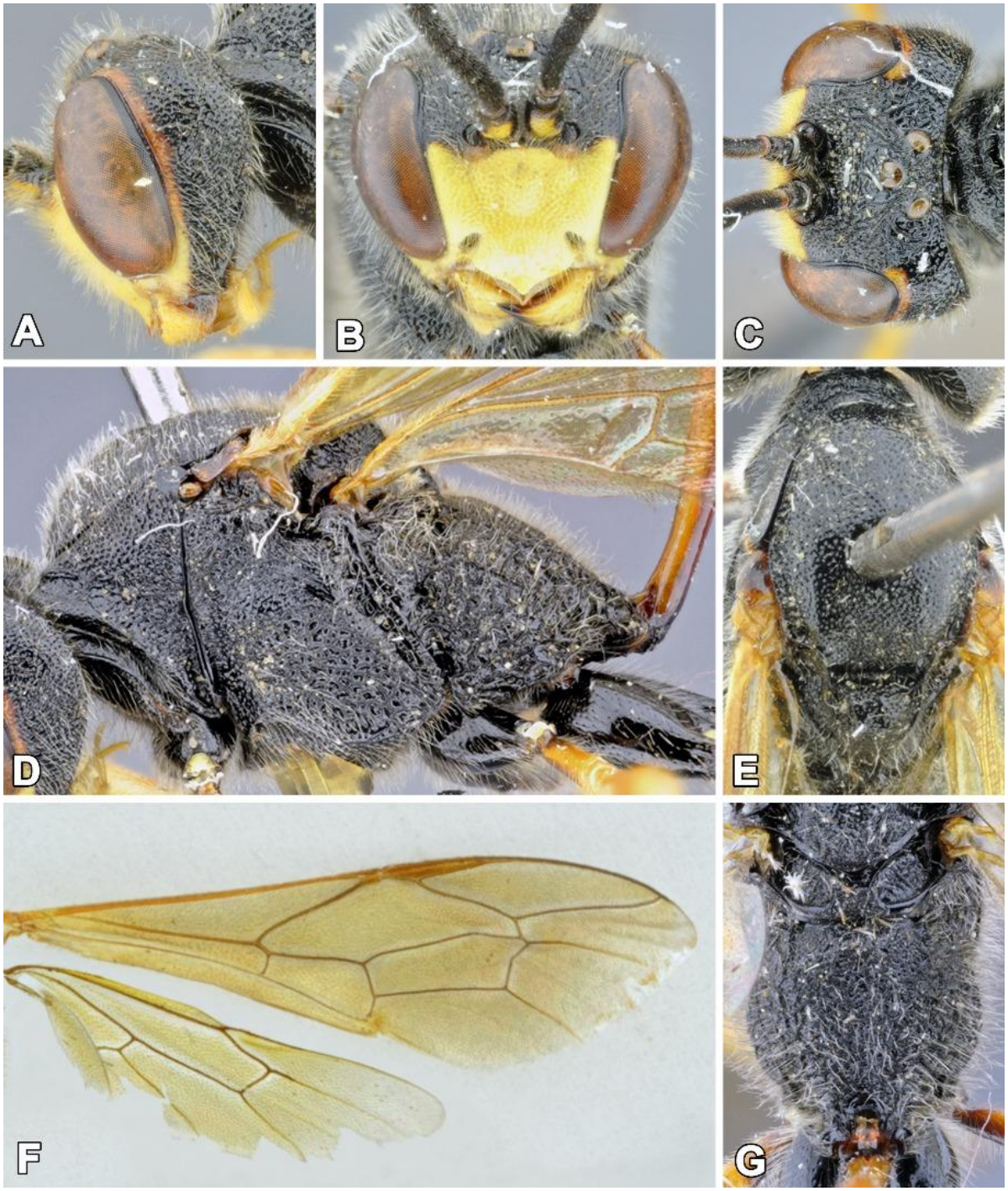

Figure 2. External morphological characters of *Erigorgus cerinops* (Gravenhorst, 1829) – Female: **A**. Head, lateral view; **B**. Head, frontal view; **C**. Head, dorsal view; **D**. Mesosoma, lateral view; **E**. Mesoscotum, dorsal view; **F**. Fore and hind wings; **G**. Propodeum, dorsal view.

