

Further records of ants (Hymenoptera: Formicidae) from Iran

Shahrokh Pashaei Rad^a, Brian Taylor^b, Roshanak Torabi^a, Ebrahim Aram^a,
Giti Abolfathi^a, Rezvan Afshari^a, Fatemeh Borjali^a, Maryam Ghatei^a, Fouzihe Hediary^a,
Farzaneh Jazini^a, Vala Heidary Kiaha^a, Zeynab Mahmoudi^a, Fatemeh Safariyan^a
and Maryam Seiri^a

^aDepartment of Zoology, Faculty of Biological Science, Shahid Beheshti
University, Teheran; ^bWilford, Nottingham, United Kingdom

(Received 18 January 2018; accepted 13 February 2018)

Wide ranging surveys of the ant fauna of Iran have enabled us to add a further 30 named species to the country list. A review of almost all the published literature and of photographs of unidentified specimens within the public domain gives a grand total of 248 species, from seven subfamilies and 37 genera. In the majority of instances, our own specimens were compared with type images available from antweb.com. This has led us to propose new or revised status for *Cataglyphis turcomanica* Crawley 1920, *Lepisiota integrisquama* (Kuznetsov-Ugamsky, 1929), *Lepisiota surchanica* (Kuznetsov-Ugamsky, 1929) and *Messor obscurior* Crawley 1920. We note that the total includes a number of what may be misidentifications and a small number of named species that seem unlikely to occur in Iran.

Keywords: Iran; ant distribution; Formicidae

Introduction

We have endeavoured to summarise records of ants (Hymenoptera: Formicidae) from Iran. Our findings are additional to those in Moradloo, Fard, Rad, and Taylor (2015), who collated all known papers and reported findings from the north eastern province of Khorazan Razavi and the north-western Zanjan Province. The following reports have come to light since: Ghahari, Collingwood, Havaskary, Ostova, and Samin (2011), Ghahari and Collingwood (2011), Ghahari, Sharaf, Aldawood, and Collingwood (2015), Ghobadi, Agosti, Mahdavi, and Jouri (2015), Hosseini, Awal, and Hosseini (2015), Hosseini, Hosseini, Katayama, and Mehrparvar (2017), Hossein Nezhad (2014), Joharchi, Halliday, Saboori, and Kamali (2011), Khandehroo, Moravvej, Namghi, and Fekrat ((2015), Kiran, Alipanah, and Paknia (2013), Latibari, Khormizi, Moravvej, and Sadeghi Namaghi (2017), Mashaly, Al-Mekhlafi, and Al-Qahtani (2013), Mirzamohamadi, Hosseini, Sadeghi Namaghi, Karimi, and Mehrparvar (2015), Mohammadi, Mosadegh, and Esfandiari (2012), and Mortazavi, Sadeghi, Aktac, Depa, and Fekrat (2015). Not all of these give species names. Here we report on collections made in twelve areas of Iran, helping to move to a comprehensive knowledge of what ant species are to be found in this large country and the diversity of species within the greatly differing ecological regions.

New collection records

The records from our collections can be seen in Appendix 1. All the records are of workers unless stated. For most species reference numbers are given to type specimen images now available on

*Corresponding author. Email: dr.brian.taylor@ntlworld.com

Antweb.org. The images can be sighted by entering the number, e.g. ANTWEB100468 and CASENT0904019, into the search box on a web browser. The search box on the Antweb site no longer leads to the specimen. Images of our specimens can be sighted by accessing the lists on the second author's website commencing at http://antsafrica.org/ant_species_2012/miscellaneous_ants_iran_list.htm. Those lists are the result of an intensive effort to review all the literature and to collate images of type specimens and many Iran specimens now to be found on the major web sites, antweb.org and AntBase.net (accessed at the beginning of October 2017). A referee has drawn attention to some of the following nomenclature differing from the "on-line" catalogue, AntCat.org. That does not have valid ICZN status and, so, we prefer to use the nomenclature in the published works, such as Bolton (1995). The name of the author K. V. Arnoldi is as given in the short abstracts in German on all his works.

DOLICHODERINAE

Dolichoderus quadripunctatus (Linnaeus, 1771). Type location Germany, no type images. Prior Iran records in Paknia, Radchenko, Alipanah, and Pfeiffer (2008). Additional findings: Ghatei 01, Rezvanshahr, Guilan; Borjali 01, Rasht. On ground and trees. Caspian moist littoral area.

Tapinoma erraticum (Latreille, 1798). Type location France, neotype images, ANTWEB1008468. Prior Iran records in Paknia et al. (2008). Additional findings: Safariyan 12, Salvat abad village; Jazini 16, Fada'ian Aslam Park, Tehran; Borjali 34, Si-ahkhal. On ground, moderate to low rainfall area.

Tapinoma karavaievi Emery, 1925. Type location imprecise. Emery (1925) gave the type location as "Turkestan", he also reported a specimen from Astrabad (northern Iran). The Emery specimens, e.g. as shown at CASENT0904019, are not from the original report by Mayr (1877, as "*Tapinoma nigerrimum*") of collections in Turkestan, in an area most probably in (now) Uzbekistan, but from Imam-Baba, Turkmenistan. Prior Iran records in Paknia et al. (2008). Additional findings: Seiri 16, Tehran area: Jazini 11, Fada'ian Aslam Park, Tehran. On ground moderate to low rainfall area.

Tapinoma simrothi Krausse, 1911. Type location Sardinia. Prior Iran records listed by Ghahari et al. (2015). Additional findings: Heidary 16, Sayyedhashemi; Mahmoodi 08, Javan-Mardan-e- Park; Aram 33, Nowdeh. On ground and trees. On ground moderate to low rainfall area.

FORMICINAE

Camponotus (Myrmentoma) lateralis (Olivier, 1792). Type location France, no type images; see junior synonym *balearis*, CASENT0912190. Mohammadi, Mossadegh, and Esfandiari (2012): Fars Province. New finding: Borjali 03, Chaf & Chamkala. Found on city plant, Caspian moist littoral area.

Camponotus (Myrmentoma) rebecca Forel, 1913. Type location Syria, CASENT0910432. Prior Iran records summarised by Moradloo et al. (2015). Additional findings: Safariyan, 07, Zagros; Mahmoodi, 25, Javan-Mardan-e-Iran Park; Kia, 03, Kokab Park. On ground moderate to low rainfall area.

Camponotus (Myrmentoma) starvi Pisarski, 1971. Type location Iraq, no type images but original drawings. Prior Iran record in Paknia, Radchenko, and Pfeiffer (2010). Additional finding: Torabi 03, Afif Abad Garden, Shiraz. Garden under tree, low rainfall area.

Camponotus (Myrmosericus) armeniacus Arnoldi, 1967. Type location Armenia, non-type images CASENT0910245 (Iran). Prior records summarised by Moradloo et al.

(2015). Additional findings: Aram 08, Bijar; Torabi 02, Saheli, Shiraz; Safariyan 08, Bijar Protected area. On ground and plant. Moderate to low rainfall.

Camponotus (Tanaemyrmex) aethiops (Latreille, 1798). Type location France, no type images. Subspecies *cashmiriensis*, CASENT0910186. Prior Iran records in Paknia et al. (2008). New findings: Torabi 04, Dar al Rahme; Kia 04, Kokab Park, Qom. On plant and ground, moderate to low rainfall area.

Camponotus (Tanaemyrmex) evansi Crawley, 1920. Type location Iraq, N.E. of Baghdad, 1919. No images on Antweb (April 2017). No prior Iran records. New findings: Seiri 07, Tehran area; Ghatei 02, Khomam, Guilan. On plant and ground. Moist and moderate rainfall.

