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Review of European scorpions, with a key to species

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Introduction

The idea to compile a synoptic table of European scorpions stems from frequent suggestions and requests made by naturalists interested in arachnology but not specializing in scorpions. This table, in combination with a simple key, should help the non-specialist in determination of taxa occurring in Europe. Since this is an overview, locality data are omitted and authors verifying occurrences are not cited. The article summarizes hitherto known data scattered in difficult-to-obtain literature.

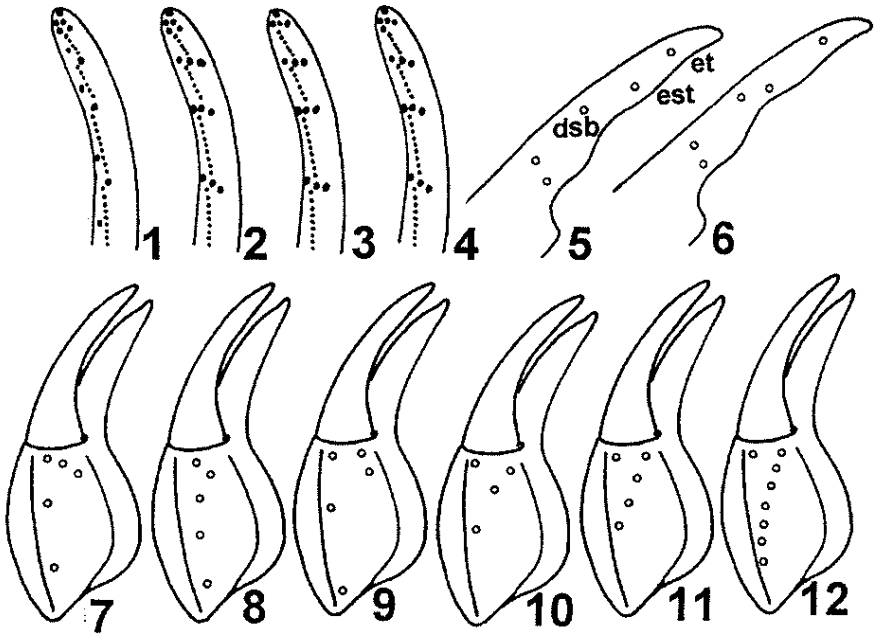
A key to European scorpions

1. Patella of pedipalp (Fig. 13E) without ventral trichobothria ..... Buthidae 2
-. Patella of pedipalp with one or more ventral trichobothria 10

2. Animal yellow or yellowish brown 3
-. Animal black 8
3. First two segments of mesosoma (Fig. 13F) with five keels .....
..... *Leiurus quinquestriatus* Hemprich & Ehrenberg, 1828*
-. First two segments of mesosoma with three keels 4
4. Movable finger of pedipalp (Fig. 13A) with external lateral granules (Figs. 2-4) 5
-. Movable finger of pedipalp without external lateral granules (Fig. 1) ..... *Compsobuthus matthiesseni* Birula, 1905*
5. Movable finger of pedipalp (Fig. 13A) with four principal distal granules and one terminal granule (Fig. 2) ..... *Mesobuthus*.... 6
-. Movable finger of pedipalp with three principal distal granules and one terminal granule (Fig. 3) ..... *Buthus occitanus* (Amoreux, 1789)
6. Fourth segment of metasoma (Fig. 13H) with 10 keels .....
..... *Mesobuthus gibbosus* (Brullé, 1832)
-. Fourth segment of metasoma with eight keels 7
7. Movable finger of pedipalp (Fig. 13A) with at most 12 diagonal rows of granules. Length from chelicerae (Fig. 13D) to end of metasoma 40 to 55 mm ..... *Mesobuthus eupeus eupeus* (C. L. Koch, 1839)
-. Movable finger of pedipalp with 13 or 14 diagonal rows of granules. Length of adult 60 to 80 mm .....
..... *Mesobuthus caucasicus caucasicus* (Nordmann, 1840)
8. Movable finger of pedipalp (Fig. 13A) with four principal distal granules and one terminal granule (Fig. 4) .....
..... *Hottentotta judaica* (Simon, 1872)*
-. Movable finger of pedipalp with three principal distal granules and one terminal granule (Fig. 3) ..... *Androctonus* 9
9. Manus of pedipalp (Fig. 13C) narrow. Dorsal surface of first metasomal segment granulated at midline .....
..... *Androctonus bicolor* (Hemprich & Ehrenberg, 1828)
-. Manus of pedipalp broad. Dorsal surface of first metasomal segment smooth ..... *Androctonus crassicauda* (Olivier, 1807)
10. Manus of pedipalp (Fig. 13C) very broad, entirely rounded, and about as wide as long .....
..... *Scorpio maurus fuscus* (Hemprich & Ehrenberg, 1829)*
---. Manus not entirely rounded and longer than wide 11

