

History of study and checklist of the scorpion fauna (Arachnida: Scorpiones) of Iran

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An updated checklist of the scorpion fauna of Iran, as well as a brief history of taxonomic research on scorpions of Iran is presented. The checklist is based on records of scorpion species whose presence has been confirmed in Iran through field expeditions, examination of scorpion collections, literature review, and personal communications from researchers. The scorpion fauna consists of 51 species (30 endemic to Iran) belonging to 18 genera and four families. © 2011 Progress in Biological Sciences. Vol. 1, No. 2, 16-28.

KEY WORDS: Scorpions, Buthidae, Scorpionidae, Hemiscorpiidae, Diplocentridae, checklist, Iran.

Abbreviations. - Specimen depositories:

FKCP – František Kovařík Collection, Praha, Czech Republic.

MCSN – Museo Civico de Storia Naturale “Giacomo Doria”, Geneva, Italy.

NHMW – Naturhistorisches Museum Wien, Vienna, Austria.

MHNG – Museum d’Histoire Naturelle, Geneva, Switzerland.

MNHN – Muséum National d’Histoire Naturelle, Paris, France.

MZUF- Museo Zoologico, Sezione del Museo di Storia Naturale, University of Florence, Italy.

RRLS - Razi Reference Laboratory of Scorpiones, Ahwaz, Iran.

ZISP – Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia.

ZMHB – Museum für Naturkunde der Humboldt-Universität zu Berlin, Germany.

ZMUH – Zoologisches Institut und Zoologisches Museum, Universität Hamburg, Germany.

ZUTC- Zoological Museum, University of Tehran, Tehran, Iran.

USNM- United States National Museum, Washington, DC, USA.

VVZC- Valerio Vignoli Zoological Collection, Italy.

INTRODUCTION

Although taxonomic and faunistic studies of the scorpion fauna of Iran were initiated by Olivier (1807) the fauna and zoogeography of Iran and its adjacent areas have still not been comprehensively studied. Research has been infrequent, and available literature is mainly based on scattered specimen collections by researchers working around the turn of twentieth century and the early 1900s. The validity of some described species and most of the subspecies, as well as their geographic distribution is ambiguous, and taxonomic revisions for some taxa may be appropriate. For example, classification of *Mesobuthus*, *Androctonus*, *Orthochirus*, and *Compsobuthus* remains challenging despite recent efforts to revise their systematics.

The scorpion fauna of desert and semi-desert areas of Iran is extremely diverse. Olivier (1807) gave the earliest description of scorpions in Iran (from the city of Kashan). Later the Russian zoologist, Alexei Andreevich Bialynitskii-Birulya (Birula, 1900, 1903, 1905 and 1917) produced a series of publications on scorpions from Iran. His reports were mainly

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based on specimens collected by another Russian zoologist, Nicholas A. Zarudny. These specimens were deposited in the zoological museum of the Russian Academy of Sciences in Saint Petersburg (ZISP). They included well-known species and several rare taxa which have been the subject of several recent taxonomic and biogeographic studies (Fet, 1984, 1997; Lourenço, 1996; Fet *et al.*, 2001). Birula described three genera and seven species in 1900, five genera and nine species in 1903, five genera and 11 species in 1905, and four genera and 17 species in 1917, clearly making significant contributions to our knowledge of scorpions in Iran. A few scorpion species were also described by the pioneering zoologists Pocock (1900) and Werner (1936).

In the mid-twentieth century, Max Vachon conducted scattered studies of the fauna of Iran. Vachon (1966) reported nine genera and 15 species. Two Iranian scorpologists, Talat Habibi and Reza Farzanpay, made contributions during the same period. Habibi (1971) recorded 24 species belong to 11 genera and, Farzanpay (1987, 1988) recorded 23 species belong to 17 genera. Based on personal communications with Max Vachon, Farzanpay (1987) claimed that four genera, *Olivierus*, *Simonoides*, *Sassanidotus*, and *Razianus*, had not been previously described. Subsequent evidence has shown that only *Sassanidotus* and *Razianus* were new genera (Kovařík and Fet, 2006a, b). *Olivierus* Farzanpay, 1987 was demonstrated to be a junior synonym of *Mesobuthus* Vachon, 1958 (synonymized by Gantenbein *et al.*, 2003), and *Simonoides* was shown by Kovařík and Fet (2006a,b) to be a junior synonym of *Orthochirus* Karsch, 1891. *Razianus* has been synonymized with *Neohemibuthus* Lourenço, 1996. However, Fet and Lowe (2000) suggested that the name *Razianus* is valid, because the genus was described under this name before being described under the name of *Neohemibuthus*. Although neglect of the International Code of Zoological Nomenclature caused some taxonomic problems, Farzanpay's book *Knowing Scorpions* made a great contribution to our knowledge of scorpions in Iran.

Further studies dealing with scorpion fauna of Iran have been published after Farzanpay's publications (1987, 1988) including a list of 17 genera and 32 species provided by Kovařík (1997). A more comprehensive study of Iranian scorpions was recently presented in a continuing series of publications by Navidpour *et al.* (2008a, b, c, d, 2010, 2011) who reported the distribution of scorpions in various provinces of Iran.