Camponotus (Tanaemyrmex) fellah Emery, 1891. Type location Egypt, CASENT0905293 (minor worker). The catalogue of Dalla Torre (1893) listed the species as *Camponotus oasisium* var. *fellah* Emery, 1891. Whilst the catalogue as a whole was edited by Dalla Torre, Volume VII is attributed to Carl Emery. Crawley (1920b: 178) noted a single worker from “Mesopotamia” or “North-West Persia” that was “probably var. *oasisium* or possibly var. *fellah* but impossible to determine without a major worker”. Prior Iran records in Paknia et al. (2008). Additional findings: Aram 03, Kamardarak; Aram 04, Dayukandi; Aram 07, Kazaj; Aram 23, Dayukandi; Safariyan 04, Bijar; Safariyan 06, Zagros; Heidary 03, Torman. Mostly on ground. Heidary collection in desert, others in moderate rainfall, montane areas.

Camponotus (Tanaemyrmex) ruzskyellus Forel, 1922 (as *Camponotus (Myrmoturba) maculatus* F. r. *ruzskyellus* n. stirps; raised to species Emery 1925: 104). Type location Armenia, CASENT0910314, also reported from Iraq. The synonymy under *C. oasisium* by Radchenko (1997b: 809) appears wrong as shown by the very clear differences between the wholly pale type and the likely dark brown workers of *oasisium* from North Africa (B.T., pers. observ.). No prior Iran reports. New findings: Aram 2, Kamardarak; Seiri 12b, Tehran area. On ground and under rock, moderate rainfall, montane areas.

Camponotus (Tanaemyrmex) sanctus Forel, 1904. Type location Israel, CASENT0249880. Prior Iran records in Paknia et al. (2008). Additional findings: Torabi 05, Azadi Park; Afshari 06, Bideh, Semirom; Borjali 02, Alborz. On ground and at least moderate rainfall.

Camponotus (Tanaemyrmex) turkestanicus Emery, 1887. Type location Turkestan, CASENT0905137. Prior Iran records in Paknia et al. (2008). New finding: Heidary 02.2, Laverekhasht. On garden soil, very low rainfall area.

Camponotus (Tanaemyrmex) xerxes Forel, 1904. Type location Iran, CASENT0905292. Prior records summarised by Moradloo et al. (2015). Additional findings: Aram 04, Dayukandi; Aram 06, Kamardaraq, 21.vii.2012; Safariyan 04, Bijar; Torabi 01, Beheshti, Shiraz; Seiri 09, 10, 11, 12a, Tehran area; Heidary 02.1, Laverekhasht; Afshari 05, Semirom; Borjali 36 & 38, Alborz. All on ground. Widespread.

Cataglyphis albicans armenus (Roger, 1859, j. syn. *armenus* Arnoldi, 1964) CASENT0903292. Type location North Africa; *armenus* from Armenia. There are no type images of *Cataglyphis albicans* so the trinomial *armenus* is used here. Prior records summarised by Moradloo et al. (2015). Additional finding: Heidary 08, Lamerd. Ice cream bait in desert.

Cataglyphis alibabae Pisarski, 1965. Type location Iraq, no type images but type drawings. No prior Iran records. New finding: Torabi 08, Baba Kouhi, Shiraz. Under a stone in low rainfall forest.

Cataglyphis bellicosus Karavaiev, 1924. CASENT0905721. Type location Iran, Douchat-Abad, nr. Tehran, Bocquillon, 23.ix.1916. Prior records summarised by Moradloo et al. (2015). Additional findings: Aram 19, Mazraeh; Safariyan 02, Abider Park; Abolfathi 06, Khomeini Square, Borujerd; Abolfathi 10, Chogha Hill, Borujerd; Heidary 04, Chahkour; Kia 08, Janat Abad, Qom; Borjali 37, Alborz; Jazini 23, Behesht-Zahra Park. All on ground. Widespread.

Cataglyphis cuneinodis Arnoldi, 1964. Type location Azerbaijan, no type images or drawings. Reported from Iran and raised to species by Radchenko (1997a). Additional finding: Safariyan 01, Ghajoor Bridge. Pitfall trap, moderate rainfall.

Cataglyphis emeryi (Karavaiev, 1910). Type location Turkmenistan, CASENT091110. Prior Iran records in Paknia et al. (2008). Additional finding: Kia 11, Veshnaveh, Qom. On ground in village, moderate rainfall, montane area.

Cataglyphis foreli (Ruzsky, 1903). Type location Russia, CASENT0911118. Listed from Iran by Radchenko (1998). Additional finding: Afshari 12, Ghale Ghadam, Semirom. On ground in field, low rainfall area.

Cataglyphis frigidus (André, 1881). Type location Syria, CASENT0102117 (probably a media worker). *Cataglyphis persicus* minor matches type. Prior Iran records in Paknia et al. (2008). Additional findings: Aram 15 & 32, Firuzabad; Torabi 12, Enghelab Park, Shiraz. On ground, moist to moderate rainfall. The majors of Paknia ZMGU1419 (held by B.T.) and Torabi 12 are identical, minors of both match the *persicus* type.

Cataglyphis kurdistanicus Pisarski, 1965. No type images but good drawings in Pisarski (1965). Type location Iraq. Prior records summarised by Moradloo et al. (2015). Additional findings: Aram 14, Jafarabad; Abolfathi 11, Gazza Square, Borujerd City; Afshari 14, Sha Ja'far, Semirom. On ground, medium to low rainfall.

Cataglyphis lividus (André, 1881). CASENT0905499. Type location Israel; subspecies *luteus* from Iran. Prior records summarised by Moradloo et al. (2015). Additional findings: Aram 18, Hashtjin; Safariyan 27, Seidan Village; Kia 10, Jamkarak, Qom; Afshari 13, Vanak, Semirom. On ground and trees, medium to low rainfall.

Cataglyphis longipedem (Eichwald, 1841). Type location Turkmenistan (Eichwald gave Krasnowodsk, or Krasnovodsk, but now Türkmenbaşy, which once was in Russia), no images on Antweb. Recorded from Iran by Crawley (1920b). Additional findings: Seiri 03, Khojir National Park; Jazini 22, Lavisian Park. On ground, forest, moderate rainfall.

Cataglyphis niger (André, 1881). Type location Israel, no type images but see the type of *Cataglyphis bicolor* F. stirps *nigra* André v. *caerulescens*, Santschi, 1929: 50, worker) from Syria CASENT0912212. Prior Iran records in Paknia et al. (2008). Additional findings: Aram 20, Nowdeh; Heidary 06, Khayrgou; Heidary 07, Ashkenan; Kia 09, Kahak, Qom. Moderate to very low rainfall.

Cataglyphis nodus (Brullé, 1832). Type location Greece, no type images but junior synonyms, e.g. *orientalis* (Forel, 1895). Type location Turkey (on label), CASENT091115. Prior Iran records in Paknia et al. (2008). Additional findings: Aram 20, Kamaradaraq; Abolfathi 07, Chogha Hill, Borujerd; Kia 07, Kohe Sefid, Qom; Mahmoodi 02, 03 & 04, Khoosar National Park. On parkland ground, moderate rainfall.

Cataglyphis rockingeri (Forel, 1911), CASENT0911109, where it is listed under *C. aenescens* (Nylander). Type location Kazakhstan. The type and the Iran workers are larger than what seems likely to be the type form *aenescens* and is uniformly dark rather than having lighter reddish areas; the overall appearance is almost silky due to the fine very spiculate sculpture. Prior records summarised by Moradloo et al. (2015). Addition-

al findings: Aram 10, Hashtjin; Aram 11, Mazraeh; Seiri 01, Garamdar. On ground, moderate rainfall.