11. Number and distribution of trichobothria on ventral side of manus (Fig. 13C) corresponds to Fig. 7 ..... *Calchas nordmanni* Birula, 1899
---. Number and distribution of trichobothria on ventral side of manus corresponds to Fig. 8 ..... *Iurus* 12
---. Number and distribution of trichobothria on ventral side of manus corresponds to Fig. 9 ..... *Belisarius xambeui* Simon, 1879
---. Number and distribution of trichobothria on ventral side of manus corresponds to Fig. 10 ..... *Euscorpius* (*Euscorpius*) 13
---. Number and distribution of trichobothria on ventral side of manus corresponds to Fig. 11 .... *Euscorpius* (*Tetratrichobothrius*) *flavicaudis* (De Geer, 1778)
---. Number and distribution of trichobothria on ventral side of manus corresponds to Fig. 12 (a row may be composed of a different number of trichobothria, but no less than six) .... *Euscorpius* (*Polytrichobothrius*) *italicus* (Herbst, 1800)
12. Adult male has fingers of pedipalps (Fig. 13A and B) bent so that at closure parts of their surfaces do not meet. Occurs only in Turkey ..... *Iurus asiaticus* Birula, 1903
---. Adult male has fingers of pedipalps bent so that at closure their entire surfaces meet. Occurs only in Greece .... *Iurus dufoureius* (Brullé, 1832)
13. Ventral side of fifth metasomal segment (Fig. 13G) smooth and rounded 14
---. Ventral side of fifth metasomal segment bears central granules that usually form a conspicuous keel .... *Euscorpius* (*Euscorpius*) *carpathicus* (Linné, 1767)
14. Distance between trichobothria dsb - est and est - et on fixed finger of pedipalps is about equal (Fig. 5) .... *Euscorpius* (*Euscorpius*) *germanus* (C. L. Koch, 1837)
---. Distance between trichobothria est - et on fixed finger of pedipalp is about twice as long as that between trichobothria dsb - est (Fig. 6) .... *Euscorpius* (*Euscorpius*) *mingrelicus* (Kessler, 1876)

* denotes species that occur only in the Asian parts of Turkey and are included to cover the entire Turkish scorpion fauna.



Figs 1-12. Figs 1-4. Dorsal aspect of movable fingers of pedipalps. Figs 5-6. Dorsal-external aspect of fixed fingers of pedipalps. Figs 7-12. Chela ventral. Schematic drawing of chela in ventral view. Fig. 1. *Compsobuthus matthiesseni*. Fig. 2. *Mesobuthus gibbosus*. Fig. 3. *Buthus occitanus*. Fig. 4. *Hottentotta judaica*. Fig. 5. *Euscorpius* (*Euscorpius*) *germanus*. Fig. 6. *E.* (*E.*) *mingrelicus*. Fig. 7. *Calchas nordmanni*. Fig. 8. *Iurus dufoureius*. Fig. 9. *Belisarius xambeui*. Fig. 10. *E.* (*E.*) *carpathicus*. Fig. 11. *E.* (*Tetratrichobothrius*) *flavicaudis*. Fig. 12. *E.* (*Polytrichobothrius*) *italicus*.

