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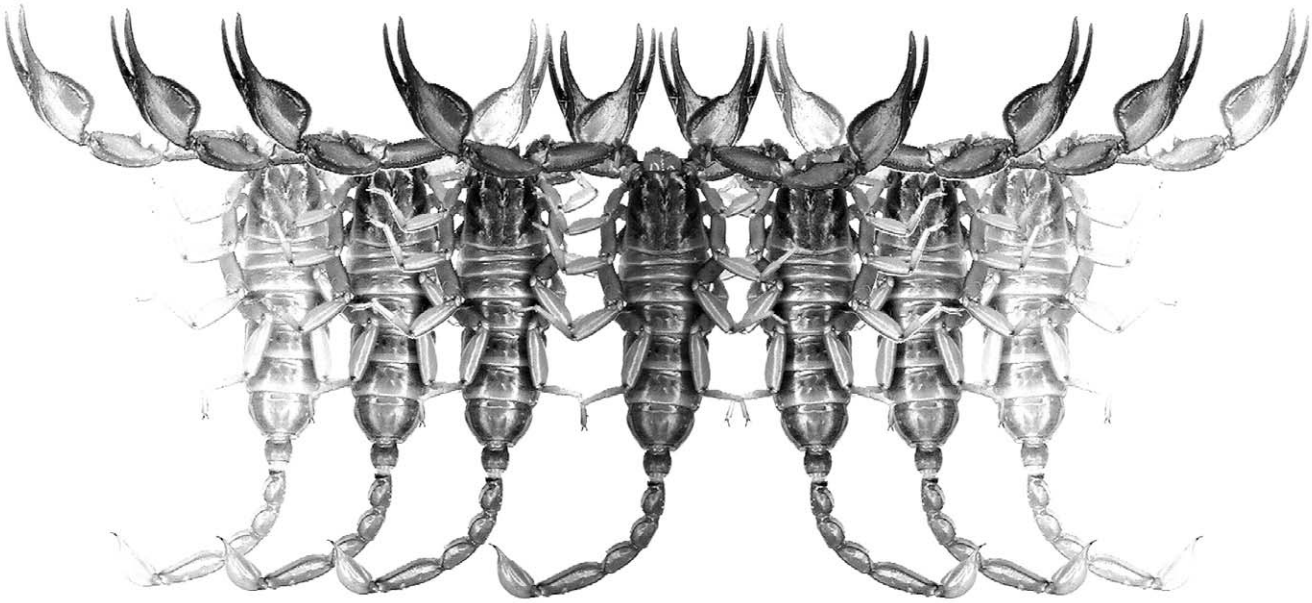

Scorpions of the Horn of Africa (Arachnida: Scorpiones). Part VIII. *Pandinops* Birula, 1913 (Scorpionidae), With Description of Two New Species

František Kovařík

August 2016 – No. 229

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Scorpions of the Horn of Africa (Arachnida: Scorpiones). Part VIII. *Pandinops* Birula, 1913 (Scorpionidae), with description of two new species

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Summary

Complete *Pandinops* trichobothrial pattern and spiniform formula of tarsomeres of legs are published for the first time. *P. friedrichi* **sp. n.** from Somalia and *P. turieli* **sp. n.** from Ethiopia and Kenya are described. Information is provided about all *Pandinops* species, their taxonomy, and distribution, and *P. turieli* **sp. n.** discovered during scorpiological expeditions in 2011–2016 is fully complemented with color photos of live and preserved specimens, as well as its habitat.

Introduction

Birula (1913: 419–422, figs. a–b) described subgenus *Pandinus* (*Pandinops*) Birula, 1913 with type species *Pandinus peeli* Pocock, 1900 and differentied the subgenus *Pandinops* from *Pandinus* (*Pandinus*) Thorell, 1877 according to morphological characters.

Vachon (1974: 953) offered to sort genus *Pandinus* Thorell, 1877 to five subgenera according to number of chelal internal and ventral trichobothria and described three other subgenera *P.* (*Pandinopsis*) Vachon, 1974 (type species by monotypy *Scorpio dictator* Pocock, 1888), *P.* (*Pandinurus*) Vachon, 1974, and *P.* (*Pandinoides*) Vachon, 1974 and also added *P.* (*Pandinops*) Birula, 1913.

Kovařík (2009: 50–59, 114–133, figs. 284–420) revised the genus *Pandinus sensu lato* and on page 50 he published these 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. 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. 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. "

In the years of 2011–2016, I have had the opportunity to participate in expeditions to the Horn of Africa, study scorpions, and publish several articles on this fauna (Kovařík, 2011a, 2011b, 2012, 2013, 2015, Kovařík & Lowe, 2012, Kovařík & Mazuch, 2011, 2015, Kovařík et al., 2013, 2015, 2016a, 2016b, and Lowe & Kovařík, 2016). During these expeditions a lot of specimens of the *Pandinus sensu lato* were collected. It was very important for the solution of taxonomy in subgeneric and generic levels because the fresh material enabled to take DNA and karyotype analysis and larger series of fresh specimens enabled to understand the intraspecific variability. This information shows that the Vachon's key was partly incorrect because the variability in number of internal chelal trichobothria disqualifies to use this character as a sole character at a subgeneric or even generic level. The examination of newly collected Horn of Africa *Pandinurus* specimens shows the intraspecific variability in chelal internal trichobothria from one to four in number (see two papers by Plíšková et al. and Kovařík et al., in preparation). However, Vachon (1974: 953) was correct in opinion that *Pandinops* is separated by 6–8 chelal internal trichobothria from all other species of *Pandinus sensu lato* which have 1–5 of these trichobothria.

Methods, Material & Abbreviations

Nomenclature and measurements follow Stahnke (1971), Kovařík (2009), and Kovařík & Ojanguren Affilastro (2013), except for trichobothriotaxy (Vachon, 1974).

