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A preliminary survey of hymenopteran fauna of Iranian mangrove ecosystem, northern part of the Persian Gulf and Oman Sea

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ABSTRACT. The order Hymenoptera comprises an important group of insects, with ecological and economic importance, and serving as ecological indicators. Investigating the diversity and distribution of fauna is considered a prerequisite for biodiversity conservation. In this research, the hymenopteran fauna in mangrove forests on the southern coast of Iran were studied during 2021–2022. The collection was made by sweeping net and light trap. The survey revealed the presence of ten species and nine genera belonging to six families. Of which, two species, *Ampulex assimilis* Kohl, 1893 (Hym.: Ampulicidae) and *Paridris leda* Kozlov & Kononova, 1985 (Hym.: Scelionidae) are recorded for the first time for the Iranian fauna. Diagnostic characters of the new records and geographical distribution of all species are provided.

Key words: Coastal areas, Fauna, Hormozgan, Hymenoptera, parasitoid, saline woodland

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INTRODUCTION

Hymenoptera (sawflies, wasps, ants, and bees) are one of four mega-diverse insect orders, comprising more than 153,000 described and possibly up to one million undescribed extant species (Grimaldi & Engel, 2005; Aguiar et al., 2013). As parasitoids, predators, and pollinators, Hymenoptera play a fundamental role in virtually all terrestrial ecosystems and are of substantial economic importance

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(Quicke, 1997). Iranian mangrove forests are located on the coast and islands of the Persian Gulf and Oman Sea, starting from the Goiter Gulf in the East (Oman Sea) to the Nayband Gulf in the West Persian Gulf. Two endemic plant species i.e., *Avicennia marina* (Forssk.) Vierh., 1907 and *Rhizophora mucronata* Lam., 1804 form the mangroves in Iran. The mangrove ecosystem in Iran covers an area of more than 27,310 hectares in southern Iran. The core area of mangrove forests in Iran is 13214.16 ha of which 9777.96 ha is related to the Qeshm Island and Khamir port (Zahed et al., 2010; Safiari, 2017). The mangrove ecosystem is ecologically important for supporting biodiversity, marine ecosystem function, and the food web of various aquatic organisms. The mangrove ecosystem can also prevent sedimentation, stabilize the habitat, and maintain nutrient cycles, thus providing protection to the inland ecosystem against the erosive force of the sea. Thus, the economic productivity of coastal and terrestrial communities relies on the maintenance of the ecological sustainability of mangroves (Budiadi et al., 2022). The mangroves are mainly threatened by natural (pest damage, storms, acid rain) and anthropogenic (oil spills, industrial wastes, infrastructure development) factors (Erfanifard, 2022). The mangrove invertebrate fauna plays a significant role in detritus production and energy flow in the mangrove inshore system. The turnover rate of nutrients is also increased by these attacks by the mangrove insects (Macintosh et al., 1981). Mangrove insects were been studied in Southeast Asia (Beaver & Browne, 1975), Thailand (Browne, 1961; Murphy, 1990; Malaysia (Beason, 1953) India (Kalshoven, 1958) and Iran (Jahani et al., 2020). Very little and scattered research has been conducted on mangrove ecosystem fauna in Iran (Jahani et al., 2020; Moslehi et al., 2023).

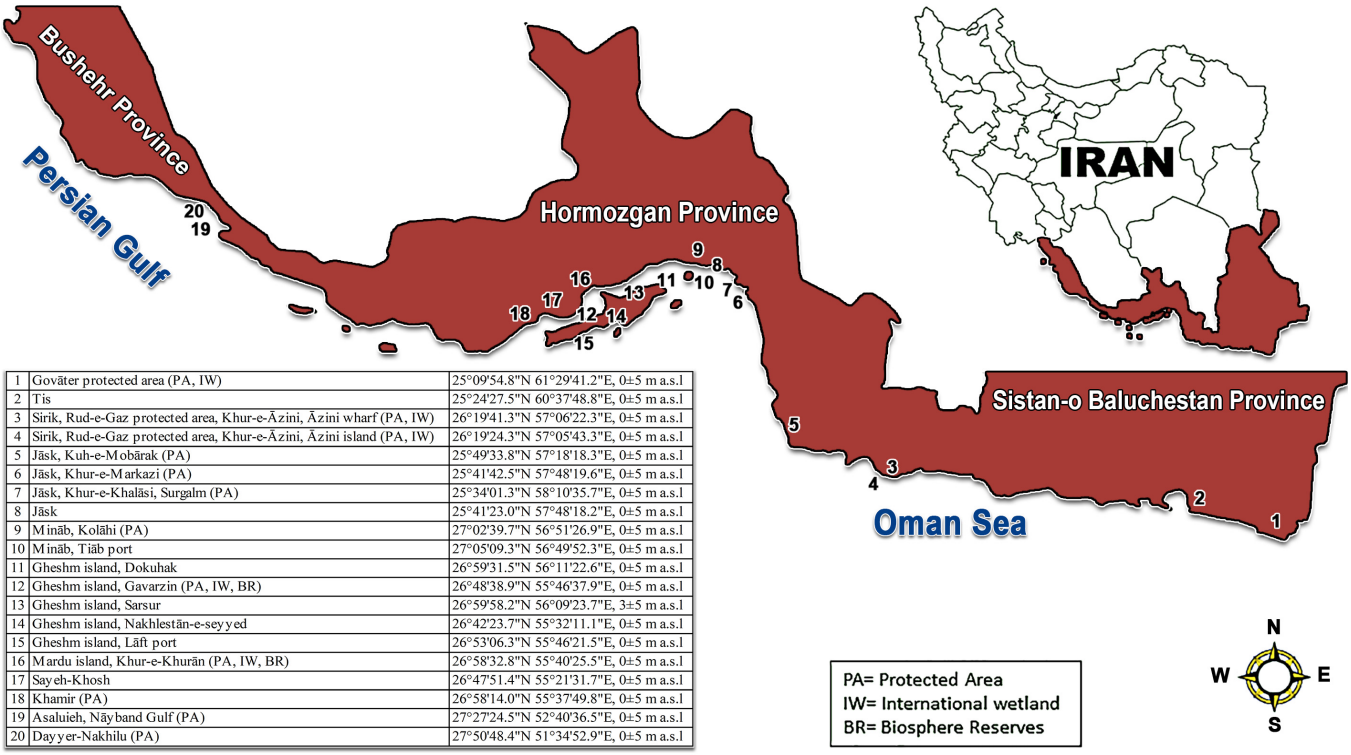
The mangrove ecosystem possesses technical problems for faunal studies. Mangrove insects are both difficult to sample reliably and are poorly known taxonomically. Due to this reason, our knowledge of the Iranian fauna of the mangrove ecosystem is inadequately explored. This paper aims to improve our understanding and to provide additional information about the fauna and distribution of Hymenoptera in the mangrove forests of the Persian Gulf and Oman Sea.