Cataglyphis ruber agilis (Forel, 1903). Type location Algeria. The type *ruber* is at CASENT0249887. The eastern populations seem to be lighter, *agilis* from Tunisia being at CASENT0912224. Prior records summarised by Moradloo et al. (2015). Additional findings: Aram 12, Hafthekhaneh; Aram 13, Nemahil; Safariyan 03, Saral field; Jazini 01, Birds Park. On ground, moderate rainfall.

Cataglyphis setipes (Forel, 1894). Type location India, CASENT0249882. Prior records summarised by Moradloo et al. (2015). Additional findings: Aram 17, Nemahil; Abolfathi 08, Seyed Hasan Park, Borujerd. On ground, moderate rainfall.

Cataglyphis turcomanica Crawley, 1920, **new status**. Type location Turkmenistan (as *Myrmecocystus viaticus*, F. subsp. *desertorum* For. var. *turcomanica*, Emery, 1898; name as *Cataglyphis bicolor* F., var. *turcomanica* Em. by Crawley, 1920b). Agosti (1990) listed this as *Cataglyphis turcomanica* (Emery). No type images. Drawings by Santschi (1929). No prior Iran record. New finding: Mahmoodi 23, Nahjol Balaghe Park. On parkland ground, moderate rainfall.

Cataglyphis viaticoides André, 1881. Type location Lebanon, CASENT0915503 (minor worker). No prior record from Iran. New findings: Heidary 05, Ashkenan; Mahmoodi 01, Khoosar National Park; Mahmoodi 24, Eram Park. On parkland ground, moderate to very low rainfall.

Formica clara Forel, 1886. CASENT0911077. Type location Syria. Prior records summarised by Moradloo et al. (2015). Additional findings: Seiri 04 & 05, Tehran area; Ghatei 16, Kiashar, Guilan; Afshari 18, Hana, Semirom; Borjali 06, Lahijan; Borjali 07, Kiashahr; Mahmoodi 35, Pardisan Forest Park; Jazini 15, Fadaeian Eslam Park; Jazini 27, Taleghani Park. On parkland ground, moderate rainfall.

Formica cunicularia Latreille, 1798 (junior synonym). CASENT0907601. Type location France. Prior records summarised by Moradloo et al. (2015). Additional findings: Aram 22, Hashtjin; Safariyan 09, Sarab Lake; Ghatei 15, Anzali, Guilan; Borjali 04, Siahkhal; Borjali 05, Chaf; Mahoodi 05, Goflogou Park; Mahmoodi 17 & 36, Pardisan Forest Park; Jazini 03 & 28, Mellat Park; Jazini 17, Taleghani Park. On parkland ground, moderate rainfall.

Formica rufibarbis Fabricius, 1793. Type location France, neotype worker ANTWEB1008421 (Seifert & Schulz, 2009). Prior Iran records in Paknia et al. (2008). Additional finding: Kia 17, Tafresh, Markasi. On parkland ground, moderate rainfall.

Lasius alienus (Förster, 1850). Type location Germany, neotype images FOCOL 0754. Seifert (1992) designated the neotype and included a listing from Turkey. Prior Iran records in Paknia et al. (2008). Additional finding: Jazini 26, Qeytariyeh Park, Tehran. On parkland ground, moderate rainfall.

Lasius flavescens Forel, 1904. Type location Uzbekistan, CASENT0911043. No prior record from Iran. New finding: Ghatei 21, Masai, Guilan. On ground, moist forest.

Lasius himalayanus Bingham, 1903. Type location India, CASENT0911043 (labelled "*L. brunneus* var. *himalayanus*"). No prior record from Iran. New findings: Kia 23, Kahak, Qom; Afshari 25, Vanak, Semirom; Borjali 09, Kelachay; Mahmoodi 29, Nahjol Balaghe Park; Jazini 29, Shahr Park. On ground, moderate rainfall.

Lasius lasioides (Emery, 1869). Type location Italy, type queen images CASENT0915590, see also Seifert (1992). Prior Iran records in Paknia et al. (2008). Additional findings: Borjali 08, Chaboksar; Mahmoodi 06, Eram Park; Jazini 10, Qeytariyeh Park. On parkland ground, moderate rainfall.

Lasius neglectus Van Loon, Boosma & Andrasfalvy, 1990. Type location Hungary. Paratype worker images CASENT0903220. Prior Iran records in Paknia et al. (2008). Additional finding: Ghatei 19, Rasht, Guilan. On ground, moist forest.

Lasius turcicus Santschi, 1921, non-type (Seifert) CASENT0906080. Type location Turkey. Prior records summarised by Moradloo et al. (2015). Additional findings: Torabi 18, Eram Garden, Shiraz; Ghatei 20, Fuman, Guilan; Ghatei 22, Shaft, Guilan; Ghatei 34, Rasht, Guilan; Borjali 10, Anzali; Borjali 11 & 12, Chuchesfahan. On ground, moist forest and montane, moderate rainfall.

Lepisiota bipartita (F. Smith, 1861), CASENT0903167. Type location Israel/Palestine ("Holy Land" on the label and in the type paper). Prior records summarised by Moradloo et al. (2015). Additional finding: Mahmoodi 19, Nahjol Balaghe Park. River valley soil, moderate rainfall.

Lepisiota dolabellae (Forel, 1911), CASENT0249883. Type location Turkey. Prior records summarised by Moradloo et al. (2015). Additional findings: Aram 24, Nowdeh; Abolfathi 13, Dar al Salam, Borujerd; Seiri 06, Tehran area; Borjali 13, Siakhkhal; Mahmoodi 07, Goflogou Park; Mahmoodi 34, Chagar Forest Park; Jazini 06, Taleghani Park; Jazini 14, Shahr Park. On ground, moderate rainfall.

Lepisiota integrisquama (Kuznetsov-Ugamsky, 1929), **new status**. Type location Kazakhstan, no type images but type drawings. Original name *Acantholepis frauenfeldi integrisquama* Kuznetsov-Ugamsky, 1929: placed as a junior synonym of *Lepisiota semenovi* by Dlussky, Soyunov, and Zabelin (1990). This has a slightly different shaped head in full-face view, a near straight upper margin to the petiole and quite abundant erect hairs on the dorsal alitrunk. No prior Iran records. New findings: Torabi 16, Baba Kouhi, Shiraz; Torabi 17, Sadieh Mound, Shiraz; Heidary 01, Khayrgou. Low to very low rainfall forest.

Lepisiota karawaiewi (Kuznetsov-Ugamsky, 1929). Type location Turkestan. Type images CASENT0912405. Reported from Iran by Ghahari, Collingwood, Tahari, and Ostovan (2009). New finding: Afshari 28, Bideh, Semirom. Montane, low rainfall.

Lepisiota litoralis (Kuznetsov-Ugamsky, 1929). Type location Turkestan, syntype worker CASENT0912406. Kuznetsov-Ugamsky's illustration of the petioles of this and *L. semenovi* show, that like our specimens, *litoralis* has a deeper incurved dorsum to the petiole in front view. No prior Iran records. Additional finding: Afshari 29, Mehr Gerd, Semirom. Montane, low rainfall.

Lepisiota semenovi (Ruzsky, 1905), no type images but type drawings. Prior records summarised by Moradloo et al. (2015). Additional findings: Torabi 15, Enghelab Park, Shiraz; Kia 27, Veshnaveh, Qom. Montane, moderate rainfall.

Lepisiota spinisquama (Kuznetsov-Ugamsky, 1929). Type location Kazakhstan (Keltamaschat = Kaltemashat northeast of Schymkent). Type images CASENT0912407. No prior Iran records. New finding: Safariyan 11, Vahdat Dam. Pitfall trap, montane, moderate rainfall.