Coloration: Head and thorax black; face, clypeus, mandibles and malar space yellow; temporal orbits reddish; legs yellow; all coaxes, hind trochanter, hind femur basally and apical half of hind tibia black; metasoma reddish; second metasomal tergite with black dorsal stripe, apical segments entirely black.

Diagnosis: This species is morphologically similar to *E. villosus* (Gravenhorst, 1892) (both species have densely punctated mesoscutum), from which it differs mainly by the coloration of face and shape of clypeus. *E. cerinops* has yellow face and clypeus, and strongly developed median clypeal tooth. In *E. vilossus*, face and clypeus are entirely black; median clypeal tooth is slightly developed.

***Erigorgus fibulator* (Gravenhorst, 1829)**

Anomalon fibulator Gravenhorst, 1829: 681, Vratislaviae. Holotype ♀. — Zoological Museum Berlin.

Material examined: 1♀ (DPPZ), IRAN, South Khorasan Province, Sedeh (33°19'00"N; 59°19'00"E; 1665m), Malaise trap, 09.IV.2015, leg: B. Motamedinia; 1♀ (ZSM), no label, Det: H. Schnee (1988); 1♂ (ZSM), no label, Det: H. Schnee (1988).

Figure 3. *Erigorgus fibulator* (Gravenhorst, 1829) – Female, General habitus, lateral view.

Distribution in Iran: Mazandaran province (Hooshyar & Vafaei-Shoushtari, 2013), South Khorasan province (current study).

Distribution: Eastern Palaearctic [Kazakhstan, Russia Far East, Tajikistan, Uzbekistan], and Western Palaearctic [Armenia, Austria, Azerbaijan, Belgium, Bulgaria, Croatia, Finland, France, Germany, Greece, Hungary, Iran, Moldova, Norway, Poland, Romania, Russia, Spain, Sweden, Switzerland, Turkey, United Kingdom, former Yugoslavia].

Morphological characters. **(Female).** Body length 18 mm; fore wing 13 mm (Fig. 3); temple widened, not constricted behind eyes in lateral view, as wide as eye in the middle; temple in lower half densely pubescent and as wide as upper half in lateral view (Fig. 4A); frons strongly rugose with a short longitudinal carina between antennal sockets; face narrowed downward, lower margin of face with dense long pubescence (Fig. 4B); clypeus with slightly developed median tooth; malar space (cheek) about 0.3× as long as basal width of mandible; inner margins of eyes strongly convergent (Fig. 4B); ocellus diameter shorter than the distance between lateral ocellus and eye (Fig. 4C); pronotum densely punctate; mesosternum with dense pubescence; mesopleurum deeply punctate (Fig. 4D); mesoscutum (Fig. 4E) sparsely punctate (punctures separated from each other by usually more than a puncture diameter) and shiny; fore wing with *Rs* vein proximal to *2m-cu*; ovipositor 0.3x hind tibia (Fig. 4F); propodeum strongly rugose with dense pubescence in lateral parts (Fig. 4G).

Coloration: Head and thorax completely black; facial orbits yellowish; temporal orbits reddish; legs black; fore femur and tibia yellowish in inner side; metasoma reddish; first metasomal tergite black; second metasomal tergite with black dorsal stripe, apical segments entirely black.

Diagnosis: This species is morphologically similar to *E. annulitarsis* (Thomson, 1892) (both species have sparsely punctated mesoscutum), from which it differs mainly by prepectal carina ventrally behind the front coxes, not elevated; hind tarsomers black, but two third the base of tarsomere I is reddish; face and clypeus entirely black. In *E. annulitarsis*, prepectal carina ventrally after the front coxes, strongly elevated; hind tarsomer I dark and following segments are yellow; face partly black, clypeus and facial orbits yellow.

