

# Illustrated catalog of scorpions

## Part I

Introductory remarks; keys to families and genera;  
subfamily Scorpioninae with keys to *Heterometrus* and *Pandinus* species

**FRANTIŠEK KOVAŘÍK**



*Pandinus (Pandinoides) cavimanus* (Pocock, 1888),  
female with larvae before first ecdysis.

**Arthropoda** Burmeister, 1843  
**Chelicerata** Lang, 1888  
**Arachnida** Cuvier, 1812  
**Scorpiones** C. L. Koch, 1837 (1753 species)

**Akravidae** Levy, 2007<sup>2)</sup> (1 species)  
**Bothriuridae** Simon, 1880 (136 species)  
 subfamily Bothriurinae Simon, 1880  
 subfamily Lisposominae Lawrence, 1928  
**Buthidae** C. L. Koch, 1837 (804 species)  
**Caraboctonidae** Kraepelin, 1905 (16 species)  
 subfamily Caraboctoninae Kraepelin, 1905  
 subfamily Hadrurinae Stahnke, 1974  
**Chactidae** Pocock, 1893 (164 species)  
 subfamily Chactinae Pocock, 1893  
 subfamily Brotheinae Simon, 1879  
 subfamily Uroctoninae Mello-Leitao, 1934  
**Chaerilidae** Pocock, 1893 (26 species)  
**Euscorpiidae** Laurie, 1896 (79 species)  
 subfamily Euscorpiinae Laurie, 1896  
 subfamily Megacormiinae Kraepelin, 1899  
 subfamily Scorpiopinae Kraepelin, 1905  
**Hemiscorpiidae** Pocock, 1893 (83 species)  
 = Hadogenidae Lourenço, 1999  
 = Liochelidae Fet & Bechly, 2001 (substitute  
 name for Ischnuridae Simon, 1879)  
 subfamily Hormurinae Laurie, 1896  
 subfamily Hemiscorpiinae Pocock, 1893  
 subfamily Heteroscorpioninae Kraepelin, 1905  
**Iuridae** Thorell, 1876 (6 species)  
**Microcharmidae** Lourenço, 1998<sup>1)</sup> (16 species)  
**Pseudochactidae** Gromov, 1998 (2 species)  
**Scorpionidae** Latreille, 1802 (243 species)  
 = Diplocentridae Karsch, 1880  
 subfamily Scorpioninae Latreille, 1802  
 subfamily Urodacinae Pocock, 1893  
 subfamily Diplocentrinae Karsch, 1880  
**Superstitioniidae** Stahnke, 1940 (11 species)  
 = Troglotayosicidae Lourenço, 1998  
 subfamily Superstitioniinae Stahnke, 1940  
 subfamily Typhlochactinae Mitchel, 1971  
**Vaejovidae** Thorell, 1876 (166 species)

<sup>1)</sup>According to Sologlad & Fet (2003: 91), Microcharmidae cannot be distinguished from Buthidae. The status of this family remains uncertain.

<sup>2)</sup> It is not entirely clear whether this family is extant or extinct.

## KEYS TO THE FAMILIES AND GENERA OF RECENT SCORPIONS

In constructing the key I relied primarily on Sissom (1990), and for genera described more recently I attempted modifications having to do with variability subsequently recorded for some of Sissom's characters and with other advances in understanding the family. Some characters are also based on other works, most importantly on Stockwell (1992). Of recent publications most useful was Sologlad & Fet (2003, 2006, and 2008), whose system I attempted to apply in a way that would allow to assemble genera in the key by their mutual relations. My chief aim was to make the key easily understandable to wide audience, for which reason the characters chosen are those easily seen and not necessarily pertinent to phylogenetic work. In some cases this may cause a problem in identifying an atypical specimen or a hitherto undescribed species, where the character used may turn out to be just intraspecific variation. On the other hand, the simplicity of the key allows to assign most taxa to genera very quickly, using but a few easily recognizable characters. An exception in this regard is the family Vaejovidae, which requires some experience in scorpion taxonomy.