In the present paper, species with confirmed presence in Iranian territories via field expeditions, examination of collections, literature review, as well as extensive personal communications with regional scorpologists are listed.

Species list

Information on general distribution of each species in Iran is provided. Comments on taxonomic status of some species are presented.

Family Buthidae C. L. Koch, 1837

Fifteen genera and 44 species belonging to the family Buthidae are found in Iran.

Genus *Androctonus* Hemprich et Ehrenberg, 1828

Androctonus baluchicus (Pocock, 1900)

Type Locality: Pakistan, northern Baluchistan.

Distribution: Afghanistan, Iran, and Pakistan (Pocock, 1900; Kovařík, 1997; Lourenço, 2005) (Fig. 1A).

Androctonus crassicauda (Olivier, 1807)

Type Locality and repository: Iran, Esphehan Province, Kashan; MNHN.

Distribution: Widely distributed in Iran and found in most provinces (Birula, 1900; Birula, 1903; Birula, 1905; Farzanpay, 1987, 1988; El-Hennawy, 1992; Akbari, 2007; Navidpour *et al.*, 2008a, b, c, d, 2010 and 2011; Piralikheirabadi *et al.*, 2009). This species recorded also from western Asia and northern Africa (Fet and Lowe, 2000) (Fig. 1A).

Genus *Apistobuthus* Finnegan, 1932

Apistobuthus susanae Lourenço, 1998

Type locality and repository: Iran, Khuzestan Province, Ahwaz; ZMUH.

Distribution: Endemic to Iran. Found in Khuzestan Province, Ahwaz; Lorestan Province, Oshtoran Kuh (Farzanpay, 1987; Lourenço, 1998; Navidpour *et al.*, 2008a; Navidpour and Lowe, 2010) (Fig. 1A).

Genus *Buthacus* Birula, 1908

Buthacus macrocentrus (Ehrenberg, 1828)

Type locality and repository: Sinai; ZMHB.

Distribution: Iran: Bushehr Province, Chahak District; Hormozgan and Khuzestan provinces (Kovařík, 2005; Navidpour *et al.*, 2008a). This species also has been recorded from Iraq, Israel, Jordan, Syria, and Turkey (Vachon, 1966; Pérez, 1974; Crucitti and Vignoli, 2002) (Fig. 1A).

Genus *Compsobuthus* Vachon, 1949

Compsobuthus garyi Lourenço and Vachon, 2001

Type locality and repository: Iran, Khuzestan Province, 45 km NW of Masdjed-e-Soleyman; MNHN.

Distribution: Endemic to Iran. Found in Khuzestan Province (Lourenço and Vachon, 2001; Kovařík and Ahmed, 2007; Navidpour *et al.*, 2008a) (Fig. 1B).

Compsobuthus jakesi Kovařík, 2003

Type locality and repository: Iraq, Najaf Province, Ash-Shabakah, Geophysics Brno base camp, 150 km SW of An-Najaf (Najaf); FKCP.

Distribution: Iran, Bushehr, Ilam, and Khuzestan provinces (Navidpour, 2008; Navidpour *et al.*, 2008a, b, c); Iraq (Kovařík, 2003) (Fig. 1B).

Compsobuthus kafkai Kovařík, 2003

Type locality and repository: Iran, Sistan va Baluchistan Province, Bampur; FKCP

Distribution: Endemic to Iran. Found in Sistan va Baluchistan Province (Kovařík, 2003; Kovařík and Ahmed, 2007) (Fig. 1B).

Compsobuthus kaftani Kovařík, 2003

Type locality and repository: Iran, Esfahan and Kerman Provinces; FKCP.

Distribution: Endemic to Iran. Found in Esfahan, Kerman, and Yazd provinces (Kovařík,

2003; Vignoli *et al.*, 2003; Vignoli and Crucitti, 2005; Navidpour *et al.*, 2011) (Fig. 1B).

Compsobuthus matthiesseni (Birula, 1905)

Type locality and repository: Iran, Qum Province (= Qom); ZISP.

Distribution: Iran, known from Azerbaijan, Bushehr, Chahar Mahal and Bakhtiyari, Fars, Hamadan, Ilam, Kerman, Kermanshah, Khuzestan, Kohgiluyeh va Boyer-Ahmad, Kordestan, Lorestan, Markazi, and Qom provinces (Birula, 1905; Farzanpay, 1987, Sissom and Fet, 1998; Kovařík, 2003; Akbari, 2007; Navidpour, 2008; Navidpour *et al.*, 2008a, b, c, d; Pirali-Kheirabadi *et al.*, 2009; Navidpour *et al.*, 2010 and 2011), Iraq, Turkey and Syria (Kovařík, 1996) (Fig. 1B).

Compsobuthus persicus Navidpour *et al.*, 2008

Type locality and repository: Iran, Bushehr Province, Borazjan, Dalaki; RRLS and FKCP.

Distribution: Endemic to Iran. Found in Bushehr and Fars provinces (Navidpour, 2008; Navidpour *et al.*, 2008b) (Fig. 1B).

Compsobuthus petriolii Vignoli, 2005

Type locality and repository: Iran, Fars Province, Takht-e-Jamshid; VVZC.

Distribution: Endemic to Iran. Found in Fars Province (Vignoli, 2005) (Fig. 1B).

