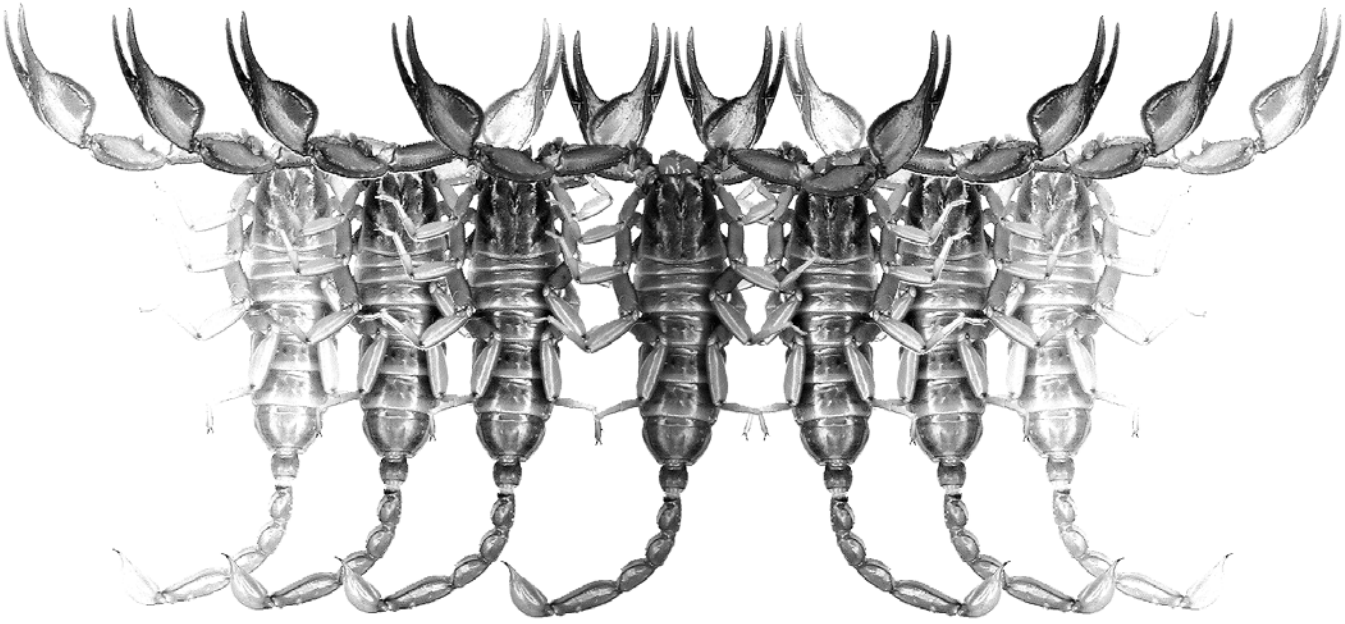
Euscorpius

Occasional Publications in Scorpiology



A Review of the Subgenus *Pandinus* Thorell, 1876 with Descriptions of Two New Species from Uganda and Ethiopia (Scorpiones: Scorpionidae)

František Kovařík

September 2011 – No. 129

Euscorpius

Occasional Publications in Scorpiology

EDITOR: **Victor Fet**, Marshall University, **'fet@marshall.edu'**

ASSOCIATE EDITOR: **Michael E. Soleglad, 'soleglad@la.znet.com'**

Euscorpius is the first research publication completely devoted to scorpions (Arachnida: Scorpiones). *Euscorpius* takes advantage of the rapidly evolving medium of quick online publication, at the same time maintaining high research standards for the burgeoning field of scorpion science (scorpiology). *Euscorpius* is an expedient and viable medium for the publication of serious papers in scorpiology, including (but not limited to): systematics, evolution, ecology, biogeography, and general biology of scorpions. Review papers, descriptions of new taxa, faunistic surveys, lists of museum collections, and book reviews are welcome.

Derivatio Nominis

The name *Euscorpius* Thorell, 1876 refers to the most common genus of scorpions in the Mediterranean region and southern Europe (family Euscorpiidae).

Euscorpius is located on Website **'http://www.science.marshall.edu/fet/euscorpius/'** at Marshall University, Huntington, WV 25755-2510, USA.

The International Code of Zoological Nomenclature (ICZN, 4th Edition, 1999) does not accept online texts as published work (Article 9.8); however, it accepts CD-ROM publications (Article 8). ***Euscorpius*** is produced in two *identical* versions: online (ISSN 1536-9307) and CD-ROM (ISSN 1536-9293). Only copies distributed on a CD-ROM from ***Euscorpius*** are considered published work in compliance with the ICZN, i.e. for the purposes of new names and new nomenclatural acts. All *Euscorpius* publications are distributed on a CD-ROM medium to the following museums/libraries:

- **ZR**, Zoological Record, York, UK
- **LC,** Library of Congress, Washington, DC, USA
- **USNM**, United States National Museum of Natural History (Smithsonian Institution), Washington, DC, USA
- **AMNH**, American Museum of Natural History, New York, USA
- **CAS**, California Academy of Sciences, San Francisco, USA
- **FMNH**, Field Museum of Natural History, Chicago, USA
- **MCZ**, Museum of Comparative Zoology, Cambridge, Massachusetts, USA
- **MNHN**, Museum National d'Histoire Naturelle, Paris, France
- **NMW**, Naturhistorisches Museum Wien, Vienna, Austria
- **BMNH**, British Museum of Natural History, London, England, UK
- **MZUC**, Museo Zoologico "La Specola" dell'Universita de Firenze, Florence, Italy
- **ZISP**, Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia
- **WAM**, Western Australian Museum, Perth, Australia
- **NTNU**, Norwegian University of Science and Technology, Trondheim, Norway
- **OUMNH**, Oxford University Museum of Natural History, Oxford, UK
- **NEV**, Library Netherlands Entomological Society, Amsterdam, Netherlands

---

Publication date: 30 September 2011

Euscorpius — Occasional Publications in Scorpiology. 2011, No. 129

A review of the subgenus *Pandinus* Thorell, 1876 with descriptions of two new species from Uganda and Ethiopia (Scorpiones: Scorpionidae)

František Kovařík

P. O. Box 27, CZ - 145 01 Praha 45, Czech Republic, www.kovarex.com/scorpio

Summary

Pandinus (*Pandinus*) *ugandaensis* **sp. n.** from Uganda and *P.* (*P.*) *mazuchi* **sp. n.** from Ethiopia are described and compared with other species of the subgenus. *P. ugandaensis* **sp. n.** is characterized by 3-4/3: 3-4/3: 4/3: 4/3 spiniform formula of tarsomere II and only two spines on the inclined anteroventral surface of tarsomere II; eight ventral trichobothria on the chela; 10–11 pectinal teeth in females and 13–14 in males; and 1.6–1.7 length to depth ratio of the fourth metasomal segment. *P.* (*P.*) *mazuchi* **sp. n.** is characterized by 7/4: 6-7/4: 6-7/5-6: 8/5 spiniform formula of tarsomere II and only two spines on the inclined anteroventral surface of tarsomere II; 10 ventral trichobothria on the chela; 15–17 pectinal teeth; and 1.85 length to depth ratio of the fourth metasomal segment. New data on taxonomic characters, occurences and ecology of *P. smithi* (Pocock, 1897) and *P. phillipsii* (Pocock, 1896) are given and the presence of *P. smithi* (Pocock, 1897) in Ethiopia is verified. Presented are also photos of localities and a key to species of the subgenus.

Systematics

Pandinus Thorell, 1876
(Figs. 1–42)

Pandinus Thorell, 1876: 12; Kraepelin, 1899: 116; Vachon, 1974: 953, figs. 113-118; Sissom, 1990: 136; Fet, 1997: 248; Fet, 2000: 465; Prendini, 2000: 44; Kovařík, 2009: 50, figs. 284-420.

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

DIAGNOSIS. Total length 60–220 mm. Pedipalp femur with 3 trichobothria, only one of them on internal surface. Pedipalp patella with 13–16 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. Telson without subaculear tubercle.

Subgenus ***Pandinus*** Thorell, 1876
(Figs. 1–42)

Pandinus (*Pandinus*): Vachon, 1974: 953; Fet, 2000: 466; Kovařík, 2009: 56, figs. 386-402, 414-417.

TYPE SPECIES. *Buthus imperator* C. L. Koch, 1841.
DIAGNOSIS. Total length 90–220 mm. Chela with 3 internal and 8–15 ventral trichobothria. Pectinal teeth number 10–21.

Pandinus* (*Pandinus*) *gambiensis Pocock, 1899
(Fig. 42)

Pandinus imperator gambiensis Pocock, 1899: 836.
Pandinus gambiensis: Vachon, 1967: 1534-1537, figs. 1, 3-5, 9-11; Vachon et al., 1970: 412-432, figs. 1-14; Prendini, 2004: 254.
Pandinus (*Pandinus*) *gambiensis*: Vachon, 1974: 953; Kovařík, 1998: 140; Fet, 2000: 466; Kovařík & Whitman, 2005: 114; Kovařík, 2009: 56, 126, figs. 386-388.

TYPE LOCALITY AND TYPE REPOSITORY. Gambia; the Natural History Museum, London, United Kingdom (BMNH).

DIAGNOSIS. Total length 130–200 mm. Base color uniformly brown to reddish brown. Legs colored approximately as body. Pectinal teeth number 15–19. Movable fingers of pedipalp and telson without noticeable sexual dimorphism. Spiniform formula of tarsomere II = 5/4: 6/4: 6/4: 6/4. Tarsomere II with 3 spines on inclined anteroventral surface. Chela with 10 ventral trichobothria.