1. Fifth metasomal segment with paired ventral median carinae ..  
 ..... **Pseudochactidae** Gromov, 1998  
 – Fifth metasomal segment with a single ventral carina or  
 without median carinae ..... 2
2. Pedipalp patella without ventral trichobothria ..... **Buthidae**  
 C. L. Koch, 1837 and **Microcharmidae** Lourenço, 1998<sup>1)</sup>  
 – Pedipalp patella with one or more ventral trichobothria  
 (Figs. C.3–6) ..... 4
4. Pedipalp femur with 9 trichobothria, of which 4 are dorsal  
 (Fig. F.7) ..... **Chaerilidae** Pocock, 1893  
 – Pedipalp femur with 3 or 4 trichobothria, of which only one is  
 dorsal (Fig. J.7) ..... 5
5. Ventral edge of cheliceral movable finger with a large basal  
 denticle (Fig. B.1) ..... 6  
 – Ventral edge of cheliceral movable finger without a large basal  
 denticle (Fig. B.2) ..... 7
6. Pedipalp patella with only one ventral trichobothrium .....  
 ..... **Iuridae** Thorell, 1876  
 – Pedipalp patella with more than one ventral trichobothria .....  
 ..... **Caraboctonidae** Kraepelin, 1905
7. Sternum very narrow, usually more than twice wider than long  
 (Fig. B.7) ..... **Bothriuridae** Simon, 1880  
 – Sternum not narrow, usually as long as wide (Figs. B.5–6) ... 8
8. Legs with one pedal spur (retrolateral spur absent) ..... 9  
 – Legs with two pedal spurs (though one or both may be lost in  
 many troglobitic species) (Fig. B.15) ..... 10

***Pandinus* Thorell, 1876**

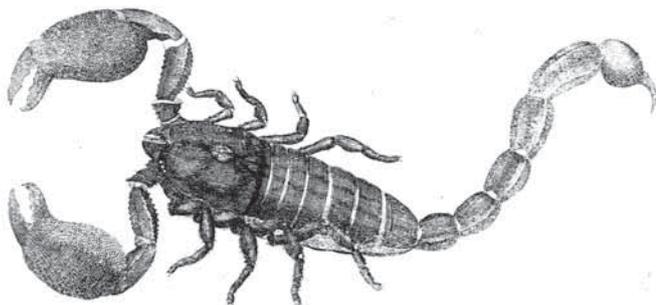
(Figs. 284–420)

*Pandinus* Thorell, 1876: 12; Kraepelin, 1899: 116; Pocock, 1900: 52; Vachon, 1974: 953; Sissom, 1990: 136; Fet, 1997: 248; Fet, 2000: 465; Prendini, 2000: 44.

TYPE SPECIES. *Buthus imperator* C. L. Koch, 1841.

DIAGNOSIS: Total length 60–220 mm. Pedipalp femur with three trichobothria, only one of them on internal surface. Pedipalp patella with 13 external and numerous (usually about 30) ventral trichobothria. Retrolateral pedal spurs absent. Lateroapical margins of tarsi produced into rounded lobes. Metasomal segments I-IV with paired ventral submedian carinae. Stridulatory organ located on opposing surfaces of pedipalp coxa and first leg.

COMMENTS: For the purpose of this catalogue I accept the five subgenera as defined by Vachon (1974) on the numbers of internal and ventral trichobothria on the pedipalp chela (see key and Plate K on page 58). However, the presented habitus photos alone show that morphology and expressions of sexual dimorphism indicate relations across the subgeneric limits. Evident is for instance a close relationship of *P. (Pandinopsis) dictator* with *P. (Pandinus) gambiensis* and *P. (Pandinus) imperator*, although the latter two are currently placed together with *P. (Pandinus) phillipsii* and *P. (Pandinus) smithi*, whose morphology, sexual dimorphism and geographic distributions rather indicate closer relations with most species of the subgenus *Pandinurus*. In contrast, this subgenera do not very well fit the Arabian *P. (Pandinurus) arabicus* and *P. (Pandinurus) percivali*, and definitely not *P. (Pandinurus) viatoris* which has a unique sexual dimorphism (Figs. 382 and 385). On the other hand, truly related appear to be species assigned to the subgenus *Pandinops* Birula, 1913, which closely resemble each other in size, morphology and sexual dimorphism. The adult male of *P. (Pandinides) platycheles* is not known, which is most regrettable because it is crucial to deciphering its relationship to *P. (Pandinides) cavimanus*, a species that has yet another unusual expression of sexual dimorphism (Figs. 286 and 290).



subgenus ***Pandinoides* Fet, 1997**

(Figs. 284–293, 403–405)

*Pandinus (Pandinoides)* Vachon, 1974: 953; Fet, 1997: 248; Fet, 2000: 468.

TYPE SPECIES. *Pandinus militaris* Pocock, 1900 = *Scorpio cavimanus* Pocock, 1888.

DIAGNOSIS: Total length 85–120 mm. Chela with 4 or 5 internal and 10–12 ventral trichobothria (Fig. K.2, page 58). Movable fingers of pedipalp, length of segments of pedipalps, and telson without noticeable sexual dimorphism. In *P. cavimanus* sexual dimorphism expressed by male having dorsal surface of chela bulging inward (Figs. 286 and 290). Pectinal teeth number 14–19.