I intentionally use here the name Somaliland (Hargeysa) for the northern territory corresponding to the former British colony (British Somaliland), which we distinguish from Somalia (Mogadisho). Somaliland has its own currency, a functional government with representation in several countries, and its officials contributed to our safe visit.

Specimen Depositories: BMNH (The Natural History Museum, London, United Kingdom); FKCP (František Kovařík, private collection, Prague, Czech Republic); MZUF (Museo Zoologico de "La Specola", Firenze, Italy); ZMHB (Museum für Naturkunde der Humboldt-Universität, Berlin, Germany); and ZSMC (Bavarian State Collection of Zoology, Munich, Germany).

Spiniform formula of tarsomere I of legs: *vm*, ventral medial; *vst*, ventral subterminal; *vt*, ventral terminal; *pd*, prolateral distal; *pt*, prolateral terminal; *pst*, prolateral subterminal; *rm*, retrolateral medial; *rt*, retrolateral terminal.

Morphometrics: D, depth; L, length; W, width.

Systematics

Family **Scorpionidae** Latreille, 1802
Pandinops Birula, 1913
(Figs. 1–69, Table 1)

Pandinus (*Pandinops*) Birula, 1913: 419–422, fig. b; Vachon, 1974: 921, 953, figs. 116–118; Fet, 2000: 469; Kovařík, 2009: 51–53, 115–118, figs. 294–298, 304–327.

TYPE SPECIES. *Pandinus peeli* Pocock, 1900

DIAGNOSIS. Total length 55–95 mm. External trichobothria on patella number 13–16 (5–6 *eb*, 2–4 *esb*, 2 *em*, 1–2 *est*, 3 *et*); ventral trichobothria on patella number 22–35; internal trichobothria on chela number 6–8; ventral trichobothria on chela number 9–13. Pedipalp chela manus lobiform. Movable fingers of pedipalp, length of segments of pedipalps, and telson without noticeable sexual dimorphism. Pectines with fulcra. Pectinal teeth number 11–21. Sternum subpentagonal, longer than wide. Carapace without distinct carinae. Dentate margin of pedipalp chela movable finger with distinct granules divided into 5–7 rows. Tergites I–VI of mesosoma bear one carina. Stridulation organ located on pedipalp coxae and first pair of legs, but can be reduced. Metasomal segments I–IV with paired parallel ventral median carinae or without carinae. Telson without subaculear tubercle. Legs with one pedal spur, retrolateral spur absent.

SPINIFORM FORMULA OF TARSOMERES OF LEGS OF *PANDINOPS* (FIGS. 45–48).
Tarsomere I. Spiniform macroseta *pd*, *vt*, *rt*, *vst* are present on legs I–IV, but *pd* can be replaced by seta in *P. bellicosus* as intraspecific variability; *pst* is present on legs III–IV; *pt* and *vm* are absent on all legs; *rm* is present on legs I–IV, but is often replaced by seta or spiniform seta (Fig. 48).
Tarsomere II. Spiniform formula is 3/4: 3/4: 3/4-5: 3/4-5. Tarsomere II with 2 spines on inclined anteroventral surface, but *P. turieli* **sp. n.** has a seta on leg III transformed to "spiniform seta" which indicates not well developed third spine (Fig. 47) as intraspecific variability.

COMMENTS. Since no data about macrosetae of tarsomeres and other characters (for example number of ventral trichobothria on pedipalp patella) have been published yet, and only the limited number of specimens of the rare *Pandinops* genus were examined in this study, I cannot define intraspecific variability exactly for most of the characters.

Pandinops bellicosus (L. Koch, 1875)
(Figs. 8, 61, 69)

Heterometrus bellicosus L. Koch, 1875: 1–4, fig. 1.
Pandinus (*Heterometrus*) *bellicosus*: Simon, 1910: 83.
Pandinus bellicosus: Kraepelin, 1899: 121 (in part).
Pandinus (*Pandinurus*) *bellicosus*: Vachon, 1974: 953; Fet, 2000: 470–471 (complete reference list until 2000).
Pandinus (*Pandinops*) *bellicosus*: Kovařík, 2000: 4–6 (in part); Kovařík, 2009: 51, 116, figs. 294, 304–308 (in part).

TYPE LOCALITY AND TYPE REPOSITORY. Ethiopia (now Eritrea), Habab (Habal - Massaua, see Kraepelin, 1899: 121), in description incorrectly gives Cairo, Egypt, ZMHB.

TYPE MATERIAL EXAMINED. **Eritrea**, Habab, leg. Jickeli, 1♂ (holotype, Fig. 69 and figs. 304–305 in Kovařík, 2009: 116), ZMHB Nr. 2521.