MATERIAL AND METHODS

This study was carried out in mangrove ecosystems in the Persian Gulf and Oman Sea of Iran during 2021-2022. Mangrove forests along the southern coast of Iran are located between the latitudes 25°100 to 27°550 north and longitudes 51°250 to 61°250 east (Safiari, 2017; Zahed et al., 2010). Significantly dense mangroves are observed in Qeshm Island and Khamir Harbor, while they form dense and open stands within other sites (Figs 1, 2). Sampling was done using light traps and sweeping nets at different locations of mangrove Forests of the Persian Gulf and Oman Sea (Figs 1) Collected specimens were temporarily stored in 75% ethanol and afterwards cleaned according to the AXA method (van Achterberg, 2009) and mounted on triangular cards. Relevant literature was used for taxonomical examination and identification of species and some species were compared with the identified species in the Hayk Mirzayans Insect Museum (HMIM). Illustrations were taken using an Olympus™ AX70 microscope and Olympus™ SZX9 stereomicroscope equipped with a Sony™ digital camera. A series of 4–5 captured images were then merged into a single in-focus image using the image-stacking software Combine ZP 1.0. Distribution of each species in Iran and general distributions are provided. All examined materials are deposited in HMIM (Hayk Mirzayans Insect Museum, The Insect Taxonomy Research Department of the Iranian Research Institute of Plant Protection, Tehran).

RESULTS

In this research, ten species within nine genera and seven subfamilies of hymenopteran fauna in mangrove ecosystems were collected and identified. Information regarding the global and Iranian distribution of species, along with some details about their hosts, are provided. Two species were identified as new records for the Iranian fauna that are marked by an asterisk (*). The compiled list of identified genera and species is as follows:



1	Govāter protected area (PA, IW)	25°09'54.8"N 61°29'41.2"E, 0±5 m a.s.l
2	Tis	25°24'27.5"N 60°37'48.8"E, 0±5 m a.s.l
3	Sirik, Rud-e-Gaz protected area, Khur-e-Āzini, Āzini wharf (PA, IW)	26°19'41.3"N 57°06'22.3"E, 0±5 m a.s.l
4	Sirik, Rud-e-Gaz protected area, Khur-e-Āzini, Āzini island (PA, IW)	26°19'24.3"N 57°05'43.3"E, 0±5 m a.s.l
5	Jāsk, Kuh-e-Mobārak (PA)	25°49'33.8"N 57°18'18.3"E, 0±5 m a.s.l
6	Jāsk, Khur-e-Markazi (PA)	25°41'42.5"N 57°48'19.6"E, 0±5 m a.s.l
7	Jāsk, Khur-e-Khalāsi, Surgalm (PA)	25°34'01.3"N 58°10'35.7"E, 0±5 m a.s.l
8	Jāsk	25°41'23.0"N 57°48'18.2"E, 0±5 m a.s.l
9	Mināb, Kolāhi (PA)	27°02'39.7"N 56°51'26.9"E, 0±5 m a.s.l
10	Mināb, Tiāb port	27°05'09.3"N 56°49'52.3"E, 0±5 m a.s.l
11	Gheshm island, Dokuhak	26°59'31.5"N 56°11'22.6"E, 0±5 m a.s.l
12	Gheshm island, Gavarzin (PA, IW, BR)	26°48'38.9"N 55°46'37.9"E, 0±5 m a.s.l
13	Gheshm island, Sarsur	26°59'58.2"N 56°09'23.7"E, 3±5 m a.s.l
14	Gheshm island, Nakhlestān-e-seyyed	26°42'23.7"N 55°32'11.1"E, 0±5 m a.s.l
15	Gheshm island, Lāft port	26°53'06.3"N 55°46'21.5"E, 0±5 m a.s.l
16	Mardu island, Khur-e-Khurān (PA, IW, BR)	26°58'32.8"N 55°40'25.5"E, 0±5 m a.s.l
17	Sayeh-Khosh	26°47'51.4"N 55°21'31.7"E, 0±5 m a.s.l
18	Khamir (PA)	26°58'14.0"N 55°37'49.8"E, 0±5 m a.s.l
19	Asaluieh, Nāyband Gulf (PA)	27°27'24.5"N 52°40'36.5"E, 0±5 m a.s.l
20	Dayyer-Nakhilu (PA)	27°50'48.4"N 51°34'52.9"E, 0±5 m a.s.l

Figure 1. Map of the sampling localities in the mangrove ecosystem in southern Iran (Hormozgan and Bushehr province).

Figure 2. The sampling localities in the mangrove ecosystem in southern Iran. **A–B.** Khamir harbour; **C.** Qeshm Island (Hormozgan province) (photos taken by Dr. Arash Bijanpour).

Taxonomic hierarchy

Class Insecta Linnaeus, 1785

Order Hymenoptera Linnaeus, 1758

Superfamily Apoidea Latreille, 1802

Family Ampulicidae Shuckard, 1840

Genus *Ampulex* Jurine, 1807*

***Ampulex assimilis* Kohl, 1893** (Fig. 3)

Material examined. Hormozgan province, Sirik, Azini Estuary (26°19'41.3"N, 57°06'22.3"E, 0±5 m a.s.l), 12.v.2022; 1♂, Sweeping net, leg. A. Hajesmailian & M. Mofidi Nayestanak.

