

Research Article

First record of two genera and species of Diapriinae (Hymenoptera: Diapriidae) from Iran

Mohammad Izadizadeh¹, Ali Asghar Talebi^{1*}, Victor Kolyada², Samira Farahani³ and Ali Ameri⁴

1. Department of Entomology, Faculty of Agriculture, Tarbiat Modares University, Tehran, Iran.

2. Zoological Museum of Moscow University, Moscow, Russia.

3. Research Institute of Forests and Rangelands, Agricultural Research Education and Extension Organization, Tehran, Iran.

4. Insect Taxonomy Research Department, Iranian Research Institute of Plant Protection, Agricultural Research, Tehran, Iran.

Abstract: Two genera, *Aneuropria* Kieffer and *Diapria* Latreille and two species, *Aneuropria foersteri* (Kieffer, 1910) and *Diapria conica* (Fabricius, 1775) (Hymenoptera: Diapriidae) are recorded from Iran for the first time. The specimens were collected using Malaise traps from Hyrcanian forests of Mazandaran, Gulian and Golestan provinces in northern Iran. Diagnostic characters and geographical distribution of the newly recorded taxa are presented.

Keywords: *Aneuropria*, *Diapria*, Northern Iran, Hyrcanian forests, Parasitoids

Introduction

The superfamily Diaprioidea was established within Proctotrupeoidea by Masner *et al.* (1979); however, Sharkey (2007) moved Diapriidae and related families to a new superfamily (i.e. Diaprioidea) based on phylogenetic study. This superfamily includes four families: Diapriidae Haliday, 1833, Ismaridae Thomson, 1858, Monomachidae Ashmead, 1902 and Maamingidae Early, Masner, Naumann & Austin, 2001 (Sharkey *et al.*, 2012), of which Diapriidae is the most species-rich family, with 2048 species reported by Huber (2017). Recently, occurrence of the family Ismaridae Thomson is recorded for the first time from Iran by a single species, *Ismarus rugulosus* Förster, 1850 (Rahmani *et al.*, 2019). So far, the families Monomachidae and Maamingidae have not been recorded from Iran.

Family Diapriidae includes three subfamilies: Ambositrinae Masner, 1961, Belytinae Förster, 1856 and Diapriinae Haliday, 1833, of which Diapriinae is largest, with 116 genera and about 1300 species (Masner and García, 2002). Species of the subfamily Diapriinae are solitary and gregarious endoparasitoids of Diptera, especially Nematocera and Cyclorrhapha. In addition, some species from Hymenoptera and Coleoptera have been reported as hosts (Yoder, 2007). In Iran, *Coptera* nr. *silvestrii* (Kieffer, 1913) was reported from *Carpomya vesuviana* Costa, 1854 (Diptera: Tephritidae) (Amini *et al.*, 2014).

The genus *Aneuropria* Kieffer, 1905 with five species is one of the small genera of Diapriinae. From this genus, *Aneuropria foersteri* (Kieffer, 1910) and *A. bifurcata* (Dodd, 1920) were reported from Palaearctic region, *A. kairali* Rajmohana & Narendran, 2000 and *A. nilgiriensis* Sharma, 1979 from Oriental region and *A. kilimandjaroi* (Kieffer, 1913) from Afrotropical region (Johnson, 1992; Notton, 2004, 2014; Rajmohana, 2006). *Aneuropria foersteri* is a pupal endoparasitoid of *Rhagoletis cerasi* (Linnaeus, 1758) (Diptera: Tephritidae) and *Piophila casei* (Linnaeus,

Handling Editor: Ehsan Rakhshani

*Corresponding author: talebia@modares.ac.ir

Received: 07 December 2019, Accepted: 10 April 2020

Published online: 02 May 2020

1758) (Diptera: Piophilidae) (Thompson, 1955; Teodorescu and Ursu, 1979).

