



The Diversity of Ants (Hymenoptera: Formicidae) in District Charsadda, Khyber Pakhtunkhwa: New Reports from Pakistan

Syed Basit Rasheed*, Ahmad Yar, Farrah Zaidi and Qaisar Jamal

Department of Zoology, University of Peshawar, Peshawar, Khyber Pakhtunkhwa

ABSTRACT

Taxonomically ants are the most neglected group of insects to be studied in Pakistan. The current study was conducted to collect ants from all three tehsils: Charsadda, Tangi and Shabqadar of district Charsadda. Ants were collected randomly from indoor (rooms, kitchen and washrooms) and outdoor (streets, crop fields, barren ground and grave yards) sites by using buccal aspirator, pitfall traps and hand pick method. A total of 19 species representing 11 genera and three subfamilies namely Formicinae, Myrmicinae and Dolichoderinae were identified during the present study. Myrmicinae was the most diverse subfamily with five genera (*Crematogaster*, *Meranoplus*, *Messor*, *Monomorium* and *Pheidole*) and 11 species (*Crematogaster subnuda*, *Meranoplus bicolor*, *Messor instabilis*, *Monomorium aberrans*, *Mo. dichroum*, *Mo. indicum*, *Pheidole binghami*, *Ph. fergusonii*, *Ph. indica*, *Ph. latinoda*, *Ph. sulcaticeps*). Formicinae was presented by seven species placed in five genera: *Camponotus* having three species (*C. compressus*, *C. oblongus* and *C. sericeus*) and one species each of *Cataglyphis* (*Ca. setipes*), *Lepisiota* (*L. frauenfeldi*), *Paratrechina* (*P. longicornis*) and *Polyrachis* (*Po. hauxwelli*) while subfamily Dolichoderinae was represented by a single species i.e. *Tapinoma melanocephalum*. The current study reports one subfamily (Dolichoderinae) seven genera (*Cataglyphis*, *Crematogaster*, *Monomorium*, *Messor*, *Pheidole*, *Polyrachis* and *Tapinoma*) with 13 species representing new country records for Pakistan.

Article Information

Received 16 September 2018

Revised 02 March 2019

Accepted 18 April 2019

Available online 02 April 2020

Authors' Contribution

SBR and AY conceived and designed the study and wrote the article. AY collected the specimens. SBR and AY identified the specimens. FZ and QJ helped in acquisition of data and edited the manuscript.

Key words

Ants, Distribution, Taxonomy, Charsadda, Pakistan.

INTRODUCTION

Among all the varieties of insects, ants are the most diverse and recognized group present on earth. This is because as group they are truly pervasive and usually quite obvious. They are eusocial and are found in all kinds of land habitats from subarctic tundra to equatorial rain forests (Brian, 1978), from marshes to deserts, from sea coastline to great elevations and from deep underground to the apex of the tallest trees (Bolton, 1994), however they are completely absent in some regions including Iceland, Greenland and Antarctica (Holldobler and Wilson, 1990), with some islands lacking any native ant species (Wilson and Taylor, 1967). The number of species decreases with increasing latitudes, altitudes, and drought (Kusnezov, 1957; Fowler and Claver, 1991; Farji-Brener and Ruggiero, 1994; Samson *et al.*, 1997). In spite of the fact that tropical regions and continental forests are amongst the poorest known, these areas have the maximum documented species diversity, with approximately 2200 species reported from Asia (Holldobler and Wilson, 1990) with 1753 species reported from Indonesia only. Other studies conducted in

tropical regions have also reported a great diversity from these areas like 852 species documented from Costa Rica and 701 from Ecuador (Ward, 2013). India, the neighbouring country of Pakistan also possess an abundant diversity of ants with 828 species and subspecies belonging to 100 genera placed in 10 subfamilies.

Ants are taxonomically placed in family Formicidae, within superfamily Vespoidea of the order Hymenoptera. They are separated from rest of the members of order via node which may be one or two segmented and connects the mesosoma with gaster, geniculate antennae, and consistently present metapleural gland in ants (Wilson, 1971). The family Formicidae includes 16 subfamilies, 296 genera and presently there are about 15000 species of ants all over the world (Bolton, 1994), of these the number of described species is more than 12000 (Bolton *et al.*, 2006) while many waiting for description but still there are large number of undiscovered species (Holldobler and Wilson 1990). From the fossils record of ants, 14 extinct genera of the 4 extinct subfamilies and 61 extinct genera of the extant subfamilies have been recognized (Bolton and Bolton, 1995). Bingham (1903) was the first to comprehensively studied the Indian Ant fauna and documented all of his finding in a book. He identified a total of 498 ant species belonging to 79 genera and 5 subfamilies. Presently ant species recorded from the Indian subcontinent are 847

* Corresponding author: basitrasheed@uop.edu.pk
0030-9923/2020/0004-1363 \$ 9.00/0
Copyright 2020 Zoological Society of Pakistan

representing 107 genera and 10 subfamilies (Narendra *et al.*, 2012).