Diagnosis. Body length 18 mm (♂); head in dorsal view transverse, 1.68 times as wide as long; integument generally brilliant metallic (Figs 3A–B, D); antennal tubercles separated from each other (Figs 3A–B); pronotum with large median tubercle adjacent to posterior margin; fore wing with two submarginal cells (SMC1 and SMC2 fused), apex of marginal cell of fore wing not reaching wing margin (Fig. 3C).

Distribution in Iran. Hormozgan province (current study).

Zoogeographical distribution. Oman, Saudi Arabia, United Arab Emirates, Yemen (Gadallah, 2020), Iran (**new record**).

Host. Unknown, but probably preys on cockroaches, which is typical for the genus (Arvidson et al., 2018).

Family Apidae Latreille, 1802

Subfamily Apinae Latreille, 1802

Genus *Apis* Linnaeus, 1758

***Apis florea* Fabricius, 1787**

Material examined. Busher Province, Mangrove protected area, Nayband Gulf (27°27'24.5"N 52°40'36.5"E, 0±5 m a.s.l.), 06.vi.2021, 15♂♂, Sweeping net., leg. H. Alipanah, H. Falsafi, E. Gilasian, M. Moghadam, H. Nasserzadeh & M. Mofidi Nayestanak.

Distribution in Iran. Southern Iran (Parichehreh et al., 2020).

Zoogeographical distribution. Widely distributed in the Oriental, Afrotropical and Palaearctic regions (Madl, 2018).

***Apis mellifera meda* Skorikov, 1929**

Material examined. Hormozgan province, Sirik, Azini Estuary (26°19'24.3"N 57°05'43.3"E, 0±5 m a.s.l), 12.vi.2022, 23♀♀, Sweeping net. leg. A. Hajesmailian & M. Mofidi Nayestanak.

Distribution in Iran. The subtropical coast of the Caspian Sea (Mazandaran); northeast Iran (Mashad); West and Central (Azerbaijan -Iranian highlands) and Southeast Iran (Kerman) (Salehi & Nazemi-Rafie, 2020).

Zoogeographical distribution. Australasian, Ethiopian, Nearctic, Oriental and Palaearctic regions.

Family Crabronidae Latreille, 1802

Subfamily Bembicinae Latreille, 1802

Genus *Bembix* Fabricius, 1775

***Bembix oculata* Panzer, 1801**

Material examined. Hormozgan province, Khamir, Mangrove protected area (Khor Khoran), Mardu Island, Gulf (26°58'32.8"N 55°40'25.5"E, 0±5 m a.s.l), 30.x.2021, 1♀, Sweeping net, leg. H. Alipanah, H. Falsafi, E. Gilasian, M. Moghadam, H. Nasserzadeh & M. Mofidi Nayestanak.

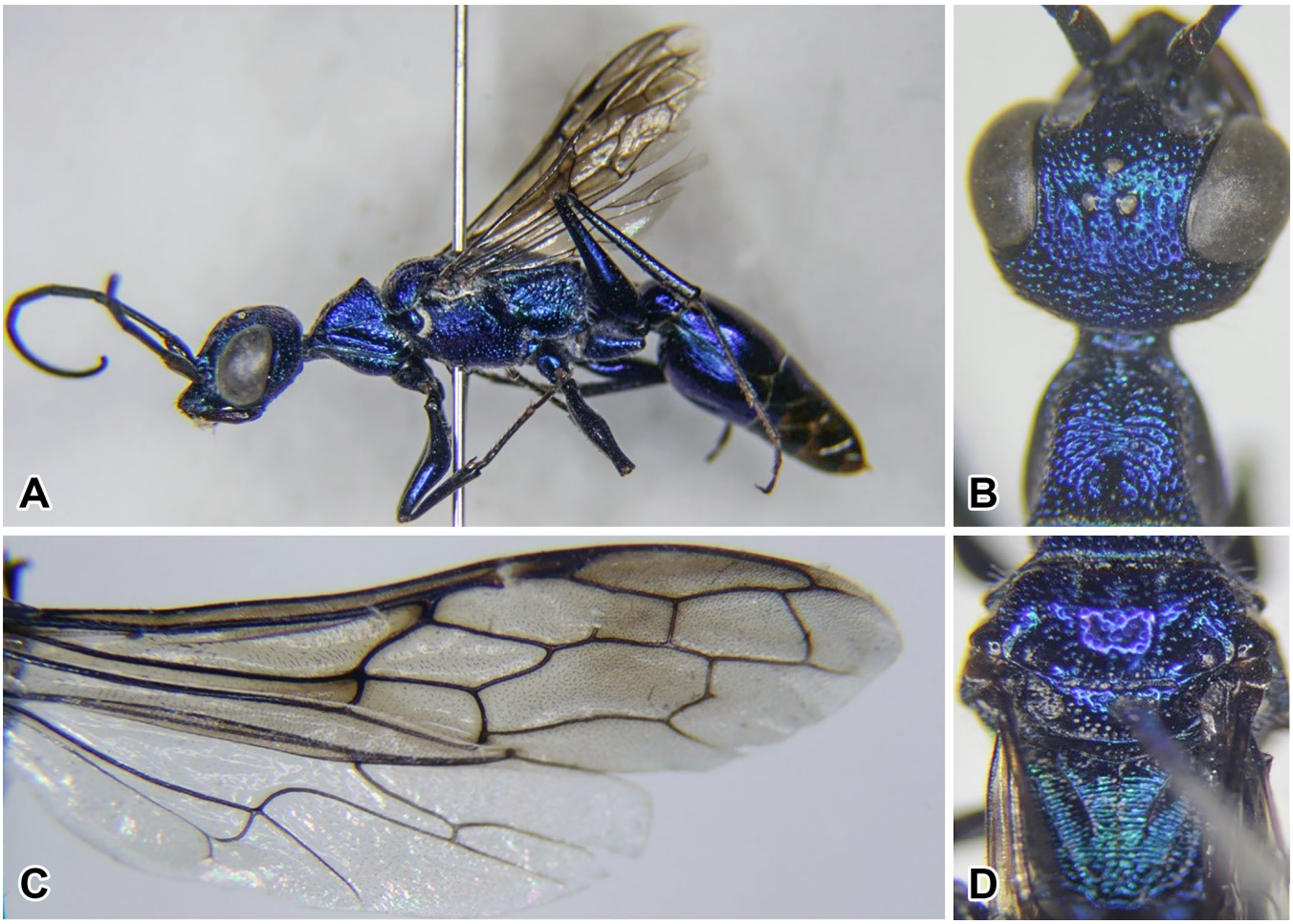


Figure 3. *Ampulex assimilis* Kohl, 1893; **A.** General habitus in lateral view; **B.** Head, in dorsal view; **C.** Fore and hind wings; **D.** Mesonotum and Propodeum.