Discussion

The genus *Erigorgus* comprises about 70 species in the world, of which 23 species occurred in the west Palaearctic, 10 species in East Palaeartcic and six species in Oriental region (Yu, et al., 2016). Both recorded species in Iran, *E. cerinops* and *E. fibulator* are widely distributed in Eastern and Western Palaearctic regions. Occurrence of only two species in Iran, emphasizing the necessity of complementary surveys in this large and complex biogeographical area. No host evidences was documented for *Erigorgus* in Iran. As in other Anomaloninae, *Erigorgus* species are solitary endoparasitoid of Lepidoptera (Schnee, 1986). On the other hand, the available information about host records of *Erigorgus fibulator* (Yu et al., 2016) are doubtful because that is based on misinterpretations of the species (Schnee, 2018). Among the neighboring countries, *Erigorgus fibulator* is a widely distributed species in Central and Western Asian area, while *E. cerinops* has only been recorded from Kazakhstan and Turkey (Yu et al., 2016). As a crossroads between the Palaearctic, Oriental and Afrotropical biogeographical regions (Firouz, 2005), many other species of *Erigorgus* are expected to be discovered in Iran. Further faunistic and taxonomic studies are necessary to reveal the occurrence and distribution of *Erigorgus* species in other parts of the country.

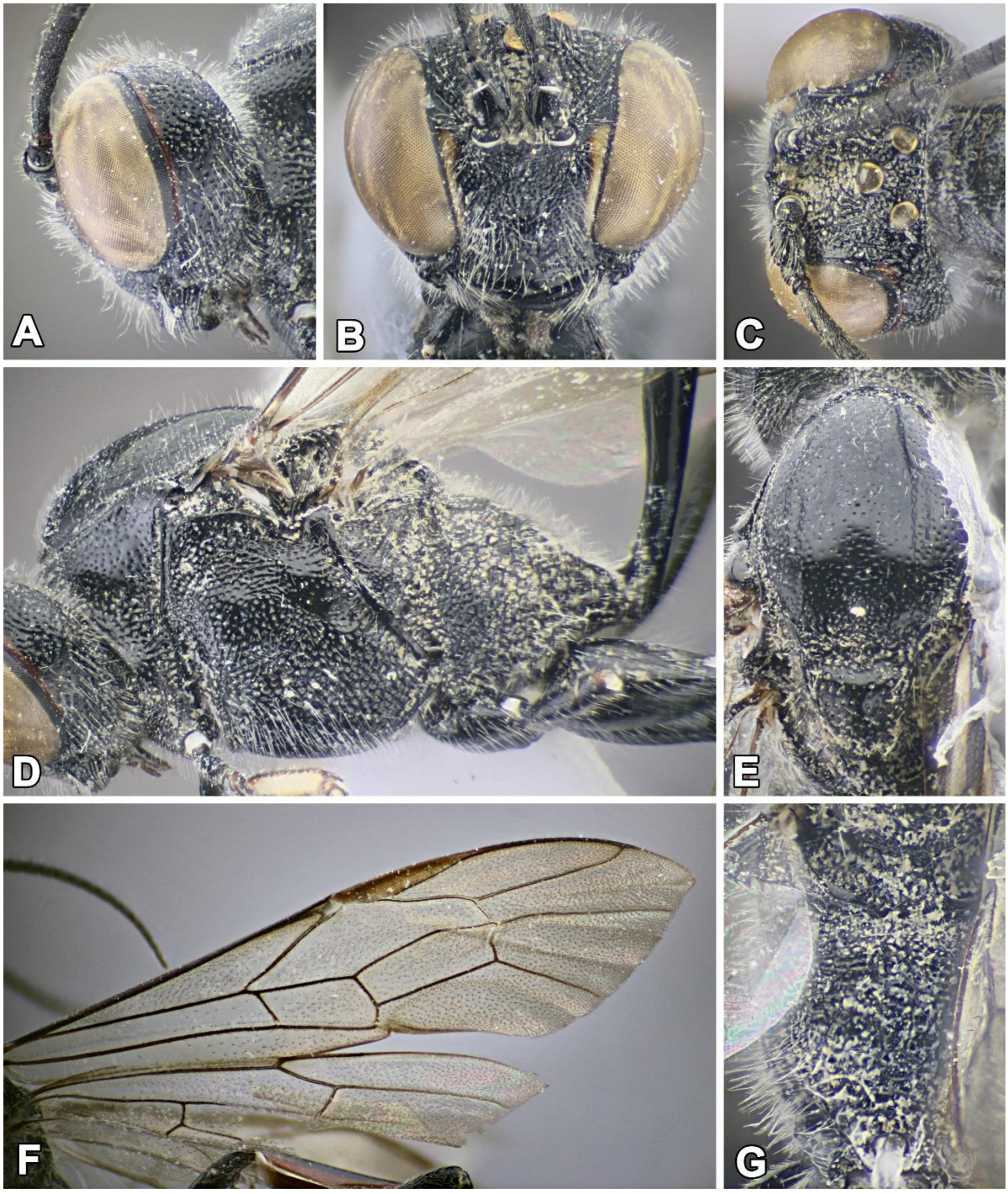

Figure 4. External morphological characters of *Erigorgus fibulator* (Gravenhorst, 1829) – Female: **A.** Head, lateral view; **B.** Head, frontal view; **C.** Head, dorsal view; **D.** Mesosoma, lateral view; **E.** Mesoscotum, dorsal view; **F.** Fore and hind wings; **G.** Propodeum, dorsal view.