Pakistan comprises of five provinces: Punjab, Sindh, Khyber Pakhtunkhwa, Baluchistan and Gilgit-Baltistan, Federally Administered Tribal Areas (FATA) and Azad Jammu & Kashmir. Zoogeographically major part of Pakistan lies in Palearctic and Oriental region while some parts i.e. southwestern Baluchistan lies in Ethiopian region. Karakorum, Hindu Kush and Himalaya form a boundary between the temperate climatic Palearctic zone and tropical and subtropical fauna of the Oriental region (Rafi *et al.*, 2010). Ecologically Peshawar and Charsadda lies in the submontane Indus region surrounded by mountains on three sides and open on the east side towards the Potwar Plateau (Mirza, 1975). The district of Charsadda came in Palearctic ecozone and should share fauna of both Palearctic and Oriental regions. Recently a species of blow fly *Wohlfahrtia maginfca* (Diptera: Sarcophagidae) that were restricted to Palearctic zone have been reported from the submontane region of Peshawar Valley pointing towards the Palearctic-Oriental Ecotone status of this region (Zaidi *et al.*, 2016).

Few independent studies working on ant genera have reported species of ants from Pakistan (Table I) but the first comprehensive study on the ants of area now comprising of Pakistan was by Bingham (1903), since then only a single published study by Umair *et al.* (2012) attempted to document the ant fauna of Potohar plateau of Pakistan and reported 21 species placed in 13 genera and 3 subfamilies. Later on two new species from a single genus were reported from the same area (Bodlah *et al.*, 2016). With limited documentation of the ant fauna of Pakistan, the current study was designed to investigate the ant diversity of District Charsadda with the aim to improve the knowledge regarding the overall ant diversity of Pakistan.

MATERIALS AND METHODS

The present study was conducted in District Charsadda of Khyber Pakhtunkhwa, a northwestern frontier province of Pakistan, located at 34°8'43" N and 71°43'51" E with an altitude of 276 metres (908 feet) and lies 29 kilometres from the provincial capital city of Peshawar. The total area of District Charsadda measures about 996 km², with population of 1.62 million (Pakistan Bureau of Statistics, 2017). There are three tehsils in district Charsadda; Charsadda, Shabqadar and Tangi. Charsadda district has abundant rainfall in months of June-August with the humid climate in monsoon season. The temperature varies from 13°C to 40°C in winter and summer respectively.

Surveys were carried out in all the three tehsils: Charsadda, Tangi and Shabqadar of district Charsadda during 2014-2015. Ants were collected randomly from various habitats i.e., crop fields, graveyard, houses (kitchen, room, washroom) and streets in different localities of the study area. Collection was done both during the day and the night time. Many studies have reported that the use of different sampling techniques enhance the diversity of ant species captured (Longino and Collwell, 1997). As one goal of the current study was to find the diversity of ants in the study area, three main sampling methods were used to sample ants randomly from various areas of Charsadda; Buccal aspirator, opportunistic hand collection and pitfall traps.

The captured ants were first killed and temporarily preserved in 75-90% ethanol filled Eppendorf tubes. After collecting and preservation the Eppendorf tubes were labeled with pre-cut square paper label having a number and information like date of collection, time of collection, locality, ecology of the site of collection and name of collector were noted down in a diary against the that specific number of the collection tube. For long term preservation alcohol in Eppendorf tubes containing preserved ants were renewed to prevent spoilage and discoloration of samples due to dust particles or any other debris collected during sampling. The samples were then brought to Entomology Lab, Department of Zoology, University of Peshawar and were properly mounted following Bolton (1994). Mounting was done by gluing the ants through Seccotine glue to the upper tip of the pre-cut triangular stiff card. Then a pin was inserted through the broader end of the card and after drying the preserved mounted ants were kept in insect box.

Identification was carried out using standard taxonomic keys. The dry preserved specimens were identified to genus level by using a key "Identification guide to the Ant genera of World" by Bolton (1994). Identification up to species level was done mostly by using Fauna of British India while for some genera recent taxonomic publications were used like for *Cataglyphis* key described by Radchenko (1998) and for *Meranoplus* key described by Schodl (1998) were used for species level identification. The identified specimens were also compared with images available online on ant web (www.antweb.org) and ant wiki (www.antwiki.org) and the identified specimens were deposited in Entomology museum, Department of Zoology, University of Peshawar, Peshawar.

Table I. Species of ants reported by different studies from Pakistan.