Distribution in Iran. East Azerbaijan (Ghazi-Soltani et al. 2010a, 2010b), Fars (Fallahzadeh et al. 2009; Atbaei et al. 2015), Guilan (Morice, 1921), Hormozgan, Khorasan-e Razavi, Markazi (Ebrahimi, 2014), Golestan, Mazandaran (de Beaumont, 1957; Ebrahimi, 2014), Qazvin (de Beaumont, 1957); Sistan and Baluchestan (Gussakovsksij, 1933), South Khorasan (Gussakovsksij, 1933; de Beaumont, 1970), Tehran (de Beaumont, 1957); no specific locality (Esmaili & Rastegar, 1974).

Zoogeographical distribution. Afghanistan, China, Europe, Iran, Middle Asia, North Africa and Pakistan (Nemkov, 2016).

Host. Diptera: Brachycera (Ebrahimi, 2015).

Family Sphecidae Latreille, 1802

Subfamily Sceliphrinae Ashmead, 1899

Genus *Sceliphron* Klug, 1801

Sceliphron madraspatanum pictum (F. Smith, 1856)

Material examined. Bushehr Province, Asaluyeh, Nayband (27°27'24.5"N 52°40'36.5"E, 0±5 m a.s.l), 06.xi.2021, 1♀, Sweeping net, leg. H. Nasserzadeh.

Distribution in Iran. Bushehr, Fars (Ebrahimi, 2014), Hormozgan (Ebrahimi, 1993, 2014), Kerman (Ebrahimi, 2014), Markazi (Ebrahimi, 2014; Hadi et al. 2014), North Khorasan, Sistan and Baluchestan (Ebrahimi, 1993, 2014).

Zoogeographical distribution. Afghanistan, Bangladesh, Central Asia, China, Greece, India, Indonesia, Iran, Japan, Kazakhstan, Malaysia, Philippines, Saudi Arabia, Syria, Taiwan, Thailand, Turkey, United Arab Emirates and Uzbekistan (Jahantigh et al., 2017).

Host. In the agroecosystem, mud wasps were found to constitute the third trophic level within the food chain, comprising vegetable crops, insect pests and spiders. Specifically, *S. madraspatanum* and its role was found to be a potential agent for pest management (Halder et al., 2012).

Subfamily Sphecinae Latreille, 1802

Genus *Prionyx* Vander Linden, 1827

***Prionyx nudatus* (Kohl, 1885)**

Material examined. Bushehr province, Asaluyeh, Sweeping net (27°27'24.5"N, 52°40'36.5"E, 0±5 m a.s.l), 06.xi.2021, 1♀, Sweeping net, leg. E. Gilasian.

Distribution in Iran. Alborz (Ebrahimi, 1993, 2014), Ardabil, East Azerbaijan, Bushehr (Ebrahimi, 2014), Golestan (Ebrahimi, 2014), Guilan, Isfahan (Ebrahimi, 2014), Kerman (Ebrahimi, 2014), Markazi (Hadi et al., 2014), Mazandaran, Qazvin (Ebrahimi, 2014) and Tehran (Ebrahimi, 2014).

Zoogeographical distribution. Afghanistan, China, Croatia, Egypt, Iran, Kazakhstan, Kyrgyzstan, Mongolia, Montenegro, Morocco, Russia, Spain, Tajikistan, Tunisia, Turkey, Turkmenistan, Ukraine, Uzbekistan (Jahantigh et al., 2017).

Host. Orthoptera; Gryllidae (Ebrahimi, 2015).

Superfamily Ichneumonoidea Latreille, 1802

Family Braconidae Nees, 1811

Subfamily Agathidinae Haliday, 1833

Genus *Coccygidium* Saussure, 1892

***Coccygidium transcaspicum* (Kokujev, 1902)**

Material examined. Hormozgan province, Khamir, Mangrove protected area (Khor Khoran), Mardu Island, Gulf (26°58'32.8"N 55°40'25.5"E, 0±5 m a.s.l), 30.x.2021, 3♀♀, Light trap, leg. H. Alipanah, H. Falsafi, E. Gilasian, M. Moghadam, H. Nasserzadeh & M. Mofidi Nayestanak.

Distribution in Iran. Sistan and Baluchestan (Hedwig, 1957), no specific locality cited (Tobias, 1986).

Zoogeographical distribution. Palaearctic region (Yu et al., 2016).

Host. The fall armyworm (FAW), *Spodoptera frugiperda* (J. E. Smith)(Gupta et al., 2020).

Subfamily Braconinae Nees, 1811

Genus *Bracon* Fabricius, 1804

***Bracon* (*Habrobracon*) *hebetor* Say, 1836**

Material examined. Hormozgan province, Khamir, Mangrove protected area (Khor Khoran), Mardu Island, Gulf (26°58'32.8"N, 55°40'25.5"E, 0±5 m a.s.l.), 30.x.2021, 1♀, Sweeping net., leg., H. Alipanah, H. Falsafi, E. Gilasian, M. Moghadam, H. Nasserzadeh & M. Mofidi Nayestanak.

Distribution in Iran. East Azerbaijan (Modarres Awal, 1997), Fars (Lashkari Bod et al., 2011), Hormozgan (Ameri et al., 2013), Isfahan (Bagheri & Nematollahi, 2006), Kerman, Tehran (Modarres Awal, 1997), Kermanshah (Noori, 1994), Qom (Norouzi et al., 2009), West Azerbaijan (Modarres Awal, 1997).

Zoogeographical distribution. Australasian, Ethiopian, Nearctic, Oriental and Palaearctic regions (Yu et al., 2016).

Host. Cosmopolitan idiobiont braconid which parasitizes the larvae of Pyralidae (Yu et al., 2016).