Acknowledgments

This research was supported by a grant from University of Zabol (No. UOZ-GR-9517-2) to ER. We sincerely grateful to Dr. Heinz Schnee for confirmation of the identified specimens and Dr. Stefan Schmidt (*Staatliche Naturwissenschaftliche Sammlungen Bayerns Zoologische Staatssammlung, Hymenoptera Collection*) for his help to providing the opportunity to study the necessary material of *Erigorgus*. Many thanks also to Behnam Motamedinia for collecting the core material for this study.

Conflict of Interests

The authors declare that there is no conflict of interest regarding the publication of this paper.

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گزارش انتشار جنس *Erigorgus* Forster (Hym., Ichneumonidae, Anomaloninae) در شرق ایران با کلید شناسایی گونه‌ها

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تاریخ دریافت: ۲۱ اسفند ۱۳۹۷، تاریخ پذیرش: ۱۵ اردیبهشت ۱۳۹۸، تاریخ انتشار: ۲۵ اردیبهشت ۱۳۹۸

چکیده: گونه‌های متعلق به جنس *Erigorgus* Forster, 1869 در ایران مورد بازبینی تاکسونومیک قرار گرفتند. نمونه‌برداری با استفاده از تله‌های مالیز در استان‌های شرقی ایران انجام شد. دو گونه شامل *Erigorgus cerinops* (Gravenhorst, 1829) و *Erigorgus fibulator* (Gravenhorst, 1829) بازبینی شدند که گزارش گونهٔ دوم نشان‌دهندهٔ انتشار این جنس در شرق ایران است. توصیف افتراقی مختصر بر اساس شکل‌شناسی معتبر به همراه کلید شناسایی مصور گونه‌های ایران ارایه شد. انتشار جغرافیایی گونه‌های گزارش شده در منطقهٔ پالئارکتیک نیز مورد بحث قرار گرفت.

واژگان کلیدی: *Erigorgus*، Gravenhorstiini، پالئارکتیک، پارازیتویید، خراسان جنوبی.