Genera	Species	Reported by
Sub family: Myrmicinae		
<i>Atopomyrmex</i>	<i>A. ceylonicus</i>	Umair <i>et al.</i> (2012)
<i>Cardiocondyla</i>	<i>C. mauritanica</i>	Siefert <i>et al.</i> (2017)
<i>Crematogaster</i>	<i>C. subnuda</i> *	
	<i>C. rothneyi</i>	Umair <i>et al.</i> (2012)
<i>Holcomyrmex</i>	<i>H. galber</i>	Umair <i>et al.</i> (2012)
	<i>H. scabriceps</i>	Umair <i>et al.</i> (2012)
<i>Meranoplus</i>	<i>M. bicolor</i> *	Umair <i>et al.</i> (2012), Schodl (1998)
	<i>M. instabilis</i> *	
<i>Messor</i>	<i>M. instabilis</i> *	
<i>Monomorium</i>	<i>M. aberrans</i> *	
	<i>M. dichroum</i> *	
	<i>M. indicum</i> *	
	<i>M. longi</i>	Umair <i>et al.</i> (2012)
	<i>M. schurri</i>	Umair <i>et al.</i> (2012)
<i>Paratopula</i>	<i>P. ceylonica</i>	Luo and Guenard (2016)
<i>Pheidole</i>	<i>P. binghami</i> *	
	<i>P. fergusonii</i> *	
	<i>P. indica</i> *	
	<i>P. latinoda</i> *	
	<i>P. sulcaticeps</i> *	
	<i>P. nietneri</i>	Umair <i>et al.</i> (2012)
	<i>P. pronotalis</i>	Umair <i>et al.</i> (2012)
	<i>P. mus</i>	Umair <i>et al.</i> (2012)
<i>Rhopalomastix</i>	Only genus described	Forel (1900)
<i>Solenopsis</i>	<i>S. geminate</i>	Umair <i>et al.</i> (2012)
<i>Stenamma</i>	<i>S. jeriorum</i>	DuBios (1998)
<i>Tetramorium</i>	<i>T. smithi</i>	Umair <i>et al.</i> (2012)
	<i>T. nursei</i>	Bingham (1903)
	<i>T. sulcinode</i>	Csosz <i>et al.</i> (2008)
Sub family: Formicinae		
<i>Camponotus</i>	<i>C. compressus</i> *	Umair <i>et al.</i> (2012)
	<i>C. confucii</i>	Umair <i>et al.</i> (2012)
	<i>C. japonicus</i>	Umair <i>et al.</i> (2012)
	<i>C. oblongus</i> *	Umair <i>et al.</i> (2012)
	<i>C. sericeus</i> *	Bingham (1908), Umair <i>et al.</i> (2012)
<i>Cataglyphis</i>	<i>C. setipes</i> *	

Genera	Species	Reported by
<i>Lasius</i>	<i>L. alienus</i>	Umair <i>et al.</i> (2012)
	<i>L. brunneus</i>	Wilson (1955)
	<i>L. carniolicus</i>	Collingwood (1982)
	<i>L. hirsutus</i>	Seifert (1992)
	<i>L. lawarai</i>	Seifert (1992)
	<i>L. niger</i>	Wilson (1955)
	<i>L. talpa</i>	Collingwood (1982)
	<i>L. wittmeri</i>	Seifert (1992)
	<i>Lepisiota</i>	<i>L. frauenfeldi</i> *
<i>Myrmica</i>	<i>M. aimonissabaudiae</i>	Radchenko and Elmes (2010)
	<i>M. brancucci</i>	Radchenko <i>et al.</i> (1999)
	<i>M. pseudorugosa</i>	Bharti (2012)
	<i>M. rigatoi</i>	Radchenko and Elmes (1998)
	<i>M. vittata</i>	Radchenko and Elmes (1999)
	<i>M. wardi</i>	Radchenko and Elmes (1999)
	<i>M. wittmeri</i>	Siefert (1992)
<i>Paratrechina</i>	<i>P. longicornis</i> *	Wetterer (2008)
<i>Polyrachis</i>	<i>P. hauxwelli</i> *	
	<i>P. hodgsoni</i>	Umair <i>et al.</i> (2012)
Sub family: Ponerinae		
<i>Diacamma</i>	<i>D. scalpratum</i>	Mayr (1879)
Sub family: Pseudomyrmecinae		
<i>Tetraponera</i>	<i>T. allaborans</i>	Bodlah <i>et al.</i> (2016)
	<i>T. nigrans</i>	Bodlah <i>et al.</i> (2016)
	<i>T. rufonigra</i>	Bingham (1903)
Sub family: Dolichoderinae		
<i>Tapinoma</i>	<i>T. melanocephalum</i> *	
Sub family: Ponerinae		
<i>Lioponera</i>	<i>L. longitarusu</i>	Umair <i>et al.</i> (2012)
Sub family: Proceratiinae		
<i>Proceratium</i>	<i>P. confinium</i>	DuBios (1998)

RESULTS

The current study was designed to investigate the ant fauna of District Charsadda as no work has been previously done on the diversity of this important group in the study area. A random collection was carried out from three tehsils i.e. Charsadda, Tangi and Shabqadar of district Charsadda by using three different collection techniques. A total of 19 species representing 11 genera and 3

subfamilies Formicinae, Myrmicinae and Dolichoderinae, were identified during this study. Myrmicinae has been the most diverse subfamily with a total of 11 species. Genus *Pheidole* was represented by the highest number of species (5 species) followed by *Camponotus* and *Monomorium* with three species each. The remaining genera were represented by one species each.