Figures 1–5: *Pandinus mazuchi* **sp. n.**, ♀ (92.5 mm) holotype. **1–2.** dorsal and ventral views. **3.** Pectinal area. **4.** Movable finger. **5.** Trichobothrial pattern. For explanation of trichobothrial nomenclature see Vachon (1974) and Kovařík (2009: 28, plate J).

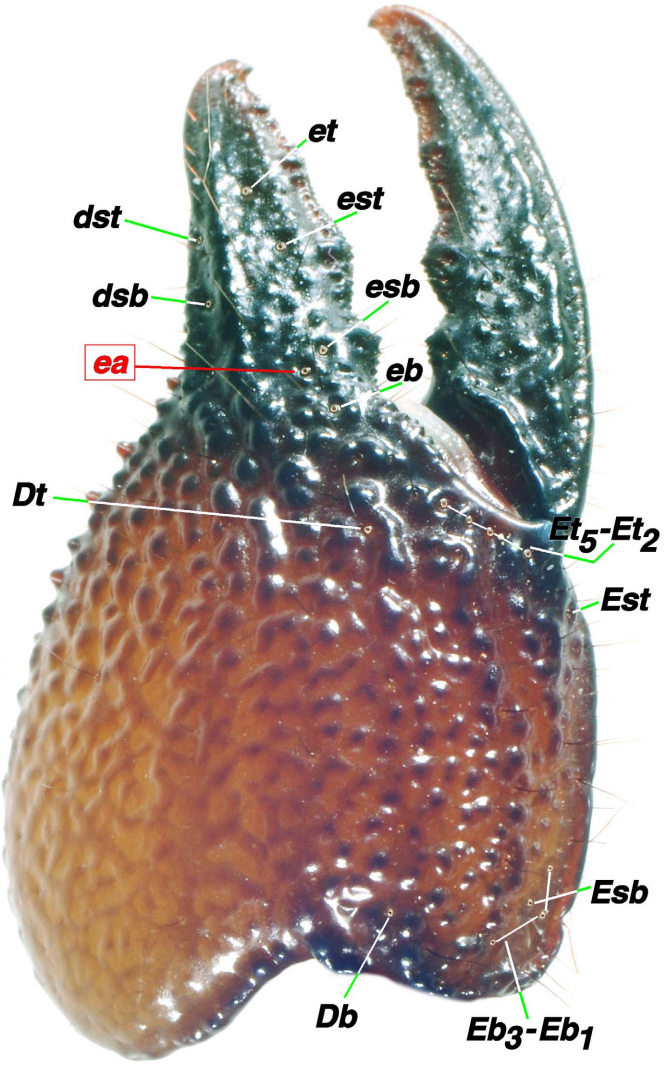


Figure 5a: *Pandinus mazuchi* **sp. n.**, ♀ (92.5 mm) holotype. Closeup of trichobothrial pattern of the chela, external view, identifying individual trichobothria visible in the image. In particular, the unique external *accessory* trichobothrium *ea* is indicated with red.

Pandinus* (*Pandinus*) *imperator (C. L. Koch, 1841)
(Figs. 36–37 and 42)

Buthus imperator C. L. Koch, 1841: 1, fig. 695.
Pandinus imperator: Vachon, 1967: 1534-1537, figs. 2, 6-8; Prendini, 2004: 255.
Pandinus (*Pandinus*) *imperator*: Vachon, 1974: 953; Kovařík, 1998: 86, 140, fig. on page 95; Fet, 2000: 466; Kovařík, 2002: 19; Kovařík, 2009: 57, 127, figs. 392-397, 132, figs. 414-415.
= *Heterometrus roeseli* Simon, 1872: 54 (syn. by Thorell, 1876: 203).
= *Scorpio simoni* Becker, 1880: 137 (syn. by Thorell, 1893: 377).

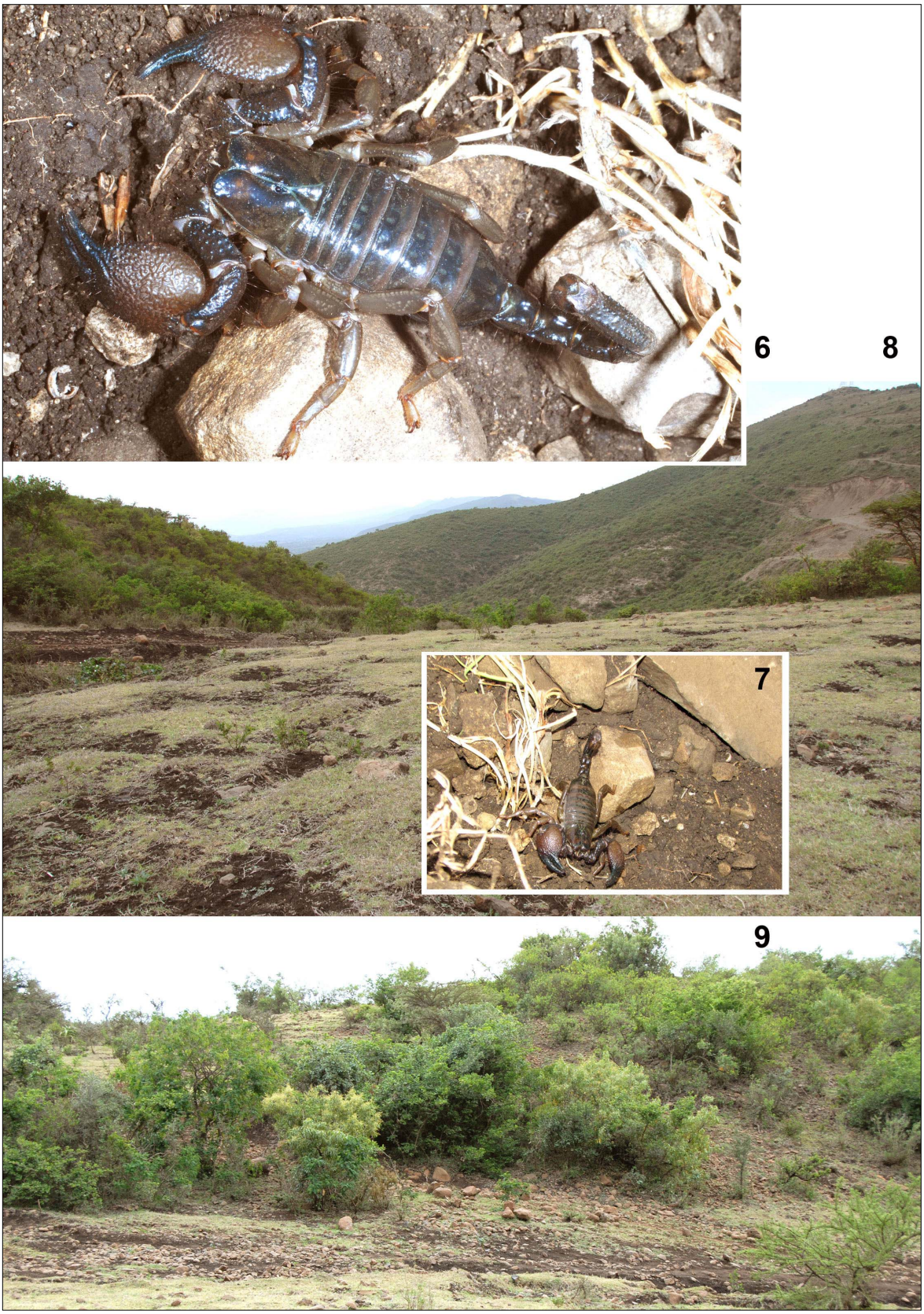
TYPE LOCALITY AND TYPE REPOSITORY. Unknown.

DIAGNOSIS. Total length 120–220 mm. Base color uniformly brown to reddish black. Legs colored as body. Pectinal teeth number 15–19. Movable finger of pedipalp and telson without noticeable sexual dimorphism. Spiniform formula of tarsomere II = 4/3: 4-5/3: 4-5/2-3: 4-5/2-3. Tarsomere II with 2 spines on inclined anteroventral surface (Fig. 37). Chela with 9–14 ventral trichobothria. Length to depth ratio of 4th metasomal segment higher than 2 (Fig. 36).