Compsobuthus plutenkoi Kovařík, 2003

Type locality and repository: Iran, Hormozgan Province, Beshagerd Mountains., Davari Village, FKCP.

Distribution: Endemic to Iran. Found in Hormozgan Province, Beshagerd Mountains (Kovařík, 2003) (Fig. 1B).

Compsobuthus rugosulus (Pocock, 1900)

Type locality and repository: Central India, Gwalior; BMNH.

Distribution: Iran, Afghanistan, India, and Pakistan (Pocock, 1900; Birula, 1905; Kovařík, 2003) (Fig. 1B).

Compsobuthus sobotniki Kovařík, 2003

Type locality and repository: Iran, Hormozgan Province, Kargushki; FKCP.

Distribution: Endemic to Iran. Found in Hormozgan Province, Kargushki (Kovařík, 2003) (Fig. 1B).

Genus *Hottentotta* Birula, 1908

Hottentotta jayakari (Pocock, 1895)

Type locality and repository: Oman, Muscat; BMNH.

Distribution: Iran, India, Oman, Saudi Arabia, United Arab Emirates (Hendrixson, 2006), and Yemen (Al-Safadi, 1992). This species, along with *H. alticola*, was listed for Iran only by Farzanpay (1988) without a specified locality. Therefore, records for Iran must be considered in doubt.

Hottentotta khoozestanus Navidpour et al., 2008

Type locality and repository: Iran, Khuzestan Province, Behbahan–Dailam road; RRLS.

Distribution: Endemic to Iran. Found in Khuzestan Province (Navidpour et al., 2008a) (Fig. 1B).

Hottentotta lorestanus Navidpour et al., 2010

Type locality and repository: Iran, Lorestan Province, Borujerd, Wenoiei Village (Navidpour et al., 2010); RRLS.

Distribution: Endemic to Iran. Found in Lorestan Province (Navidpour et al., 2010) (Fig. 1B).

Hottentotta saulcyi (Simon, 1880)

Type locality and repository: Iraq, Mosul; MNHN, ZMUH.

Distribution: Iran: Chahar Mahal va Bakhtiyari, Hamadan, Hormozgan, Ilam, Kermanshah, Khuzestan, Kohgiluyeh va Boyer-Ahmad, and Lorestan provinces (Vachon, 1966; Farzanpay, 1987; Kovařík, 1997, 2007; Navidpour et al., 2008a, b, c, d, Pirali Kheirabadi, et al., 2009; Navidpour et al., 2010); Afghanistan, Iraq, and Turkey (Kovařík, 1997; Crucitti and Vignoli, 2002; Yağmur et al., 2008). (Fig. 1C)

Hottentotta schach (Birula, 1905)

Type locality and repository: Iran, Khuzestan Province, Dehdez; ZISP.

Distribution: Endemic to Iran. Found in Fars and Khuzestan provinces (Birula, 1905; Kovařík, 2007; Navidpour et al., 2008a); Iraq (Kovařík, 2007) (Fig. 1C).

Hottentotta zagrosensis Kovařík, 1997

Type locality and repository: Iran, Fars Province, Zagros Mountains, Abshar village; FKCP.

Distribution: Endemic to Iran. Found in Fars, Khuzestan, Kohgiluyeh va Boyer-Ahmad, Lorestan, and West Azerbaijan provinces (Kovařík, 1997, 2007; Navidpour et al., 2008d; 2010) (Fig. 1B).

Genus *Iranobuthus* Kovařík, 1997

Iranobuthus krali Kovařík, 1997

Type locality and repository: Fars Province, 10 km E of Sivand village; FKCP.

Distribution: Endemic genus and species to Iran. Found in Esphehan and Fars provinces (Kovařík, 1997; Vignoli et al., 2003; Navidpour and Mashipour, 2009) (Fig. 1D).

Genus *Kraepelinia* Vachon, 1974

Kraepelinia palpator (Birula, 1903)

Type locality and repository: Iran, Kerman Province, Sarghad; ZISP.

Distribution: Iran: Found in Kerman and Yazd provinces (Birula, 1903; Farzanpay, 1987; Fet, 1987; Vignoli and Crucitti, 2005), Turkmenistan (Fet, 1984, 1994) (Fig. 1D).

Genus *Liobuthus* Birula, 1898

Liobuthus kessleri Birula, 1898

Type locality and repository: Turkmenistan; ZISP.

Distribution: Iran, Khorasan-e Razavi, Sarakhs (Farzanpay, 1987); Kazakhstan, Tajikistan, Turkmenistan, Uzbekistan (Vachon, 1958; Farzanpay, 1987; Fet, 1988, 1994) (Fig. 1D).

Genus *Mesobuthus* Vachon, 1950

Mesobuthus caucasicus (Nordmann, 1840)

Type locality and repository: Caucasus, Georgia, Tbilisi; Helsinki University.

Distribution: Iran, Azerbaijan, Esphehan, Khorasan, Markazi, Semnan, Sistan va Baluchistan, and Tehran provinces (Pocock, 1900; Birula, 1903; Habibi, 1971; Farzanpay, 1987; Vignoli

et al., 2003), Afghanistan, Armenia, Azerbaijan, China, Georgia, Iraq, Kazakhstan, Mongolia, Russia, Tajikistan, Turkey, Turkmenistan, Ukraine and Uzbekistan (Fet, 1988; Fet, 1994; Karataş, 2005) (Fig. 1E).