Lepisiota surchanica (Kuznetsov-Ugamsky, 1929), **new status**. Type location Uzbekistan, no type images but type drawings. Original name *Acantholepis frauenfeldi surchanica* Kuznetsov-Ugamsky, 1929. The status is revised as the fine surface sculpture and the petiole shape, notably the upper margin, seem diagnostic. No prior Iran records. New findings: Torabi 14, Beheshti, Shiraz; Mahmoodi 33, Western Cascade; Jazini 21, Pirouzi Park. On ground, moderate rainfall.

Paratrechina jaegerskioeldi (Mayr, 1904). Type location Egypt, no images of the type but cotype images CASENT0910993. No prior Iran records. New finding: Torabi 25,

Hafezieh. Low rainfall, forest. As with *P. vividula* (see below), the placement of this species in *Nylanderia* by LaPolla, Brady, and Shattuck (2010) was due to a misunderstanding of the type species for *Paratrechina*, which is *P. vagabunda* Motschoulsky, 1863. Below his clear illustrated description of *vagabunda*. Motschoulsky (1863) wrote (in French and Latin): “A second smaller species, more slender and of a lighter colour on the alitrunk and legs is not rare (uncommon) on the plants in our hot houses [he lived in St Petersburg] and I have named this *Paratr. currens*”. As *P. vagabunda* was given as 2.54 mm long, the smaller *P. currens* would not have been the slender, long-legged *P. longicornis*.

Paratrechina vividula (Nylander, 1846). Type location Finland (in a hothouse), paralectotype CASENT0102538. Prior Iran records in Paknia et al. (2008). Additional findings: Torabi 19 & 21, Azadi Park, Shiraz; Torabi 20, Baba Kouhi, Shiraz; Kia 24, Kokab Park, Qom; Jazini 07, Fada’ian Aslam Park, Tehran. On parkland ground, moderate rainfall.

Plagiolepis alluaudi Emery, 1894. Type location Seychelle Islands, but well known as a tramp species, CASENT0101699. No prior Iran records. New findings: Torabi 22, Azadi Park, Shiraz; Afshari 32, Vanak, Semirom. Low rainfall forest.

Plagiolepis ancylensis Santschi, 1920. Type location Turkey. Type images CASENT0912415. No prior Iran records. New finding: Kia 31, Dastjerd, Qom. Montane, moderate rainfall.

Plagiolepis pygmaea (Latreille, 1798). Type location France, no type images. Images of subspecies *minu* (*Plagiolepis pygmaea* Latr. v. *Minu*, Forel, 1911, from Greece) CASENT0909856. The Iran specimens match *minu* exactly. Prior report by Ghahari and Collingwood (2011). Additional findings: Torabi 23, Azadi Park, Shiraz; Torabi 24, Eram Garden, Shiraz; Afshari 33, Ghale Ghadam, Semirom; Borjali 14, Lasht-e Neshah; Borjali 15, Chuchesfahan; Borjali 16, Chaf; Mahmoodi 09, Eram Park; Mahmoodi 28, Goflogou Park. On parkland ground, moderate rainfall.

Plagiolepis schmitzii Forel, 1895. Type location Portugal (Madeira). Type images CASENT0909859. Ghahari et al. (2015). New findings: Ghatei 30, Masai, Guilan; Mahmoodi 10, Eram Park. Moist to moderate rainfall.

Plagiolepis taurica Santschi, 1920. Type location Ukraine. Type images CASENT0912433. Prior Iran records in Paknia et al. (2008). Additional findings: Aram 05 (alates, male and queen), Haftehkaneh; Seiri 17 (dealate queen), Seghe Tooli. Moderate rainfall montane.

Polyrhachis lacteipennis F. Smith, 1858. Type location India, type images queen CASENT0903386. Prior Iran records in Paknia et al. (2008). Additional finding: Heidary 15, Chahkower. Very low rainfall area. Dietrich (2004) separated specimens from Israel, Jordan and Yemen as a new species, *Polyrhachis palaeartica*. Antweb do not have photographic images of the type but Dietrich gave SEM images of the lateral and dorsal alitrunk of the worker and the dorsal alitrunk of the queen. The worker appears to be a close fit to those from Israel and Iran held by B.T. Dietrich, however, mentioned *P. lacteipennis* only vaguely and did not sight the type queen or, apparently, the type of what he refers to as “*Polyrhachis simplex*”, which also is not on Antweb. The SEM image of the *P. palaeartica* queen is a near exact match for the *P. lacteipennis* queen, CASENT0903386. He separated *P. grisescens* as a separate species but the type images (CASENT0905639) also are little or no different from the fresh specimens from Israel and Iran. So we leave our findings as *P. lacteipennis*.

Proformica ferreri Bondroit, 1918. Non-type CASENT0906299, location Spain. Prior records summarised by Moradloo et al. (2015). Additional finding: Safariyan 10, Seidan

Village. Montane, moderate rainfall. Paknia, Radchenko, and Pfeiffer (2010) reported *Proformica epinotalis* from Iran. There is a syntype of that species at CASENT0912272 and an Iran specimen on ANTWEB1008083. The latter is smaller than the syntype and has a distinctly narrower head. According to Galkowski, Lebas, Wegnez, Lenoir, and Blatrix (2017) the taxonomy of the genus is confused and in need of revision. This reiterates Agosti (1994) and the situation is compounded by the dimorphic workers common to the genus.

MYRMICINAE

Aphaenogaster gibbosa (Latreille, 1798). Type location France; no type images; junior synonym *laevior* (*A. striola* var. *laevior* Forel, 1892) CASENT0907684. Prior Iran records in Paknia et al. (2008). Additional findings: Ghatei 35, Shaft, Guilan; Borjali 17, Lahijan; Borjali 19, Chaboksar. Found on or in soil, Caspian moist littoral area.

Aphaenogaster subterranea (Latreille, 1798). Type location France; no type images; subspecies *ichnusa* (*Aphaenogaster* (*Attomyrma*) *subterranea* Latr., v. *ichnusa*, Santschi, 1925) CASENT0913132. No prior Iran records. New finding: Borjali 20, Lahijan. Found on soil, Caspian moist littoral area.

Aphaenogaster syriaca Emery, 1908. Type location Lebanon, CASENT0904176. Prior Iran records in Paknia et al. (2008). Additional findings: Ghatei 36, Bame Sabz, Lahijan, Guilan; Borjali 18, Langarud. Found on soil, Caspian moist littoral area.

Cardiocondyla elegans Emery, 1869. Type location Italy, CASENT0904460. Prior Iran records in Paknia et al. (2008). Additional record: Ghatei 37 (queen), Lahijan, Guilan; Ghatei 38, Shaft, Guilan. Found on parkland soil, Caspian moist littoral area.

Cardiocondyla persiana Seifert, 2003. Type location Iran, Fars and Shiraz, purported type specimen CASENT0919736 but it is substantially smaller (ca 80%) than that in Seifert's drawing (assuming the scales are correct) and lacks the head sculpture, etc. The Torabi specimen reported here is an exact match for the drawn specimen. Additional finding: Torabi 26, Enghelab Park, Shiraz. Found under a tree, low rainfall forest.

Cardiocondyla sahlbergi Forel, 1913. Type location Israel/Palestine, CASENT0908341. The Safariyan specimen is a queen, or gyne, and matches that drawn by Seifert (2003). Prior Iran record in Seifert (2003). Additional finding: Safariyan 18 (queen), Sarab Lake. Pitfall trap at edge of grassland, moderate rainfall montane area.

Cardiocondyla stambuloffii Forel, 1892. Type location Bulgaria, CASENT090756. Prior Iran records in Paknia et al. (2008). Additional findings: Borjali 21, Astaneh-ye Ashrafiyeh; Borjali 22, Rodsar. Found on parkland soil and plant, Caspian moist littoral area.