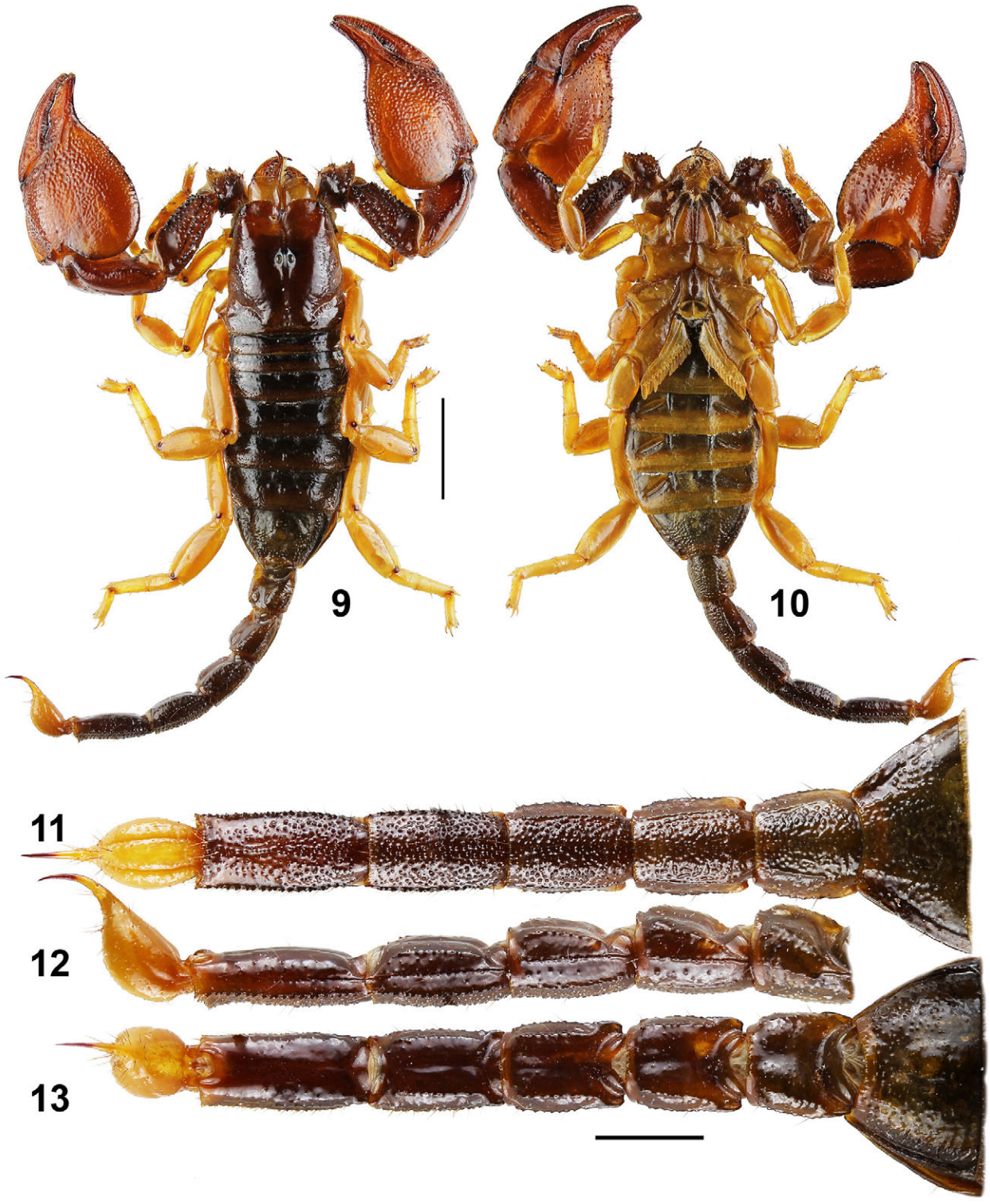
ADDITIONAL MATERIAL EXAMINED. "Abyssinia or Egypt", possibly **Eritrea**, 1898, 1♂ (Figs. 8 and 61), FKCP.

DIAGNOSIS. Total length 80–95 mm. Color uniformly reddish black, legs and telson yellow (only old speci-

Figures 1–8: Figures 1–4. *Pandinops eritreaensis*, male holotype, pedipalp chela dorsal (1), external (2) and ventral (3) and patella external (4). **Figures 5–7**. *Pandinops pococki*, male holotype, pedipalp chela dorsal (5), external (6) and ventral (7). **Figure 8**. *Pandinops bellicosus*, male from "Abyssinia or Egypt", possibly Eritrea, pedipalp chela dorsal.

mens preserved for more than 100 years in alcohol were studied). Carapace smooth in the middle, several granules sparsely along margins. External trichobothria on patella number 14–15 (5–6 *eb*, 3 *esb*, 2 *em*, 1 *est*, 3 *et*); ventral trichobothria on patella number 31–35; internal trichobothria on chela number 7 or 8, ventral trichobothria on chela number 11–12. Pedipalp chela hirsute rather densely. Pedipalp chela dorsally smooth to bumpy, without granules. Chela internal smooth with two longitudinal carinae rather smooth. Chela of male length/ width ratio is 1.72. Pectinal teeth number 19–21 in males, female unknown. Metasomal segments I–II ventrally smooth, III–V tuberculated with several granules on metasomal segment V only; two smooth ventral carinae on metasomal segments I–IV and one on segment V well developed. Spiniform formula of tarsomere II = 3/4: 3/4: 3/4-5: 3/4-5. Tarsomere II with 2 spines on inclined anteroventral surface. Length to width ratio of male metasomal segment V is 2.41.