Mesobuthus eupeus (C. L. Koch, 1839)

Type locality and repository: Types lost; "Caucasus"; Georgia, Tbilisi.

Distribution: Iran, widely distributed and known from Ardebil, Azerbaijan, Esphehan, Golestan, Kerman, Khorasan, Markazi, Mazandaran, Semnan, Sistan va Baluchistan, Tehran, and Yazd provinces (Habibi, 1971; Farzanpay, 1987; Kovařík, 1997; Vignoli *et al.*, 2003; Vignoli and Crucitti, 2005; Navidpour *et al.*, 2008a, b, c, d; Pirali-Kheirabadi *et al.*, 2009; Mirshamsi *et al.*, 2010; Navidpour *et al.*, 2010 and 2011); Afghanistan, Armenia, Central Asia, China, Georgia, Iraq, and Turkey (Fet, 1988, 1994; Karataş and Karataş, 2001, 2003; Kovařík *et al.*, 2011) (Fig. 1E).

Comment: Traditionally, this species represents at least 14 taxonomically valid morphological subspecies distinguishable by coloration and color patterns and carination (Fet and Lowe, 2000). However, results of recent studies have shown that some subspecies are full species and must be raised to the species level, e.g. *M. e. phillipsi* (Mirshamsi *et al.*, 2010; 2011), and that some subspecies are synonyms, e.g. *M. e. philippovitschi* and *M. e. eupeus* (Kovařík *et al.*, 2011).

Mesobuthus macmahoni (Pocock, 1900)

Type locality and repository: Pakistan, northern Baluchistan; BMNH.

Distribution: Kerman and Sistan va Baluchistan provinces, Afghanistan and Pakistan (Pocock, 1900; Habibi, 1971; Navidpour *et al.*, 2011) (Fig. 1E).

Comment: The existence of this species in Iran was questioned by Farzanpay (1988) but was recently confirmed in Kerman by Navidpour *et al.* (2011)

Mesobuthus phillipsi (Pocock, 1889)

Type locality and repository: Iran, Bushehr Province, Bushehr; BMNH.

Distribution: Iran, in Bushehr, Chahar-Mahal va Bakhtiyari, Fars, Hormozgan, Ilam, Khuzestan, Kohgiluyeh va Boyer-Ahmad, and Lorestan provinces; Iraq, Syria and Turkey (Navidpour *et al.*, 2008a, b, c, d; Pirali-Kheirabadi *et al.*, 2009; Navidpour *et al.*, 2010; Mirshamsi *et al.*, 2010; Kovařík *et al.*, 2011; Mirshamsi *et al.*, 2011) (Fig. 1E).

Mesobuthus vesiculatus (Pocock, 1899)

Type locality and repository: The type locality of this species (Astracan) is ambiguous (Fet and Lowe, 2000).

Distribution: Endemic to Iran. Found in Esphehan, Tehran, and Yazd provinces (Fet and Lowe, 2000; Vignoli *et al.*, 2003; Vignoli and Crucitti, 2005) (Fig. 1E).

Genus *Odontobuthus* Vachon, 1950

Odontobuthus bidentatus Lourenço et Pézier, 2002

Type locality and repository: Iraq, 180 km north of Bagdad, Khanagin-Dyala; MHNG.

Distribution: Iran, west foothills of Zagros Mountains; Iraq (Lourenço and Pézier, 2002; Navidpour *et al.*, 2008a, b, c, d; Lowe, 2010) (Fig. 1F).

Odontobuthus doriae (Thorell, 1876)

Type locality and repository: Iran, Tehran; MCSN.

Distribution: Endemic to Iran. Found in high elevations of western, southeastern, and central parts of Iran (Pocock, 1900; Birula, 1903; Farzanpay, 1987; Lourenço and Pézier, 2002; Lowe, 2010; Navidpour *et al.*, 2011) (Fig. 1F).

Odontobuthus odonturus (Pocock, 1897)

Type locality: Pakistan, Khelat Frontier (Kemball).

Distribution: Iran, India, Pakistan (Birula, 1900; Farzanpay, 1987; Lourenço and Pézier, 2002; Lowe, 2010) (Fig. 1F).

Comment: All of the previous records of this species in Iran are now considered as *O. bidentatus* Lourenço and Pézier, 2002. However, its occurrence in the eastern parts of Iran is possible. Therefore, the existence of this species in Iran needs confirmation.

Genus *Orthochirus* Karsch, 1891

Orthochirus farzanpayi (Vachon et Farzanpay, 1987)

Type locality and repository: Iran, Hormozgan Province, North of Bandar-e-Abbas; NHMW.

Distribution: Endemic to Iran. Found in Bushehr, Hormozgan, Kerman, and Khuzestan provinces (Farzanpay, 1987; Kovařík and Fet, 2006a; Navidpour *et al.*, 2008a, b and 2011) (Fig. 1G).

Orthochirus fuscipes (Pocock, 1900)

Type locality and repository: Pakistan, northern Baluchistan; BMNH.

Distribution: Iran, Sistan va Baluchistan Province (Kovařík, 2004), India, Pakistan (Pocock, 1900: 29) (Fig. 1G).