Only a single species *Tapinoma melanocephalum* was collected from indoor (kitchen and rooms) site while, *Cataglyphis setipes*, *Meranoplus bicolor*, *Messor instabilis*, *Polyrhachis hauxwelli*, *Camponotus sericeus* and *Pheidole sulcaticeps* were collected from outdoor (crop fields, lawns, streets, barren grounds, trees, and graveyards) sites. However, remaining 12 species were collected both from indoor as well as outdoor sites.

Details for collected fauna is as follows:

Subfamily: Myrmicinae

Genus: *Crematogaster* Lund, 1831

Crematogaster subnuda Mayr, 1879

Material examined

Charsadda: Prang, 15.VIII.2014, leg. Ahmad, 12 workers; Prang, 10.IX.2014, leg. Asim, 07 workers; Rajar, 05.III.2015, leg. Ahmad, 05 workers; Shabqadar, 11.V.2015, leg. Ijaz, 09 workers.

Comments

Ants were captured from houses (rooms and kitchens), college building, streets, parks (play grounds having grass managed by workers) and some grass fields (unmanaged fields). This is the first report of this species from Pakistan.

Genus: *Meranoplus* Smith, 1853

Meranoplus bicolor (Guerin-Meneville, 1844)

Material examined

Charsadda: Nisatta, 20.IV.2015, leg. Majid, 14 workers, Harichand, 14.VI.2015, leg. Ahmad 05 workers, Prang, 05.III.2015, leg. Ahmad, 08 workers.

Comments

Ants were captured from the fields of wheat and other grasslands. Previously this species was reported by Schodl (1998) and Umair *et al.* (2012).

Genus: *Monomorium* Mayr, 1855

1. *Monomorium indicum* Forel, 1902

Material examined

Charsadda: Sardaryab, 07.VII.2014, leg. Kamran, 12 workers; Umarzai, 03.VIII.2014, leg. Ahmad, 15 workers; Harichand, 07.II.2015, leg. Younus, 34 workers; Prang, 01.IV.2015, leg. Ahmad, 22 workers, 16.II.2015, leg.

Famran, 14 workers; Rajar, 20.VI.2015, leg. Farman, 26 workers; Prang, 11.III.2015, leg. Younus, 12 workers, 15.V.2015, leg. Ahmad, 19 workers; Tangi, 18.IV.2015, leg. Ahmad, 15 workers; Turangzai, 05.V.2015, leg. Ahmad 09 workers; Shabqadar, 27.VI.2015, leg. Ayaz, 09 workers; Sardheri, 28.IV.2015, leg. Ahmad 17 workers; Nisatta, 02.X.2014, leg. Ahmad 14 workers.

Comments

Specimens were collected from houses, streets, shops. This is the first report of this species from Pakistan.

2. *Monomorium aberrans* Forel, 1902

Material examined

Charsadda, 22.IX.2014, leg. Younus, 10 workers, Tangi: Umarzai, 18.IV.2015, leg. Ahmad, 11 workers.

Comments

Specimens were collected from houses: kitchens (near sugar boxes). This is the first report of this species from Pakistan.

3. *Monomorium dichroum* Forel, 1902

Material examined

Charsadda: Bobak, 09.IX. 2014, leg. Ahmad, 10 workers; Tangi, 13.XI.2014, leg. Younus, 15 workers.

Comments

Specimens were recorded from houses, kitchens, grass fields and trees. Our study reports it for the first time from Pakistan.

Genus: *Pheidole* Westwood, 1840

1. *Pheidole fergusonii* Forel, 1902

Material examined

Charsadda: Rajar, 05.VII.2014, leg. Ahmad, 17 workers; Nisatta, 10.VIII.2014, leg. Ahmad, 11 workers.

Comments

Specimens were sampled from rooms and streets and bare grounds. This is the first report of this species from Pakistan.

2. *Pheidole latinoda* Roger, 1863

Material examined

Charsadda: Prang, 02.III.2014, leg. Ahmad, 05 workers; Umarzai, 07.VI.2014, leg. Younus, 11 workers.

Comments

Specimens were collected from houses (rooms),

streets and bare grounds. Present study reports it for the first time from Pakistan.

3. *Pheidole sulcaticeps* Roger, 1863

Material examined

Tangi, 23.VI.2014, leg. Waheed, 09 workers

Comments

Specimens were collected from bare grounds. Current study reports it for the first time from Pakistan.

4. *Pheidole binghamii* Forel, 1902

Material examined

Charsadda: Nisatta, 20.III.2015, leg. Ahmad, 05 workers; Tangi, 10.IV.2014, leg. Younus, 06 workers; Umarzai, 15.V.2014, leg. Ahmad, 17 workers.