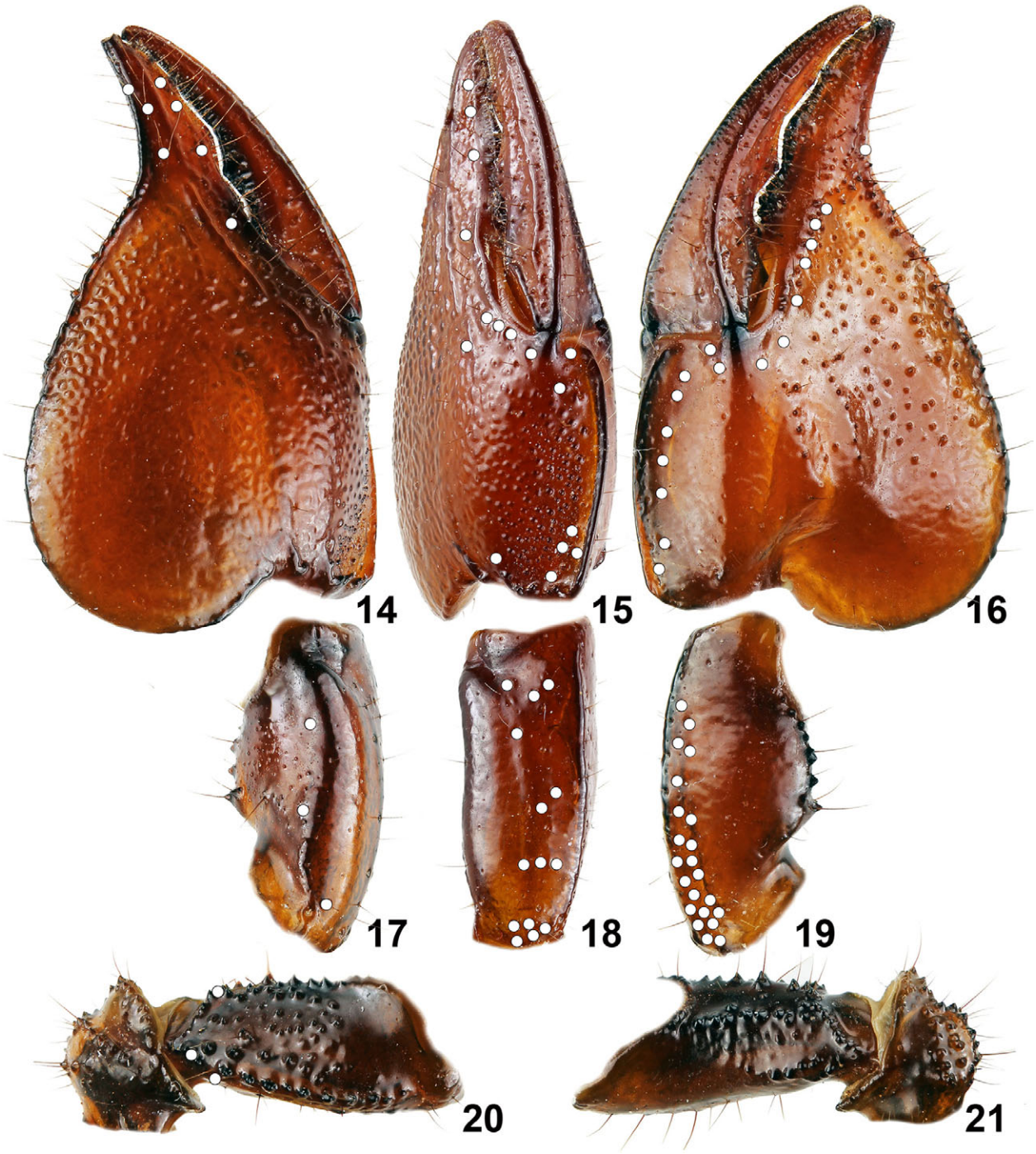
COMMENTS. *Pandinops bellicosus* is based on a male for which L. Koch (1875: 4) gives Cairo as the type locality. However, this provenance is erroneous (Simon, 1910: 83, Kraepelin, 1899: 121). No original label is attached



Figures 9–13: *Pandinops friedrichi* **sp. n.**, male holotype. **Figures 9–10**. Dorsal (9) and ventral (10) views. Scale bar: 10 mm. **Figures 11–13**. Metasoma and telson with sternite VII in Fig. 11 and tergite VII in Fig.13, ventral (11) lateral (12) and dorsal (13) views. Scale bar: 5 mm.

to the holotype, instead it bears a label stating: holotype *Pandinus bellicosus* (L. Koch, 1875), Hababab, Jickeli leg., Nr. 2521.

Trichobothrial pattern and spiniform formula of tarsomeres of legs are checked according to the additional male from FKCP.



Figures 14–21: *Pandinops friedrichi* **sp. n.**, male holotype, pedipalp segments. Chela dorsal (14), external (15), and ventral (16). Patella dorsal (17), external (18) and ventral (19). Trochanter and femur dorsal (20) and ventral (21). Trichobothrial pattern is indicated in Figures 14–20.

Pandinops colei (Pocock, 1896)
(Figs. 62, 69)

Scorpio colei Pocock, 1896: 180–181, figs. 2, 2a in plate XI).

Pandinus colei: Kraepelin, 1899: 120–121; Pocock, 1900b: 59– 60.

Pandinus (*Pandinops*) *colei*: Birula, 1913: 422; Vachon, 1974: 953; Fet, 2000: 469 (complete reference list until 2000); Kovařík, 2003: 149 (? in part); Kovařík, 2009: 51–52, 116, figs. 309–311.

TYPE LOCALITY AND TYPE REPOSITORY. Somaliland, Goolis Mountains, inland of Berbera, BMNH.

TYPE MATERIAL EXAMINED. **Somaliland**, inland of Berbera, leg. E. L. Phillips, 1♀ (holotype, Fig. 62 and figs. 309–311 in Kovařík, 2009: 116), BMNH No. 1895.6. 1.48.

DIAGNOSIS. Total length 71–82 mm. Carapace smooth in middle, several granules sparsely along margins, more granulated in anterior part. Internal trichobothria on chela number 7, ventral trichobothria on chela number 10. Pedipalp chela hirsute. Pedipalp chela dorsally densely covered by pointed granules. Chela of female length/ width ratio is 1.68. Pectinal teeth number 11–13 in both sexes. Metasomal segments I–II ventrally smooth, III–V granulated; metasomal segments I–IV without ventral carinae. Spiniform formula of tarsomere II = 3/4: 3/4: 3/4-5: 3/4-5. Tarsomere II with 2 spines on inclined anteroventral surface. Length to width ratio of female metasomal segment V is 2.24.

Pandinops eritreaensis (Kovařík, 2003)
(Figs. 1–4, 63, 69)

Pandinus (*Pandinops*) *eritreaensis* Kovařík, 2003: 149–150, fig. 16; Kovařík, 2009: 53, 117, figs. 295, 312–316.