Diapria Latreille, 1796 is cosmopolitan genus belonging to the subfamily Diapriinae with 25 species. Johnson (1992) listed 23 species from different regions: Palaearctic (11 species), Oriental (four species), Nearctic (three species), Neotropical (three species), Australasian (one species) and Afrotropical (one species). Later, Notton (1993) described two species (i.e., *Diapria cava* Notton, 1993; *D. luteipes* Notton, 1993) from British Isles (England). Species of the genus *Diapria* are pupal endoparasitoid of Syrphidae (Diptera) (Thompson, 1955).

Prior to this study only six species of Diapriinae were reported from Iran including: *Coptera* nr. *silvestrii* (Kieffer, 1913) (Amini *et al.*, 2014), *Coptera inaequalifrons* (Jansson, 1942), *Entomacis perplexa* (Haliday, 1857), *Spilomicrus formosus* Jansson, 1942, *Trichopria myrmecobia* (Kieffer, 1911) and *T. longicornis* (Thomson, 1858) (Samin *et al.*, 2018). So far, no data have been available on the genera *Aneuropria* and *Diapria* in Iran. Here we report two genera and two species of this subfamily, as a part of an ongoing research on the Diapriidae fauna of Iran.

Materials and Methods

Material for this study was collected from northern area of Iran during 2010–2017 using Malaise traps (Figs. 1A, B). The specimens were extracted from the traps monthly, transferred to 70% ethyl alcohol, and stored in a freezer for subsequent examination. For the preparation of samples, they were transferred to a 96% mixture of 40% xylene and 60% alcohol, moved after 2 days to amyl acetate for one day, and finally placed on a piece of absorbing paper for drying (AXA method; van Achterberg, 2009). The dried specimens were card-mounted and labeled. Illustrations were done using an Olympus AX70 microscope and Olympus SZX9 stereomicroscope equipped with a BMZ-04-DZ digital imaging system (Behin Pajouhesh Co., Iran). A series of 4 or 5 captured images were merged into a single in-focus image using the image-stacking software Combine ZP1.0. Morphological terminology follows Nixon (1980) and Masner and Garcia (2002). Specimens are deposited in the insect collection of the Department of Entomology, Tarbiat Modares University, Tehran (TMUC) and the Research Institute of Forests and Rangelands, Tehran (RIFR).



Figure 1 Habitats of northern Iran where the specimens were collected **A.** Golestan, Ali Abad, Zarin Gol village, **B.** Mazandaran province, Alikola.

Results

The genera *Aneuopria* and *Diapria* are reported from Iran for the first time, each represented by a single species.

Genus: *Aneuopria* Kieffer, 1905

Diagnosis (Female) Body color black with appendages lighter, predominantly smooth, highly shining, with relatively little pilosity some hairy cushions, but no foamy structures (Fig. 2A, C); Antenna 12-segmented, with multisegmented clava; clavomeres moderately flattened ventrally, A12 longest and largest segment (Fig. 2A, B); mesosoma moderately elongate, pronotal collar with dense hairy cushion; scutellum with two pits on anterior margin; median keel of propodeum reduced; fore wing without basal and stigmal veins; petiole short, about as long as wide; anterior margin on 2nd tergite without notch medially (Fig. 2C).

Aneuopria foersteri (Kieffer, 1910)

Material examined: 7♀♀; Golestan, Ali Abad, Zarin Gol village (36°48'58" N, 55°02'13" E, 694m a.s.l.), 14-V-2016, 2♀♀ (TMUC), 04.VII.2016, 2♀♀ (TMUC), 15.VII.2016, 2♀♀ (RIFR), 26.VII.2016, 1♀ (TMUC). Leg. S. Farahani.

Diagnosis (Female): Body length 3.3-3.4 mm; head in dorsal view 1.2 times as wide as length, with scattered sparse hairs (Fig. 2C); eye small, temple longer than length of eye (Fig. 2A), postgena with cushion of hairs (Fig. 2A, C); antenna clavate (Fig. 2B), scape 4.75 times as long as wide (Fig. 2B); notauli complete and deep (Fig. 2C); pronotum and mesopleuron smooth and shiny, mesopleuron with transverse keel on lower margin; fore wing reduced, not reaching beyond posterior margin of propodeum (Fig. 2C); metapleuron, propodeum and petiole pubescent (Fig. 2C); paired longitudinal keel (plicae) on propodeum strongly developed (Fig. 2C). Body black, antennae and legs yellowish brown (Fig. 2A).