Comments

Specimens were collected from bare grounds, melon fields, damp soil and streets. Our study report it for the first time from Pakistan.

5. *Pheidole indica* Mayr, 1879

Material examined

Charsadda: Utmanzai, 03.VIII.2014, leg. Ahmad, 12 major workers; Prang, 07.IX.2014, leg. Ahmad, 07 major workers and 5 minor workers; Rajar, 02.III.2015, leg. Ahmad 12 major workers.

Comments

Specimens were collected from houses (rooms, kitchens washrooms), streets and grounds. This is the first report of this species from Pakistan.

Genus: *Messor* Forel, 1890

Messor instabilis Smith, 1858

Material examined

Charsadda: Prang, 25.II.2014, leg. Ahmad, 42 workers; 03.III.2014, leg. Ahmad, 22 workers; Tangi; 15.IV.2014, leg. Younus, 24 workers; Nisatta, 05.V.2014, leg. Ahmad, 21 workers; Shabqadar, 10.III.2015, leg. Ahmad, 15 workers.

Comments

Specimens were collected from graveyards, streets and bare grounds. This is the first report of this species from Pakistan.

Subfamily: Formicinae

Genus: *Lepisiota* Santschi, 1926

Lepisiota frauenfeldi Mayr, 1855

Material examined

Charsadda: Tangi, 12.IV.2014, leg. Younus, 09 workers; Prang, 08.VI.2014, leg. Ahmad, 12 workers; Turangzai, 16.V.2014, leg. Taimur, 19 workers; Sardaryab, 07.III.2014, leg. Kamran, 21 workers.

Comments

Specimens were collected from bare grounds, streets and houses. All morphological characters were exactly similar to that described by Bingham (1903) except colour which was shining black as compared to yellowish and dark brown. This species was previously reported by Umair *et al.* (2012) from Potohar region of Pakistan.

Genus: *Camponotus* Mayr, 1861

1. *Camponotus compressus* Fabricius, 1787

Material examined

Charsadda: Prang, 22.III.2014, leg. Ahmad, 09 workers (03 minor and 05 major workers); 10.VI.2014, leg. Ahmad 06 workers (2 major and 4 minor workers) Rajar, 19.V.2014, leg. Ahmad, 11 workers (07 major and 4 minor); Nisatta, 14.IX.2014, leg. Kamran, 08 workers (05 minor and 3 major workers); Sardheri, 05.III.2014, leg. Ahmad, 06 major workers.

Comments

Samples were collected from graveyards, grass fields and bare grounds. This species was previously reported by Umair *et al.* (2012) from Pakistan.

2. *Camponotus oblongus* Forel, 1916

Material examined

Charsadda: Mandani, 01.III.2014, leg. Ahmad, 11 workers; Shabqadar, 28.III.2014, leg. Kamran, 11 workers (08 major and 03 minor workers), Turangzai, 24.V.2014, leg. Ahmad, 13 workers (06 minor and 7 major workers); Quaid Abad, 03.IX.2014, leg. Ahmad, 06 workers (2 major and 4 minor).

Comments

Samples were collected from fruit shops, grass fields and graveyards. This species was previously reported by Umair *et al.* (2012) from Pakistan.

3. *Camponotus sericeus* Fabricius, 1798

Material examined

Tangi, 06.III.2014, leg. Younus, 07 workers; shabqadar, 05.VI.2014, leg. Kamran, 06 workers.

Comments

Ant specimens were collected from trees and bare

grounds. [Bingham \(1903\)](#) and [Umair *et al.* \(2012\)](#) has previously reported this species from Pakistan.

Genus: *Polyrachis* Smith, 1857
Polyrachis hauxwelli Bingham, 1903

Material examined

Charsadda: Umerzai, 17.VII.2014, leg. Farman, 08 workers; Nisatta, 28.VI.2014, leg. Ahmad, 06 workers.

Comments

Specimens were collected from the fields of hybrids and other plants. This is the first report of this species from Pakistan.

Genus: *Cataglyphis* Foerster, 1850
Cataglyphis setipes Forel, 1894

Material examined

Charsadda: Prang, 03.III.2014, leg. Ahmad, 07 workers; Tangi, 10.IV.2014, leg. Younis, 05 workers; Sherpao, 23.V. 2014, leg. Ahmad, 06 workers.

Comments

Specimens were collected from the graveyards and other dry bare grounds. This is the first report of this species from Pakistan.

Genus: *Paratrechina* [Motschulsky](#), 1863
Paratrechina longicornis [Latreille](#), 1802

Material examined

Nisatta, 07.X.2014, leg. Ahmad, 10 workers; Shabqadar, 12.VIII.2014, leg. Kamran, 07 workers; 15.VI.2014, leg. Ahmad, 09 workers; Prang, 18.VI.2014, leg. Ahmad, 11 workers.