Orthochirus gruberi Kovařík et Fet, 2006

Type locality and repository: Iran, Kerman Province, near Ğoupār; FKCP.

Distribution: Endemic to Iran. Found in Kerman Province (Kovařík and Fet, 2006a; Navidpour *et al.*, 2011) (Fig. 1G).

Orthochirus iranus Kovařík, 2004

Type locality and repository: Iran, Bushehr Province, Chamak, 17 km NW Bandar-e Genaveh; FKCP.

Distribution: Endemic to Iran. Known from Bushehr, Hamadan, Ilam, Khuzestan, Kohgiluyeh va Boyer-Ahmad, and Lorestan provinces (Kovařík, 2004; Navidpour *et al.*, 2008a, b, c, d; 2010) (Fig. 1G).

Orthochirus scrobiculosus (Birula, 1900)

Type locality and repository: “Azerbaijan, Lenkoran” (incorrect type locality, most likely Krasnovodsk, Turkmenistan; Fet and Lowe, 2000); UWCP.

Distribution: Iran, Khorasan, Semnan and Tehran provinces. The distribution of *O. scrobiculosus* extends from central Asia throughout Iran and Iraq to Jordan, southern Israel, and Sinai (Pocock, 1889; Vachon, 1966; Habibi, 1971; Levy and Amitai, 1980; Fet, 1988; Kovařík, 1996, 2004) (Fig. 1G).

Orthochirus stockwelli (Lourenço et Vachon, 1995)

Type locality and repository: Iran, Hormozgan Province, Bandar-Abbas; MNHN.

Distribution: Endemic to Iran. Found in Bushehr, Hormozgan and Khuzestan Provinces (Lourenço and Vachon, 1995; Kovařík and Fet, 2006a; Navidpour *et al.*, 2008a, b) (Fig. 1G).

Orthochirus varius Kovařík, 2004

Type locality and repository: Iran, Hormozgan Province, Beshagerd Mountains, Davari vil-lage, FKCP.

Distribution: Endemic to Iran. Found in Hormozgan Province (Kovařík, 2004) (Fig. 1G).

Orthochirus zagrosensis Kovařík, 2004

Type locality and repository: Iran, Fars Province, Dasht-e-Arzhan, FKCP.

Distribution: Endemic to Iran. Found in Espahan, Kerman, Khuzestan, Kohgiluyeh va Boyer-Ahmad, and Yazd provinces (Kovařík, 2004; Vignoli and Crucitti, 2005; Navidpour *et al.*, 2008d, 2011) (Fig. 1G).

Genus *Polisius* Fet et al., 2001

Polisius persicus Fet et al., 2001

Type locality and repository: Iran, Sistan va Baluchistan, North of Zahedan; USNM.

Distribution: Endemic genus and species to Iran, Esfahan, Ilam, Kerman, and Sistan va Baluchistan provinces (Fet *et al.*, 2001; Vignoli *et al.*, 2003; Navidpour *et al.*, 2008c, 2011) (Fig. 1D).

Genus *Razianus* Farzanpay, 1987

Razianus zarudnyi (Birula, 1903)

Type locality and repository: Iran, Sistan va Baluchistan, Kalagan and Geh, Makran; ZISP.

Distribution: Endemic genus and species to Iran. Found in Bushehr, Chahar Mahal va Bakhtiyari, Hormozgan, Ilam, Khuzestan, Kohgiluyeh va Boyer-Ahmad, Lorestan, and Sistan va Baluchistan provinces (Birula, 1903, 1905; Farzanpay, 1987; Lourenço, 1996; Fet, 1997; Navidpour *et al.*, 2008a, b, c, d; Piralikheirabadi *et al.*, 2009; Navidpour *et al.*, 2010) (Fig. 1D).

Genus *Sassanidotus* Farzanpay, 1987*Sassanidotus gracilis* (Birula, 1900)

Type locality and repository: Iran, Sistan va Baluchistan Province, Nasirabad; ZISP.

Distribution: Iran, Kerman, and Sistan va Baluchistan Provinces, Afghanistan, Pakistan (Kovařík and Fet, 2006b) (Fig. 1F). It is probably a senior synonym of *Mesobuthus gabrielis* Werner, 1929 from Kerman (Navidpour *et al.*, 2011) (Fig. 1G).*Sassanidotus zarudnyi* (Birula, 1903)

Type locality and repository: Iran, Sistan va Baluchistan Province, Neizar; ZISP. The holotype from Tehran, is absent from the collection of the Zoological Museum of Moscow State University. Therefore, Kovařík and Fet (2006b) designated a neotype on the basis of a male specimen collected by N.A. Zarudny from Sistan va Baluchistan Province.

Distribution: Endemic to Iran. Found in Sistan va Baluchistan and Tehran Provinces (Birula, 1903, Farzanpay, 1987, Kovařík and Fet, 2006b) (Fig. 1F).

Genus *Vachoniolus* Levy et al., 1973*Vachoniolus iranensis* Navidpour et al., 2008

Type locality and repository: Iran, Khuzestan Province, near Masjed-Soleyman, RRLS.