Cardiocondyla ulianini Emery, 1889. Type location Russia, CASENT0904461. No prior Iran records. New findings: Paknia ZMGU1418 (held by B.T.; this may be *C. brachyceps*), Miankaleh, viii.2004; Safariyan 17, Sarab Lake; Safariyan 22, Vahdat Dam. Pitfall trap at edge of grassland, moderate rainfall montane area.

Crematogaster (*Cr.*) *afghanica* Pisarski, 1967. Type location Afghanistan, FOCOL1798-1. A comparison of the type images strongly suggest that *Cr. afghanica* may be a simple junior synonym of *Cr. auberti*. Pisarski (1967) did not mention *Cr. auberti* apparently basing his separation on a comparison with *Cr. sorokini* Ruzsky. That also, however, seems almost indistinguishable from *Cr. auberti* and was described originally as a variety of *Cr. auberti*. New findings: Paknia ZMGU053 (held by B.T.), Fars Province, Lars City, ii.2002; Seiri 24, Tehran area. Parkland, moderate rainfall.

Crematogaster (Cr.) auberti Emery, 1869. Type location France, CASENT0904499. Prior report by Ghahari and Collingwood (2011). New findings: Safariyan 14, Ghajoor Bridge; Afshari 43, Shah Ja'far, Semirom. On ground, moderate to low rainfall.

Crematogaster (Cr.) schmidti (Mayr, 1853). Type location Austria, CASENT0908487. Prior Iran records in Paknia et al. (2008). Additional findings: Aram 21, Kazaj; Ghatei 39, Rezvanshahr, Guilan; Ghatei Sangar, Guilan; Kia 41, Kokab Park, Qom; Borjali 23, Langarud. On trees, mostly moist areas.

Crematogaster (Cr.) sorokini Ruzsky, 1905. Type location Kazakhstan (Turkestan), nontype images CASENT0914149. Prior Iran records in Paknia et al. (2008). Additional findings: Safariyan 15 & 16, Bijar; Heidary 09, Paghalat. On parkland ground and trees, moderate rainfall. Antweb has *Cr. bogojawlenskii* as raised to species by Dlussky, Soynov, and Zabelin (1990) but they listed it as a synonym of *Cr. sorokini*.

Crematogaster (Cr.) subdentata Mayr, 1877. Type location Kazakhstan (Bairakum, Sarafschan Valley), CASENT0902140. Prior records summarised by Moradloo et al. (2015). Additional records: Abolfathi 28, Imam Huseyn Sq., Borujerd; Afshari 42, Sadegh Abad, Semirom; Mahmoodi 18, Khargush Darreh Forest Park; Mahmoodi 27, Chagar Forest Park; Jazini 02 & 05, Shahr Park. On parkland ground and trees, moderate rainfall.

Messor alexandri Thomé & Thomé, 1981. Type location Syria, CASENT0913151 (*Messor barbarus* L. stirps *structor* Latr. var. *Alexandri*, Santschi, 1917). Reported from Iran by Ghahari (2011). Additional: Mahmoodi 26, Chagar Park. On parkland ground, moderate rainfall.

Messor ceresis Santschi, 1934. Type location Lebanon, CASENT0913172. Prior Iran record Hossein Nezhad, Rad, Firouzi, and Agosti (2012). Additional findings: Kia 49, Kokab, Qom; Borjali 26, Anzali; Jazini 04, Behesht-Zahra Park. On parkland ground, moderate rainfall.

Messor concolor Thomé & Thomé, 1981. Type location Algeria, CASENT0904126. Other authors have suggested this is a junior synonym of *Messor wasmanni* Krausse but there are no type images of that. Images labelled *M. wasmanni*, e.g. CASENT0106293, show only very weak sculpture on the front of the head and on the alitrunk. Our specimens match the *concolor* type. Prior records summarised by Moradloo et al. (2015). Additional records: Abolfathi 29, Goldasht Garden, Borujerd; Abolfathi 30, Dorahi, Borujerd; Kia 48, Alavi Park, Qom; Afshari 52, Komeh, Semirom; Mahmoodi 37, Chagar Forest Park; Seiri 20 & 21, Tehran area; Jazini 08, Lavisan Park; Jazini 30, Taleghani Park; Jazini 31, Niavaran Park. On parkland ground, moderate rainfall.

Messor dentatus Santschi, 1927. Type location Israel, CASENT0907733. Prior records summarised by Moradloo et al. (2015). Additional records: Aram 27, Nemahil; Heidary 11, Sayyedhashemi. On ground, farmland, dry to very dry.

Messor denticulatus Santschi, 1927 (given in Santschi [p. 240 and 249] as *Messor minor* André stirps *laboriosus*; received from M. Karavaiew under the name *meridionalis*). Type location Turkmenistan (Aşgabat = Ashgabat), CASENT0913176; another specimen, CASENT091377, has a Karavaiew label and a second label "*Messor instabilis laboriosus* Sants." The name *denticulatus* is not in the Santschi paper (Bolton, 1995: 482, had this as published "v.1927"). The origin is Kuznetsov-Ugamksij(y) 1927: 90, which bears the date 14.ii.1927, and is given as "*Messor barbarus meridinalis* var. *denticulatus* nov." from Aschabad (Bolton, 1995: 482, had this as published "iv.1927"). Prior Iran records in Paknia et al. (2008). Additional finding: Afshari 51, Mehr Gered, Semirom. Mountain garden, low rainfall.

Messor ebeninus Santschi, 1927. Type location Lebanon, CASENT0249823. Prior records summarised by Moradloo et al. (2015). Additional findings: Aram 28, Hashtjin; Aram 31, Nemahil; Mahmoodi 20 & 21, Javan-Mardan-e-Iran Park. On parkland ground, moderate rainfall.

Messor hebraeus Santschi, 1927. Type location Israel, CASENT0913184. No prior Iran record. New finding: Kia 50, Khave, Qom. On parkland ground, moderate rainfall.

Messor melancholicus Arnoldi, 1977. Type location Azerbaijan, CASENT0913198. No prior Iran records. New findings: Safariyan 24, Saral Field; Torabi 31, Beheshti, Shiraz; Ghatei 47, Shaft, Guilan; Ghatei 57, Anzali, Guilan; Borjali 25, Alborz. On ground, all rainfall areas.

Messor nahali Thomé & Thomé, 1981. Type location Syria, CASENT0913772. No prior Iran records. New finding: Torabi 34, Hafezieh, Shiraz. Low rainfall forest.

Messor obscurior Crawley, 1920, **new status**. Type location Iraq, CASENT0907731. Original name *Messor barbarus* race *semirufus* E. André var. *obscurior*. Crawley, 1920a. Crawley gave major TL 7.5-8.0, minor TL 3.5 mm. Dark brown, some almost black, uniform except for lighter appendages; sculpture on head and alitrunk coarser than *semirufus*. Baroni Urbani (1974) noted he based his synonymy on the original description and had not seen the type specimens. Equally, he had not seen the type of *semirufus* as that appears to have been lost. No prior Iran records. New findings: Aram 26, Jafarabad, 30.v.2012; Abolfathi 35, Fial, Borujerd; Heidary 10, Torman; Mahmoodi 12, Pardisan Forest Park. Moderate rainfall to dry areas.

Messor rufotestaceus (Foerster, 1850). Type location Algeria, no type images. It appears there may be a second species *M. thoracicus* (Mayr, 1862) originally described as *Atta thoracica*. Type location Syria, again no type images, or of the junior synonym *Aphaenogaster gracilinodis* Emery 1878. Type location Syria, no type images. Prior Iran records in Paknia et al. (2008), see ANTWEB1008075. Additional findings: Torabi 36, Sadih Shiraz; Afshari 54, Komer, Semirom. Garden soil, low rainfall.