Family Ichneumonidae Latreille, 1802

Genus *Enicospilus* Stephens, 1835

Enicospilus pallidus (Taschenberg, 1875)

Material examined. Hormozgan Province, Bandar-e, Khamir, light trap, (26°58'14.0"N 55°37'49.8"E, 0±5 m a.s.l), 30.x.2021, 1♀, Sweeping net, leg. H. Alipanah, H. Falsafi, E. Gilasian, M. Moghaddam, H. Nasserzadeh & M. Mofidi Nayestanak.

Distribution in Iran. Hormozgan Province, Bandar-e, Khamir (Johansson et al., 2021).

Zoogeographical distribution. Chad, Democratic Republic of Congo, Ethiopia, Kenya, Pakistan, South Africa, Sudan, Tanzania (Yu et al., 2016), Iran (Johansson et al., 2021).

Host. *Enicospilus* species are primarily known as nocturnal parasitoids of a wide range of lepidopteran larvae, particularly those are free-living caterpillars; however, the few species with long ovipositors seem to attack larvae that mine plant stems (Yu et al., 2016).

Superfamily Platygastroidea Haliday, 1833

Family Scelionidae Haliday, 1833

Genus *Paridris* Kieffer, 1908

Paridris leda Kozlov & Kononova, 1985* (Fig. 4)

Material examined. Hormozgan province, Sirik, Azini Estuary (26°19'24.3"N 57°05'43.3"E, 0±5 m a.s.l), 12.v.2022, 1♀, Sweeping net leg. A. Hajesmailian & M. Mofidi Nayestanak.

Diagnosis. Eyes setose; antennae densely pubescent, antennomere 2 oblong, 2 times as long as wide, antennomere 3 about 1.5 times as long as wide, antennomere 4 slightly longer than wide, antennomere 5 as long as wide; antennomere 6 transverse; mesonotum basally smooth (finely sculptured in *P. stenus* Kononova & Petrov), with distinct notauli (disappeared in *P. stenus*); stigmal vein as long as postmarginal vein (at most 0.85 times as long as postmarginal vein in *P. stenus*); basal abdominal horn smooth and shining (sculptured in *P. stenus*) (Fig. 4).

Figure 4. *Paridris leda* Kozlov & Kononova, 1985, general habitus. **A.** Lateral view; **B.** Dorsal view.

Distribution in Iran. Hormozgan province, Sirik, Azini Estuary (current study).

Zoogeographical distribution. Moldavia, Turkey (Kozlov & Kononova, 1985, 1990), Iran (**new record**).

Host. Unknown.

DISCUSSION

Ten species belonging to nine genera of the order Hymenoptera were collected and identified. Of these, two species, *Ampulex assimilis* and *Paridris leda* are new records for the Iranian fauna. Our samples were captured by light trap and sweeping nets therefore, we have no information about their host associations. None of the identified species have been reported as pests or herbivores. The samples were collected by light trap and sweep net, each of these methods is suitable for certain species. Mangrove trees provide crucial environmental services including habitat for birds, fish and invertebrates. They are responsible for coastal protection from hurricanes, floods, sea level rise, wave action and erosion (Kathiresan & Bingham, 2001; Sherman et al., 2001). Mangrove systems are recognized as one of the most fragile ecosystems, hence they are amongst the most threatened ecosystems globally (Taylor et al., 2003; Martinuzzi et al., 2009). Based on the mentioned reasons, the study of biodiversity in mangrove ecosystems is important. Species of the order Hymenoptera contribute to the biodiversity of an ecosystem and have a crucial role in maintaining ecological balance. High biodiversity often indicates good ecosystem health and resilience against disturbances. Pests are always one of the serious threats to mangrove ecosystems. Parasitoids perform an important ecosystem service by suppressing pest populations. Iranian fauna of the Mangrove ecosystem is poorly investigated. In recent years, 10 species are reported for the first time from mangroves in the south of Iran; *Apis mellifera* L. (Hym.: Apidae), *Muscina prolapsa* Fallen (Dipt.: Muscidae), *Oria musculosa* (Hubner) (Lep.: Noctuidae), *Agrotis daedalus* (Lep.: Noctuidae), *Lygephila* sp. (Lep.: Erebidae), *Helicoverpa armigera* (Hubner) (Lep.: Noctuidae), *Xylocopa latipes* (Drury 1773) (Hym.: Apidae**)**, *Hypaetha schmidti* (W. Horn, 1927) (Col.: Carabidae), *Mylabris variabilis* (Pallas, 1781) (Col.: Meloidae), *Polistes carolina* (Linnaeus, 1767)(Hym.: Vespidae) (Jahani et al., 2020).

Concerning diverse climatic conditions and many unexplored areas such as Sistan and Baluchestan province, in Iran, we expect that the Hymenoptera fauna of the mangrove ecosystem of Iran will be substantially increased by further investigations. Iran is located in the Western Palaearctic region, with some influences from the Afrotropical and Oriental regions, particularly evident in the southern regions of Iran (Ghafouri Moghaddam et al., 2019; Derafshan et al., 2021; Minab et al., 2023). *Coccygidium transcaspicum was* reported from India (belonging to the Oriental zoogeographical region. This species was previously identified in India as a natural predator of *Spodoptera frugiperda* (J.E. Smith, 1797) (Lepidoptera: Noctuidae) (Gupta et al., 2020) which has recently become a serious threat in the southern provinces of Iran as an invasive alien species (Naseri et al., 2024). Additionally, *A. assimilis*, documented for the first time in Iran through this study, had previously been reported in the Afrotropical region (Gadallah, 2020). In this study, the biology and host information of the recorded species remains unknown because the specimens were collected by light traps and sweeping net. The results of this research may be useful for future biocontrol of insect pests and ecological studies. We expected that the mangrove fauna of Iran may be substantially increased in future studies.

AUTHOR'S CONTRIBUTION

The authors confirm their contribution to the paper as follows: A. Ameri: Identification, imaging the specimens, preparing the diagnostic characters, preparation of the draft, corrections on the final contents of the manuscript; H. Lotfalizadeh: Identification of some specimens; A.A. Talebi: Supervisor, confirmation of the identified species and technical review of the manuscript; A. Bagheri: Technical review of the manuscript, collection of specimens. E. Ebrahimi: Supervisor, confirmation of the identified species and technical review of the manuscript. The authors read and approved the final version of the manuscript.