***P. (Pandinoides) cavimanus* (Pocock, 1888)**

(Figs. 284–290, 403–405)

*Scorpio cavimanus* Pocock, 1888: 247.

*Pandinus cavimanus*: Kraepelin, 1899: 121; Vachon, 1974: 953; Lamoral & Reynders, 1975: 564; Kovařík, 1998: 140; Fet, 2000: 468; Prendini, 2000: 44; Kovařík, 2002: 18; Kovařík, 2003: 149; Kovařík & Whitman, 2005: 113.

= *Pandinus militaris* Pocock, 1900: 61 (syn. by Kovařík, 2002: 1, 20).

TYPE LOCALITY AND TYPE REPOSITORY. Umyamuezi; Kilimandjaro, Tanzania; BMNH.

DIAGNOSIS: Total length 95–120 mm. Chela of pedipalp bears 4 or 5 internal and 9–12 ventral trichobothria. Base color uniformly brown to reddish black. Pectinal teeth number 14–17. Dorsal surface of manus usually smooth. Seventh mesosomal segment ventrally smooth. Metasomal segments with ventral carinae. Dorsal keels on third and fourth metasomal segments with terminal tubercle scarcely larger than preceding tubercles. Movable fingers of pedipalp, length of segments of pedipalps, and telson without noticeable sexual dimorphism. Sexual dimorphism expressed in male having dorsal surface of chela bulging inward (Figs. 286 and 290).

**Figures 284–290** (page 114). ***Pandinus (Pandinoides) cavimanus*** (Pocock, 1888). **284–285**. Dorsal and ventral views, ♂ (125 mm), Kenya, Nguni, north of Ngomeni, FKCP. **286**. Chela, ♂ (110 mm), Tanzania, Arusha distr., Naberera env., FKCP. **287**. Carapace, ♀ (112 mm) lectotype of *Pandinus militaris*, Somalia, Aimola in Boran country, BMNH No. 1897.11.10.4-5. **288–289**. Dorsal and ventral views, ♀ (120 mm), Kenya, Nguni, north of Ngomeni, FKCP. **290**. Chela, ♀ (90 mm), Tanzania, Arusha distr., Naberera env., FKCP.

## Scorpio Linné, 1758

(Figs. 421–494)

*Scorpio* Linné, 1758: 624 (in part); Sissom, 1990: 136; Fet, 2000: 473; Prendini, 2000: 44.

TYPE SPECIES. *Scorpio maurus* Linné, 1758.

DIAGNOSIS: Pedipalp femur with three trichobothria, of them only one on internal surface. Patella of pedipalp with 19 trichobothria, three on ventral (Fig. C.3, page 19) and 13 on external surface. Chela of pedipalp with 26 trichobothria. Retrolateral pedal spurs absent. Lateroapical margins of tarsi produced into rounded lobes. Metasomal segments I to IV with paired ventral submedian carinae. Stridulatory organ absent. Total length 50 to 80 mm.

### *Scorpio maurus* Linné, 1758

(Figs. 421–494)

*Scorpio maurus* Linné, 1758: 624; Pocock, 1888: 251; Kraepelin, 1899: 124; Vachon, 1950: 161 (1952: 333); Vachon, 1974: 919; Sissom, 1990: 75, 132; Fet, 2000: 473; Fet, Braunwalder & Cameron, 2002: 177.

TYPE LOCALITY AND TYPE REPOSITORY. “Africa“, type lost; neotype from Tunisia, Utica (northwest of Carthage); MNHN.

COMMENTS: For the purpose of this catalogue I accept that the genus *Scorpio* contains only one species, *S. maurus*, which has 11 subspecies. However, from the photos (Figs. 421–475) it seems evident that this situation is not final. Whereas the Moroccan populations are likely to remain acceptable as subspecies in the future, other subspecies are likely to be eventually upgraded to species. This concerns especially *S. m. kruglovi* and *S. m. arabicus* with smooth chela and long fixed fingers, and *S. m. fuscus* with a large and very different genital operculum (Fig. 446). An atypical genital operculum is present also in *S. m. occidentalis* (Fig. 465).

SEXUAL DIMORPHISM: All populations of *Scorpio maurus* show similar sexual dimorphism expressed chiefly in the shape of the genital operculum (male Fig. 466, female Fig. 467) and in the surface of the mesosoma, which is matte in males (Fig. 428) and glossy in females (Fig. 430). Another difference is in the shape of the chela, especially the length of the fixed finger which is shorter in the male (Fig. 469) than in the female (Fig. 470). However, the latter feature requires taking into account also the different length of the fixed finger in individual subspecies (Figs. 468–475).