Messor structor (Latreille, 1798) (subspecies *varrialei*). Type location France, CASENT0905855. Prior records summarised by Moradloo et al. (2015). Additional findings: Aram 25, Kazaj; Seiri 19 (queen) & 23, Tehran area; Borjali 27 & 30, Anzali; Jazini 09, Qeytariyeh Park; Jazini 18, Fadaeian Eslam Park. On parkland ground, moderate rainfall.

Messor syriacus Thomé, 1969. Type location Syria, CASENT0913178. No prior Iran records. New findings: Safariyan 23, Babargorgor Village; Torabi 32, Hafezieh, Shiraz; Mahmoodi 30, Shohadaye-Khalij-e-Frars Lake. On ground, moderate to low rainfall.

Messor testaceus Donisthorpe, 1950. Type location Turkey, CASENT0913184. No prior Iran records. New finding: Borjali 24, Rasht. Moist littoral area.

Messor turcmenochorassanicus Arnoldi, 1977. Type location Turkestan, no type images. See ANTWEB1008076, minor worker from Iran, identified by Radchenko (2013), from Deana Protected Area, Paknia, Radchenko & Pfeiffer (2010). Additional findings: Borjali 35, Alborz; Jazini 25, Pirouzi Park. On parkland ground, moderate rainfall.

Monomorium indicum Forel, 1902. Type location India, CASENT0913803. No prior Iran records. New findings: Heidary 12, Paghalat; Ghatei 58, Ghanavat, Qom; Mahmoodi 14 & 38, Khoosar National Park. Garden and in house, no rainfall association.

Monomorium kusnezowi Santschi, 1928. Type location Turkmenistan (Bairam-Ali), CASENT0913803. Prior Iran records in Paknia et al. (2008). Additional finding: Torabi 37, Hafezieh, Shiraz. Low rainfall forest.

Monomorium salomonis (Linnaeus, 1758). Type location Egypt. No type images but generally well recognised tramp species. Prior records summarised by Moradloo et al. (2015). Additional findings: Aram 33, Nowdeh. Moderate rainfall.

Myrmica constricta Karavaiev, 1934. Type location Ukraine, CASENT0913076. No prior Iran records listed by Paknia et al. (2008) but *Myrmica specioides* Bondroit, 1916 appeared in Paknia (2010). The latter, type location France, CASENT0904068 (labelled Bondroit, Paris), appears identical to CASENT0913076. Radchenko and Elmes (2010) gave keys to separate the species. Their Key 5.1, Couplet 15 effectively separates via -scape base gradually curved to “*constricta*”, and, scape base strongly angled to “*specioides*”. The definite *specioides* type (CASENT0904068) has a near straight scape base whereas the *constricta* type has a distinctly angled scape base. That is the converse of Radchenko and Elmes (2010) statement. The specimen sent to B.T. as ZMGU635 is *specioides*. That recorded here as Ghatei 55 and the specimen from Iran, Mazandarin (Paknia), on ANTWEB1008079 (as *specioides*) are *constricta*. New records: Paknia ZMGU635, Amole, 2006; Ghatei 55, Masai, Guilan. On park ground, Caspian moist littoral area.

Myrmica deplanata Emery, 1921, with prior unavailable name *Myrmica scabrinodis lobicornis* Nyl. var. *deplanata*, Ruzsky, 1905, type location Russia, no type images. Junior synonym, *moravica* (*Myrmica moravica* Soudek, 1922) type location Czech Republic, CASENT0904084. The distribution list in Radchenko and Elmes (2010) includes Iran, without details, but see CFH000021, from Mazandaran by Firouzi (note lateral and dorsal images appear to be wrongly scaled, the head is correct, by comparison with Borjali 28). See also Firouzi, Pashaei Rad, Hossein Nezhad, and Agosti (2011). Additional finding: Borjali 28, Khoshk-e Bijar. On park ground, Caspian moist littoral area.

Myrmica gallienii Bondroit, 1920, junior synonym from Ukraine (CASENT0900287), type location France. Prior records summarised by Moradloo et al. (2015). Male Aram 31b – see CASENT0172723 from Belarus. Additional findings: Aram 29, Nemahil; Aram 31a (queen), Nemahil; Afshari 56, Hana, Semirom; Afshari 68, Sadegh Abad, Semirom; Borjali 29, Rasht; Borjali 41 (queen), Rasht. Park or farm land, moist to low rainfall.

Pheidole cicatricosa Stitz, 1917. Type location Algeria, major FOCOL 1293, minor FOCOL 1289 (under *Pheidole pallidula*). No prior Iran records. New finding: Kia 60, Salfchegan, Semirom. Also the previously thought “*Pheidole jordanica*” Paknia ZMGU 1353, from Gonbad, vii.2004. On park ground, montane, moderate rainfall.

Pheidole fervens F. Smith, 1858. Type location Singapore, major CASENT0901520, minor CASENT0901519. Not listed as such in prior Iran records. New findings: Kia 26, Koohe khezr, Qom; Ghatei 59, Stahkhal, Guilan. On ground, moist to moderate rainfall.

Pheidole latinoda Roger, 1863. Type location Sri Lanka or India, no type images. No prior Iran record. New finding: Heidary 14a, Lamerd. Attracted to bait in desert.

Pheidole orientalis Müller, 1923, CASENT0904193. Type location “Orient”. In Seifert (2016), which postdates the second author’s on-line consideration of “*Pheidole pallidula*” by some ten years, it is considered that *Pheidole orientalis* is a junior synonym of *P. koshnewnikovi* Ruzsky, 1905. While there are similarities, the latter is consistently some 20% smaller than the *orientalis* type and those we report here. Prior records summarised by Moradloo et al. (2015). Additional findings: Aram 30, Mazraeh; Mahmoodi 13, 16 & 21, Chagar Forest Park; Jazini 19, Mellat Park. On ground moderate rainfall.

Pheidole pallidula (Nylander, 1849). Type location Sicily, no type images but see CASENT0913386 (bears unpublished name *Pheidole pallidula* v. *obscurata* Santschi,

from Tangier), type location Sicily. Prior records summarised by Moradloo et al. (2015). Additional findings: Abolfathi 39, Gazza Sq., Borujerd; Seiri 22, Tehran area; Heidary 14b, Lamerd. Moderate rainfall to dry areas.

Pheidole providens (Sykes, 1835). Type location India, no type images but later drawing, and likely junior synonym *Pheidole indica* Mayr, 1879, type location India, major CASENT0906613, minor CASENT0906612. Probably among *Pheidole teneriffana* in prior Iran records (Paknia et al. 2008). Additional findings: Abolfathi 38, Ghiam Sq., Borujerd; Afshari 61, Semirom, Isfahan; Borjali 31, Anzali. Moderate rainfall montane areas.

Solenopsis fugax (Latreille, 1798). Type location France, no type images, subspecies *emesus* Thomé & Thomé 1980, from Syria, CASENT0912415. Prior Iran records in Paknia et al. (2008). Additional finding: Borjali 39 & 42, Chaf (queens); Borjali 43, Chuchesfahan. Caspian moist littoral area.

Strongylognathus christophi Emery, 1889. Type location Russia, type queen no images but see syntype worker CASENT0904866, from same location. No prior record from Iran, although Paknia (2010) lists a *Strongylognathus* species (as sp. ir-astaneh-01). New findings: Borjali 32, Kelachay; Ghatei 62, Shat, Guilan. Caspian moist littoral area.

Temnothorax nadigi (Kutter, 1925). Type location Switzerland, CASENT0907572. Prior Iran record Paknia, Radchenko, and Pfeiffer (2010). Additional finding: Ghatei 44, Masal, Guilan. Caspian moist littoral area.