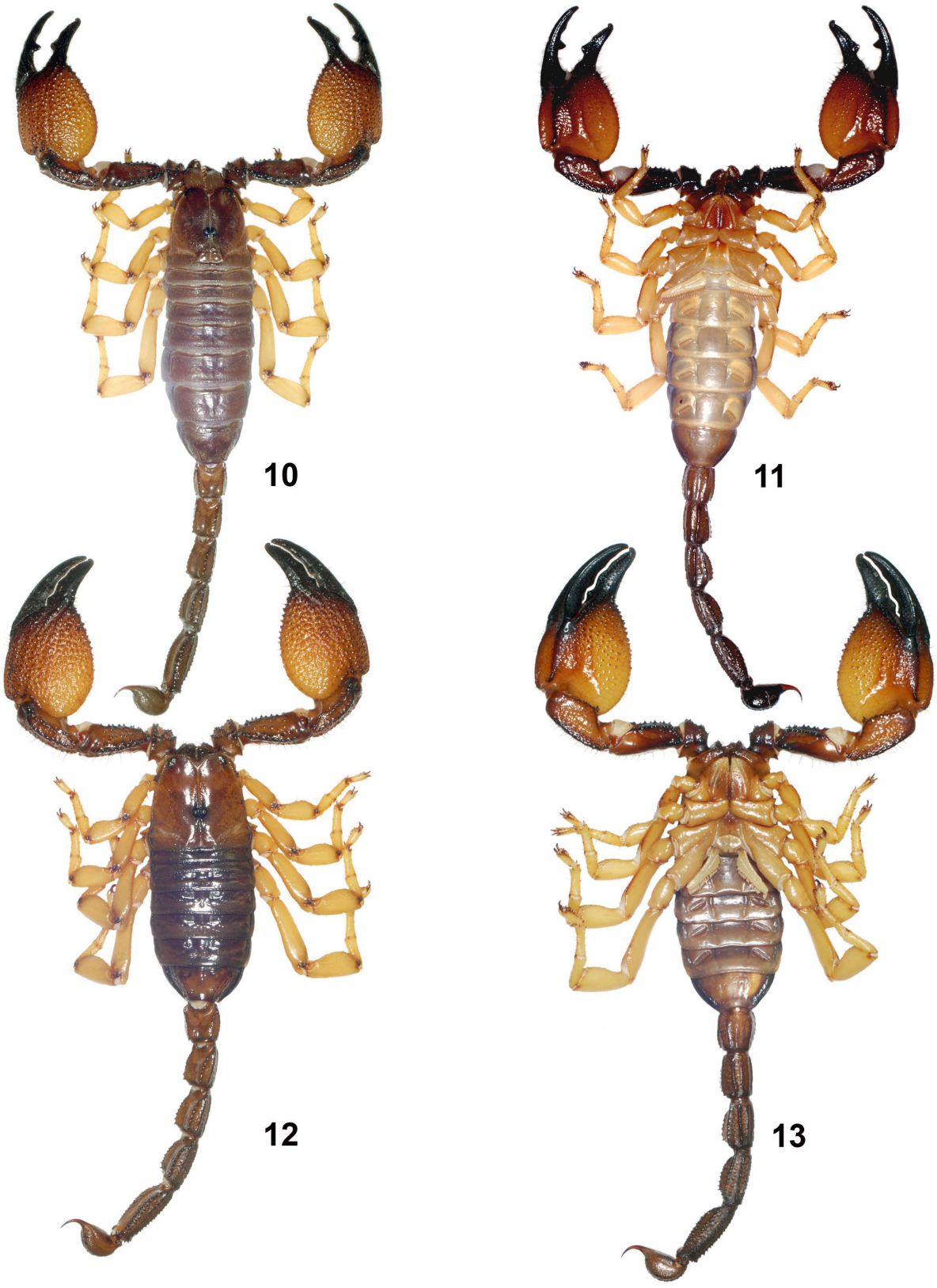
Pandinus* (*Pandinus*) *mazuchi Kovařík**, sp. n.**
(Figs. 1–9, 35, 39, 42)

TYPE LOCALITY AND TYPE REPOSITORY. Ethiopia, Jijiga env., 09°20'15.8"N 42°42'17.5"E, 2100 m a.s.l.; the author´s collection (FKCP).

TYPE MATERIAL. Ethiopia, Jijiga env., 09°20'15.8"N 42°42'17.5"E, 2100 m a.s.l. (Figs. 8–9), 16.VII.2011, 1♀ (holotype) 1♀7juvs. (paratypes, still alive), leg. F. Kovařík and D. Hegner. All types are in the author´s collection (FKCP).



Figures 6–9: *Pandinus mazuchi* **sp. n.**, ♀ holotype photographed at the type locality (6–7) and the type locality, Ethiopia, Jijiga env., 09°20'15.8"N 42°42'17.5"E, 2100 m a.s.l . (8–9).



Figures 10–13: *Pandinus phillipsii* (Pocock, 1896). **10–11.** ♂ (125 mm), dorsal and ventral views, Somaliland, 15 km N of Sheikh, Goolis Mts., 09°58.927'N 45°10.377'E, 1247 m a.s.l. **12–13.** ♀ (109 mm), dorsal and ventral views, Somaliland, Sheikh, 09°57'25.9"N 45°09'52.2"E, 1492 m a.s.l.

Figures 14–16: *Pandinus phillipsii* (Pocock, 1896). Juvenile (80 mm) at the locality Somaliland, Sheikh, Goolis Mts., 09°56'23"N 45°11'14.2"E, 1439 m a.s.l. The large photo (14) is an overall view after overturning a smaller boulder. The smallest photo (15) shows a shallow depression under the boulder in which the scorpion was hiding and underwent an ecdysis (the same spot is shown in the large photo by an arrow). Small arrow points to a partial exuvia of this specimen. The lower photo (16) shows the entire juvenile after removal from the hiding place.

ETYMOLOGY. Named after Tomáš Mazuch, a Czech herpetologist and my friend, who visited Ethiopia and Somaliland with me.

DIAGNOSIS. Total length 92.5 mm. Color uniformly brown to reddish black, only legs, telson and chela reddish brown. Chelicerae brown, reticulate, with black fingers and anterior margin. External trichobothria on patella number 16 (5 *eb*, 3 *esb*, 2 *em*, 1 *est*, 5 *et*); ventral trichobothria on chela number 10. Accessory trichobothrium *ea* on chela is present and located between trichobothria *esb* and *eb* on the base of the fixed finger. Carapace lacking carinae and smooth (without granules), with very fine and shallow punctures. Dorsal carinae on first throught fourth metasomal segments terminate in a larger tooth most conspicuous on fourth segment. Spiniform formula of tarsomere II = 7/4: 6-7/4: 6-7/5-6: 8/5. Tarsomere II with 2 spines on inclined anteroventral surface. Pectinal teeth number 15–17. Pedipalps sparsely hirsute, mainly chela. Granules on dorsal surface of chela not conical and pointed, their summits sometimes confluent. External surface of chela smooth, with several conical granules in anterior part and without carinae. Length to depth ratio of 4th metasomal segment = 1.85.

DESCRIPTION. The adult female holotype is 92.5 mm long. The habitus is shown in Figs. 1–2. For position and distribution of trichobothria of pedipalps see Fig. 5. External trichobothria on the patella number 16 (5 *eb*, 3 *esb*, 2 *em*, 1 *est*, 5 *et*); ventral trichobothria on the chela number 10. Trichobothrium *ea* (Fig. 5a) on the chela is present and located between trichobothria *esb* and *eb* on the base of the fixed finger (Fig. 5 versus Fig. 29). Sexual dimorphism is unknown.

COLORATION (Figs. 1–5). The carapace, mesosoma, metasoma and femur and patella of pedipalp are uniformly brown to reddish black. The chela is reddish brown and its fingers are black. The legs and telson are brown. The juveniles are entirely black, including the legs. The chelicerae are brown, reticulate, with black fingers and anterior margins.

CARAPACE. The carapace (Fig. 1) lacks carinae but has a deep sagittal furrow with a forked, Y-shaped furrow on each side in the posterior part. The surface is smooth, without granules and with very fine and shallow punctures. The anteromedial margin of the carapace is strongly concave. Present are a pair of median eyes and three lateral eyes with a furrow behind the lateral eyes. The distance ratio of the pair of median eyes from the anterior or the posterior margin of the carapace is, respectively, 0.53 or 0.47.

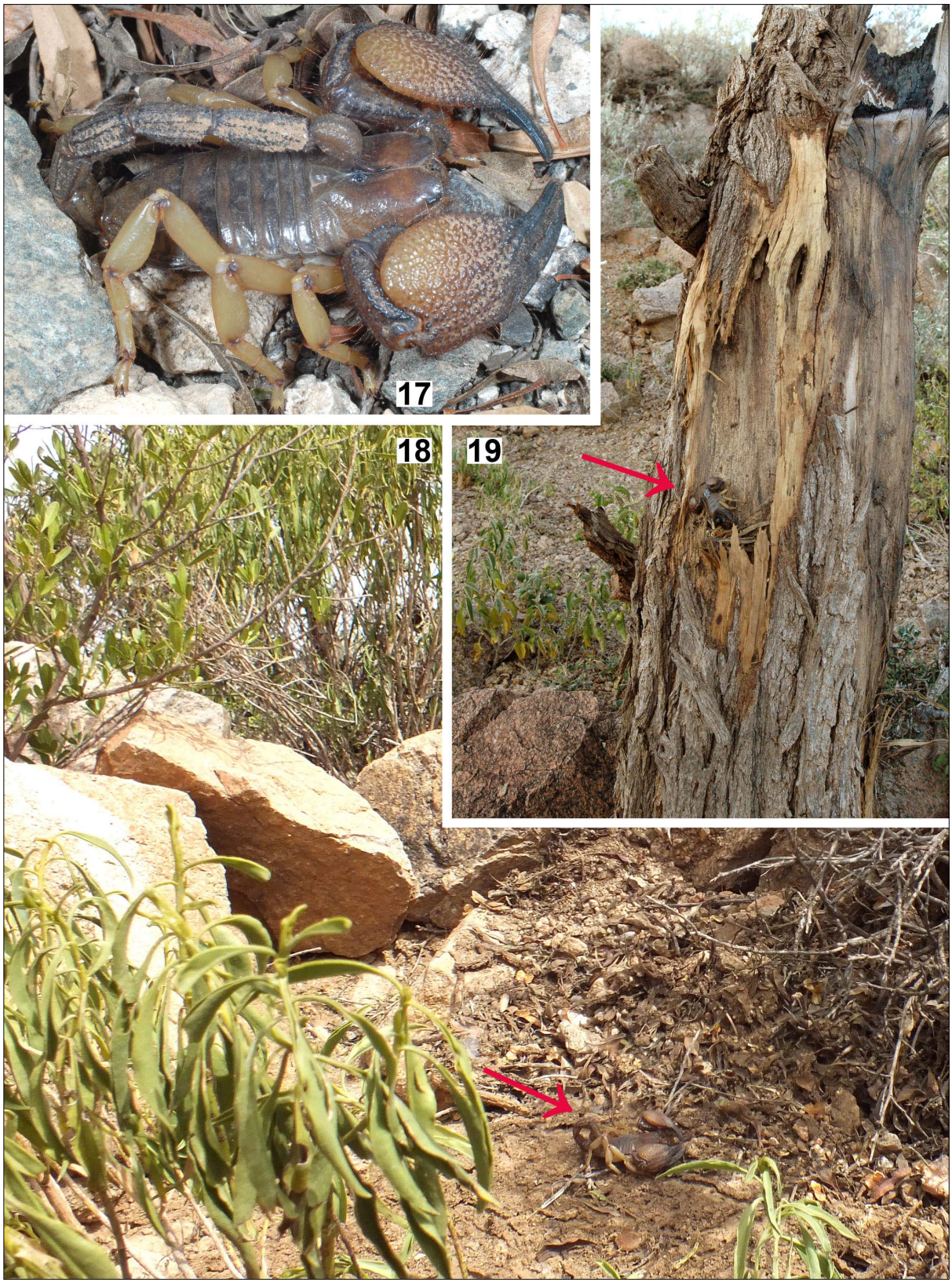
MESOSOMA. The tergites are smooth, each with an incomplete, smooth sagittal carina and symmetrical shallow furrows. The sternites are smooth, lack carinae and each bears two pronounced furrows that reach neither anterior nor posterior margins. The pectinal teeth number 15–17. The pectines have three marginal lamellae and three middle lamellae, all with numerous reddish setae. The characteristic fulcra are long and bear usually four or five white setae on the tip.