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AVAILABILITY OF DATA AND MATERIAL

The specimens listed in this study are deposited in the Hak Mirzayans Insect Museum (Insect Taxonomy Research Department of the Iranian Research Institute of Plant Protection, Tehran), and are available from the curator, upon request.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

CONSENT FOR PUBLICATION

Not applicable.

CONFLICT OF INTERESTS

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

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REFERENCES

Achterberg, C. van. (2009) Can Townes type Malaise traps be improved? Some recent developments. *Entomologische Berichten*, 69 (4), 129–135.

Arvidson, R., Landa, V., Frankenberg, S. & Adams, M.E. (2018) Life history of the emerald jewel wasp *Ampulex compressa*. *Journal of Hymenoptera Research*, 63, 1–13.

Aguiar, A., Deans, A.R., Engel, M.S., Forshage, M., Huber, J.T., Jennings, J.T., Johnson, N., Lelej, A.S., Longino, J.T., Lohrmann, V., Miko, I., Ohl, M., Rasmussen, C., Taeger, A. & Yu, D.S.K. (2013) Order Hymenoptera. *Zootaxa*, 3703 (1), 51–62. https://doi.org/10.11646/zootaxa.3703.1.12

Ameri, A., Talebi, A.A., Beyarslan, A., Kamali, K. & Rakhshani, E. (2013) Study of the genus *Bracon* Fabricius, 1804 (Hymenoptera: Braconidae) of southern Iran with description of a new species. *Zootaxa*, 3754 (4), 353–380. https://doi.org/10.11646/zootaxa.3754.4.2

Atbaei, M., Fallahzadeh, M. & Ljubomirov, T. (2015) A contribution to the fauna of Crabronidae (Hymenoptera, Apoidea) in South-Western Iran. Journal of Insect Biodiversity, 3 (11), 1–30. https://doi.org/10.12976/jib/2015.3.11

Bagheri, M.R. & Nematollahi, M.R. (2006) Biology and damage rate of safflower shoot fly *Acanthiophilus helianthi* in Esfahan province. *Proceedings of 17th Iranian Plant Protection Congress, 2006*, Alborz, Iran, p. 268.

Beason, C.F.C. (1953) *The Ecology and Control of the Forest Insects of India and Neighbouring Countries*. 2nd edition. Forest Research Institute, Dehradun. 767 p.

Beaver, R.A. & Browne, F.G. (1975) The Scolytidae and Platypodidae (Coleoptera) of Thailand. *Oriental Insects*, 9, 283–311. https://doi.org/10.1080/00305316.1975.10434499

Browne, F.G. (1961) The biology of Malayan Scolytidae and Platypodidae. *Malayan Food Recipes*, 22, 1–255.

Budiadi, B., Widiyatno, W., Nurjanto, H.H., Hasani, H., Jihad, A.N. (2022) Seedling growth and quality of *Avicennia marina* (Forssk.) Vierh. under growth media composition and controlled salinity in an Ex situ nursery. *Forests*, 13 (5), 684. https://doi.org/10.3390/f13050684

Danilov, Y.N. (2012) The digger wasps of the genus *Prionyx* Vander Linden (Hymenoptera: Sphecidae) of Russia and Central Asia, with a key to species, new synonymies, and lectotype designations. *Zootaxa*, 3526, 59–71. https://doi.org/10.11646/zootaxa.3526.1.6

de Beaumont, J. (1970) Sphecidae de l'Iran (Hym.) (Résultats de voyages entomologiques de Willi Richter, Stuttgart, en Iran, en 1954 et 1956). *Stuttgarter Beiträge zur Naturkunde aus dem Staatlichen Museum für Naturkunde in Stuttgart*, 220, 1–18

de Beaumont, J. (1957) Sphecidae du nord de l'Iran (Hym.). *Mitteilungen der Schweizerischen Entomologischen Gesellschaft,* 30, 127–139.

Derafshan, H.A., Olmi, M., Ghafouri Moghaddam, M., Nader, E. & Rakhshani, E. (2021) New records of Dryinidae Haliday, 1833 (Hymenoptera, Chrysidoidea) from Iran. *Zoosystema*, 43 (23), 563–583. https://doi.org/10.5252/zoosystema2021v43a23

Ebrahimi, E. (1993) The sphecid wasps of subfamily Sphecinae in Iran (Hymenoptera: Sphecidae). *Journal of Entomological Society of Iran*, 12–13, 87–104.

Ebrahimi, E. (2008) A contribution to the sphecid wasps of Iran (Hymenoptera: Sphecidae), including first record of six species. *Journal of Entomological Society of Iran*, 28 (1), 93–97.

Ebrahimi, E. (2014) Families Ampulicidae, Sphecidae, Crabronidae. In: Askari, H., Farazmand, H., Hosseini Nezhad, A., Manzari, S., Mirabolfathi, M., Mofidi-Neyestanak, M., Morovati, M., Zand, E. & Zare, R. (eds) *Insects of Iran*. Publication No. 20. Iranian Research Institute of Plant Protection, Tehran, pp. 1–62.

Ebrahimi, E. (2015) Aculeate wasps and their role in natural equilibrium and pest control (with a review of the Iranian species). *BioControl in Plant Protection*, 2 (2), 59–68. https://doi.org/10.22092/bcpp.2015.102995

Erfanifard, Y., Lotfi Nasirabad, M., Stereńczak, K. (2022) Assessment of Iran's mangrove forest dynamics (1990–2020) using landsat time series. *Remote Sensing*, 14 (19), 4912. https://doi.org/10.3390/rs14194912

Esmaili, M. & Rastegar, R. (1974) Identified species of Aculeate Hymenoptera of Iran. *Journal of the Entomological Society of Iran*, 2 (1), 41–52.

Fallahzadeh, M., Ostovan, H. & Saghaei, N. (2009) A contribution to the fauna of Sphecidae and Crabronidae (Hymenoptera) in Fars province, Iran. *Plant Protection Journal*, 1, 234–248.