Distribution: Endemic to Iran. Found in Khuzestan Province (Navidpour *et al.*, 2008a) (Fig. 1F).**Family Scorpionidae Latreille, 1802**

Only one genus and species of scorpions belonging to the family Scorpionidae is found in Iran.

Genus *Scorpio* Linnaeus, 1758*Scorpio maurus* Linnaeus, 1758

Type locality and repository: Iran, Bushehr Province, Bushehr, Persian Gulf, Iran; BMNH.

Distribution: This species is widely distributed in Iran and known from Azerbaijan, Busher, Chahar Machal va Bakhtiyari, Esphehan, Fars, Gilan, Ilam, Khorasan, Khuzestan, Kohgiluyeh va Boyer-Ahmad, Kordestan, Lorestan,

Qazvin, and Semnan provinces (Birula, 1905; Farzanpay, 1987; Vignoli *et al.*, 2003; Navidpour *et al.*, 2008a, b, c, d; Pirali-Kheirabadi *et al.*, 2009; Navidpour *et al.*, 2010); northern Africa: Algeria, Egypt, Libya, Mauritania, Morocco, Senegal, and Tunisia; Asia: Iraq, Israel, Jordan, Kuwait, Lebanon, Qatar, Saudi Arabia, Syria, Turkey, Yemen (Levy and Amitai, 1980) (Fig. 1H).Comment: This species comprises 19 taxonomically accepted subspecies, but the characters used for their distinction, such as coloration, granulation, number of denticles on the pectin and spines on the tarsi, and form of the sternal plate of the pectin, show great variation and no reliable diagnostic morphological characteristics have been found for the distinction of subspecies (Levy and Amitai, 1980). Two subspecies found Iran, *S. m. townsendi* and *S. m. kruglovi* (Farzanpay, 1987).**Family Hemiscorpiidae Pocock, 1893**

One genus and five species of scorpions belonging to the family Hemiscorpiidae are found in Iran.

Genus *Hemiscorpius* Peters, 1861*Hemiscorpius acanthocercus* Monod et Lourenço, 2005

Type locality and repository: Iran, Hormozgan Province, Abad-Geno, 38 km north of Bandar Abbas; NHMW.

Distribution: Endemic to Iran. Found in Hormozgan Province, vicinity of Bandar Abbas (Monod and Lourenço, 2005) (Fig. 1H).

Hemiscorpius enischnochela Monod et Lourenço, 2005

Type locality and repository: Iran, Hormozgan Province, 115 km east of Bandar Abbas; NHMW.

Distribution: Endemic to Iran. Found in Hormozgan Province, vicinity of Bandar Abbas and Khuzestan Province, south of Masjed-e-Soleyman (Monod and Lourenço, 2005) (Fig. 1H).

Hemiscorpius gaillardi (Vachon, 1974)

Type locality and repository: Iran, east, no locality specified, MNHN.

Distribution: Endemic to Iran. Known from eastern Iran, no locality specified (Farzanpay, 1987; Monod and Lourenço, 2005) (Fig. 1H).

Hemiscorpius lepturus Peters, 1861

Type locality and repository: Iraq (Mendeli near Baghdad); ZMHB.

Distribution: Iran: Esfahan, Fars, Hamadan, Kohkiluyeh and Boyer Ahmad, Kerman, Khuzestan, and Lorestan provinces (Birula, 1905; Farzanpay, 1987; Farzanpay, 1988; Kovařík, 1997; Monod and Lourenço, 2005; Akbari, 2007; Navidpour *et al.*, 2008a, b, c, d; Pirali-Kheirabadi *et al.*, 2009; Navidpour *et al.*, 2010, 2011) (Fig. 1H).

Hemiscorpius persicus Birula, 1903

Type locality and repository: Iran, Sistan va Baluchistan, Sarbaz; ZISP.

Distribution: Endemic to Iran. Known only from Sistan va Baluchistan Province (Birula, 1903; Monod and Lourenço, 2005) (Fig. 1H).

Family Diplocentridae Karsch, 1880

A single genus and species of scorpions belonging to the family Diplocentridae is found in Iran.

Genus *Nebo* Simon, 1878

Nebo henjamicus Francke, 1980

Type locality and repository: Iran, Henjam Island, Persian Gulf: BMNH.

Distribution: Endemic to Iran. Found in Henjam Island, Persian Gulf (Francke, 1980) (Fig. 1H).

Discussion

The current study increases the list of scorpions in Iran to at least 51 nominal species belonging to 18 genera and four families: Buthidae with 44 species (86%), Scorpionidae with one species (2%), Hemiscorpiidae with five species (10%), and Diplocentridae with one species (2%).

The geographic occurrence of scorpion species in regions of Iran is shown in Table 1. Thirty of 51 species and three of the 18 genera are endemic to Iran. This exceeds 58% of the species and 16% of the generic diversity and reveals high endemism in scorpions of the Iranian Plateau and Zagros Mountains. The family Buthidae is the most diverse family of scorpions in Iran. In this family, *Compsobuthus*, *Orthochirus*, and *Hottentotta* are the most speciose genera with 10, eight, and six described species, respectively (Table 1). Thirty-two of 51 species occur in the Zagros Mountains and southwestern regions of Iran. These correspond to 62.8% of total specific diversity of scorpions in Iran. Notably, this geographic area shows high endemism, exceeding 65% of species diversity (21 of 32 species). This demonstrates the important role of the Zagros Mountains in shaping the present distribution of animal taxa (Macey et al., 1998; Rastegar-Pouyani, 2006). The large number of species restricted to a particular mountain system suggests that the speciation process has often occurred more strongly in mountainous areas (Prendini, 2005).