Type locality and type repository. Eritrea, Asmara env.; FKCP.

TYPE MATERIAL EXAMINED. **Eritrea**, Asmara env., 1983, leg. Dorsak, 1♂ (holotype, Figs. 1–4, 63 and figs. 295, 312–316 in Kovařík, 2009: 117), FKCP.

DIAGNOSIS. Male holotype 73 mm long. Base color uniformly brown to reddish brown. Carapace smooth in middle, several granules sparsely along margins. External trichobothria on patella number 14 (5 *eb*, 3 *esb*, 2 *em*, 1 *est*, 3 *et*); ventral trichobothria on patella number 26; internal trichobothria on chela number 6–7 , ventral trichobothria on chela number 11–12. Pedipalp chela hirsute rather sparsely. Pedipalp chela dorsally tuberculated/granulated, lobe of manus smooth. Chela internal sparsely granulate and with 2 short keels, each with less than 10 granules. Chela of male lobate, length/ width ratio is 1.56. Pectinal teeth number 16 in male, female unknown. Metasomal segments I–II ventrally uneven but without granules, III–V granulated; metasomal segments I–IV with ventral carinae indicated only. Spiniform formula of tarsomere II = 3/4: 3/4: 3/5: 3/5.Tarsomere II with 2 spines on inclined anteroventral surface. Length to width ratio of male metasomal segment V is 2.

Pandinops friedrichi Kovařík, **sp. n.**
(Figs. 9–21, 64, 69, Table 1)
http://zoobank.org/urn:lsid:zoobank.org:act:6093783E-A723-4CB7-8C9C-BC3F066EF6AB

Pandinus (*Pandinops*) *peeli*: Kovařík, 2003: 150 (in part); Kovařík & Whitman, 2005: 114; Kovařík, 2009: 53, 118, figs. 323–324 (in part).

Type locality and type repository. Somalia, Deschek Wama, ZSMC.

TYPE MATERIAL EXAMINED. **Somalia**, Deschek Wama, 12.V.1989, leg. Politzar, 1♂ (holotype, Figs. 9–21, 64), ZSMC, 1♂ (paratype), FKCP.

ADDITIONAL MATERIAL EXAMINED (not included in type series). Somalia, Sar Uanle (about 20 km South from Chisimaio, 00°29'48"S 42°25'30"E), V.–VI.1973, 1♂ (figs. 323–324 in Kovařík, 2009: 118), MZUF.

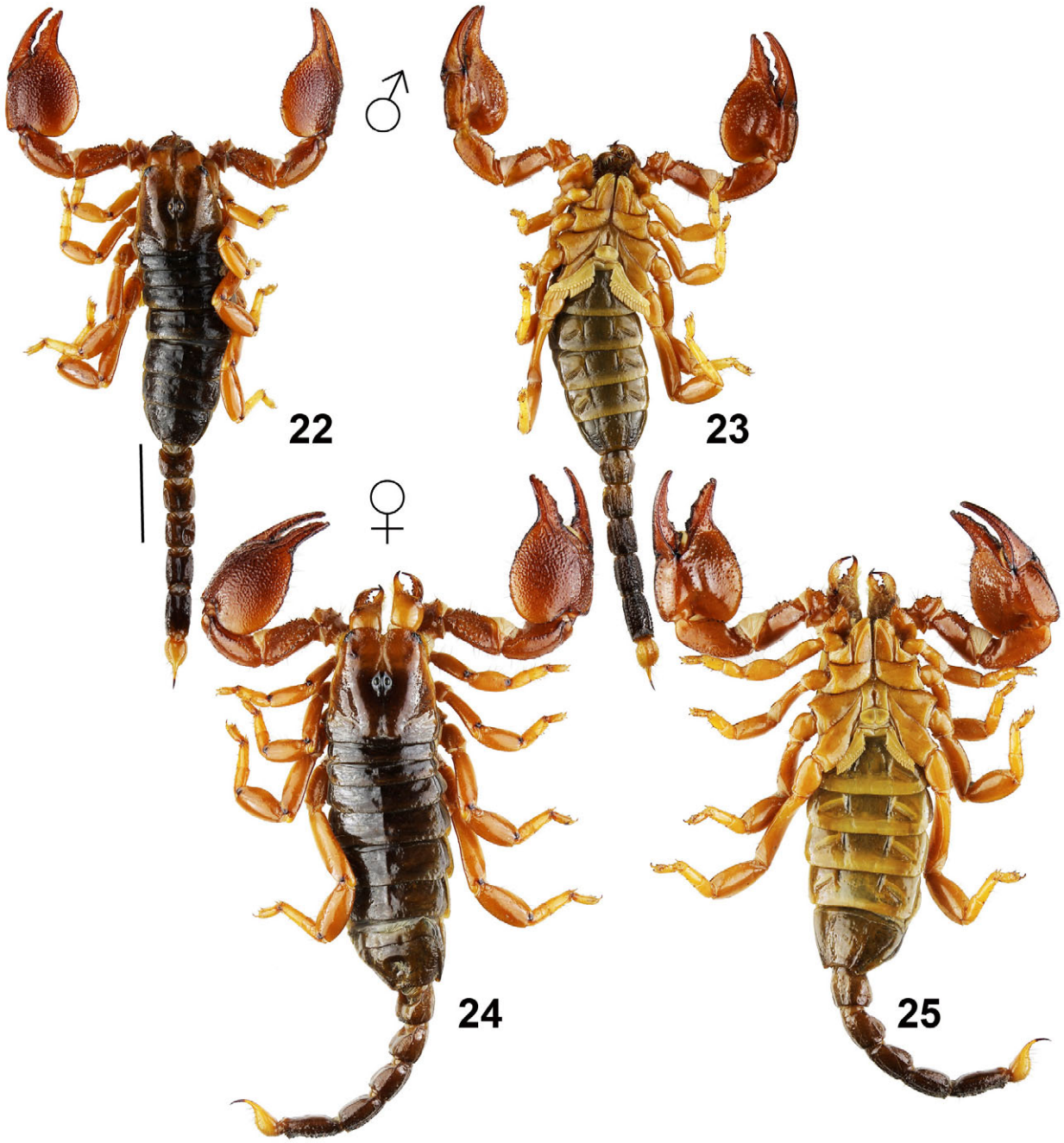
ETYMOLOGY. It is a pleasure to name this species after Stefan Friedrich (Munich, Germany).