METASOMA AND TELSON (Fig. 35). The first throught fourth segments bear eight carinae. The first throught third segments bear smooth ventral and lateral carinae; the fourth segment bears these carinae with several smooth teeth. The dorsal carinae on the first throught fourth segments terminate in a larger tooth most conspicuous on the fourth segment. The fifth segment bears five carinae and a row of granules on the lateral surfaces, which may form an incomplete carina. All carinae on the fifth metasomal segment bear strong granules. The surface between the carinae is granulate on the fifth segment and smooth on the other segments. The telson is elongate, with aculeus shorter than the vesicle. The surface of the telson is unevenly granulated and bears an incomplete carinae.

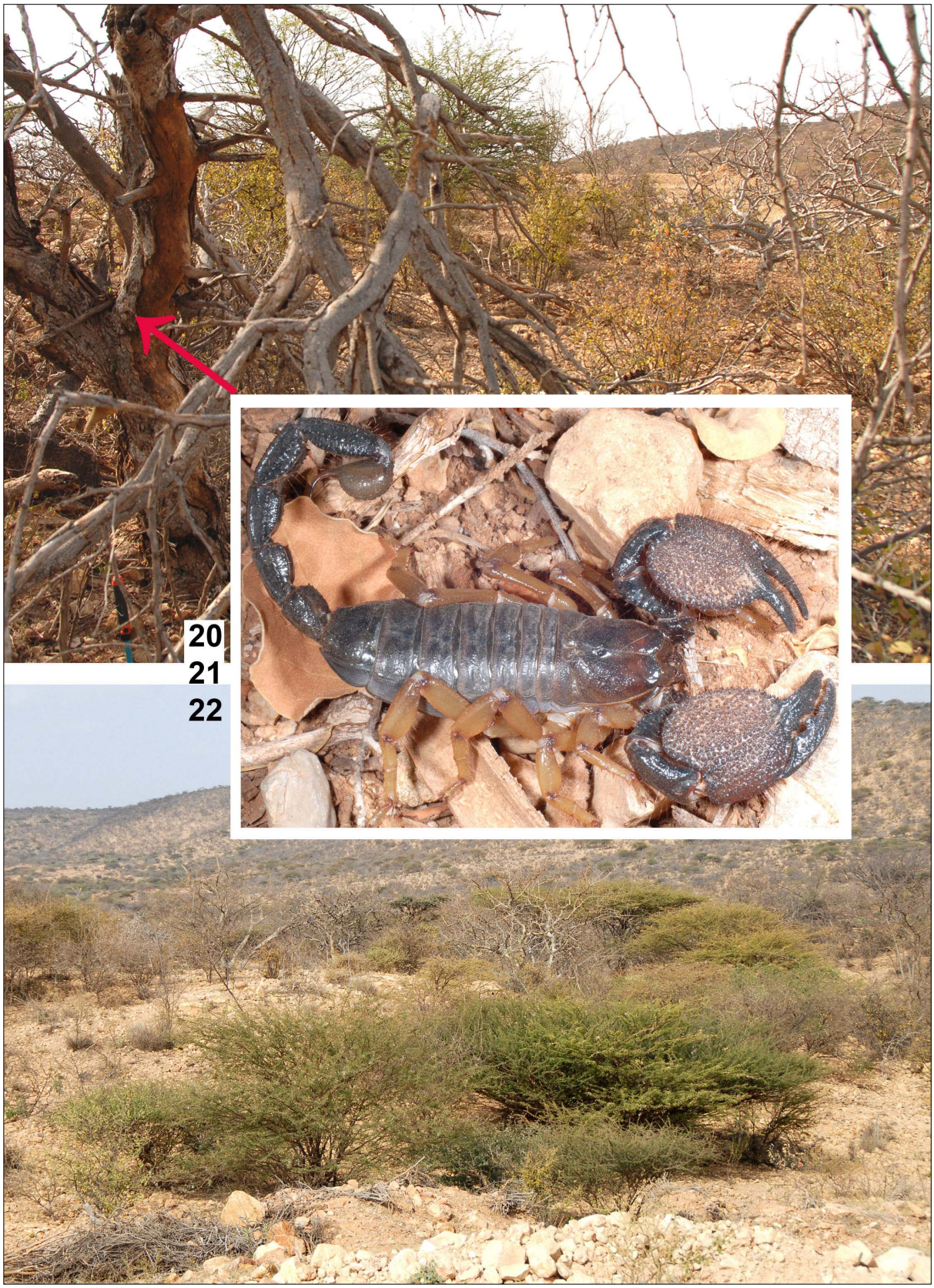
LEGS. The legs are smooth, without carinae and granules, and unevenly hirsute. Tarsomere I is hirsute and with two or three spinae. Tarsomere II has two spines on the inclined anteroventral surface. The spiniform formula of tarsomere II is 7/4: 6-7/4: 6-7/5-6: 8/5 (Fig. 39).

PEDIPALPS (Fig. 5). The pedipalps are sparsely hirsute, mainly the chela. The femur and patella of pedipalp are smooth with several large granules and with punctures as fine as on the carapace. The femur bears four carinae composed of several large, round granules, only the externoventral carina is smooth.The patella bears four to five smooth and incomplete carinae without granules. Two large and several small granules are only on the external surface of the patella. The chela bears only two smooth ventral carinae. The dorsal surface of the chela bears granules that are neither conical nor pointed and whose summits may be confluent. The external surface of the chela is smooth, with several conical granules in anterior part and without carinae. The chela of pedipalp has a lobe. The dentate margins of the movable and fixed fingers are armed with two parallel rows of denticles extending the entire length of the finger, without external and internal granules but with larger granules which indicate six subrows on the movable finger (Fig. 4) and five subrows on the fixed finger.

MEASUREMENTS IN MM. Female holotype. Total length 92.5; carapace length 12.2, width 12.3; metasoma and telson length 42.4; first metasomal segment length 5.3, width 5.4, depth 4.2; second metasomal segment length 5.7, width 4.7, depth 3.9; third metasomal segment length 6.2, width 4.3, depth 3.8; fourth metasomal segment length 7.0, width 3.9, depth 3.8; fifth metasomal segment length 8.9, width 3.8 depth 3.8; telson length 9.3; telson width 3.9; pedipalp femur length 8.1, width 4.1; pedipalp patella length 8.8, width 4.8; chela



Figures 17–19: *Pandinus phillipsii* (Pocock, 1896). **17–18.** ♀ (109 mm) at the locality Somaliland, Sheikh, 09°57'25.9"N 45°09'52.2"E, 1492 m a.s.l. **19.** ♂ (125 mm) on a tree after removal of dry bark, Somaliland, 15 km N of Sheikh, Goolis Mts., 09°58.927'N 45°10.377'E, 1247 m a.s.l.



Figures 20–22: *Pandinus smithi* (Pocock, 1897), ♂ (107 mm), at the locality, Ethiopia, 55 km S of Degehbur, 07°49'27.2"N 43°41'56.3"E, 1053 m a.s.l. Red arrow points to the spot at which the specimen was found under bark.

length 18.7; manus width 11.5; movable finger length 10.6.

AFFINITIES. The described features distinguish *P. mazuchi* **sp. n.** from all other species of the subgenus *Pandinus* Thorell, 1876. *P. mazuchi* **sp. n.** is characterized by 7/4: 6-7/4: 6-7/5-6: 8/5 spiniform formula of tarsomere II and only two spines on the inclined anteroventral surface of tarsomere II (Fig. 39). These two characters distinguish *P. mazuchi* **sp. n.** from all species except *P. phillipsii*, which however differs in shape of spines of tarsomere II (Fig. 40 versus Fig. 39), bigger total length (100–125 mm), more and different pilosity of dorsal carinae of metasomal segments, more granulated external surface of pedipalps (Fig. 13), and yellow legs (Fig. 10–13). *P. mazuchi* **sp. n.** has the total length less than 95 mm and the legs brown (Fig. 1). Other differences are apparent in the number and positions of the trichobothria. In *P. mazuchi* **sp. n.**, a trichobothrium *ea* (Fig. 5a) is present on the chela, located between trichobothria *esb* and *eb* on the base of the fixed finger (Fig. 5 versus Fig. 29). The ventral trichobothria on the chela number 10 in *P. mazuchi* **sp. n.** (Fig. 5) and *P. gambiensis* (fig. 10 in Vachon, 1967 and specimens in the author's collection), eight in *P. ugandaensis* **sp. n.** (Fig. 29), 9–14 in *P. imperator* (fig. 7 in Vachon, 1967 and specimens in the author's collection), and 13–15 in *P. smithi* and *P. phillipsii* (specimens in author's collection).