Figures 468–475 (page 137). Chela and patella of *Scorpio maurus* subspecies. 468. *Scorpio maurus*

*arabicus* (Pocock, 1900), ♀(62 mm) holotype, Arabia, BMNH. 469–470. *Scorpio maurus weidholzi* Werner, 1929. 469. ♂(64 mm), Morocco, Moyen Atlas, 11 km E El Hammam, Tritin env., 33°09′04″N 05°28′46″W, 1360 m, FKCP. 470. ♀(66 mm), Morocco, E of Casablanca, Ben-Slimane env., 33°37′34″N 07°11′02″W, 220 m, FKCP. 471. *Scorpio maurus fuscus* (Ehrenberg, 1829), ♀(67 mm), Turkey, Cevlik near Samandag, FKCP. 472–473. *Scorpio maurus punicus* Fet, 2000, Tunisia, Kasserine prov., Jebel Chambi Mtns., 24 km W Kasserine, FKCP. 472. ♂(70 mm). 473. ♀(67 mm). 474–475. *Scorpio maurus fuliginosus* (Pallary, 1928), Morocco, Haut Atlas Mtns., Tizi-n-Test, 30°50.1′N 08°22.6′W, 1521 m, FKCP. 474. ♂(80 mm). 475. ♀(78 mm).

### *Scorpio maurus maurus* Linné, 1758

(Figs. 421–423)

*Scorpio maurus* Linné, 1758: 624.

*Scorpio maurus maurus*: Birula, 1910: 158; Vachon, 1950: 166 (1952: 338); Fet, 2000: 475.

*Scorpio maurus typique*: Vachon, 1951: 3.

= *Buthus testaceus* C. L. Koch, 1838: 3, fig. 342 - see Fig. on page 49 (syn. by Birula, 1910: 158).

= *Scorpio maurus trarasensis* Bouisset & Larrouy, 1962: 316 (type locality: northeastern Tlemcen, Algeria). **Syn. n.**

DISTRIBUTION: In a broad band along the shores of the Mediterranean Sea from northeastern Morocco through Algeria and into Tunisia.

Figures 421–423 (page 134). *Scorpio maurus maurus* Linné, 1758. 421–422. Dorsal and ventral views, ♂(56 mm), Algeria, Lambessa, FKCP. 423. Pectens, ♂(60 mm), Morocco, FKCP.

### *Scorpio maurus arabicus* (Pocock, 1900)

(Figs. 424–427, 468)

*Heterometrus arabicus* Pocock, 1900: 363.

*Scorpio maurus arabicus*: Birula, 1910: 179; Kovařík, 1998: 141; Fet, 2000: 475.

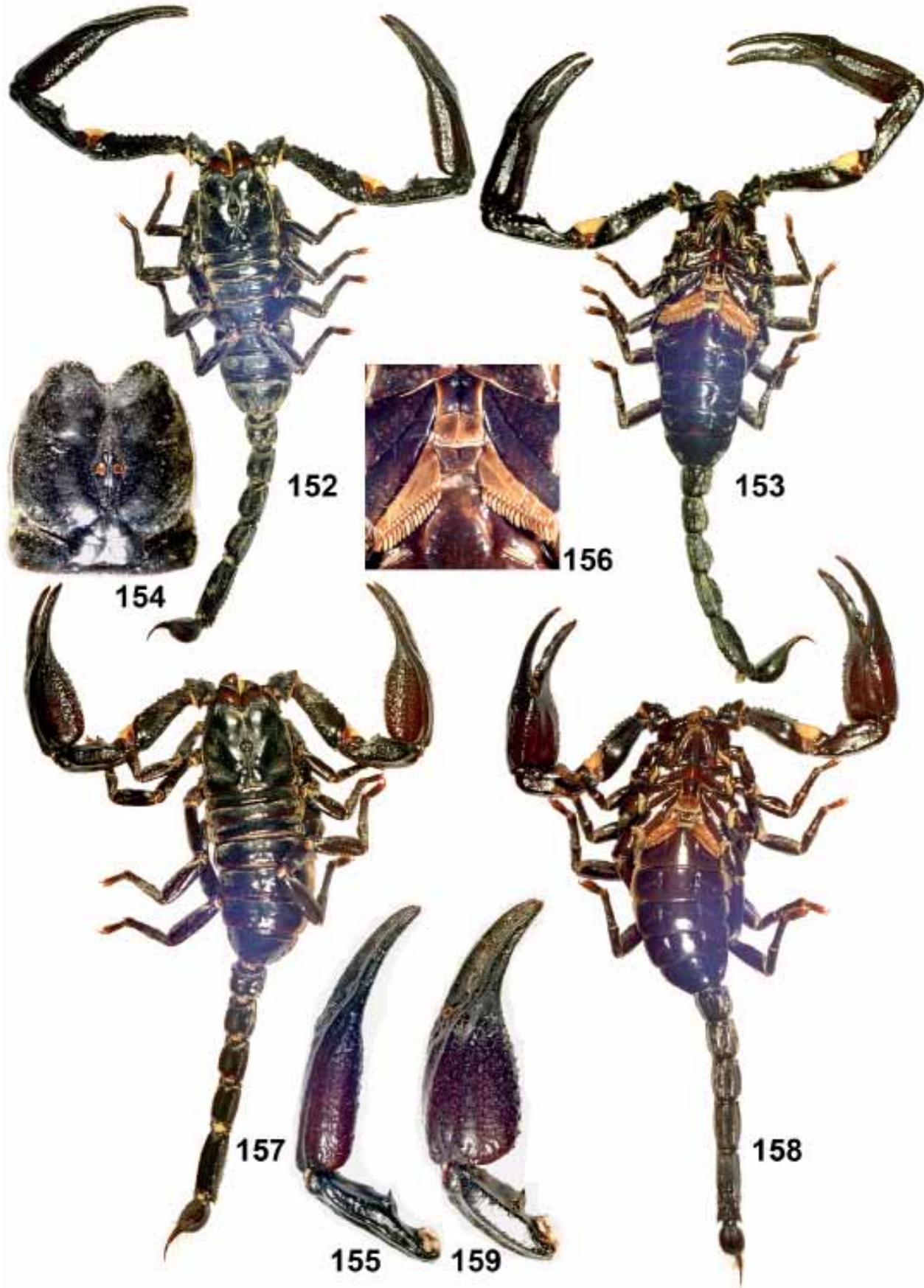
= *Scorpio maurus yemenensis* Werner, 1936: 183; Vachon, 1950: 164 (1952: 336); Fet, 2000: 480. **Syn. n.**