DIAGNOSIS. Total length 61–80 mm. Base color uniformly reddish brown to black, legs and telson yellow, pedipalp chela orange to reddish brown. Carapace smooth in middle, covered by granules along margins. External trichobothria on patella number 14–15 (5 *eb*, 3 *esb*, 2 *em*, 1–2 *est*, 3 *et*); ventral trichobothria on patella number 22–28; internal trichobothria on chela number 6–7, ventral trichobothria on chela number 9–12. Pedipalp chela hirsute rather sparsely. Pedipalp chela dorsally smooth to bumpy, without pointed granules, lobe smooth. Chela internal smooth sparsely granulated mainly in anterior part, with two longitudinal carinae indicated by 4–6 granules. Chela of male length/ width ratio is 1.62–1.69. Pectinal teeth number 15–16 in males. Sternite VII densely granulated. Metasomal segments I–V ventrally densely granulated; metasomal segments I–IV with ventral carinae absent. Spiniform formula of tarsomere II = 3/4: 3/4: 3/5: 3/5. Tarsomere II with 2 spines on inclined anteroventral surface. Length to width ratio of male metasomal segment V is 2.14–2.17.

DESCRIPTION. The adult males are 61–80 mm long, female unknown. The habitus is shown in Figs. 9–10. For position and distribution of the trichobothria of pedipalps see Figs. 14–20. External trichobothria on patella number 14–15 (5 *eb*, 3 *esb*, 2 *em*, 1–2 *est*, 3 *et*); ventral trichobothria on patella number 22–28; internal trichobothria on chela number 6–7, ventral trichobothria on chela number 9–12.

Coloration (Figs. 9–10). The base color is uniformly reddish brown to black, legs and telson are yellow, pedipalp chela is orange to reddish brown, chelicerae are yellow to orange, and carapace is reddish brown to black, lighter in the anterior part.

Carapace and mesosoma (Figs. 9–10). The entire carapace is smooth in the middle, covered by granules along margins. The anterior margin of the carapace is symme-

