On the distribution and taxonomy of vespine wasps of Iran
(Hymenoptera: Vespidae: Vespinae)

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DVOŘÁK L., GHAHARI H., CARPENTER J.M. & ABBASI R. 2012: On the distribution and taxonomy of vespine wasps of Iran (Hymenoptera: Vespidae: Vespinae). *Acta Musei Moraviae, Scientiae biologicae* (Brno) 97(2): 69–86. – Nine species from three genera (*Dolichovespula* Rohwer, 1916, *Vespa* Linnaeus, 1758, and *Vespula* Thomson, 1869) of vespine wasps have hitherto been published from Iran. We summarize the published data on Iranian Vespinae, and also give new distributional records for the species. Only six species, for which specimens were checked by the senior author or by J. M. Carpenter, are considered as actually forming the fauna of Iran in this paper: *Vespa orientalis* Linnaeus, 1771, *Vespa crabro* Linnaeus, 1758, *Vespula germanica* (Fabricius, 1793), *Vespula vulgaris* (Linnaeus, 1758), *Dolichovespula sylvestris* (Scopoli, 1763), and *Dolichovespula omissa* (Bischoff, 1931). The occurrence of another three species, published by Iranian researchers, was not confirmed: *Vespula rufa* Linnaeus, 1758, *Dolichovespula saxonica* (Fabricius, 1793), and *Dolichovespula media* (Retzius, 1783). In addition to the synonymies and distributional data, an identification key is given for all the recorded species. The presence of *Dolichovespula omissa* Bischoff, 1931, in Iran is verified.

**Key words.** Hymenoptera, Vespidae, Vespinae, taxonomy, distribution, Iran

**Introduction**

Scattered literature has presented data on the vespine wasps of Iran. The monograph of Du Buysson (1905) is more than 100 years old, and contains the first description of a new taxon with Iran as type locality. Pérez (1910) then described another taxon from the Caspian region. Subsequent works focussing on the social wasp fauna of Iran are the studies of Du Buysson (1912) and Morice (1921). Descriptions of hornets from Iran and some faunistic data were later published by Birula (1925ab, 1930). Bequaert (1931) commented on color forms in *Vespa crabro* Linnaeus, 1758. Blüthgen & Guesenleitner (1970) published a very complex study with the records of numerous species from many localities on the vespid fauna of Iran. New faunistic data were provided in the study of Guiglia (1977). Two papers by Archer (1981, 1992) were focussed on *Vespa crabro* and the *Dolichovespula sylvestris* (Scopoli, 1763) species group, and contained data pertinent

The objective of this paper is to summarise the available published data on Iranian Vespinae, as well as present new data, and also discuss some aspects of the fauna. Additionally, an identification key is prepared for all the vespine species reported from Iran.

Material and methods

Museum and private collections housing material discussed in this contribution are abbreviated in the text as follows:

AMNH .......................... American Museum of Natural History, New York, USA
BMNH ........................... The Natural History Museum, London, United Kingdom
HGTI ................................. H. Ghahari, Tehran, Iran
HNHM ................................. Hungarian Natural History Museum, Budapest, Hungary
JGLA ...................................... J. Gusenleitner, Linz, Austria
LCTS ................................. L. Castro, Teruel, Spain
LDTC ................................. L. Dvořák, Tri Sekery, Czech Republic
MMBC .................................. Moravian Museum, Brno, Czech Republic
MSI ...................................... Maryam Salehifard, Iran
MZL ..................................... Museum of Zoology, Lausanne, Switzerland
NMPC .................................. The National Museum, Prague, Czech Republic
OLM ..................................... The Upper Austrian State Museum, Linz, Austria
RAI ...................................... R. Abbasi, Iran
SMNS .................................. Natural Museum of Nature Sciences Stuttgart, Stuttgart, Germany
SMF ...................................... Senckenberg Museum, Frankfurt, Germany
ZMMU .................................. Zoological Museum of Moscow State University, Russia

The material studied personally by the senior author was identified according to Archer (1989); the nomenclature and species distribution follow Carpenter & Kojima (1997) at the species level.

The acronym meW (= worker) is used throughout the text.