TYPE LOCALITY AND TYPE REPOSITORY. Arabia; BMNH.

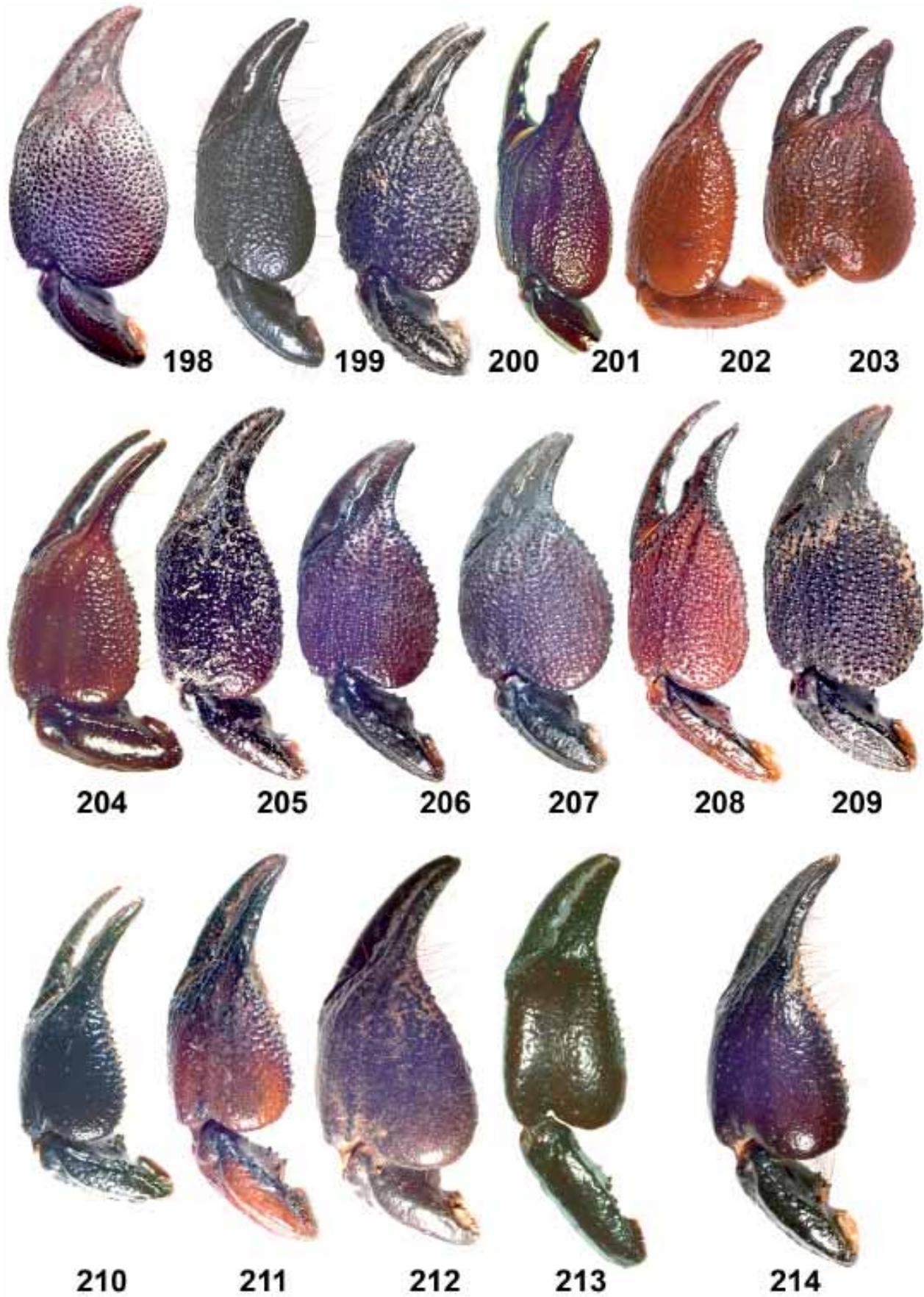
COMMENTS: After comparing topotypes of *S. m. yemenensis* from Yemen, Sana’a env., with the holotype of *S. m. arabicus*, I conclude that they belong to the same taxon.