Several ecological morphotypes exist in Iran. Among the listed species *Androctonus crassicauda*, *Hottentotta* spp., *Mesobuthus eupeus*, *M. caucasicus*, *M. vesiculatus*, *Orthochirus scrobiculosus*, and some *Compsobuthus* species are the most geographically widespread and must be considered as habitat generalist species. These species shelter under stones or any other available cover and display few ecomorphological adaptations (Prendini, 2005). All species of *Odontobuthus*, and the species *Scorpio maurus*, are pelophilous species, which burrow in sandy loam and clay soils (Lowe, 2010). The species *Polisius persicus*, *Apisthobuthus persicus*, and *Liobuthus kessleri* are psammophilous species, which are the most specialized and poorly adapted to live outside their sandy habitats. Other Iranian scorpion species display adaptations for living in narrow cracks and crevices of rocks. These are known as lithophilous species (*Iranobuthus krali* and *Compsobuthus matthiesseni*).

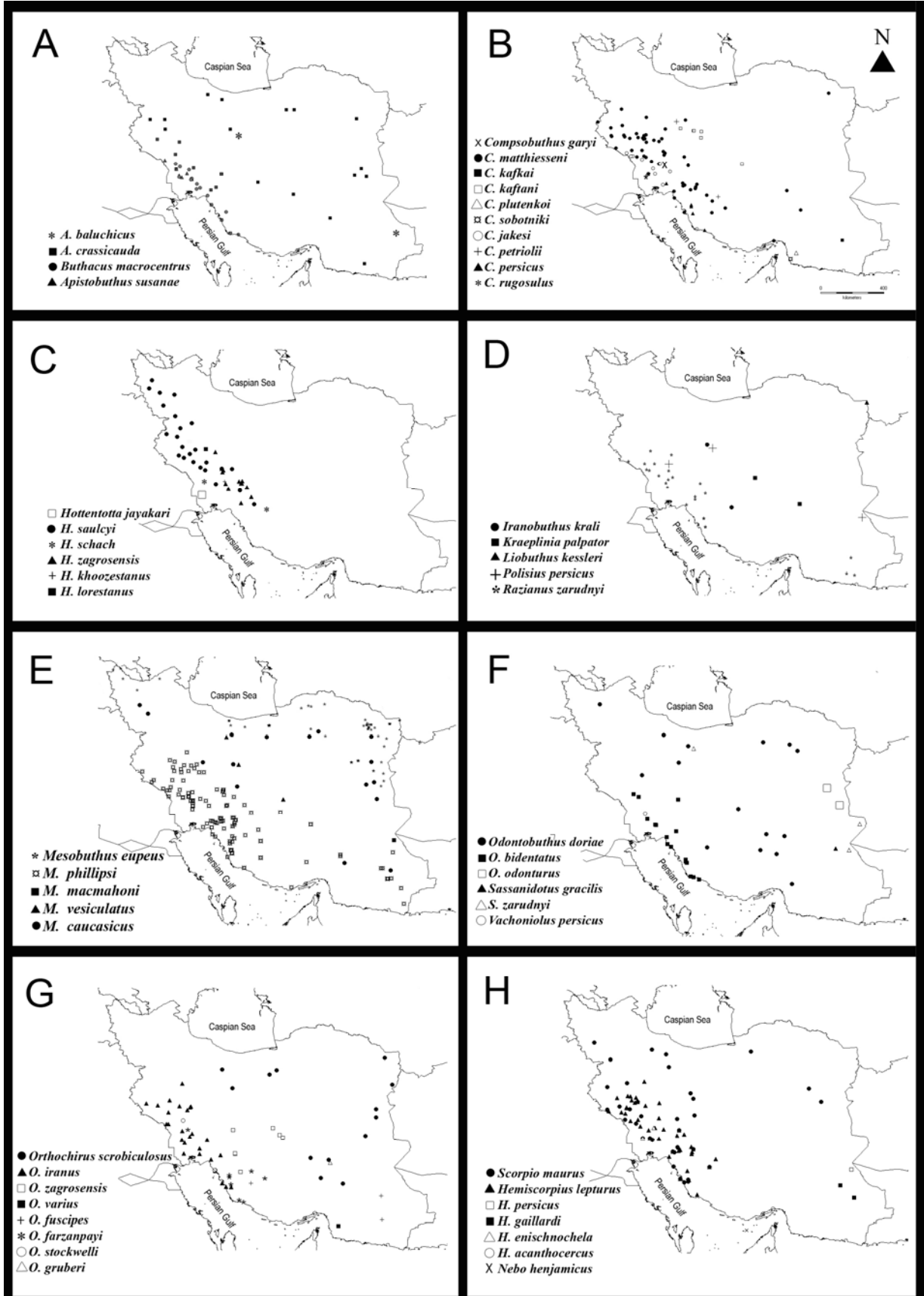


Fig.1. The geographic distribution of Iranian scorpions.