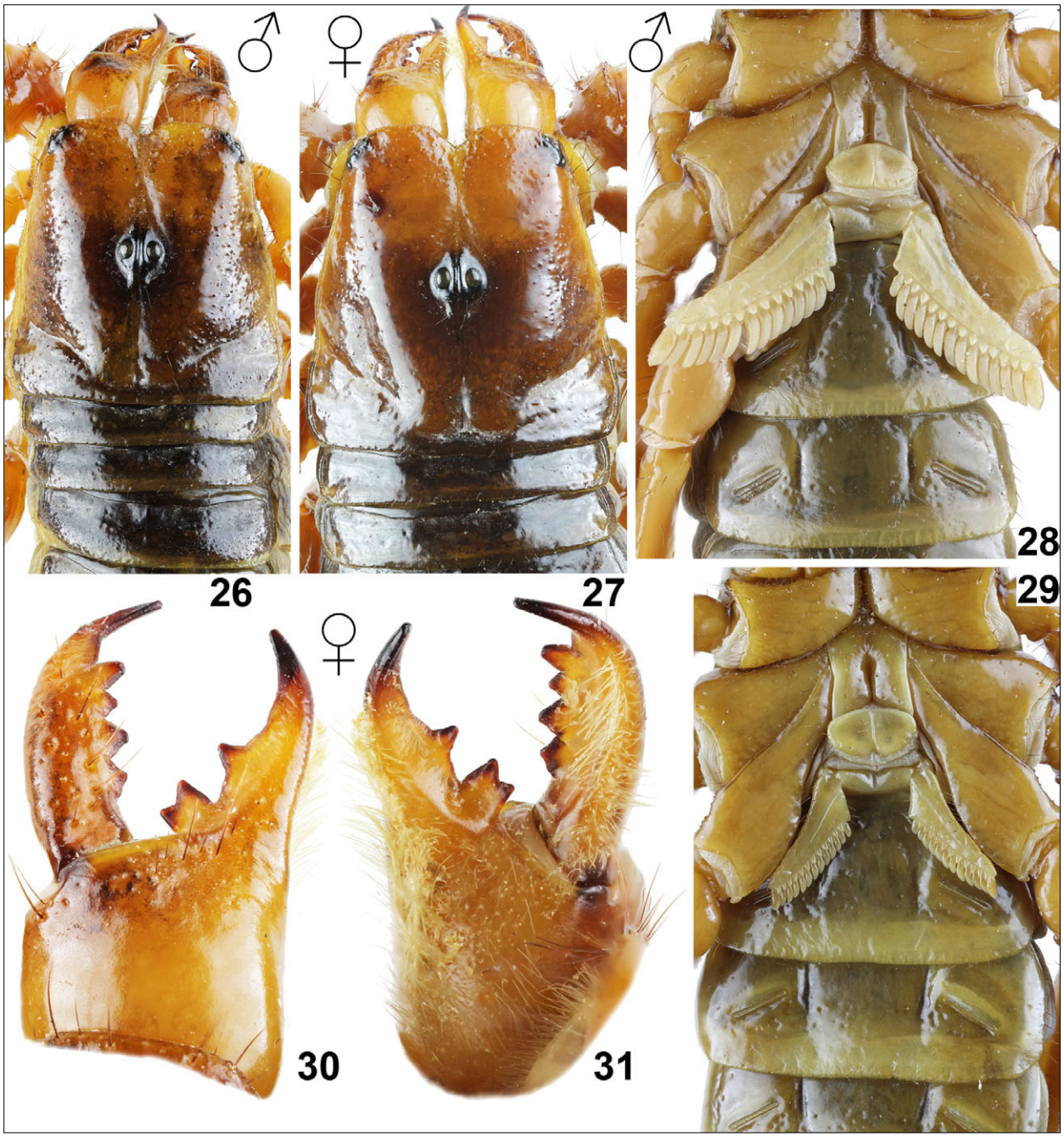


Figures 22–25: *Pandinops turieli* **sp. n. Figures 22–23**. Male holotype in dorsal (22) and ventral (23) views. **Figures 24–25**. Female paratype in dorsal (24) and ventral (25) views. Scale bar: 10 mm.

trically concave, medially strongly convex, and it bears several macrosetae. The tergites are smooth and can be very finely granulated, mainly tergite VI; tergite VII is strongly granulated. The pectinal tooth count is 15–16 in males, female unknown. The pectine marginal tips extend to quarter of the fourth sternite in the male. The sternites are smooth, without carinae, but with two longitudinal furrows; sternite VII is densely granulated.

Metasoma and telson (Figs. 11–13). The metasomal segments I–IV bear a total of 6 sparsely granulated carinae. The ventral carinae are absent. The fifth segment has five variously developed and granulated carinae. The dorsal and lateral surfaces of the segments are smooth with several solitary granules. The metasomal segments I–V ventrally densely granulated with the same intensity on all segments. The entire metasoma and telson are sparsely hirsute. The telson is smooth, elongate, with the aculeus approximately as long as vesicle or shorter.

Pedipalps (Figs. 14–21). The pedipalps are hirsute. The femur is granulated dorsally and bears four carinae com-

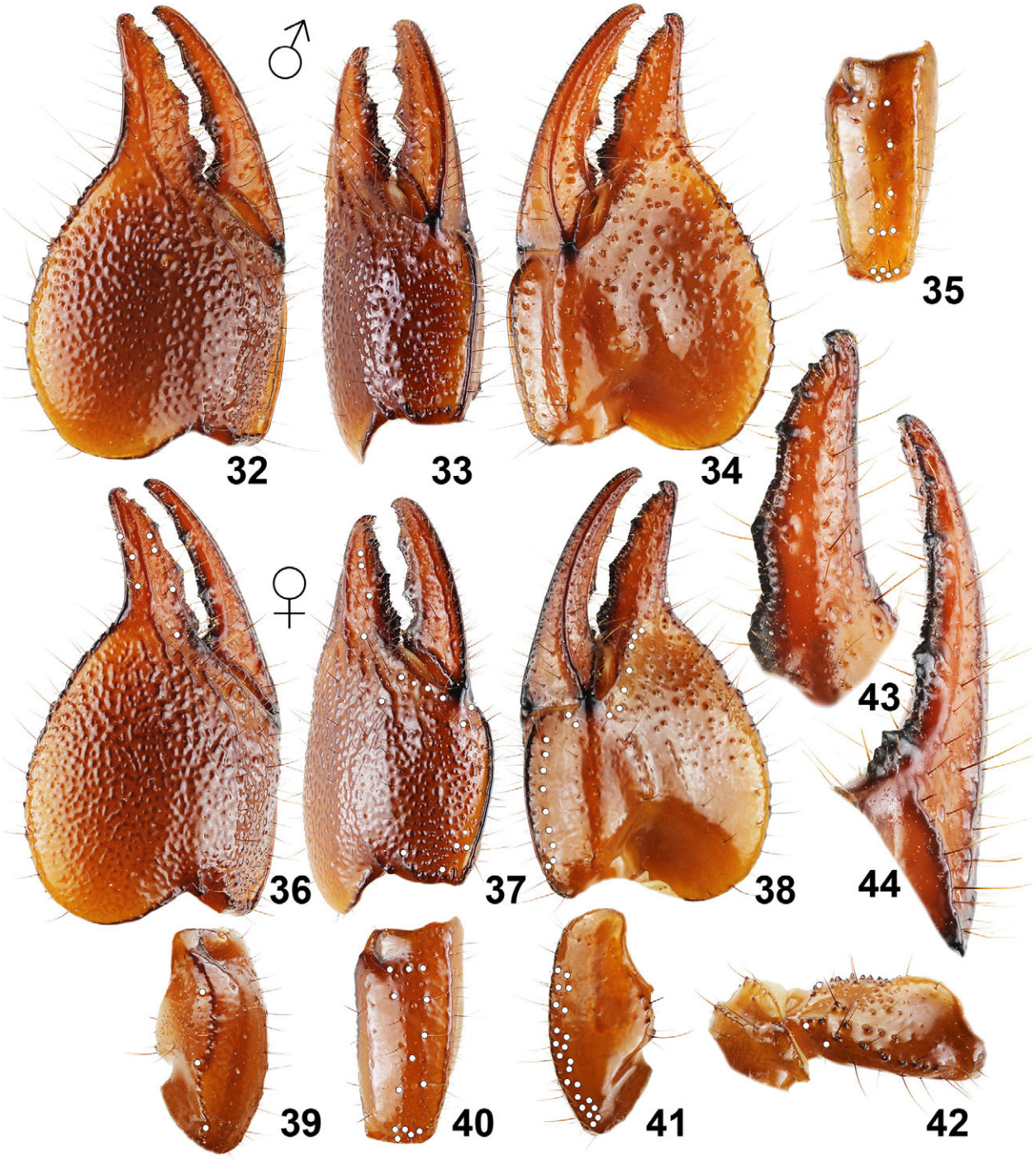


Figures 26–31: *Pandinops turieli* **sp. n. Figures 26**, **28**. Male holotype, chelicerae, carapace and tergites I–III (26) and coxosternal area with sternites III–IV (28). **Figures 27**, **29–31**. Female paratype, chelicerae, carapace and tergites I–II (27), coxosternal area and sternites III–IV (29), and left chelicera dorsal (30) and ventral (31) views.