DISTRIBUTION: Arabian Peninsula.

Figures 424–427 (page 134). *Scorpio maurus arabicus* (Pocock, 1900), chela, dorsal and ventral views, and pectens, ♀(62 mm) holotype, Arabia, BMNH.



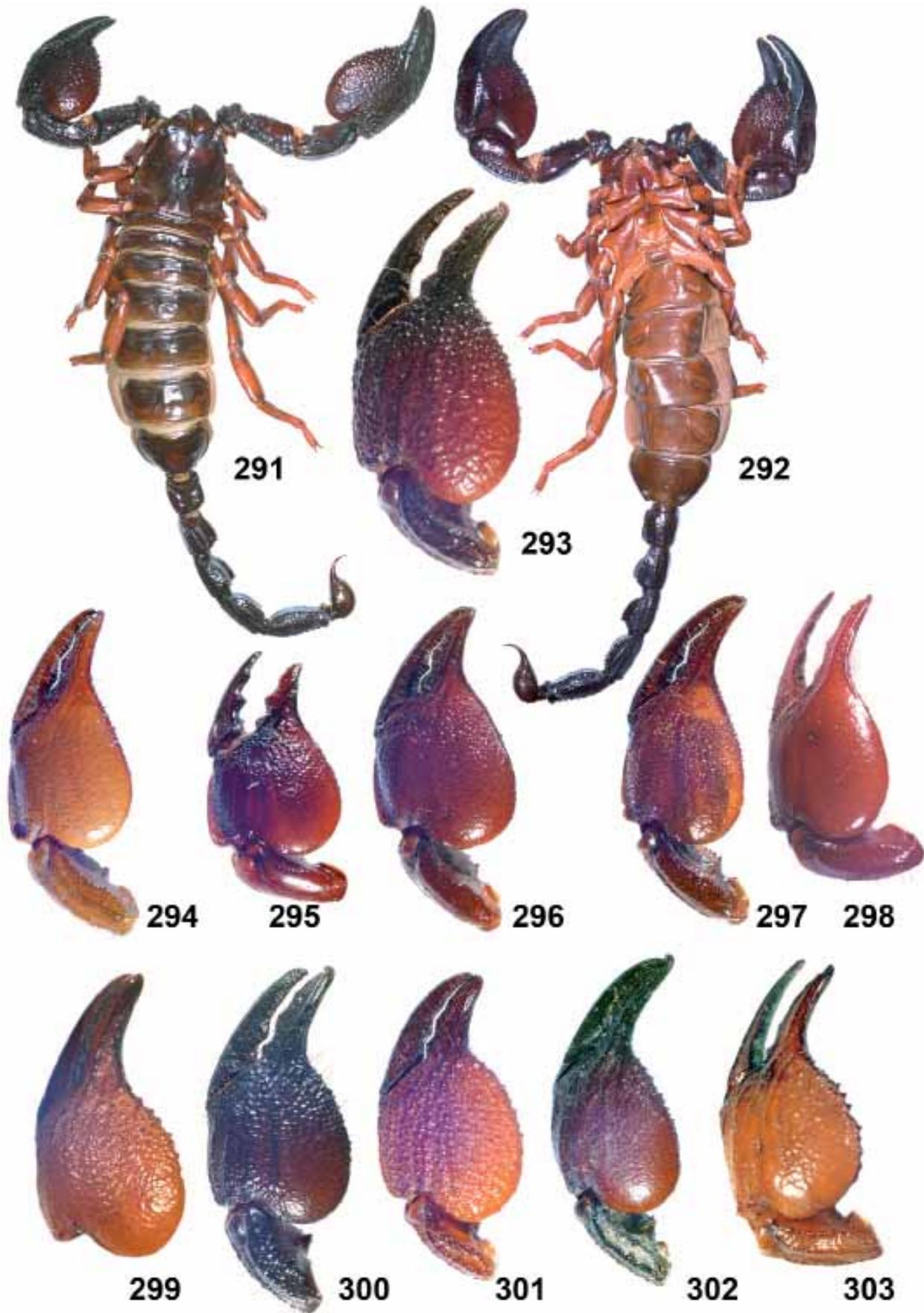
Figures 152–159. *Heterometrus thorellii*. 152–155. ♂. 156–159. ♀. See pages 44–45.