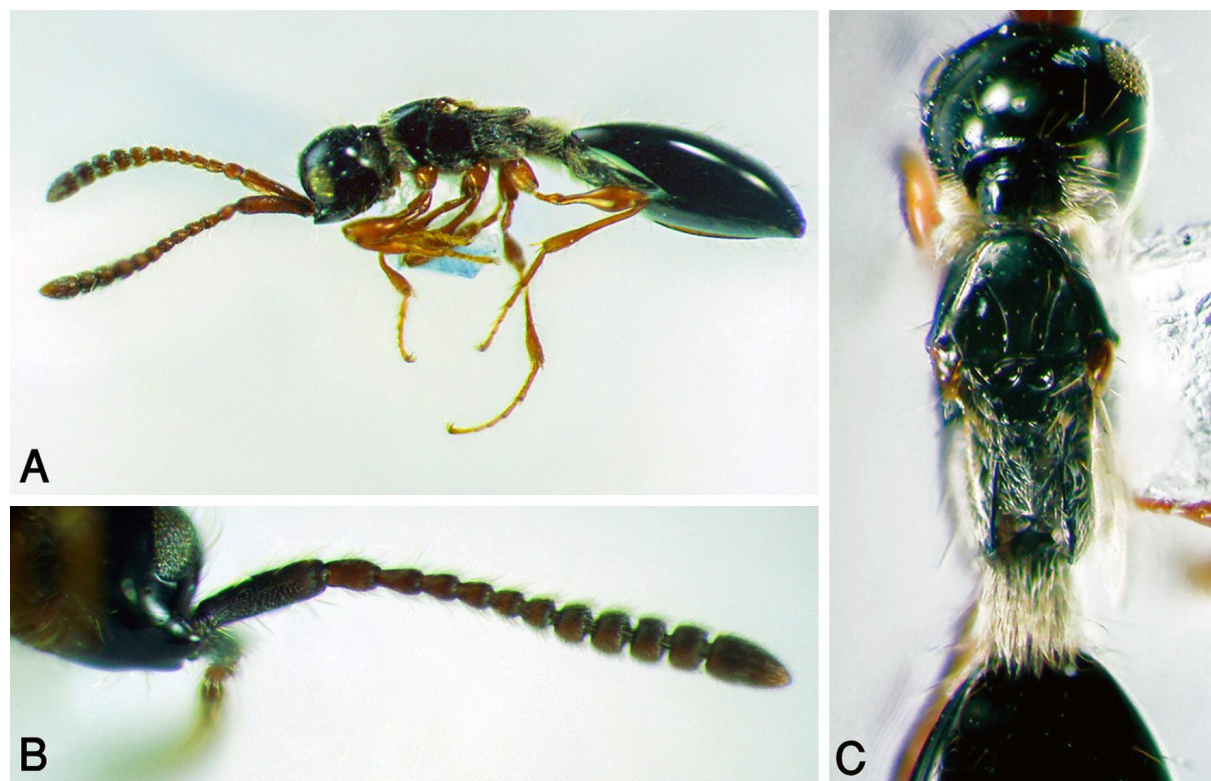


Figure 2 *Aneuopria foersteri* (Kieffer, 1910): **A.** Lateral habitus of female; **B.** Antenna; **C.** Mesosoma.

Distribution in Iran: Golestan province.

General distribution: Afrotropical, Palaearctic (Denmark, Germany, Finland, Ukraine, United Kingdom, Russia (Johnson, 2015), Iran (New record)).

Biology: Endoparasitoid of *Rhagoletis ceraci* (Diptera: Tephritidae) (Thompson, 1955) and *Piophila casei* (Diptera: Piophilidae) (Teodorescu and Ursu, 1979).