Comments

Specimens were collected both indoors and outdoors areas such as rooms and road sides and streets. [Wettere \(2008\)](#) has previously reported this species from Pakistan.

Subfamily: Dolichoderinae
Genus: *Tapinoma* Foerster, 1850
Tapinoma melanocephalum Fabricius, 1793

Material examined

Charsadda: Prang, 03.IX.2014, leg. Ahmad, 12 workers; Rajar, 19.III.2016, leg. Ahmad, 16 workers.

Comment

Specimens were collected from kitchen and rooms.

This is the first report of this species from Pakistan.

DISCUSSION

Current study of ant diversity in district Charsadda is the first account of ants in the study area as well as in Khyber Pakhtunkhwa, which reports 19 species placed in 11 genera and three subfamilies. Our study reports one subfamily, seven genera and their 13 species for the first time from Pakistan.

The first comprehensive work on the ant fauna predate the creation of Pakistan when [Bingham \(1903\)](#) carried out a detailed study on the diversity of this important group in Indo-Pak subcontinent, Ceylon and Burma. In his work [Bingham \(1903\)](#) reported 498 species placed in 79 genera. As Bingham work cover whole of the subcontinent including Burma and Ceylon and covers almost all types of habitats resulting in such a huge number of species reported during that work. Current study covers only a single district of Khyber Pakhtunkhwa having not highly diverse habitats where ant species could occur, which could be the possible reason for reporting 19 species belonging to 11 genera only, however, all the species identified in current study were also reported by [Bingham \(1903\)](#) in his work "Fauna of British India".

The current study reports a total of 19 species, all of which are reported for the first time reported from the study area. Thirteen of the species reported during present work represent reports of species in Pakistan since 1947. Six species i.e. *Meranoplus bicolor*, *Camponotus compressus*, *Camponotus oblongus*, *Camponotus sericeus*, *Lepisiota frauenfeldi*, *Paratrechina longicornis* has been already reported by other studies. One of the species, *Paratrechina longicornis* is already enlisted in the ant fauna of Pakistan on the Antwiki (www.antwiki.org) and Antweb (www.antweb.org) websites without mentioning any direct citation while remaining five species i.e. *Camponotus compressus*, *Camponotus oblongus*, *Camponotus sericeus*, *Lepisiota frauenfeldi*, *Meranoplus bicolor* were reported by [Umair *et al.* \(2012\)](#) from Potohar plateau of Punjab, Pakistan. Sixteen species documented by [Umair *et al.* \(2012\)](#) i.e. *Holcomyrme scabricps*, *H. glaber*, *Pheidole nietneri*, *P. pronotalis*, *P. mus*, *Monomorium logni*, *M. schurri*, *Solenopsis geminate*, *Atopomyrmex ceylonicus*, *Crematogaster rothneyi*, *Tetramorium smithi*, *Polyrachis hodgsoni*, *Camponotus confucii*, *C. japonicas*, *Lasius alienus* and *Liponera longitarsus* are not reported in current survey. This could be due to difference in ecological and habitat condition from which the collections were made.

All of the species that are recognized in this study are also reported by different studies from India and present in the list of Indian ants species enlisted by [Bharti \(2011\)](#).

Bharti (2011) enlisted a total of 652 valid species known to occur in India. Previously Umair *et al.* (2012) reported 21 species placed in 13 genera from Pakistan and then Bodlah *et al.* (2016) further added two species from a single genus *Tetraponera*. Other studies done on various genera reported 23 different species from Pakistan. Our study further adds 13 species, 4 new genera and one subfamily to the ant fauna of Pakistan bringing the total number of species to 59, genera to 18 and subfamilies to six (Table 1).

Our study shows that only a single species i.e. *Tapinoma melanocephalum* has been reported from indoor collection sites where as seven species have been reported only from outdoor collection site, while remaining 11 species have been reported both from indoor as well as outdoor collection site. No association has been observed between outdoor collection site type and occurrence of species. As mentioned earlier that certain species reported from Potohar region of Punjab (Umair *et al.*, 2012) are not reported in current studies. Description of those species shows that they have been mostly collected from the forest area of Ayub Park or from the hilly areas of Islamabad. Our study area most consist of arid and semiarid habitats so species reported in current study were not reported by Umair *et al.* (2012) and vice versa due to difference in habitat of the two study areas.

Our study area occurs in the palearctic ecozone and Afghanistan is also in palearctic region, so similarity of fauna may be expected up to some extent. It is clearly justified by results that some of the species reported in this study are also documented by different studies carried out in Afghanistan. Five species i.e. *Monomorium indicum*, *Cataglyphis setipes* (*Cataglyphis longipedum*), *Camponotus sericeus*, *Tapinoma melanocephalum* and *Acathelepis frauenfeldi* (*Lepisiota frauenfeldi*) were also reported by Collingwood (1961) from Afghanistan.