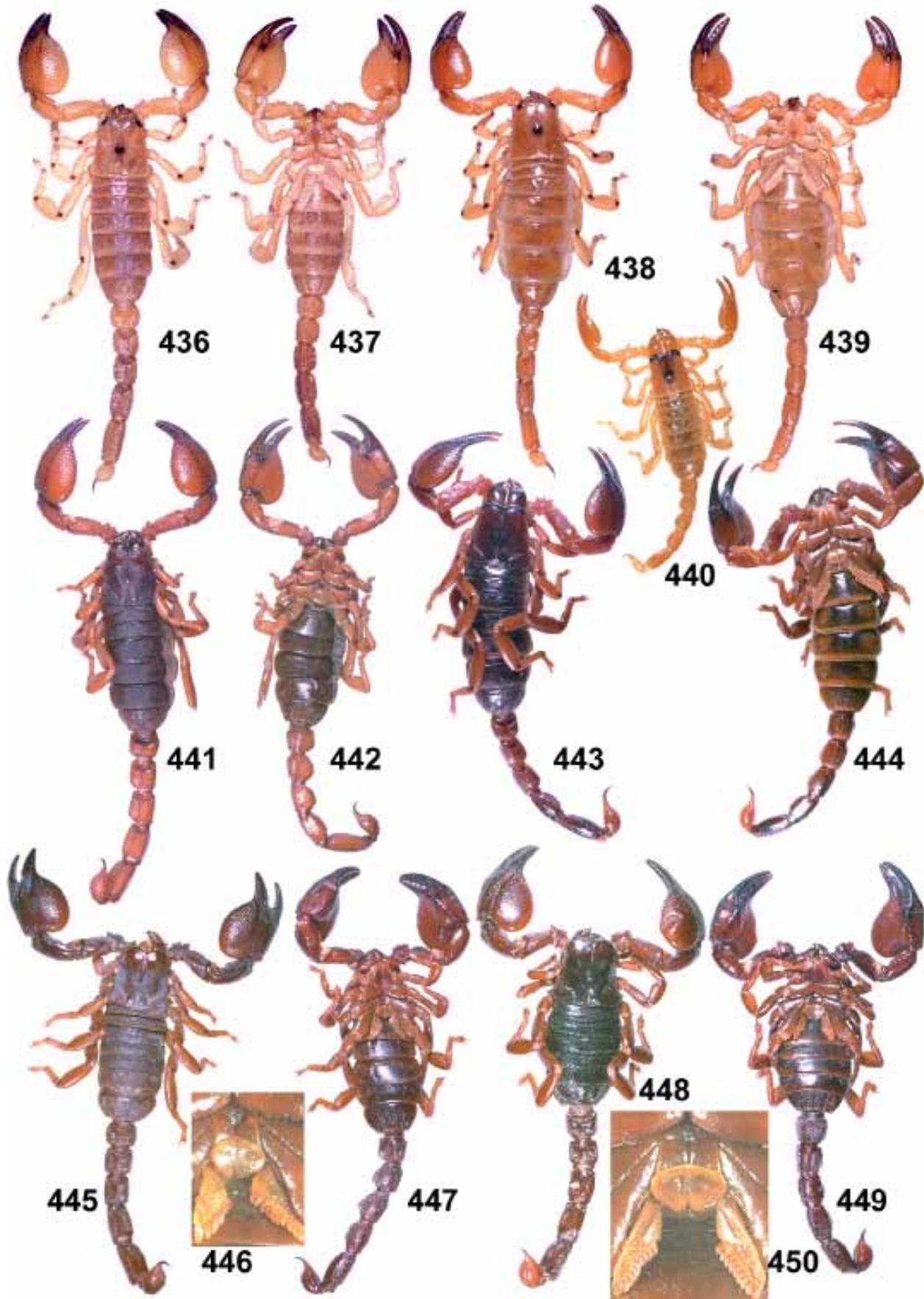
Figures 198–214. Chela and patella of *Heterometrus* species. See page 49.