Tetramorium caespitum (Linnaeus, 1758), no type images but see (subspecies) CASENT0904802 etc. Type location Europe. Prior records summarised by Moradloo et al. (2015). Also *Tetramorium caespitum flavidulum* Emery 1909, type location Turkey, CASENT0904803, and *T. caespitum fusciclava* Emery 1925, type location, Italy, CASENT0904802. Additional findings: Aram 31 (queen), Nemahil; Safariyan 19, Sarab Lake; Safariyan 20, *flavidulum* form, Bijar Protected area; Ghatei 63, Fuman, Guilan; Ghatei 45, *fusciclava* form, Revanshahr, Guilan; Ghatei 64, Sangar, Guilan; Afshari 66 Vanak, Semirom. Caspian moist littoral and moderate rainfall montane areas.

Tetramorium chefketi Forel, 1911. Type location Turkey, CASENT0909100. Prior records summarised by Moradloo et al. (2015). Additional findings: Abolfathi 41, Andishe Town, Borujerd; Borjali 33, Anzali; Jazini 20, Niavaran Park. Caspian moist littoral and moderate rainfall montane areas.

Tetramorium davidi Forel, 1911. Type location Israel/Palestine, CASENT0904826. Prior records summarised by Moradloo et al. (2015). Additional finding: Torabi 40, Persepolis, Shiraz. Low rainfall forest.

Tetramorium indocile Santschi, 1927. Type location Kyrgyzstan (Kisil-Kija = Kızıl Kıya Pass, approx. 42°42'N, 78°54'E), CASENT0913998. No prior Iran record. New findings: Afshari 46, Komeh, Semirom; Mahmoodi 15, Nahjol Balaghe Park. Low to moderate rainfall areas.

Tetramorium striativentre Mayr, 1877. Type location Turkmenistan, non-type (type was a queen; no type images and type location not given by Mayr; Antweb has "Samar-kand", which is in Uzbekistan) CASENT0280927. Prior records summarised by Moradloo et al. (2015). Additional finding: Safariyan 21, Sarab Lake. Moderate rainfall montane area.

Trichomyrmex perplexus (Radchenko, 1997). Type location Armenia, no type images. Prior Iran record, as *Monomorium perplexum*, Paknia, Radchenko, and Pfeiffer (2010).

Additional finding: Safariyan 25, Vahdat Dam. Pitfall trap, moderate rainfall montane area.

PONERINAE

Brachyponera sennaarensis (Mayr, 1862). Type location Sudan, CASENT0902474. Prior Iran records summarised by Moradloo et al. (2015). Additional finding: Heidary 13, Siga. Very low rainfall area. Damp habitat in house.

Discussion

In their checklist of Iran ants, Paknia et al. (2008) listed 110 species belonging to 26 genera and six subfamilies. Paknia et al. (2010) added a further 32 species and six more genera. Moradloo et al. (2015) found a further six species. Here we list a further 30 named species. Taken at face value the combination of the foregoing and the other papers listed in the introduction gives a grand total of 248 species, from seven subfamilies and 37 genera. It has to be said, however, that there are a number of what seem possible misidentifications and a small number of other named species that seem unlikely to occur in Iran. Many of the foregoing come from habitats entirely different to those found in Iran or from geographical locations far distant from Iran. Four are listed as genus members only and have no descriptions or available images. Of the named species there are three for which the original description is not accessible and eight for which no images are available. One is imaged on Antweb (CASENT0910243) and labelled as *Crematogaster* sp. 19. Our own combined studies appear to have found five as yet undescribed species. Numerically, the predominant genera in our studies reflect those of the whole country. The genera *Cataglyphis*, 34 species, and *Messor*, 31 species, are almost entirely restricted to dry zones. The other most abundant genera, *Camponotus*, 32 species, *Monomorium*, 14 species and *Tetramorium*, 17 species, have members living in almost all climatic zones but, taxonomically, the Palaearctic members have been relatively poorly studied. Paknia et al. (2008) similarly commented on the apparent dominance of the three main genera being due in part to their preferred habitats being in mainly arid and semi-arid areas. They speculated that, as members of those genera are relatively large in size, the dominance might be a simple result of most of the sampling being by hand collecting. Paknia et al. (2010) noted that the Caspian Hyrcanian forests yielded up several species from otherwise unrepresented genera. The surveys we report included much hand collecting, complemented by use of pitfall trapping, that yielded up specimens of small to minute ants, including *Aphaenogaster* and *Cardiocondyla*. Here we cover contrasting climatic areas (see the summary map, Figure S1). With the exception of the central Kavir-e-Namak, or Great Salt Desert, and the eastern Dasht-e Lut, Lut Desert, reasonably comprehensive ant collections now have been made across much of Iran.

Disclosure Statement

No potential conflict of interest was reported by the authors.

Supplementary material

The Annex with Supplementary Tables 1–2 and a map with the collecting localities is available as supplementary information via the “Supplementary” tab on the articles online page (<http://dx.doi.org/10.1080/10.1080/09397140.2018.1442301>).

References

This list does not include a small number of papers listed by other authors as being delivered at, for instance, an Iranian Plant Protection Congress, or as theses.

- Agosti, D. (1990). Review and reclassification of *Cataglyphis* (Hymenoptera: Formicidae). *Journal of Natural History*, 24, 1457–1500.
- Agosti, D. (1994). The phylogeny of the ant tribe Formicini (Hymenoptera: Formicidae) with the description of a new genus. *Systematic Entomology*, 19, 93–117.
- Baroni Urbani, C. (1974). Studi sulla mirmecofauna d'Italia. XII. Le Isole Pontine. *Fragmenta Entomologica* 9, 225–252.
- Bolton, B. (1995). *A new general catalogue of the ants of the world*. Cambridge (Mass.): Harvard.
- Crawley, W. C. (1920a). Ants from Mesopotamia and north-west Persia. *The Entomologist's Record and Journal of Variation*, 32, 162–166.
- Crawley, W. C. (1920b). Ants from Mesopotamia and north-west Persia (concluded). *Entomologists Record and Journal of Variation*, 32, 177–179.
- Dalla Torre, C. G. (1893). *Catalogus Hymenopterorum hucusque descriptorum systematicus et synonymicus. Vol. 7. Formicidae (Heterogyna)*. Leipzig: W. Engelmann.
- Dietrich, C. O. (2004). Taxonomische Beiträge zur Myrmekofauna Jordaniens (Hymenoptera: Formicidae). *Denisia*, 14, 319–344.
- Dlussky, G. M., Soyunov, O. S., & Zabelin, S. I. (1990). *The ants of Turkmenistan* [in Russian]. Ashkhabad: Ylym Press.
- Emery, C. (1925). In: P. Wytzman, *Genera Insectorum. Hymenoptera, Fam. Formicidae, subfam. Formicinae. Fasc. 183*. Bruxelles: L. Desmet-Verteneuil.
- Firouzi, F., Pashaei Rad, S., Hossein Nezhad, S., & Agosti, D. (2011). Four new records of ants from Iran (Hymenoptera: Formicidae). *Zoology in the Middle East*, 52, 71–78.
- Galkowski, C., Lebas, C., Wegnez, P., Lenoir, A., & Blatrix, R. (2017). Redescription of *Proformica nasuta* (Nylander, 1856) (Hymenoptera, Formicidae) using an integrative approach. *European Journal of Taxonomy*, 290, 1–40.
- Ghahari, H., Collingwood, C. A., Tahari, M., & Ostovan, H. (2009). Faunistic notes on Formicinae (Insecta: Hymenoptera) of rice fields and surrounding grasslands in Northern Iran. *Munis Entomology and Zoology*, 4, 184–189.
- Ghahari, H., & Collingwood, C. A. (2011). A study on the ants (Hymenoptera: Formicidae) of southern Iran. *Calodema*, 176, 1–5.
- Ghahari, H., Collingwood, C. A., Havaskary, M., Ostova, H., & Samin, Y. (2011). A contribution to the knowledge of ants (Hymenoptera: Formicidae) from the Arasbaran Biosphere reserve and vicinity, Northwestern Iran. *Jordan Journal of Agricultural Sciences*, 7, 558–563.
- Ghahari, H., Sharaf, M. R., Aldawood, A. S., & Collingwood, C. A. (2015). A contribution to the study of the ant fauna (Hymenoptera: Formicidae) of Eastern Iran. *Contributions to Entomology*, 65, 341–359.
- Ghobadi, M., Agosti, D., Mahdavi, M., & Jouri, M. H. (2015). Effects of harvester ants' nest activity (*Messor* spp.) on structure and function of plant community in a steppe rangeland (Case Study: Roodshoor, Saveh, Iran). *Journal of Rangeland Science*, 5, 269–283.
- Hosseini, A., Awal, M. M., & Hosseini, M. (2015). New faunistic records of Formicidae (Insecta: Hymenoptera) from Iran's northeast. *Asian Myrmecology*, 7, 113–127.
- Hosseini, A., Hosseini, M., Katayama, N., & Mehrparvar, M. (2017). Effect of ant attendance on aphid population growth and above ground biomass of the aphid's host plant. *European Journal of Entomology*, 114, 106–112.
- Hossein Nezhad, S., Rad, S. P., Firouzi, F., & Agosti, D. (2012). New and additional records for the ant fauna from Iran (Hymenoptera: Formicidae). *Zoology in the Middle East*, 55, 65–74.
- Hossein Nezhad, S. (2014). The first report of *Tapinoma israele* (Hym: Formicidae: Dolichoderinae) from Iran. *Journal of Entomological Society of Iran*, 34, 55–56.
- Joharchi, O., Halliday, B., Saboori, A., & Kamali, K. (2011). New species and new records of mites of the family Laelapidae (Acari: Mesostigmata) associated with ants in Iran. *Zootaxa*, 2972, 22–36.