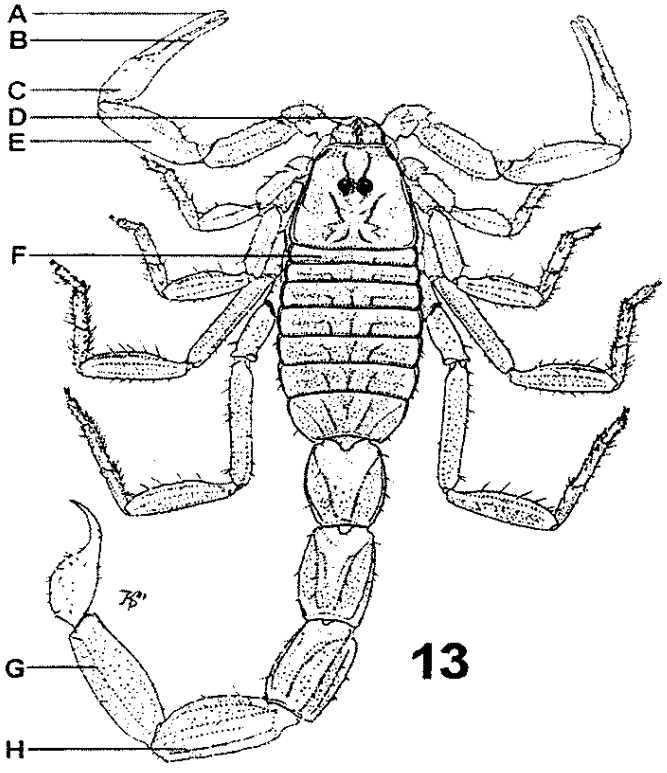


Fig. 13. Dorsal view of a scorpion.
A. Movable finger.
B. Fixed finger.
C. Manus.
A, B, and C. Chela
D. Chelicera.
E. Patella.
F. First mesosomal segment.
G. Fifth metasomal segment.
H. Fourth metasomal segment.

Table I. Distribution of European scorpions

	Albania	Austria	Bosnia	Bulgaria	Croatia	Czech Republic	England	France	Greece	Hungary	Italy	Lithuania	Macedonia	Malta	Moldavia	Portugal	Romania	Russia	Slovenia	Spain	Switzerland	Turkey	Ukraine	Yugoslavia
Buthidae Simon, 1879																							
Androctonus bicolor (Hemprich & Ehrenberg, 1828)	-	-	-	-	-	-	-	-	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Androctonus crassicauda (Olivier, 1807)	-	-	-	-	-	-	-	-	?	-	-	-	-	-	-	-	-	-	-	-	x	-	-
Buthus occitanus (Amoreux, 1789)	-	-	-	-	-	-	-	x	?	-	?	-	-	x	-	x	-	-	-	x	-	-	-
Buthus occitanus occitanus (Amoreux, 1789)	-	-	-	-	-	-	-	x	-	-	-	-	-	-	-	x	-	-	-	x	-	-	-
Compsobuthus matthiesseni Birula, 1905 *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	x	-
Hottentotta judaica (Simon, 1872) *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	?	-
Leiurus quinquestriatus Hemprich & Ehrenberg, 1828 *	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	x	-
Mesobuthus caucasicus caucasicus (Nordmann, 1840)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	x	-	-	-	x	x
Mesobuthus eupeus eupeus (C. L. Koch, 1839)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	x	-	-	-	x	-
Mesobuthus gibbosus (Brullé, 1832)	x	-	-	x	-	-	-	x	x	-	-	-	x	-	-	-	-	-	-	-	-	x	x
Chactidae Pocock, 1893																							
Euscorpius (*Euscorpius*) *carpathicus* (Linné, 1767)	x	x	x	x	x	x	-	x	x	?	x	-	x	x	-	x	x	-	x	x	x	x	x
E. (*Euscorpius*) *germanus* (C. L. Koch, 1837)	-	x	-	?	-	-	-	?	x	-	x	-	-	-	-	-	-	-	-	-	x	-	-
E. (*Euscorpius*) *mingrelicus* (Kessler, 1876)	-	-	x	-	x	-	-	-	x	-	x	-	-	-	?	-	-	x	x	-	-	x	-
E. (*Polytrichobothrius*) *italicus* (Herbst, 1800)	x	x	x	-	x	-	-	x	x	x	x	x	x	x	-	-	x	x	x	x	x	x	-
E. (*Tetratrichobothrius*) *flavicaudis* (De Geer, 1778)	-	-	-	-	-	-	x	x	x	-	x	-	-	x	-	-	-	-	-	x	-	-	-
Iuridae Thorell, 1876																							
Calchas nordmanni Birula, 1899	-	-	-	-	-	-	-	-	x	-	-	-	-	-	-	-	-	-	-	-	-	x	-
Iurus asiaticus Birula, 1903	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	x	-
Iurus dufoureius (Brullé, 1832)	-	-	-	-	-	-	-	-	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Scorpionidae Peters, 1862																							
Scorpio maurus fuscus (Hemprich & Ehrenberg, 1829)*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	x	-
Superstitionidae Stahnke, 1940																							
Belisarius xambeui Simon, 1879	-	-	-	-	-	-	-	x	-	-	-	-	-	-	-	-	-	-	-	x	-	-	-

Discussion

Euscorpius Thorell, 1876 is the most characteristic genus for Europe, whose species have otherwise spread only to the northernmost Africa (near the Mediterranean coast) and the Caucasus. Unfortunately the subspecific taxonomy of *Euscorpius* is not entirely clear. The number of hitherto described subspecies is rather large, and some of them do not appear to be justified by geographic distribution. This is true especially for *E. carpathicus* that includes 24 subspecies, of which 16 have been recorded from Italy. A revision of the entire genus is much needed in my opinion. Apart from the subspecies, the status of *E. (E.) mesotrichus* Hadži, 1929 that is usually regarded as a synonym of *E. carpathicus* also needs to be ascertained. For this reason *E. mesotrichus* is not included, although a future revision may well show this species to be valid.