Genus: *Diapria* Latreille, 1796

Diagnosis: (Female) head round; postgenal cushion developed (Fig. 3A); antenna 12-segmented, with multisegmented clava (Fig. 3B); anterior margin of pronotum and propleuron with dense cushions (Fig. 3A); mesoscutum moderately convex, with scattered bristles; anterior scutellar pit large and deep;

often with longitudinal ridges; scutellar disc subrectangular, with strong median longitudinal keel; propodeum short and hairy (Fig. 3C), with distinct median keel; wings always present, submarginal vein in forewing almost straight, reaching basal third of wing, stigmal vein rudimentary, basal vein not developed; petiole elongate, with irregular longitudinal keels and abundant pilosity; anterior margin of syntergite with median notch (not straight) (Fig. 3C).

***Diapria conica* (Fabricius, 1775)**

Material examined: 3♀♀; Iran, Guilan province, Roodsar, Rahimabad, Ziaz (36°52'34.44" N, 50°13'17.40" E, 537 m a. s. l.), 29.V.2010, 2♀♀ (TMUC), Leg. M. Khayrandish. Mazandaran province, Alikola (36°13'14" N, 53°39'24" E, 1626 m a.s.l.) 25-IV-2016, 1♀, (RIFR), Leg. S. Farahani.