DISCUSSION. Within the subgenus *Pandinus* there are two types of sexual dimorphism. Males of *P. smithi* and *P. phillipsii* have more pronounced tooth on the movable fingers of pedipalps than females (Figs. 10–11) and relatively larger telsons. Both sexes of these two species have yellow legs (Figs. 10–13). *P. mazuchi* **sp. n.** appears to be closer to *P. gambiensis*, *P. imperator* and *P. ugandaensis* **sp. n.**, which lack the noted sexual dimorphism and do not have yellow legs. On the other hand, it is closer to *P. smithi* and *P. phillipsii* in the higher number of spines on tarsomere II. The sexual dimorphism of *P. mazuchi* **sp. n.** is currently unknown, for which reason I am keeping the juveniles (paratypes) alive in the hope that some of them are males and the species can be propagated in captivity.

Pandinus* (*Pandinus*) *phillipsii (Pocock, 1896)
(Figs. 10–19, 40, 42)

Scorpio phillipsii Pocock, 1896: 181, Pl. XI. Figs. 3, 3a; Pocock, 1897: 398.
Pandinus phillipsi: Kraepelin, 1899: 120; Pocock, 1900: 58.
Pandinus (*Pandinus*) *phillipsii*: Vachon, 1974: 953; Kovařík, 1998: 141; Fet, 2000: 467; Kovařík, 2003: 152; Kovařík, 2009: 57, 128, figs. 398-402.
= *Pandinus intermedius* Borelli, 1919: 375 (syn. by Kovařík, 2003: 152).
= *Pandinus citernii* Borelli, 1919: 378 (syn. by Kovařík, 2003: 152).

TYPE LOCALITY AND TYPE REPOSITORY. Doolob, Goolis Mtns, inland of Berbera, Somaliland; the Natural History Museum, London, United Kingdom (BMNH).

DIAGNOSIS. Total length 100–125 mm. Color of adults uniformly reddish brown, legs yellow, always lighter-colored than body (Figs. 10–13). Pectinal teeth number 15–20. Granules on manus of pedipalp not conical and pointed, their summits sometimes confluent. Male has more pronounced tooth on movable finger of pedipalp and larger telson than female. Chela hirsute, with 13–15 ventral trichobothria. Spiniform formula of tarsomere II = 7/4: 7/4: 7-8/5: 7-8/5. Tarsomere II with 2 spines on inclined anteroventral surface (Fig. 40).

Pandinus* (*Pandinus*) *smithi (Pocock, 1897)
(Figs. 20–22, 41, 42)

Scorpio smithii Pocock, 1897: 398.
Pandinus (*Pandinus*) *smithi*: Vachon, 1974: 953; Kovařík, 1998: 141; Fet, 2000: 468; Kovařík, 2003: 152; Kovařík, 2009: 58, 126, figs. 389-391.

TYPE LOCALITY AND TYPE REPOSITORY. Hargesa (Hargeysa), Somaliland; the Natural History Museum, London, United Kingdom (BMNH).

DIAGNOSIS. Total length 100–110 mm. Color of adults uniformly reddish brown, legs yellow to yellowish, always lighter-colored than body. Pectinal teeth number 18–21. Granules on manus of pedipalp conical and pointed. Male has more pronounced tooth on movable finger of pedipalp and larger telson than female. Chela very densely hirsute, with 13–15 ventral trichobothria. Spiniform formula of tarsomere II = 7/4: 7-8/4: 8/5-6: 8-9/5. Tarsomere II with 3 spines on inclined anteroventral surface (Fig. 41).

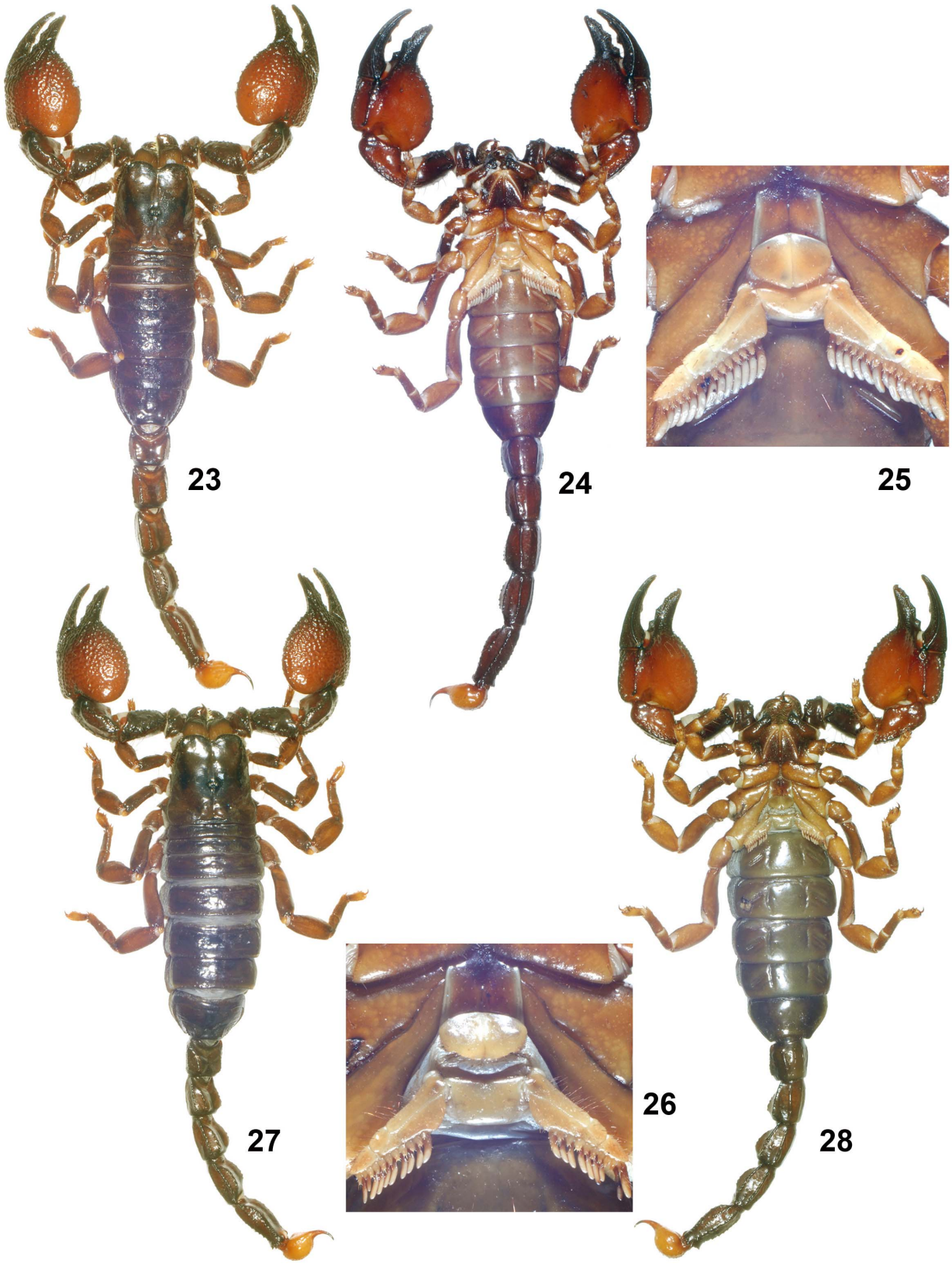
Pandinus* (*Pandinus*) *ugandaensis Kovařík**, sp. n.**
(Figs. 23–34, 38, 42)

TYPE LOCALITY AND TYPE REPOSITORY. Uganda, Kaabong env.; the author´s collection (FKCP).

TYPE MATERIAL. Uganda, Kaabong env. (Fig. 32), 2011, 2♂ (holotype and paratype), 2♀ (allotype and paratype), leg. native colector. All types are in the author´s collection (FKCP).

ETYMOLOGY. Named after country of occurence.

DIAGNOSIS. Total length is 90–110 mm. Color uniformly reddish black, only legs, telson and chela reddish brown.



Figures 23–28: *Pandinus ugandaensis* **sp. n. 23–25.** ♂ (97 mm) holotype, dorsal and ventral views and pectinal area. **26–28.** ♀ (105 mm) allotype, pectinal area and dorsal and ventral views.