Czech authors have frequently stated that the population of *E. carpathicus* found at an isolated locality near Slapy, central Bohemia, is not autochthonous but introduced from e. g. Bulgaria. Although specimens from this population have been studied by Max Vachon and Viktor Fet, their subspecific affiliation remains to be determined. Viktor Fet (in litt.) agrees with my opinion that the population of *E. carpathicus* at Slapy appears to belong to the same subspecies as the population at the nearest locality in Austria, which favors the thesis of autochthony. At any rate, the possibility of introduction from Bulgaria can be unequivocally rejected.

List of species and subspecies of the genus *Euscorpius* Thorell, 1876

Euscorpius* (*Euscorpius*) *carpathicus (Linné, 1767)
E. (E.) c. aegaeus Caporiacco, 1950
E. (E.) c. apuanus Caporiacco, 1950
E. (E.) c. aquileiensis (C. L. Koch, 1837)
E. (E.) c. argentarii Caporiacco, 1950
E. (E.) c. balearicus Caporiacco, 1950
E. (E.) c. calabriae Caporiacco, 1950
E. (E.) c. candiota Birula, 1903
E. (E.) c. canestrinii Fanzago, 1872
E. (E.) c. carpathicus (Linné, 1767)
E. (E.) c. concinnus (C.L.Koch, 1837)
E. (E.) c. corsicanus Caporiacco, 1950
E. (E.) c. garganicus Caporiacco, 1950

E. (*E.*) *c. hadzii* Caporiacco, 1950
E. (*E.*) *c. ilvanus* Caporiacco, 1950
E. (*E.*) *c. lagostae* Caporiacco, 1950
E. (*E.*) *c. linosae* Caporiacco, 1950
E. (*E.*) *c. niciensis* (C. L. Koch, 1841)
E. (*E.*) *c. oglasae* Caporiacco, 1950
E. (*E.*) *c. ossae* Caporiacco, 1950
E. (*E.*) *c. palmarolae* Caporiacco, 1950
E. (*E.*) *c. picenus* Caporiacco, 1950
E. (*E.*) *c. sicanus* (C. L. Koch, 1837)
E. (*E.*) *c. tauricus* (C. L. Koch, 1837)
E. (*E.*) *c. tergestinus* (C. L. Koch, 1837)
***E.* (*Euscorpius*) *germanus* (C. L. Koch, 1837)**
E. (*E.*) *g. alpha* Caporiacco, 1950
E. (*E.*) *g. croaticus* Caporiacco, 1950
E. (*E.*) *g. germanus* (C. L. Koch, 1837)
E. (*E.*) *g. marcuzzii* Valle, Berizzi, Bonino, Gorio, Gimmillaro-Negri & Percassi, 1971
***E.* (*Euscorpius*) *mingrelicus* (Kessler, 1876)**
E. (*E.*) *m. caporiaccoi* Bonacina, 1980
E. (*E.*) *m. ciliciensis* Birula, 1898
E. (*E.*) *m. gamma* Caporiacco, 1950
E. (*E.*) *m. histrorum* Caporiacco, 1950
E. (*E.*) *m. legrandi* Lacroix, 1995
E. (*E.*) *m. mingrelicus* (Kessler, 1876)
E. (*E.*) *m. ollivieri* Lacroix, 1995
E. (*E.*) *m. phrygius* Bonacina, 1980
E. (*E.*) *m. uludagensis* Lacroix, 1995
***E.* (*Polytrichobothrius*) *italicus* (Herbst, 1800)**
E. (*P.*) *i. awhasicus* (Nordmann, 1840)
E. (*P.*) *i. etruriae* Caporiacco, 1950
E. (*P.*) *i. italicus* Herbst, 1800
E. (*P.*) *i. oligotrichus* Hadži, 1929
E. (*P.*) *i. polytrichus* Hadži, 1929
E. (*P.*) *i. zakynthi* Caporiacco, 1950
***E.* (*Tetratrichobothrius*) *flavicaudis* (De Geer, 1778)**
E. (*T.*) *f. algeriacus* (C. L. Koch, 1838)
E. (*T.*) *f. cereris* Rivellini, 1986
E. (*T.*) *f. galitae* Caporiacco, 1950
E. (*T.*) *f. flavicaudis* (De Geer, 1778)
E. (*T.*) *f. massiliensis* (C. L. Koch, 1837)

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