Results

Key to Vespinae reported from Iran

This key contains all the species reported from Iran so far, meaning all verified as well as dubious species. The key is modified from those by Archer (1989) and Dvořák & Roberts (2006). The metasomal terga are denoted as tergum I, etc.
1. Vertex long: distance from posterior ocellus to posterior margin of head 3–4 times as long as distance from ocellus to compound eye (Fig. 1). *Vespa* Linnaeus, 1758. ................................................................. 2.
   - Vertex short: distance from posterior ocellus to posterior margin of head only slightly longer than distance from ocellus to compound eye (Fig. 2). ........................................................................................... 3.

2. Body brown and yellow; tergum V entirely brown. ..............................
   .......................................................................................... *Vespa orientalis* Linnaeus, 1771
   - Body black, yellow, and reddish; tergum V almost entirely yellow. ........
   .......................................................................................... *Vespa crabro* Linnaeus, 1758

3. Oculo-malar space short: distance between mandible and lower margin of eye shorter than width of antennal scapus (Fig. 3). *Vespula* Thomson, 1869. ................................................................. 4.
   - Oculo-malar space long: distance between mandible and lower margin of eye the same or longer than width of antennal scapus (Fig. 4). *Dolichovespula* Rohwer, 1916. ................................................................. 6.

4. Ocular sinus yellow only in the lower part; tergum I with black hairs. ....
   .......................................................................................... *Vespula rufa* (Linnaeus, 1758)
   - Ocular sinus entirely yellow; tergum I with pale hairs. ................. 5.

5. Margin behind third mandibular tooth distinctly concave (Fig. 5). Males: aedeagus without small backwardly directed pointed barb on each side bellow apical spoon-shaped region; aedeagus emarginate apically (Fig. 7). .................................................. *Vespula germanica* (Fabricius, 1793)
   - Margin behind third mandibular tooth straight (Fig. 6). Males: aedeagus with small backwardly directed pointed barb on each side bellow apical spoon-shaped region; aedeagus rounded apically (Fig. 8). .................
   .......................................................................................... *Vespula vulgaris* (Linnaeus, 1758)

6. Pronotum rugose on lower side (Fig. 4); ocular sinus almost entirely yellow. ........................................ *Dolichovespula media* (Retzius, 1783)
   - Pronotum not rugose on lower side (Fig. 3); ocular sinus yellow only in lower part. ................................................................. 7.

7. Lower third of clypeus with sparse and fine punctures, distances between punctures on the center of clypeus larger than puncture diameter (Fig. 9); clypeus usually with black longitudinal stripe, which is sometimes reduced to 1–3 black spots in middle; exceptionally completely yellow. .................................................. *Dolichovespula saxonica* (Fabricius, 1793)
   - Lower third of clypeus with dense and coarse punctures, distances between punctures on the center of clypeus more or less equal to puncture diameter (Fig. 10); clypeus usually entirely yellow, rarely with 1–3 black spots in middle. ................................................................. 8.

8. Anterior angles of clypeus sharply produced and pointed apically in queens (Fig. 10) and sharply rectangular in males; sting distinctly
curved. Parasitic species, without workers. Males: paramere narrow in
dorsal view, inner (medial) side parallel for basal 3/4 of length, then
slightly lobate and not produced apically (Fig. 11).

- Anterior angles of clypeus bluntly produced in all castes (Fig. 9). Sting
straight. Males: paramere wide in dorsal view, inner (medial) side
emarginate basally, then parallel and produced apically (Fig. 12).

**Dolichovespula sylvestris** (Scopoli, 1763)

**Review of the species**

A total of nine vespine species from three genera have been recorded from Iran by
different researchers. Since the basis of the records for three species is unclear, only six
species are considered as actually forming the Iranian fauna in this study, as discussed
below. The list of species with synonymies and distributional data and some comments are
given below. A map indicating the provinces of Iran is provided in Fig. 13.

**Genus Vespa Linnaeus, 1758**

*Vespa crabro Linnaeus, 1758*

= *Vespa crabro germana* Christ, 1791
= *Vespa crabro var. caspica* Pérez, 1910

E, 890 m, 26.vi.2001, 2 WW, T. Osten leg., J. Gusenleitner det. (SMNS); 5 km E Nowshahr, 1.vi.1976, 1 ♀, C. Holzschuh and F. Ress leg., J. Gusenleitner det. (JGLA); Bozak, 11.ix.1955, 1 W, F. Schmid leg., determiner
unknown (MZL); Nooshahr (=Now Schahr), 4.viii.1961, 1 W, J. Klapperich leg., L. Dvořák det. (HNHM).