Present study recorded total 19 species belonging to 11 genera and 3 subfamilies from district charsadda. It also adds 13 species, 4 genera and one subfamily to the checklist of ants of Pakistan as these are the first report of these species from Pakistan, however this field still require lot of work. Future studies should include more unexplored areas and diversity in habitats which should be surveyed for the ant fauna of Pakistan. Along with ant diversity ecological studies should also be conducted to know the effect of presence or absence of these important bioengineers and ecological indicators on the ecology of a particular area.

ACKNOWLEDGEMENTS

The authors are thankful to the students of GPGC Charsadda for their help in collection of samples during

the study period.

Statement of conflict of interest

The authors declare no conflict of interest.

REFERENCES

- Baroni Urbani, C. and de Andrade, M.L., 2003. The ant genus *Proceratium* in the extant and fossil record (Hymenoptera: Formicidae). *Mus. Reg. Sci. Nat. Monog.*, **36**: 1–492.
- Bharti, H., 2011. List of Indian ants (Hymenoptera: Formicidae). *Halteres*, **3**: 79-87.
- Bharti, H. 2012. Two new species of the genus *Myrmica* (Hymenoptera: Formicidae: Myrmicinae) from the Himalaya. *Tijdschr. Ent.*, **155**: 9–14. <https://doi.org/10.1163/004074912X631742>
- Bharti, H., Guenard, B., Bharti, M. and Economo, E. P., 2016. An updated checklist of the ants of India with their specific distributions in India states (Hymenoptera, Formicidae). *Zookeys*, **551**: 1-83. <https://doi.org/10.3897/zookeys.551.6767>
- Bingham, C.T., 1903. *Hymenoptera*. Vol. II: *Ants and cuckoo-wasps*. Taylor & Francis, London.
- Bodlah, I. Rasheed, M.T., Gull-e-Fareen, A., Ajmal, M.S. and Bodlah, M.A., 2016. First record of two new species of genus *Tetraponera* (Hymenoptera: Pseudomyrmecinae: Formicidae) from Pakistan. *J. Ent. Zool. Stud.*, **4**: 1028-1030.
- Bolton, B., 1994. *Identification guide to the ant genera of the world*. Harvard University Press. <https://doi.org/10.1097/00010694-197804000-00022>
- Bolton, B., Bolton, B., 1995. *A new general catalogue of the ants of the world* (No. C/595.796 B6).
- Bolton, B., Alpert, G., Ward, P.S. and Naskrecki, P., 2006. *Bolton's catalogue of ants of the world: 1758–2005*. Harvard University Press, Cambridge, Massachusetts.
- Brian, M.V. ed., 1978. *Production ecology of ants and termites* (Vol. 13). Cambridge University Press.
- Collingwood, C.A., 1982. Himalayan ants of the genus *Lasius* (Hymenoptera: Formicidae). *Syst. Ent.*, **7**: 283-296. <https://doi.org/10.1111/j.1365-3113.1982.tb00446.x>
- Collingwood, C.A., 1961. The third Danish expedition to Central Asia. Zoological Results 27. Formicidae (Insecta) from Afghanistan. *Vidensk. Medd. Dan. Naturhist. Foren.*, **123**: 51-79.
- Csosz S., Radchenko, A. and Schulz, A., 2007. Taxonomic revision of the Palearctic *Tetramorium chefketi* species complex (Hymenoptera: Formicidae). *Zootaxa*, **1405**:1-38.