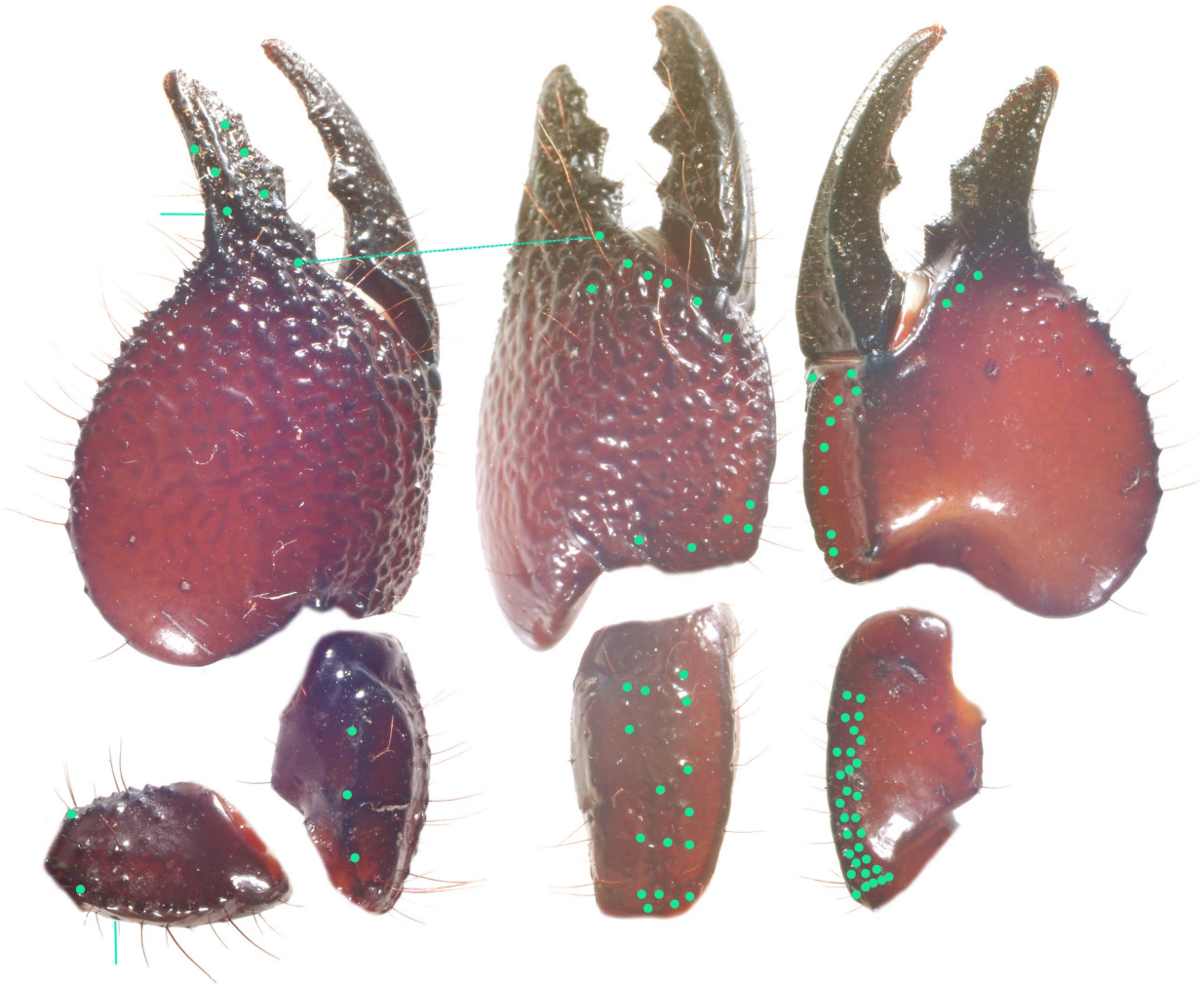


Figure 29: *Pandinus ugandaensis* **sp. n.**, ♂ (97 mm) holotype, trichobothrial pattern. For explanation of trichobothrial nomenclature see Vachon (1974) and Kovařík (2009: 28, plate J).

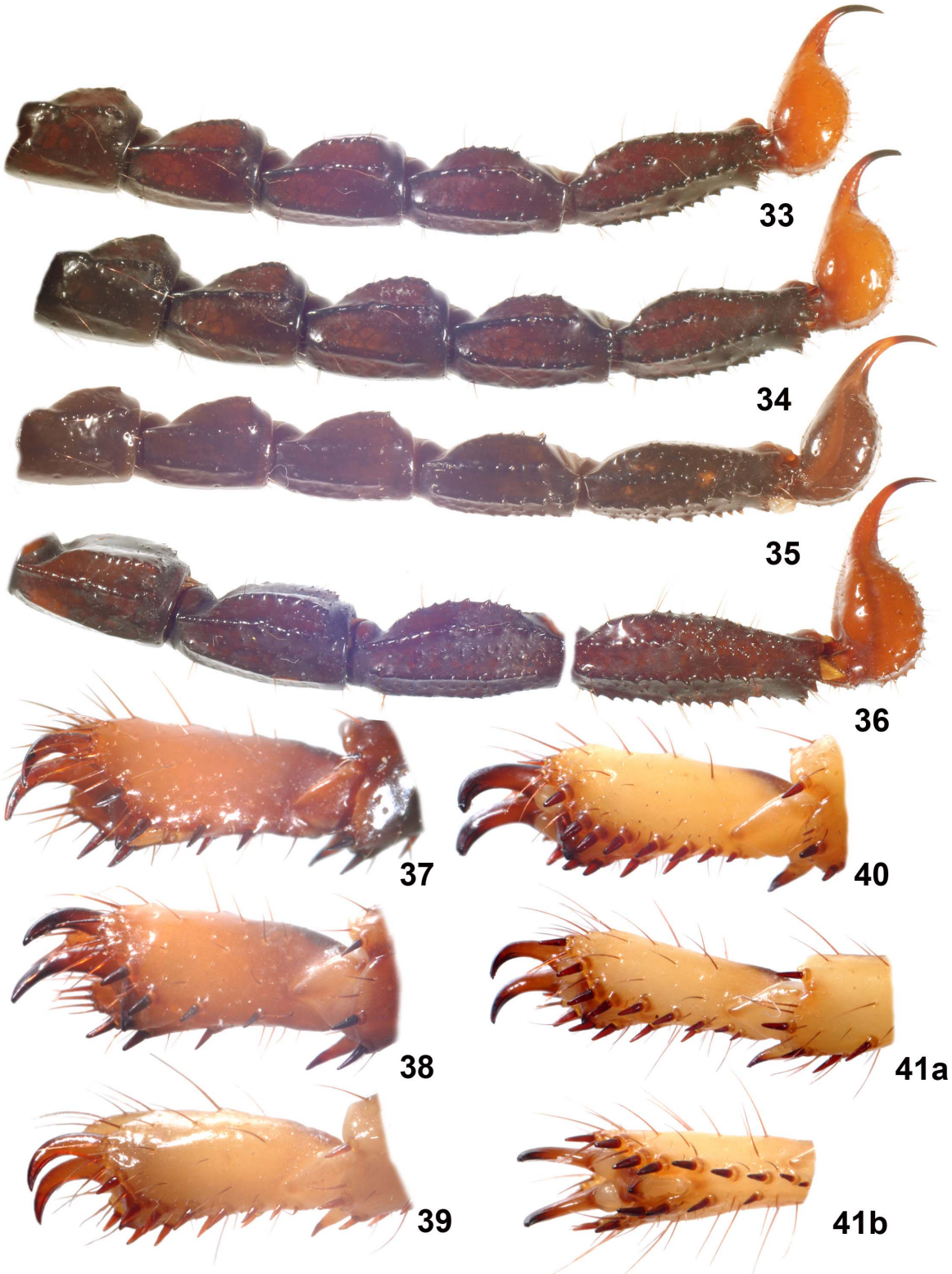
Chelicerae brown, reticulate, with black fingers and anterior margins. External trichobothria on patella number 16 (5 *eb*, 3 *esb*, 2 *em*, 1 *est*, 5 *et*); ventral trichobothria on chela number 8. Carapace lacks carinae and is smooth without granules, with very fine and shallow punctures. Pectinal teeth number 13–14 in males and 10–11 in females. Dorsal carinae on metasomal segments composed of three to seven round teeth of similar size. Spiniform formula of tarsomere II = 3-4/3: 3-4/3: 4/3: 4/3. Tarsomere II legs with 2 spines on inclined anteroventral surface. Pedipalps sparsely hirsute, mainly chela. Granules on dorsal surface of chela not conical and pointed, their summits sometimes confluent. External surface of chela smooth, with several conical granules in anterior part and without carinae. Length to depth ratio of 4th meatsomal segment = 1.6–1.7.

DESCRIPTION. The adults are 90–110 mm long. The habitus is shown in Figs. 23–28. For position and distribution of trichobothria of pedipalps see Fig. 29. External trichobothria on patella number 16 (5 *eb*, 3 *esb*, 2 *em*, 1 *est*, 5 *et*); ventral trichobothria on chela number eight. Sexual dimorphism is minor. Movable fingers of pedipalps and telson do not show any noticeable sexual dimorphism.

COLORATION (Figs. 23–28). The carapace, mesosoma, metasoma and femur and patella of pedipalp are uniformly reddish black. The legs, telson and chela are reddish brown, and fingers of the chela are black. The chelicerae are brown, reticulate, with black fingers and anterior margins of chelicerae.

CARAPACE. The carapace (Fig. 23) lacks carinae but has a deep sagittal furrow with a forked, Y-shaped furrow on each side in the posterior part. The surface is smooth, without granules and with very fine and shallow punctures. The anteromedial margin of the carapace is strongly concave. Present are a pair of median eyes and three lateral eyes with a furrow behind the lateral eyes. The

Figures 30–32: *Pandinus ugandaensis* **sp. n. 30.** ♂ (97 mm) holotype. **31.** ♀ (105 mm) allotype. **32.** Uganda, Kaabong env., type locality and native collector.



Figures 33–41: 33–36. Metasoma and telson in lateral views. 33. *Pandinus ugandaensis* **sp. n.**, ♂ holotype. **34.** *Pandinus ugandaensis* **sp. n.**, ♀ allotype. **35.** *Pandinus mazuchi* **sp. n.**, ♀ holotype. **36.** *Pandinus imperator* (C. L. Koch, 1841), ♂ (115 mm), Ghana, FKCP. **37–41. Tarsomere II of 4th leg. 37.** *Pandinus imperator* (C. L. Koch, 1841), ♂ (115 mm), Ghana, FKCP. **38.** *Pandinus ugandaensis* **sp. n.**, ♂ holotype. **39.** *Pandinus mazuchi* **sp. n.**, ♀ holotype. **40.** *Pandinus phillipsii* (Pocock, 1896), ♀ (109 mm), Somaliland, Sheikh, 09°57'25.9"N 45°09'52.2"E, 1492 m a.s.l., FKCP. **41.** *Pandinus smithi* (Pocock, 1897), ♂ (107 mm), Ethiopia, 55 km of Degehbur, 07°49'27.2"N 43°41'56.3"E, 1053 m a.s.l., FKCP.