**Distribution in Iran** (Fig. 14). East Azarbayan (SAKENIN et al. 2010), Golestan (EBRAHIMI & CARPENTER 2008, 2012, this paper), Guilan (PÉREZ 1910, MORICE 1921, EBRAHIMI & CARPENTER 2008), Ilam (this paper), Khuzestan (ABD-RABOU et al. 2005), Mazandaran (EBRAHIMI & CARPENTER 2008, 2012, this paper).

**General distribution.** British Isles, Europe except extreme north and south; Asia east to
Japan and south to Iran, and China; introduced into North America and Guatemala
(CARPENTER & KOJIMA 1997, LANDOLT et al. 2010).

**Remarks.** Pérez (1910) described the form *Vespa crabro caspica* from the Caspian
region. Fifteen years later, Birula (1925a,b) described *Vespa crabro meridionalis* from
the same region. These descriptions agree with each other, hence it is evident that both
authors described the same taxon. Bequaert (1931) commented on data from Pérez
(1910), Birula (1925b), and Morice (1921). Dubatolov et al. (2003) published an essay
about the *Vespa crabro* subspecies described by Birula (1925a,b). As Dubatolov et al.
(2003) established, the earlier published paper is Birula (1925a), so the correct
authorship of his *Vespa crabro meridionalis* is Birula, 1925a: 55. Archer (1992)
mentioned that some specimens from Iran lack a yellow patch on tergum II, which is
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typical for *V. crabro caspica* or *V. crabro meridionalis*, so he included Iranian populations in his west European form (*V. crabro germana* Christ, 1791). On the other hand, ARCHER (1992) noted that Iranian populations (with or without a yellow patch on tegrum II) differ also by a darker tegrum III. In fact, *Vespa crabro* is a species very variable in color. The presently prevailing taxonomic point of view does not accept any subspecies in this very plastic and widely distributed species. Also, MORICE (1921) reported a record from Guilan province under the name *Vespa crabro crabroniformis* Smith, 1852, but this form is restricted to China (ARCHER 1992).

*Vespa orientalis* Linnaeus, 1771

= *Vespa orientalis* aegyptiaca André, 1884


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Figs 1–6. 1 – Vespa orientalis, vertex. 2 – Dolichovespula omissa, vertex. 3 – Vespula rufa, thorax from lateral view. 4 – Dolichovespula media, thorax from lateral view. 5 – Vespula germanica, mandibles. 6 – Vespula vulgaris, mandibles. Photos: J. M. Carpenter.
Mohammadabad, 3.–5.v.1973, 1♀, viii.2003, 1♀, Ghaemshahr, 12 m, i.2001, 1♂, W, G. Omidi leg., L. Dvořák det. (LDTC); Sari, 15 m, iv.2005, 1♀, H. Barimani leg., L. Dvořák det. (destr); Savadkooh, 550 m, xi.2005, 1♀, Dvořák det. (LDTC).

V. Major leg., J. Gusenleitner det. (OLM).

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Gusenleitner det. (OLM).


General distribution. Southern Italy; southeastern Europe; northern Africa; Arabian peninsula; Asia east to India, Nepal, and China: Xinjiang; introduced into Madagascar and Mexico (Carpenter & Kojima 1997, Dvořák 2006).

Remarks. Morice (1921) reported V. orientalis aegyptiaca from Ghazvin. Richards (1985: 427) noted regarding this form “The Egyptian populations seem to be rather variable but do not differ essentially from V. o. orientalis L.”. Archer (1998a) agreed with this conclusion.

This species is widely distributed and plentiful in Iran (Fig. 15).

Genus *Vespula* Thomson, 1869

= Pseudovespa Schmiedeknecht, 1881
= Paravespula Blüthgen, 1938
= Allovespula Blüthgen, 1943
= Rugovespula Archer, 1982