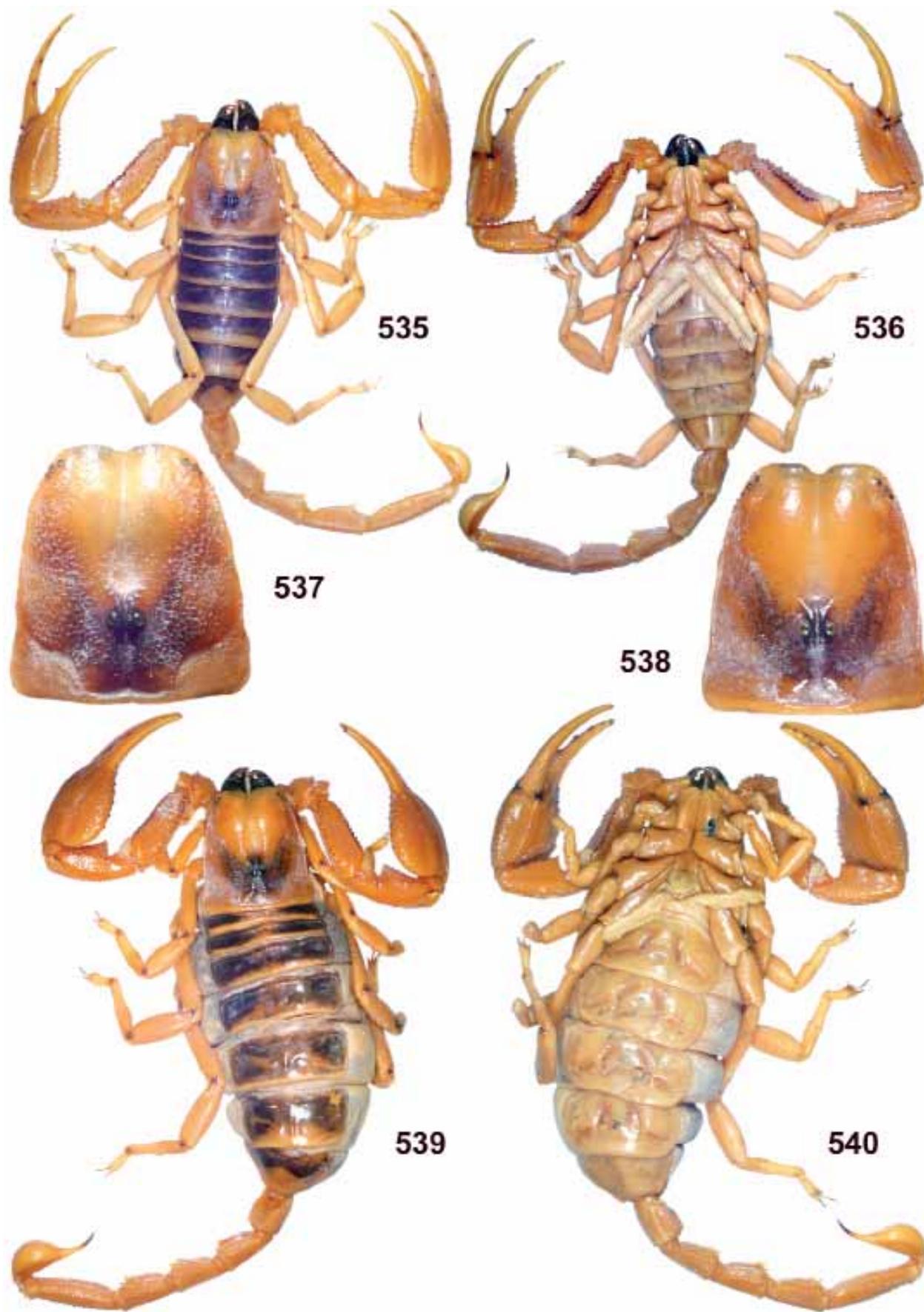
Figures 275–283. *Heterometrus swammerdami*. See page 44.



Figures 291–303. 291–293. *Pandinus platycheles*, ♀ (see page 51). 294–298. Chela of subgenus *Pandinops*. See page 51. 299–303. Chela of subgenus *Pandinurus*. See page 54.



Figures 436–450. 436–440. *Scorpio maurus townsendi*. 436–437. ♂. 438–439. ♀. See pages 62–63. 441–444. *S. m. kruglovi*. 441–442. ♂. 443–444. ♀. See page 61. 445–450. *S. m. fuscus*. 445–447. ♂. 448–450. ♀. See page 61.



Figures 535–540. *Opisththalmus flavescens*. 535–537. ♂. 538–540. ♀. See page 66.