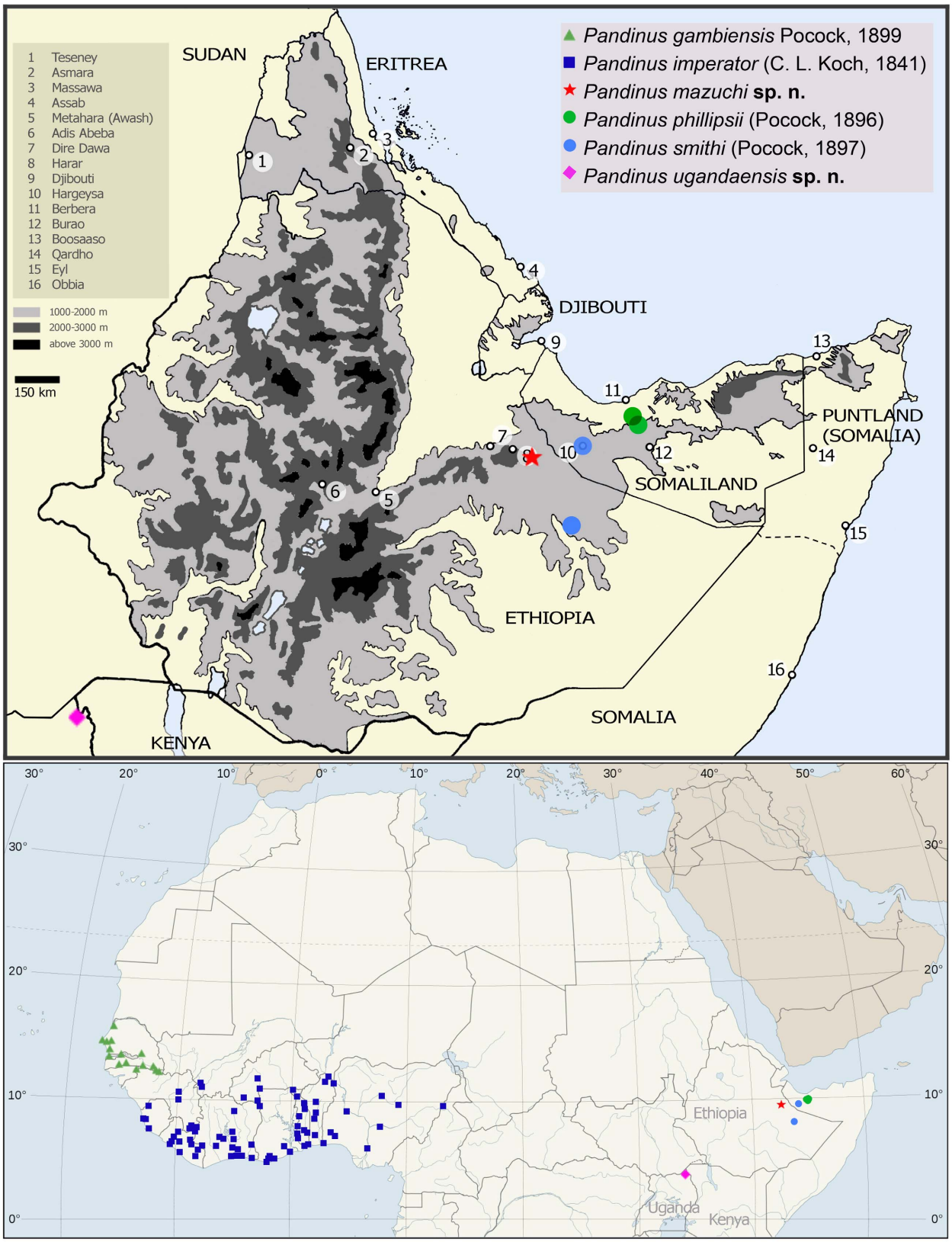


Figure 42: Distribution map of the subgenus *Pandinus*. Localities of *P. imperator* and *P. gambiensis* are after Prendini (2004: 255, fig. 13), localities of other species are new records except Hargeysa (type locality of *P. smithi*). Type locality of *P. phillipsii* corresponds with new records (Goolis Mts.). Other localities of *P. phillipsii* and *P. smithi* cited by older authors (Borelli, 1919; Pocock, 1896, 1897, and 1900) are not included in the map. Exact distributions of these species need to be further investigated.

distance ratio of the pair of median eyes from the anterior or the posterior margin of the carapace is, respectively, 0.52 or 0.48.

MESOSOMA. The tergites are smooth and bear an incomplete, smooth sagittal carina and shallow, symmetrical furrows. The sternites are smooth, lack carinae and bear two pronounced furrows that reach neither the anterior nor the posterior margin. The pectinal teeth number 13–14 in males and 10–11 in females. The pectines have three marginal lamellae and three middle lamellae, both bearing numerous reddish setae. The characteristic fulcra are long and bear numerous white setae.

METASOMA AND TELSON (Figs. 33–34). The first throught fourth segments bear eight carinae. The ventral and lateral carinae are smooth. The dorsal carinae are composed of three to seven round teeth of similar size. The fifth segment bears five carinae and a short row of granules on the lateral surfaces which may form incomplete carinae. All carinae on the fifth metasomal segment are composed of granules. The surface between the carinae is smooth, with solitary granules. The telson is bulbous, with the aculeus shorter than the vesicle. The surface of the telson is smooth and bears an incomplete carina.

LEGS. The legs are smooth, without carinae and granules, and unevenly hirsute. Tarsomere I is hirsute and with two or three spinae. Tarsomere II has two spines on the inclined anteroventral surface. The spiniform formula of tarsomere II is 3-4/3: 3-4/3: 4/3: 4/3 (Fig. 38).

PEDIPALPS (Fig. 29). The pedipalps are sparsely hirsute, mainly the chela. The femur and patella are smooth, with several large granules and punctures as fine as on the carapace. The femur bears four carinae composed of several large, round granules, only the externoventral carina is smooth.The patella bears four to five smooth, incomplete carinae without granules. Several granules are only on the external surface of the patella. The chela bears only two smooth ventral carinae. The dorsal surface of the chela bears granules that are neither conical nor pointed and whose summits may be confluent. The external surface of the chela is smooth, with several conical granules in anterior part and without carinae. The chela has a lobe. The dentate margins of the movable and fixed fingers are armed with two parallel rows of denticles extending the entire length of the finger, without external and internal granules but with larger granules which indicate six subrows on the movable finger and five subrows on the fixed finger.

MEASUREMENTS IN MM. Male holotype. Total length 97; carapace length 13.8, width 13.6; metasoma and telson length 48.6; first metasomal segment length 6.0, width 6.6, depth 5.2; second metasomal segment length 6.9, width 6.0, depth 5.0; third metasomal segment length 7.4, width 5.7, depth 4.8; fourth metasomal segment length 8.1, width 5.1, depth 4.8; fifth metasomal segment length 10.0, width 4.4, depth 4.4; telson length 10.2; telson width 4.5; pedipalp femur length 8.5, width 4.9; pedipalp patella length 9.8, width 5.4; chela length 19.9; manus width 12.5; movable finger length 12.4.

Female allotype. Total length 105; carapace length 14.5, width 15.1; metasoma and telson length 47.4; first metasomal segment length 6.2, width 6.7, depth 5.3; second metasomal segment length 6.6, width 6.0, depth 5.1; third metasomal segment length 7.0, width 5.8, depth 5.1; fourth metasomal segment length 8.1, width 5.2, depth 4.9; fifth metasomal segment length 10.0, width 4.5, depth 4.5; telson length 9.5; telson width 4.5; pedipalp femur length 8.5, width 4.9; pedipalp patella length 9.8, width 5.5; chela length 20.1; manus width 12.6; movable finger length 12.2.

AFFINITIES. The described features distinguish *Pandinus ugandaensis* **sp. n.** from all other species of the subgenus *Pandinus*. Among the species of this subgenus, *P. ugandaensis* **sp. n.** has the lowest number (8) of ventral trichobothria on the chela (other species have 9 to 15; see affinities of *P. mazuchi* **sp. n.**) and the lowest number of pectinal teeth (13–14 in males and 10–11 in females, whereas other species have 16 to 21 in males and at least 15 in females). Other characters are cited in the key below. The most closely related species appears to be *P. imperator* that may have a identical spiniform formula of tarsomere II (3-4/3: 3-4/3: 4/3: 4/3 in *P. ugandaensis* **sp. n.** and 4/3: 4/3: 4-5/3: 4-5/2-3 in *P. imperator*) with two spines on the inclined anteroventral surface, which securely distinguishes these two species from *P. gambiensis* Pocock, 1899 and *P. smithi* (three spines on the inclined anteroventral surface of tarsomere II) and from *P. phillipsii* and *P. mazuchi* **sp. n.** **(**tarsomeres II of fourth legs with spination formula 7-8/5, Figs. 39 and 40). *P. ugandaensis* **sp. n.** is best distinguished from *P. imperator* morphometrically, e.g. in *P. imperator* the length to depth ratio of the fourth metasomal segment is greater than 2, whereas in *P. ugandaensis* **sp. n.** it is 1.6–1.7 (Figs. 33–34, 36).