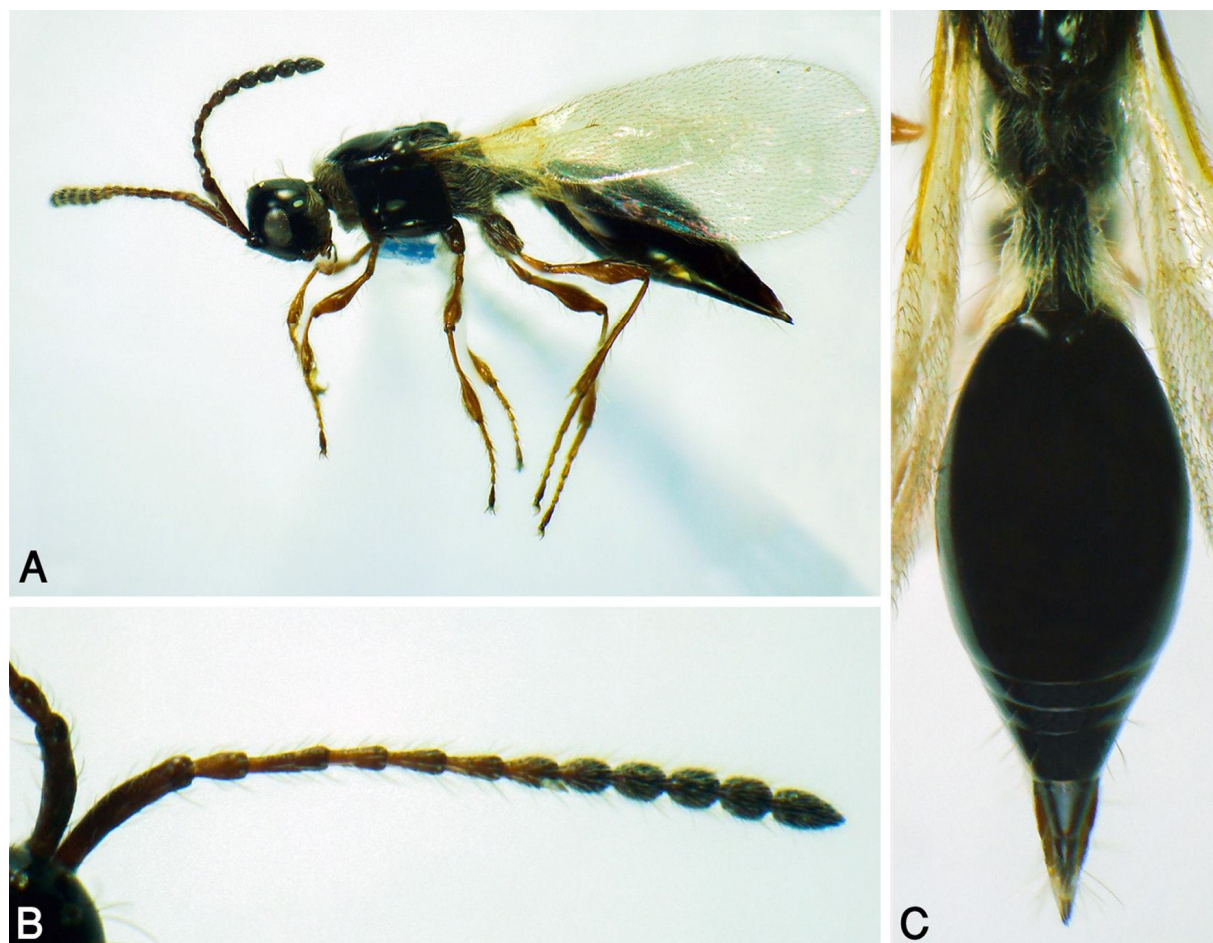


Figure 3 *Diapria conica* (Fabricius, 1775): **A.** Lateral habitus of female, **B.** Antenna, **C.** Abdomen.

Diagnosis (Female): Body length 3.1-3.6 mm; length of fore wing 2.4-2.9 mm; head in dorsal view a little wider than length (30: 28), with long sparse setae; antenna with five-jointed club (Fig. 3B), 6th antennal segment 2.1 times as long as wide (Fig. 3B); pronotum with thick woolly collar; mesoscutum with two pairs of bristles; scutellum in anterior with a deep pit and scutellar disc with sharp keel; propodeum and petiole pubescent (Fig. 3C); petiole 1.8 times as long as wide; metasoma more than 2.0 times longer than its largest width (Fig. 3B), anterior margin of tergite 2 + 3 with a deep emargination (Fig. 3C); 6th tergite longer than wide (Fig. 3C).

Distribution in Iran: Guilan and Mazandaran provinces.

General distribution: North Africa, Nearctic and Palaearctic (Austria, Czech Republic, Denmark, Finland, France, Sweden, United Kingdom) (Kieffer, 1916; Kozlov, 1978; Johnson, 2015). Iran (**New record**).

Biology: Parasitoid of *Eristalis tenax* (Linnaeus, 1758) (Syrphidae) (Nixon, 1980).

Discussion

In this study, *Diapria conica* and *Aneuropria foersteri* are reported for the first time from Iran. *Diapria conica* is a common species and widely distributed in the Palaearctic region (Nixon, 1980; Masner and García, 2002). *Diapria conica* is a pupal parasitoid of *Eristalis tenax* (Linnaeus, 1758) (Diptera: Syrphidae), which has been reported from several provinces of Iran (Dusti and Hayat, 2006). The host record for *A. foersteri* includes *Rhagoletis cerasi* (Diptera: Tephritidae), which is an important pest of cherry and recorded from north-central and north-western provinces of Iran (Mohamadzadeh Namin and Korneyev, 2018). Northern Iran is characterized by a great diversity in vegetation, natural ecosystems and farm lands due to significant differences in the topography and the varied climate (Kiani et al., 2017). Therefore, more researches in northern and other parts of the country are required to better understand the real diversity of this large family and we expect that the Diapriidae fauna of Iran will be substantially increased.

Acknowledgments

We would like to thank the Department of Entomology, Tarbiat Modares University and Research Institute Forests and Rangelands for providing financial support. The authors would like to thank two reviewers, Dr. Ehsan Rakhshani (University of Zabol) and Dr. Vasilisa G. Chemyreva (Russian Academy of Sciences) for their valuable comments and recommendations on the earlier version of this paper.