- DuBois, M.B., 1998a. A revision of the ant genus *Stenammina* in the Palaearctic and Oriental regions (Hymenoptera: Formicidae: Myrmicinae). *Sociobiology*, **29**: 193-403.
- Farji-Brener, A.G., Ruggiero, A., 1994. Leaf-cutting ants (*Atta* and *Acromyrmex*) inhabiting Argentina: patterns in species richness and geographical range sizes. *J. Biogeogr.*, **21**: 391-399. <https://doi.org/10.2307/2845757>
- Forel, A., 1900a. Un nouveau genre et une nouvelle espèce de Myrmicide. *Annls. Soc. Ent. Belg.* **44**: 24-26.
- Fowler, H.G. and Claver, S., 1991. Leaf-cutter ant assemblies: effects of latitude, vegetation, and behaviour. In: *Ant-plant interactions* (eds. C.R. Huxely and D.F. Cutler) Oxford University Press, Oxford. pp. 51-59.
- Holldobler, B. and Wilson, E.O., 1990. *The ants*. Harvard University Press. pp. 746. <https://doi.org/10.1007/978-3-662-10306-7>
- Kusnezov, N., 1957. Numbers of species of ants in faunas of different latitudes. *Evolution*, **11**: 298-299. <https://doi.org/10.1111/j.1558-5646.1957.tb02898.x>
- Longino, J.T. and Colwell, R.K., 1997. Biodiversity assessment using structured inventory: capturing the ant fauna of a tropical rain forest. *Ecol. Appl.*, **7**: 1263-1277. [https://doi.org/10.1890/1051-0761\(1997\)007\[1263:BAUSIC\]2.0.CO;2](https://doi.org/10.1890/1051-0761(1997)007[1263:BAUSIC]2.0.CO;2)
- Luo, Y.Y. and Guénard, B., 2016. Descriptions of a new species and the gyne in the rarely collected arboreal *ratopula* and *Rotastruma* (Hymenoptera: Formicidae) from Hong Kong, with a discussion on their ecology. *Asian Myrmecol.*, **8**: 1-16.
- Mayr, G., 1879. Beiträge zur Ameisen-Fauna Asiens. – *Verhandl. kaiserlich-königlichen Zool. –Bot. Gesellsch. Wien.*, **28**: 645-686.
- Mirza, M.R., 1975. Freshwater fishes and zoogeography of Pakistan. *Bijdragen tot de dierk.*, **45**: 144-176. <https://doi.org/10.1163/26660644-04502001>
- Narendra, A., Ali, T.M. and Series, S.C., 2012. Ant species composition and diversity in the Sharavathi River Basin, Central Western Ghats. *Sahyadri Conserv. Ser. 3, ENVIS Tech. Rep.*, **20**: 51.
- Pakistan Bureau of Statistics, 2017. *Block Wise Provisional Summary Results of 6th Population & Housing Census-2017*. Pakistan Bureau of Statistics. Govt. of Pakistan. Pakistan.
- Radchenko, A.G. and Elmes, G.W., 1998. Taxonomic revision of the *rita* species-group of the genus *Myrmica* (Hymenoptera, Formicidae). *Vestn. Zool.* **32**: 3-27
- Radchenko, A.G. and Elmes, G.W., 1999a. Ten new species of *Myrmica* (Hymenoptera, Formicidae) from the Himalaya. *Vestn. Zool.*, **33**: 27-46
- Radchenko, A.G. and Elmes, G.W., 2010. *Myrmica* ants of the Old World. *Fauna Mundi*, **3**: 1-789.
- Radchenko, A.G., 1998. A key to ants of the genus *Cataglyphis* Foerster (Hymenoptera, Formicidae) from Asia. *Ent. Rev.*, **78**: 475-480.
- Rafi, M.A., Jurgen, W., Matin, M.A., Zia, A., Sultan, A. and Naz, F., 2010. Faunistics of tiger beetles (Coleoptera: Cicindelidae) from Pakistan. *J. Insect Sci.*, **10**: 116. <https://doi.org/10.1673/031.010.11601>
- Samson, D.A., Rickart, E.A. and Gonzales, P.C., 1997. Ant diversity and abundance along an elevational gradient in the Philippines I. *Biotropica*, **29**: 349-363. <https://doi.org/10.1111/j.1744-7429.1997.tb00436.x>
- Schödl, S., 1998. Taxonomic revision of Oriental *Meranoplus* F. Smith, 1853 (Insecta: Hymenoptera: Formicidae: Myrmicinae). *Annls. Naturhist. Mus. Wien. B. Bot. Zool.* **100**: 361-394.
- Seifert, B., 1992. A taxonomic revision of the Palaearctic members of the ant subgenus *Lasius* s.str. (Hymenoptera: Formicidae). *Abh. Ber. Naturk. Görlitz*, **66**: 1-67.
- Seifert, B., Okita, I. and Heinze, J., 2017. A taxonomic revision of the *Cardiocondyla nuda* group (Hymenoptera: Formicidae). *Zootaxa*, **4290**: 324-356. <https://doi.org/10.11646/zootaxa.4290.2.4>
- Umair, M., Zia, A., Naeem, M. and Chaudhry, M.T., 2012. Species composition of ants (Hymenoptera: Formicidae) in Potohar Plateau of Punjab Province, Pakistan. *Pakistan J. Zool.*, **44**: 699-705.
- Ward, P.S. (ed.), 2013. *Ant web: Ants of Indonesia*. Available from: <http://www.Antweb.org/indonesia.jsp> Accessed 8 October 2018.
- Wetterer, J.K., 2008. Worldwide spread of the longhorn crazy ant, *Paratrechina longicornis* (Hymenoptera: Formicidae). *Myrmecol. News*, **11**: 137-149.
- Wilson, E.O., 1955a. A monographic revision of the ant genus *Lasius*. *Bull. Mus. Comp. Zool.*, **113**: 1-201
- Wilson, E.O., 1971. *The insect societies*. Harvard University Press.
- Wilson, E.O. and Taylor, R.W., 1967. The ants of Polynesia (Hymenoptera: Formicidae). *Pacif. Insects Monogr.*, **14**.
- Zaidi, F., Fatima, S. H., Khisroon, M. and Gul A., 2016. Distribution modeling of three screwworm species in ecologically diverse landscape of North West Pakistan. *Acta Trop.*, **162**: 56-65. <https://doi.org/10.1016/j.actatropica.2016.06.015>