Gadallah, N.S. (2020) Biodiversity of the aculeate wasps (Hymenoptera: Aculeata) of the Arabian Peninsula: Apoidea (Spheciformes), Ampulicidae. *Zootaxa*, 4754 (1), 17–19. https://doi.org/10.11646/zootaxa.4754.1.5

Ghafouri Moghaddam, M., Rakhshani, E., Arabzadeh, M.A., Derafshan, H.A. & Kavallieratos, N.G. (2019) The Stephanidae (Hymenoptera, Stephanoidea) of Iran with the description of a new species. *Insect Systematics & Evolution*, 50 (5), 583–600. https://doi.org/10.1163/1876312X-00002191

Ghazi-Soltani, G., Ebrahimi, E., Iranipur, S. & Pour Abad, R. (2010a) Sphecid wasps from East Azerbaijan province, Iran (Hymenoptera: Sphecidae). *Munis Entomology and Zoology*, 5, 796–803.

Ghazi-Soltani, G., Iranipur, S. & Ebrahimi, E. (2010b) The wasps of family Sphecidae (Hymenoptera), subfamilies Larrinae, Astatinae, Pemphredoninae, Nyssoninae and Philanthinae in East Azarbaijan province. *Iranian Journal of Plant Protection Science*, 41, 179–186.

Grimaldi, D. & Engel, M.S. (2005) *Evolution of the Insects*. Cambridge University Press, Cambridge. 755 p.

Gupta, A., Soujanya, P.L., van Achterberg, C. & Sekhar, J.C. (2020) *Coccygidium transcaspicum* (Kokujev) (Hymenoptera: Braconidae) parasitizing larvae of invasive pest *Spodoptera frugiperda* (J.E. Smith) (Lepidoptera: Noctuidae) in India. *Zootaxa*, 4750 (2), 293–297. https://doi.org/10.11646/zootaxa.4750.2.13

Gussakovskij, V.V. (1933) Sphecidae et Psammocharidae (Hymenoptera), a cl. N. Zarudnyi in Persia orientali collectae. *Trudy Zoologicheskogo Instituta Akademii Nauk SSSR*, 1, 269–307. [in Russian]

Hadi, F., Ebrahimi, E., Modaress-Najafabadi, S. & Goldasteh, Sh. (2014) Introducing and identification of the species of Sphecidae (Hym) in Khomein (Iran). *Journal of Entomological Research*, 7 (1), 61–82.

Halder, J., Rai, A.B., Kodandaram, M.H., Shivalingaswamy, T.M. & Dey, D. (2012) Mud wasp, *Sceliphron madraspatanum* (Fabricius) (Hymenoptera: Sphecidae): A threat or nature's regulation of spider fauna in the vegetable agroecosystem? *Journal of Biological Control,* 26 (4), 373-375.

Hedwig, K. (1957) Ichneumoniden und Braconiden aus den Iran 1954 (Hymenoptera). *Jahresheft des Vereins für Vaterlaendische Naturkunde*, 112 (1), 103–117.

Jahani, A., Hosseinzadeh Monfared, S., Ghasemi, M. & Shirvany, A. (2020) Mass trapping and identification of insect of mangrove forests (*Avicennia marina*) using cylindrical trap, yellow sticky trap and bucket-color trap (Case study: Minab city). *Journal of Animal Environment*, 11 (4), 211–220.

Jahantigh, F., Rakhshani, E., Mokhtari, A. & Ramroodi, S, (2017) Catalogue of Ampulicidae, Crabronidae and Sphecidae of Iran (Hymenoptera, Apoidea). *Zootaxa*, 4301 (1), 1–96. https://doi.org/10.11646/zootaxa.4307.1.1

Johansson, N., Ameri, A., Riedel, M., Talebi, A.A. & Ebrahimi, E. (2021) Contribution to the Ophioninae (Hymenoptera: Ichneumonidae) of Iran with description of 16 new species and an illustrated key to the *Eremotylus* of the Western Palaearctic. *Zootaxa*, 5023 (2), 151–206. https://doi.org/10.11646/zootaxa.5023.2.1

Kalshoven, L.G.E. (1958) Studies on the Biology of Indonesian Scolytidae. 4. Data o on the habitats of Scolytidae-first part. *Tijdschrift* voor *Entomologie*, 101, 157–180.

Kathiresan, K. & Bingham, B.L. (2001) Biology of Mangroves and Mangrove Ecosystems. *Advances in Marine Biology*, 40, 1–171. https://doi.org/10.1016/S0065-2881(01)40003-4

Kozlov, M.A. & Kononova, S.V. (1985) New Palearctic genera of scelionids (Hymenoptera, Scelionidae) of the fauna of the USSR. *Vestnik Zoologii*, 4, 36–40.

Kozlov, M.A. & Kononova, S.V. (1990) *Scelioninae of the Fauna of the USSR (Hymenoptera, Scelionidae, Scelioninae)*. Nauka, Leningrad. 344 p.

Lashkari-Bod, A., Rakhshani, E. Talebi, A.A., Lozan, A. & Žikić, V. (2011) New records of Cheloninae (Förster, 1862) and Braconinae (Nees, 1811) (Insecta: Hymenoptera: Braconidae) from Iran. *Checklist*, 7 (5), 632–634. https://doi.org/10.15560/7.5.632

Madl, M. (2018) A preliminary catalogue of the Hymenoptera (Insecta) of the Republic of Djibouti. *Linzer biologische Beiträge*, 50, 907–967.

Macintosh, D.J., Aksornkoae, S., Vannucci, M., Field, C.D., Clough, B.F., Kjerfve, B., Paphavasit, N. & Wattayakorn, G. (1981) *Research and its Application in the Management of the Mangroves of Asia and the Pacific*. Final Report of the Integrated Multidisciplinary Survey and Research Programme of the Ranong Mangrove Ecosystem; UNDP/UNESCO regional project. Funny Publishing Limited Partnership, Bangkok, Thailand. 183 p.