- Khandehroo, F., Moravvej, G., Namghi, H. S., & Fekrat, L. (2015): New records of ant species (Hymenoptera: Formicidae) to the fauna of Iran: *Camponotus alii* Forel, 1890 and *Proformica korbi* (Emery, 1909). *Asian Myrmecology*, 7, 129–131.
- Kiran, K., Alipanah, H., & Paknia, O. (2013): A new species of the ant genus *Aphaenogaster* Mayr (Hymenoptera: Formicidae) from Iran. *Asian Myrmecology*, 5, 45–51.
- LaPolla, J. S., Brady, S. G., & Shattuck, S. O. (2010): Phylogeny and taxonomy of the *Prenolepis* genus-group of ants (Hymenoptera: Formicidae). *Systematic Entomology*, 35, 118–131.
- Latibari, M. H., Khormizi, M. Z., Moravvej, G., & Sadeghi Namaghi, H. (2017): Survey on ants (Hymenoptera: Formicidae) and their aphid partners (Homoptera: Aphididae) in Northeast and Center of Iran. *Entomofauna*, 38, 369–376.
- Mashaly, A. A. M., Al-Mekhlafi, F. A., & Al-Qahtani, A. M. (2013): Foraging activity and food preferences of the samsun ant, *Pachycondyla sennaarensis*. *Bulletin of Insectology*, 66, 187–193.
- Mirzamohamadi, S., Hosseini, M., Sadeghi Namaghi, H., Karimi, J., & Mehrparvar, M. (2015): Symbiotic ants (Hymenoptera: Formicidae) associated with aphids (Hemiptera: Aphididae) in Golestan province, Iran. *Iranian Journal of Animal Biosystematics*, 11, 101–111.
- Mohammadi, S., Mossadegh, M. S., & Esfandiari, M. (2012): Eight ant species (Hym.: Formicidae) new for the fauna of Iran. *Munis Entomology and Zoology*, 7, 847–851.
- Moradloo, S., Fard, R. N., Rad, S. P., & Taylor, B. (2015): Records of ants (Hymenoptera: Formicidae) from Northern Iran. *Zoology in the Middle East*, 61, 168–173.
- Mortazavi, Z. S., Sadeghi, H., Aktac, N., Depa, L., & Fekrat, L. (2015): Ants (Hymenoptera: Formicidae) and their aphid partners (Homoptera: Aphididae) in Mashhad region, Razavi Khorasan Province, with new records of aphids and ant species for Fauna of Iran. *Halteres*, 6, 4–12.
- Motschoulsky, V. de. (1863): Essai d'un catalogue des insectes de l'île Ceylan. *Bulletin de la Société Impériale des Naturalistes de Moscou*, 36, 1–153
- Paknia, O., & Kami, H. G. (2007): New and additional records for the Formicid (Hymenoptera: Insecta) fauna of Iran. *Zoology in the Middle East*, 40, 85–90.
- Paknia, O., Radchenko, A., Alipanah, H., & Pfeiffer, M. (2008): A preliminary checklist of the ants (Hymenoptera: Formicidae) of Iran. *Myrmecological News*, 11, 151–159.
- Paknia, O., Radchenko, A., & Pfeiffer, M. (2010) New records of ants (Hymenoptera: Formicidae) from Iran. *Asian Myrmecology*, 3, 29–38.
- Pisarski, B. (1965): Les fourmis du genre *Cataglyphis* Foerst. en Irak (Hymenoptera, Formicidae). *Bulletin de l'Académie Polonaise des Sciences. Série des Sciences Biologiques*, 13, 417–422.
- Pisarski, B. (1967): Fourmis (Hymenoptera: Formicidae) d'Afghanistan récoltées par M. Dr. K. Lindberg. *Annales Zoologici (Warsaw)*, 24, 375–425.
- Radchenko, A. G. (1997a): Review of ants of the genus *Cataglyphis* Foerster (Hymenoptera, Formicidae) of Asia [in Russian]. *Entomologicheskoe Obozrenie*, 75, 424–442.
- Radchenko, A. G. (1997b): Review of ants of the subgenera *Tanaemyrmex*, *Colobopsis*, *Myrmamblis*, *Myrmosericus*, *Orthonotomyrmex* and *Paramyrmamblis* of the genus *Camponotus* (Hymenoptera, Formicidae) in the Asian Palearctic [In Russian.]. *Zoologicheskii Zhurnal*, 76, 806–815.
- Radchenko, A. G. (1998): A key to ants from the genus *Cataglyphis* Foerster (Hymenoptera, Formicidae) from Asia. *Entomological Review*, 78, 475–480.
- Santschi, F. (1929): Etude sur les *Cataglyphis*. *Revue Suisse de Zoologie*, 36, 25–71.
- Seifert, B. (1992): A taxonomic revision of the Palearctic members of the ant subgenus *Lasius* s. str. (Hymenoptera: Formicidae). *Abhandlungen und Berichte des Naturkundemuseums Görlitz*, 66, 1–67.
- Seifert, B. (2003): The ant genus *Cardiocondyla* (Insecta: Hymenoptera: Formicidae) a taxonomic review of the *C. elegans*, *C. bulgarica*, *C. batesii*, *C. nuda*, *C. shuckardi*, *C. stambuloffii*, *C. wroughtoni*, *C. emeryi* and *C. minutior* species groups. *Annalen des Naturhistorischen Museums in Wien*, 104B, 203–338.
- Seifert, B., & Schulz, R. (2009): A taxonomic revision of the *Formica rufibarbis* Fabricius, 1793 group (Hymenoptera: Formicidae). *Myrmecological News*, 12, 255–272.
- Seifert, B. (2016): Inconvenient hyperdiversity – the traditional concept of “*Pheidole pallidula*” includes four cryptic species (Hymenoptera: Formicidae). *Soil Organisms*, 88, 1–17.