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Distribution in Iran (Fig. 16). East Azerbayan (EBRAHIMI & CARPENTER 2008, this paper), Fars (EBRAHIMI & CARPENTER 2008, this paper), Ghazvin (MORICE 1921, this paper), Golestan (this paper), Guilan (MORICE 1921, this paper), Hamadan (this paper), Isfahan (LEHR et al. 2007, EBRAHIMI & CARPENTER 2008, this paper), Kerman (EBRAHIMI & CARPENTER 2008, this paper), Kermanshah (DU BUYSSON 1912, MORICE 1921, this paper), Khorasan (BLÜTHGEN & GUSENLEITNER 1970, GUGLIA 1977, EBRAHIMI & CARPENTER 2008, this paper), Khuzestan (this paper), Kohguluyeh and Boyerahmad (EBRAHIMI & CARPENTER 2008, this paper), Kordestan (EBRAHIMI & CARPENTER 2008, this paper), Lorestan (EBRAHIMI & CARPENTER 2008, this paper), Markazi (EBRAHIMI & CARPENTER 2008, this paper), Mazandaran (EBRAHIMI & CARPENTER 2008, this paper), Qom (EBRAHIMI & CARPENTER 2008), Semnan (this paper), Sistan and Baluchestan (EBRAHIMI & CARPENTER 2008), Tehran (EBRAHIMI & CARPENTER 2008, this paper), West Azerbayan (EBRAHIMI & CARPENTER 2008, this paper), Yazd (this paper), Zanjan (ABBASI et al. 2008, this paper).

Figs 16–17. Distribution in Iran: 16 – Vespula germanica. 17 – Vespula vulgaris (only verified data were accepted).


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**General distribution.** Europe; northern Africa; Asia east to Korea and south to northern India; introduced into many regions of the world: Iceland, New Zealand, Australia, Ascension Island, South Africa, Chile, Argentina, USA, Canada (CARPENTER & KOJIMA 1997).

**Remarks.** This species is widely distributed and plentiful in Iran (Fig. 16).

**Vespula rufa (Linnaeus, 1758)**

Published data from Iran: East Azarbayan (SAKENIN et al. 2010), Kordestan (ABD-RABOU et al. 2005).

**General distribution:** Europe except extreme south; Turkey; through Siberia to Nepal, Russian Far East, Korea, and Japan; Canada; northern USA (CARPENTER & KOJIMA 1997).

**Remarks.** The senior author has as yet not had any possibility to study the reported material of this species. The occurrence of this species in mountain regions of north and northwestern Iran is possible, as it is widely distributed from Europe to East Asia (see the distribution map in Fig. 3 of ARCHER (1997)), but the accuracy of the cited records is unclear. We therefore do not consider this species as a part of the Iranian fauna, pending confirmation of the identification of specimens.

**Vespula vulgaris (Linnaeus, 1758)**

**Material.** Khorasan: Mashhad (Torogh), 900 m, 17.ix.2010, 2 WW, M. Salehifard leg., J. M. Carpenter det. (MSI et AMNH).

**Distribution in Iran** (Fig. 17): Kermanshah (ABD-RABOU et al. 2005), Khorasan (this paper).

**General distribution.** Europe except extreme south; Asia south to Kazakhstan, Mongolia, Kashmir, northern China, east to Korea and Japan; introduced into Iceland, New Zealand, and Australia (CARPENTER & KOJIMA 1997). Note that this species was considered to be Holarctic, but CARPENTER AND GLARE (2010) have recently shown that this was based on misidentification of North American specimens.

**Remarks.** Iran has been listed in its distribution by ARCHER (1989: 37) and also see maps in Fig. 5 of ARCHER (1998b), and Fig. 1 of ECK (1999). However, no precise locality has ever been published by Archer or Eck. The accuracy of the record of ABD-RABOU et al. (2005) is unclear, so the only exactly confirmed record of *V. vulgaris* from Iran is our one presented in the paper.

**Genus Dolichovespula Rohwer, 1916**

≡ *Pseudovespula* Bischoff, 1931
≡ *Boreovespula* Blüthgen, 1943
≡ *Metavespula* Blüthgen, 1943


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Dolichovespula media (Retzius, 1783)

Published data from Iran: East Azarbayjan (SAKENIN et al. 2010), Hamadan (ABD-RABOU et al. 2005).

General distribution: Europe except extreme south; northern Africa; Asia south and east to southern Siberia, Mongolia, China, Korea, and Japan (CARPENTER & KOJIMA 1997).

Remarks. The senior author has as yet not had any possibility to study the reported material of this species. The occurrence of this species in north and northwestern Iran is possible, but the accuracy of the cited records is unclear, and the distribution map in Fig. 3 of ARCHER (1999) has no points in Iran. Therefore, we do not consider this species as a part of the Iranian fauna, pending confirmation of the identification of specimens.