Martinuzzi, S., Gould, W.A., Lugo, A.E. & Medina, E. (2009) Conversion and recovery of Puerto Rican mangroves: 200 years of change. *Forest Ecology and Management*, 257, 75–84. https://doi.org/10.1016/j.foreco.2008.08.037

Minab, F., Rakhshani, E., Talamas, E.J. & Ghafouri Moghaddam, M. (2023) A checklist of Platygastridae and Scelionidae (Hymenoptera, Platygastroidea) of Iran. *Journal of Insect Biodiversity and Systematics*, 9 (2), 343–383. https://doi.org/10.52547/jibs.9.2.343

Modarres Awal, M. (1997) *List of Agricultural Pests and their Natural Enemies in Iran*. Ferdowsi University Press, Mashhad. 427 p.

Morice, F. (1921) Annotated lists of Aculeate Hymenoptera (except Heterogyna) and chrysids recently collected in Mesopotamia and North-West Persia. *The Journal of the Bombay Natural History Society*, 27, 816–828.

Mosleh, M., Bernier, C., Zakeri, O. & Ahmadi, A (2023) First report of *Streblote solitaria* (Lepidoptera: Lasiocampidae) damage on *Avicennia marina* trees in southern mangroves of Iran. *Acta Ecologica Sinica*, in press, https://doi.org/10.1016/j.chnaes.2023.08.008

Murphy, D.H. (1990) The recognition of some insects associated with mangroves in Thailand. In: Field, C.D. (ed) *Four papers on Insects and Ground Mesofauna at Ranong*. UNDP/UNESCO. Hongkong, pp. 15–24.

Naseri, M., Bemani, M., Alipanah, H., Noorbakhsh, S. & Zohdi, H. (2024) First report of the fall armyworm, *Spodoptera frugiperda* (Lepidoptera, Noctuidae: Noctuinae) from Iran. *Journal of Entomological Society of Iran*, 44 (1), in press.

Nemkov, P.G. (2016) Digger wasps of the genus Bembix fabricius, 1775 (Hymenoptera: Crabronidae: Bembicinae) of Russia and adjacent territories. *Far Eastern Entomologist*, 313, 1–34.

Noori, P. (1994) The parasitism trend of the wasp *Habrobracon hebetor* Say on *Chloridea* spp. in chickpea fields of Kermanshah Province. *Applied Entomology and Phytopathology*, 61, 22–30.

Norouzi, A., Talebi, A.A., Fathipour, Y. & Lozan, A.I. (2009) *Aparteles laspeyresiellus* (Hymenoptera: Braconidae), a new record for Iran insect fauna. *Journal of Entomological Society of Iran*, 28 (2), 79–80.

Parichehreh, S., Tahmasbi, G., Sarafrazi, A., Tajabadi, N. & Solhjouy-Fard, S. (2020) Distribution modeling of *Apis florea* Fabricius (Hymenoptera, Apidae) in different climates of Iran. *Journal of Apicultural Research*, 61 (4), 469–480. https://doi.org/10.1080/00218839.2020.1775962

Quicke, D.L.J. (1997). *Parasitic Wasps*. Chapman & Hall, London. 470 p.

Safiari, S. (2017) Mangrove forests in Iran. *Journal of Iran Nature*, 2 (2), 49–57.

Salehi, S. & Nazemi-Rafie, J. (2020) Discrimination of Iranian honeybee populations (*Apis mellifera meda*) from commercial subspecies of *Apis mellifera* L. using morphometric and genetic methods. *Journal of Asia-Pacific Entomology*, 23, 591–598. https://doi.org/10.1016/j.aspen.2020.04.009

Sherman, R.E., Fahey, T.E. & Martinez, P. (2001) Hurricane impacts on a Mangrove forest in the Dominican Republic: Damage patterns and early recovery. *Biotropica*, 33 (3), 393–408. https://doi.org/10.1111/j.1744-7429.2001.tb00194.x

Taylor, M., Ravilious, C. & Green, E.P. (2003) Mangroves of east Africa.*UNEP–WCMC Biodiversity Series*, 13, 1–24.

Tobias, V.I., ed. (1986) [*Keys to the Insects of the European Part of the USSR. Volume III Hymenoptera. Part IV*.] Nauka Publisher, Leningrad. [English translation published in 1995, Science Publishers, Inc., New Hampshire]. 883 p.

Yu, D.S., van Achterberg, C. & Horstmann, K. (2016) World Ichneumonoidea 2011. Taxonomy, Biology, Morphology and Distribution. Taxapad, Vancouver, Canada.

Zahed, M.A., Rouhani, F., Mohajeri, S., Bateni, F., & Mohajeri, L. (2010) An overview of Iranian mangrove ecosystems, northern part of the Persian Gulf and Oman Sea. *Acta Ecologica Sinica*, 30 (4), 240–244. https://doi.org/10.1016/j.chnaes.2010.03.013

مطالعه فون بال‌غشاییان رویشگاه‌های حرا در سواحل خلیج فارس و دریای عمان

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چکیـــده: راسته بال‌غشاییان گروه مهمی از حشرات دارای اهمیت اکولوژیک و اقتصادی بوده و به عنوان نشانگرهای اکولوژیک نیز شناخته می شوند. پژوهش در مورد تنوع و انتشار فون به عنوان پیش‌شرط‌های حفاظت از تنوع زیستی مورد توجه قرار دارد. در این تحقیق، فون بال غشاییان رویشگاهای حرا در سواحل خلیج فارس و دریای عمان طی سال‌های ۱۴۰۱-۱۴۰۰ مورد بررسی قرار گرفت. نمونه‌ها به وسیله تور جارو و تله نوری جمع‌آوری گردید. تعداد ۱۰ گونه متعلق به ۹ جنس و ۷ زیرخانواده مختلف شناسایی شدند. از بین آنها دو گونه *Ampulex assimilis* Kohl, 1893 از خانواده Ampulicidae و *Paridris leda* Kozlov & Kononova, 1985 از خانواده Scelionidae گزارش جدید برای ایران بودند. پراکنش جغرافیایی همه گونه‌ها در ایران و جهان و خصوصیات مهم ریخت‌شناسی دو گزارش جدید ارایه شد.

واژگـــان کلیدی: نوار ساحلی، فون، هرمزگان، بال‌غشاییان، پارازیتوییید، نمک‌زار جنگلی