Table 1. Geographic distribution of 51 scorpion species in the Zagros mountains and the Iranian plateau.

Species	Zagros ranges	Central Iranian plateau	Alborz mountains	Eastern Iranian ranges	Northwestern Iranian ranges	Baluchistan
<i>Androctonus baluchicus</i>	-	-	-	-	-	+
<i>Androctonus crassicauda</i>	+	+	+	+	+	+
<i>Apistobuthus susanae</i> *	+	-	-	-	-	-
<i>Buthacus macrocentrus</i>	+	-	-	-	-	-
<i>Compsobuthus garyi</i> *	+	-	-	-	-	-
<i>C. jakesi</i>	+	-	-	-	-	-
<i>C. kafkai</i> *	-	-	-	-	-	+
<i>C. kaftani</i> *	-	+	-	-	-	-
<i>C. matthiesseni</i>	+	+	+	+	+	+
<i>C. persicus</i> *	+	+	-	-	-	-
<i>C. petriolii</i> *	+	+	-	-	-	-
<i>C. plutenkoi</i> *	+	-	-	-	-	-
<i>C. rugosulus</i>	-	-	-	+	-	+
<i>C. sobotniki</i> *	+	-	-	-	-	-
<i>Hottentotta jayakari</i>	+?	-	-	-	-	-
<i>H. khoozestanus</i> *	+	-	-	-	-	-
<i>H. lorestanus</i> *	+	-	-	-	-	-
<i>H. saulcyi</i>	+	-	-	-	+	-
<i>H. schach</i> *	+	+	-	-	-	-
<i>H. zagrosensis</i> *	+	-	-	-	-	-
<i>Iranobuthus krali</i> †*	-	+	-	-	-	-
<i>Kraepelinia palpator</i>	-	+	-	-	-	+
<i>Liobuthus kessleri</i>	-	-	-	+	-	-
<i>Mesobuthus caucasicus</i>	-	+	+	+	+	+
<i>M. eupeus</i>	-	+	+	+	+	+
<i>M. macmahoni</i>	-	-	-	-	-	+
<i>M. phillipsi</i>	+	-	-	-	-	-
<i>M. vesiculatus</i> *	-	+	+	-	-	-
<i>Odontobuthus bidentatus</i>	+	-	-	-	-	-
<i>O. doriae</i> *	-	+	+	-	-	-
<i>O. odonturus</i>	-	-	+	+?	-	-
<i>Orthochirus farzanpayi</i> *	+	-	-	-	-	-
<i>O. fuscipes</i>	-	-	-	-	-	+
<i>O. gruberi</i> *	-	+	-	-	-	+
<i>O. iranus</i> *	+	-	-	-	-	-
<i>O. scrobiculosus</i>	+	+	+	+	+	+
<i>O. stockwelli</i> *	+	-	-	-	-	-
<i>O. varius</i> *	+	-	-	-	-	-
<i>O. zagrosensis</i> *	+	-	-	-	-	-
<i>Polisius persicus</i> †*	+	+	-	-	-	+
<i>Razianus zarudnyi</i> †*	+	-	-	-	-	+
<i>Sassanidotus gracilis</i>	-	-	-	-	-	+
<i>S. zarudnyi</i> *	-	+	+	-	-	+
<i>Vachoniolus iranus</i> *	+	-	-	-	-	-
<i>Scorpio maurus</i>	+	+	+	+	+	+
<i>Hemiscorpius acanthocercus</i> *	+	-	-	-	-	-
<i>H. enischnochela</i> *	+	-	-	-	-	-
<i>H. gaillardia</i> *	-	-	-	-	-	+
<i>H. lepturus</i>	+	+	-	-	-	-
<i>H. persicus</i> *	-	-	-	-	-	+
<i>Nebo henjamicus</i> *	+	-	-	-	-	-
Total no. species	32	18	10	9	6	19

† endemic genus; * endemic species

It is still difficult to assess the true species diversity of scorpions in Iran. Systematic investigations of scorpion fauna using ultraviolet-light detection methods have not been conducted in much of central, eastern, and southern Iran.

According to Williams (1968), using conventional methods of collection such as day-time rock rolling or excavation of burrows underestimates scorpion diversity. Therefore, if ultraviolet-light detection methods are employed for an extended period, the records will increase significantly. This study also demonstrated that the greatest species diversity was in southwestern areas of Iran, which is partly due to more sampling effort. In addition, a more rigorous sampling regime using ultraviolet-light detection and conventional methods has been em-

ployed in this area (Navidpour *et al.*, 2008a, b, c, d; Pirali-Kheirabadi *et al.*, 2009; Navidpour *et al.*, 2010). It may be an artifact of collecting bias, but the great diversity of habitat types in the foothills of Zagros Mountains supports this observation.

Recent studies dealing with scorpions of Iran uncovered several novel endemic species (Kovařík, 1997, 2003, 2004; Vignoli, 2005; Navidpour *et al.*, 2008 a, b, c, d; Pirali-Kheirabadi *et al.*, 2009; Navidpour and Lowe, 2009; Navidpour *et al.*, 2010). However, the faunistic information on scorpions of Iran is incomplete. The complete knowledge of the scorpion fauna of Iran and its various aspects will be possible using a variety of morphological, ecological, and molecular approaches.

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