Key to species of the subgenus *Pandinus* Thorell, 1876

1. Legs yellow (Figs. 10–13). Male has more pronounced tooth on movable finger of pedipalp than female (Figs. 10 and 12) and a relatively larger telson. 2

– Legs not yellow, colored approximately as body (Fig. 1). Movable finger of pedipalp and telson without noticeable sexual dimorphism (Figs. 23 and 27). (Sexual dimorphism of *P. mazuchi* **sp. n.** is not known, but all

type females and juveniles have brown to black legs.) 3

2. Granules on manus of pedipalp conical and pointed (Fig. 21). Tarsomere II with 3 spines on inclined anteroventral surface (Fig. 41). …... ***P. smithi*** (Pocock, 1897)
– Granules on manus of pedipalp not conical and pointed, their summits may be confluent (Fig. 10). Tarsomere II with 2 spines on inclined anteroventral surface (Fig. 40). ..... ***P. phillipsii*** (Pocock, 1896)

3. Tarsomere II with 3 spines on inclined anteroventral surface. ..... ***P. gambiensis*** Pocock, 1899
– Tarsomere II with 2 spines on inclined anteroventral surface (Figs. 37–39)..... 4

4. Spination formula of tarsomere II of 4th leg = 4-5/2-3 (Figs. 37–38) 5
– Spination formula of tarsomere II of 4th leg = 8/5 (Fig. 39) ..... ***P. mazuchi*** Kovařík**, sp. n.**

5. Chela with 9–14 ventral trichobothria. Length to depth ratio of 4th metasomal segment greater than 2 (Fig. 36). ..... ***P. imperator*** (C. L. Koch, 1841)
– Chela with 8 ventral trichobothria (Fig. 29). Length to depth ratio of 4th metasomal segment = 1.6–1.7 (Figs. 33–34). ..... ***P. ugandaensis*** Kovařík**, sp. n.**

BIOGEOGRAPHY AND ECOLOGY. Ecology of the west African species *P. gambiensis* and *P. imperator* is well known (see Prendini, 2004: 256-257). *P. imperator* constructs burrows which may contain up to 20 individuals. This species is readily available in pet stores in Europe, the USA and Japan, and there is extensive literature on proper maintenance and breeding in captivity (Kovařík, 2009: 57). The ecology of *P. ugandaensis* **sp. n.** is probably similar to that of *P. imperator*. The biotopes and habits of the Ethiopian and Somaliland species of *Pandinus* have been to some extent revealed by two recent expeditions (see also Kovařík & Mazuch, 2011 and Kovařík, 2011). Excavation of burrows known for *P. imperator* or *Scorpio maurus* Linné, 1758 (see Kovařík, 2009: 138) has not been observed in any *Pandinus* encountered in these countries, however future fieldwork of longer duration may prove otherwise. *P. mazuchi* **sp. n.** was found at the elevation of 2100 m (Figs. 8–9) in relatively cooler and more humid conditions than *P. phillipsii* and *P. smithi* (Figs. 14–22). All specimens of *P. mazuchi* **sp. n.** (females and juveniles) were collected under rocks during day (females and juveniles) or in rocky taluses at night using UV lamps (immature juvenile). Juveniles of *P. phillipsii* were encountered at elevations around 1500 m in relatively drier areas and also in finer-grained taluses offering shallow hiding places (Figs. 14–16). An adult female of *P. phillipsii* (Figs. 17–18) and females of the subgenus *Pandinurus* (*Pandinus magretti* Borelli, 1901 and two new species) were found at lower elevations (900–1492 m) under large boulders, whereas all males of *P. phillipsii* and *P. smithi* were found under the bark of dry trees up to two meters above the ground (Figs. 19 and 20).

Acknowledgments

Thanks are due to David Hegner, Tomáš Mazuch, Pavel Novák and David Vašíček (all from Czech Republic), who participated in the expedition to Ethiopia and Somaliland; Tomáš Mazuch for photos in Figures 18–19 and help with Figure 42, and Pavel Novák for the photo in Figure 7; Michael Bauer (Austria) for supplying the specimens of *Pandinus ugandaensis* **sp. n.** and photo in Figure 32 of the type locality; and Victor Fet and Michael Soleglad for their help in processing the manuscript.

References

BECKER, L. 1880. Études sur les scorpions. *Annales de la Société Entomologique de Belgique,* 25: 134–145.

BORELLI, A. 1919. Missione per la frontiera Italo Etiopica sotto il comando del Capitano Carlo Citerni. Risultati Zoologici. Scorpioni. *Annali del Museo Civico di Storia Naturale di Genova*, 48(1918–19): 359–381.

FET, V. 1997. Notes on the taxonomy of some Old World scorpions (Scorpiones: Buthidae, Chactidae, Ischnuridae, Scorpionidae). *Journal of Arachnology*, 25: 245–250.

FET, V., W. D. SISSOM, G. LOWE & M. E. BRAUNWALDER. 2000. *Catalog of the Scorpions of the World (1758–1998)*. New York: The New York Entomological Society, 689 pp.

KOCH, C. L. 1841. *Die Arachniden*, 9(1842): 108 pp. (Figs. 695–698), Nürnberg.

KOVAŘÍK, F. 1998. *Štíři* [*Scorpiones*]. Jihlava (Czech Republic): Publishing House ”Madagaskar”, 176 pp (in Czech).

KOVAŘÍK, F. 2002. A checklist of scorpions (Arachnida) in the collection of the Forschungsinstitut und Naturmuseum Senckenberg, Frankfurt am Main, Germany. *Serket*, 8(1): 1–23.

KOVAŘÍK, F. 2003. Scorpions of Djibouti, Eritrea, Ethiopia, and Somalia (Arachnida: Scorpiones),

with a key and descriptions of three new species. *Acta Societatis Zoologicae Bohemicae*, 67: 133–159.

KOVAŘÍK, F. 2009. Illustrated catalog of scorpions. Part I. Introductory remarks; keys to families and genera; subfamily Scorpioninae with keys to *Heterometrus* and *Pandinus* species. Prague: Clairon Production, 170 pp.

KOVAŘÍK, F. 2011. *Buthus awashensis* sp. n. from Ethiopia (Scorpiones: Buthidae). *Euscorpius*, 128: 1–6.

KOVAŘÍK, F. & T. MAZUCH. 2011. *Hemiscorpius novaki* sp. n. from Somaliland (Scorpiones: Hemiscorpiidae). *Euscorpius*, 126: 1–9.

KOVAŘÍK, F. & S. WHITMAN. Cataloghi del Museo di Storia Naturale dell´Università di Firenze – sezione di zoologia «La Specola» XXII. Arachnida Scorpiones. Tipi. Addenda (1998-2004) e checklist della collezione (Euscorpiinae esclusi). *Atti della Società Toscana di Scienze Naturali, Memorie, serie B,* 111 (2004): 103–119.

KRAEPELIN, K. 1899. Scorpiones und Pedipalpi. *In* F. Dahl (ed.), *Das Tierreich. Herausgegeben von der Deutschen Zoologischen Gesellschaft.* Berlin: R. Friedländer und Sohn Verlag, 8. Lieferung. 265 pp.

POCOCK, R. I. 1896. Report upon the Scorpions, Spiders, Centipedes, and Millipedes obtained by Mr. and Mrs. E. Lort Philips in the Goolis Mountains inland of Berbera, N. Somaliland. *Annals and Magazine of Natural History*, 6(18): 178–186.

POCOCK, R. I. 1897. Solifugae, Scorpiones, Chilopoda, and Diplopoda. The first expedition from Somaliland to Lake Lamu. *Appendix C to Donaldson Smith`s Through Unknown African Countries, Greenwood Press, Publishers, New York*, 1897: 392–407.

POCOCK, R. I. 1899. On the Scorpions, Pedipalps, and Spiders from Tropical West Africa represented in the Collection of the British Museum. *Proceedings of the Zoological Society of London*, 1899: 833–885.

POCOCK, R. I. 1900. On a collection of Insects and Arachnids made in 1895 and 1897 by Mr. C. A. V. Peel, F. Z. S. in Somailand, with descriptions of new species. 9. Chilopoda and Arachnida. *Proceedings of the Zoological Society of London*, 1900: 48–55.

PRENDINI, L. 2004. On the scorpions of Gabon and neighboring countries, with a reassessment of the synonyms attributed to *Babycurus buettneri* Karsch and a redescription of *Babycurus melanicus* Kovařík. *California Academy of Sciences Memoir*, 28: 235–267.

SIMON, E. 1872: Etudes ser les Scorpions. Révision des *Heterometrus* du groupe de l´*H. afer*, L. *Revue et Magasin de Zoologie Pure et Appliquée*, 23(2): 51–59, 23(3) 97–101.

SISSOM, W. D. 1990. Systematics, biogeography and paleontology. Pp. 64–160. *In*: Polis, G. A. (ed.): *The Biology of Scorpions.* Stanford: Stanford University Psress, 587 pp.

THORELL, T. 1876. On the classification of Scorpions. *Annals and Magazine of Natural History*, 4(17): 1–15.

VACHON, M. 1967. Le grand scorpion du Sénegal: *Pandinus gambiensis* Pocock, 1899 doit etre considéré comme une véritable espéce et non comme une sous-espéce de *Pandinus imperator* C. L. Koch, 1842. *Bulletin de l´Institut Fondamental d´Afrique Noire*, A, Sciences Naturelles, 29: 1534–1537.

VACHON, M. 1974. Étude des caractéres utilisés pour classer les familles et les genres de Scorpions. *Bulletin du Muséum national d´Histoire naturelle*, Paris, 140: 857–958.

VACHON, M., R. ROY & M. CONDAMIN. 1970. Le développement postembryonnaire du Scorpion *Pandinus gambiensis* Pocock. *Bulletin de la Société d´Histoire naturelle de l´Afrique du Nord*, 32A(2): 412–432.