References

- Amini, A., Sadeghi, H., Lotfalizadeh, H. and Notton, D. 2014. Parasitoids (Hymenoptera: Pteromalidae, Diapriidae) of *Carpomya vesuviana* Costa (Diptera: Tephritidae) in South Khorasan province of Iran. *Biharean Biologist*, 8(2): 122-123.
- Dusti, A. F. and Hayat, R. 2006. A Catalogue of the Syrphidae (Insecta: Diptera) of Iran. *Journal of the Entomological Research Society*, 8(3): 5-38.
- Huber, J. T. 2017. Biodiversity of Hymenoptera. In: Footitt, R. G., Adler, P. H. (Eds), *Insect Biodiversity: Science and Society* (2nd edn). Wiley-Blackwell, Oxford, pp: 419-462.
- Johnson, N. F. 1992. Catalog of World species of Proctotrupoidea, exclusive of Platygasteridae (Hymenoptera). *Memoirs of the American Entomological Institute*, 51: 1-825.
- Johnson, N. 2015. Fauna Europaea: Diapriidae. In: Mitroiu, M.-D., Noyes, J., Cetskovic, A., Nonveiller, G., Radchenko, A., Polaszek, A., Ronquist, F., Forshage, M., Pagliano, G., Gusenleitner, J., Bartalucci, M., Olmi, M., Fusu, L., Madl, M., Johnson, N., Jansta, P., Wahis, R., Soon, V., Rosa, P., Osten, T., Barbier, Y. and de Jong, Y. (Eds.), *Fauna Europaea: Hymenoptera-Apocrita (excl. Ichneumonoidea)*. *Biodiversity Data Journal* 3, e4186. [Accessed 25 November 2019].
- Kiani, M., Mohammadi, S., Babaei, A., Sefidkon, F., Naghavi, M. R., Ranjbar, M., Razavi, S. A., Saeidi, K., Jafari, H., Asgari, D. and Potter, D. 2017. Iran supports a great

- share of biodiversity and floristic endemism for *Fritillaria* spp. (Liliaceae): A review. *Plant Diversity*, 39: 245-262.
- Kieffer, J. J. 1916. Diapriidae. *Das Tierreich*. Vol. 44. Walter de Gruyter and Co., Berlin, 627 pp.
- Kozlov, M. A. 1978. Fam. Proctotrupidae. In: Medvedev, G. S. (Ed.), *A key to the insects of the European Part of the USSR. Opredelitel' nasekomykh evropeiskoi chasti SSSR*. Nauka Publishers, Leningrad. pp. 538-664 (in Russian).
- Masner, L. and García J. L. 2002. The genera of Diapriinae (Hymenoptera: Diapriidae) in the New World. *Bulletin of the American Museum of Natural History*, 268: 1-138.
- Masner, L., Barron, J. R., Danks, H. V., Finnamore, A. T., Francoeur, A., Gibson, G. A. P., Mason, W. R. M. and Yoshimoto, C. M. 1979. Hymenoptera. In: Danks, H. V. (Ed.), *Canada and its Insect Fauna. Memoirs of the Entomological Society of Canada No. 108*: 485-508.
- Mohamadzadeh Namin, S. and Korneyev, V. A. 2018. An annotated checklist of fruit flies (Diptera: Tephritidae) of Iran. *Zootaxa*, 4369(3): 377-405.
- Nixon, G. E. J. 1980. Diapriidae (Diapriinae). Hymenoptera, Proctotrupeoidea. *Handbooks for the Identification of British insects*, 8(3): 1-55.
- Notton D. G. 1993. New species of *Trichopria* and *Diapria* from the British Isles (Hym., Proctotrupeoidea, Diapriidae). *Entomologist's Monthly Magazine*, 129: 139-149.
- Notton, D. G. 2004. A catalogue of types of Diapriinae (Hymenoptera, Diapriidae) at the National Museum of Natural History, Paris, with notes on the classification of Diapriinae and a brief history of the types of Jean-Jacques Kieffer (1856-1925). *Zoosystema*, 26(2): 315-352.
- Notton, D. G. 2014. A catalogue of the types of Diapriinae (Hymenoptera, Diapriidae) at the Natural History Museum, London. *European Journal of Taxonomy*, 75: 1-123.
- Rahmani, Z., Kim, C. J., Ghafouri Moghaddam, M. and Rakhshani, E. 2019. Family Ismaridae Thomson (Hymenoptera, Diaprioidea), new to fauna of Iran. *Entomological Research*, 49: 409-415.
- Rajmohana, K. 2006. Studies on Proctotrupeoidea and Platygastridae (Hymenoptera: Insecta) of Kerala. *Memoirs of the Zoological Survey of India*, 21(1): 1-105.
- Samin, N., Bagriacik, N., Turrisi, G. F., Masner, L., Gençer, L., Imani, S., Lee, J. W., Pujade-Villar, J. 2018. A faunistic study of Chrysididae, Diapriidae, Dryinidae, Figitidae and Proctotrupidae (Hymenoptera) from Iran. *Wuyi Science Journal*, 34: 33-42.
- Sharkey, M. J. 2007. Phylogeny and classification of Hymenoptera. *Zootaxa*, 1668: 521-548.
- Sharkey, M. J., Vilhelmsen, L., Heraty, J., Liljeblad, J., Dowling, A. P. G., Schulmeister, S., Murray, D., Deans, A. R., Ronquist, F., Krogmann, L. and Wheeler, W. C. 2012. Phylogenetic relationships among superfamilies of Hymenoptera. *Cladistics*, 28: 80-112.
- Teodorescu, I. and Ursu, A. 1979. [Species of Diapriinae (Hymenoptera-Proctotrupeoidea), puparia parasites of synantropic Diptera]. *Studii si Cercetari de Biologie Seria Biologie Animala*, 31: 131-136.
- Thompson, W. R. 1955. A catalogue of the parasites and predators of insect pests. Section 2. Host parasite catalogue, Part 3. Hosts of the Hymenoptera (Calliceratid to Evaniid). Commonwealth Agricultural Bureaux, The Commonwealth Institute of Biological Control, Ottawa, Ontario, Canada.
- van Achterberg, C. 2009. Can Townes type Malaise traps be improved? Some recent developments. *Entomologische Berichten Amsterdam*, 69(4): 129-135.
- Yoder, M. J. 2007. Advances in diapiiid (Hymenoptera: Diapriidae) systematics, with contributions to cybertaxonomy and the analysis of rRNA sequence data. Dissertation (Doctor of Philosophy)-Texas A & M University. 185 pp.