Dolichovespula omissa Bischoff, 1931


Distribution in Iran (Fig. 18). Tehran (this paper).

General distribution. Europe except extreme south; Turkey; Russia and Kazakhstan east to 90° E (CARPENTER & KOJIMA 1997).

Remarks. ARCHER (1989) listed this species from numerous countries including Iran. ARCHER (1999: Fig. 2) plotted two points on a map in southern Iran, but these records were not specified. This species was not listed in EBRAHIMI & CARPENTER (2008), therefore our record from Tehran is the first precise published locality of D. omissa from Iran.
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**Dolichovespula saxonica** (Fabricius, 1793)

**Published data from Iran:** East Azarbayjan (GHAHARI et al. 2007, SAKENIN et al. 2010), West Azarbayjan (ABD-RABOU et al. 2005).

**General distribution:** Europe except extreme south; Asia south and east to southern Siberia, Mongolia, China, Korea, and Japan (CARPENTER & KOJIMA 1997).

**Remarks.** The senior author has as yet not had any possibility to study the reported material of this species. The occurrence of this species in north and northwestern Iran is possible, but the accuracy of the cited records is unclear, and the distribution map in fig. 6 of ARCHER (1999) has no points in Iran. Therefore, we do not consider this species as a part of the Iranian fauna, pending confirmation of the identification of specimens.

**Dolichovespula sylvestris** (Scopoli, 1763) = *Vespa silvestris* \[!] var. *sumptuosa* du Buysson, 1905

**Material.** Golestan: Shahkooh (= Schahkuh), 1 ♀ 1 W, A. Giordani Soika det., L. Dvořák revid. (HNHM).


**Distribution in Iran** (Fig. 19). East Azarbayjan (EBRAHIMI & CARPENTER 2008), Golestan (this paper), Guilan (ARCHER 1981), Khuzestan (ARCHER 1981), Kohguiluyeh and Boyerahmad (CASTRO & DVOŘÁK 2009), Mazandaran (ABD-RABOU et al. 2005, EBRAHIMI & CARPENTER 2008, this paper), Tehran (ARCHER 1981, EBRAHIMI & CARPENTER 2008, this paper), West Azarbayjan (BIRULA 1930, ARCHER 1981, BLÜTHGEN & GUSENLEITNER 1970).

**General distribution:** Europe except extreme north; Morocco; through southern Siberia to Afghanistan, Pakistan, Kashmir, Mongolia, and China (CARPENTER & KOJIMA 1997).

**Remarks.** DU BUYSSON (1905) described *Vespa silvestris* var. *sumptuosa* from “Perse centrale”. This form or subspecies is about as common as the nominotypical form in Iran. The Iranian specimens mentioned by BIRULA (1930), BLÜTHGEN & GUSENLEITNER (1970), ARCHER (1981), and CASTRO & DVOŘÁK (2009), as well as all the material deposited in HNHM belongs to this taxon. ARCHER (1989) ranked *sumptuosa* as a valid subspecies of *Dolichovespula sylvestris*, but ARCHER (1999, 2006) did not. CASTRO & DVOŘÁK (2009) summarised the distribution of form/subspecies *sumptuosa*.

*Dolichovespula sylvestris* is distributed in northern and southwestern parts of Iran, with very rare occurrence in southern provinces.

**Conclusions**

For four of the six species that we consider to comprise the fauna of Iran there are numerous locality records. However, all the regions of Iran have not been thoroughly sampled so far and surely other new distributional records are expected for the species.
The recent review on Iranian vespids by Ebrahimi & Carpenter (2008) documented several new distributional records mostly based on recent collections. Iran forms a large part of the Iranian plateau, and covers an area of 1,623,779 km² incorporating various geographical regions and climates (Fig. 13), the southern coast of Indian Ocean being known as zoogeographical bridge between Afrotropical and Oriental Regions. Therefore, with attention to the fauna of adjacent countries of Iran, we expect that some other vespine species (commented above as doubtful) remain to be discovered in Iran. To find new species and also new distributional records, more samplings and surveys should be conducted on this insect group in Iran. This highlights the general need for future collecting to gain a better knowledge of Iranian vespid biodiversity. The three species we consider as dubious have either had Iran included in their distributions without precise localities, or are based on questionable identifications. We hope that the further samplings in different regions of Iran will result in the collection of other vespine species, especially the doubtful species.

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