اولین گزارش دو جنس و گونه از زنبورهای زیرخانواده (Hymenoptera: Diapriidae) *Diapriinae* از ایران

محمد ایزدی زاده^۱، علی اصغر طالبی^{۱*}، ویکتور کولیدادا^۲، سمیرا فراهانی^۳ و علی عامری^۴

۱- گروه حشره شناسی کشاورزی، دانشکده کشاورزی، دانشگاه تربیت مدرس، تهران، ایران.

۲- موزه جانورشناسی دانشگاه مسکو، مسکو، روسیه.

۳- مؤسسه تحقیقات جنگل‌ها و مراتع، سازمان تحقیقات، ترویج و آموزش کشاورزی، تهران، ایران.

۴- بخش تحقیقات رده‌بندی، مؤسسه تحقیقات گیاه‌پزشکی کشور، سازمان تحقیقات، ترویج و آموزش کشاورزی، تهران، ایران.

پست الکترونیکی نویسنده مسئول مکاتبه: talebia@modares.ac.ir

دریافت: ۱۵ مهر ۱۳۹۸؛ پذیرش: ۲۲ فروردین ۱۳۹۹

چکیده: دو جنس *Diapria* و *Aneuopria* و دو گونه *Diapria* و *Aneuopria foersteri* (Kieffer, 1910) (Hymenoptera: Diapriidae) *conica* (Fabricius, 1775) برای اولین بار از ایران گزارش می‌شوند. نمونه‌ها به وسیله تله مالیز از استان‌های مازندران، گلستان و گیلان جمع‌آوری شدند. خصوصیات افتراقی و انتشار جغرافیایی جنس‌ها و گونه‌ها ارایه شد.

واژگان کلیدی: *Diapria*، *Aneuopria*، مازندران، گلستان، گیلان، جنگل‌های هیرکانی، پارازیتوئید