posed of several strong granules. The patella is smooth, finely granulated on internal surface only, there are two externo lateral smooth carinae and one internal carina is indicated by 5–7 big granules. Pedipalp chela is dorsally smooth to bumpy, without carinae and pointed granules, lobe smooth. Several well defined granules are present on external suface. The chela internal is smooth, sparsely granulated mainly in anterior part, with two short characteristic smooth longitudinal carinae indicated by 4–6 granules. The movable and fixed fingers of the pedipalp with distinct granules in a row divided into 5–7 rows by big concave granules.

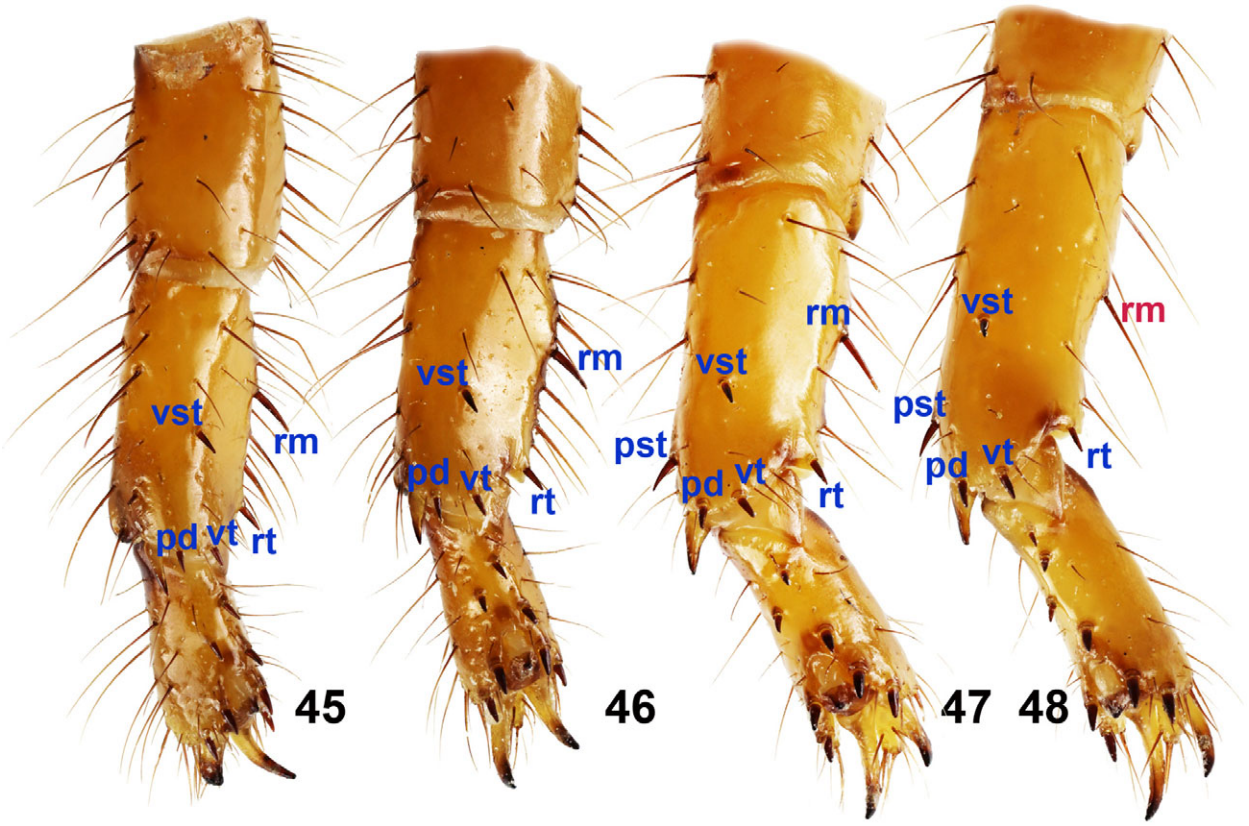
Legs. All legs are without distinct carinae and smooth. The tarsomeres are hirsute with setae and macrosetae more densely on legs I–II. For spiniform formula of tarsomeres of legs see paragraph under *Pandinops* section.

Measurements. See Table 1.



Figures 32–44: *Pandinops turieli* **sp. n.**, pedipalp segments. **Figures 32–35**. Male holotype. Chela dorsal (32), external (33), and ventral (34). Patella external (35). **Figures 36–44**. Female paratype. Chela dorsal (36), external (37), and ventral (38). Patella dorsal (39), external (40) and ventral (41). Trochanter and femur dorsal (42). Fixed (43) and movable finger (44) dentitions. Trichobothrial pattern is indicated in Figures 35, 36–42.

AFFINITIES. The described features distinguish *P. friedrichi* **sp. n.** from all other species of the genus. They are recounted in the key below. Kovařík (2009: 53, 118, figs. 323–324) misidentified the specimen from MZUF collection as *P. peeli*, which has also granulated metasomal segments I–II ventrally but differently than *P. friedrichi* **sp. n.** (see the key below and Figs. 64 versus 66). These two species occur in different areas of distribution. *P. peeli* is known from the northern Somaliland, and *P. friedrichi* **sp. n.** from south Somalia (Fig.



Figures 45–48: *Pandinops turieli* **sp. n.**, female paratype, right legs I–IV, retrolateral aspect. Abbreviations: *vst*, ventral subterminal; *vt*, ventral terminal; *pd*, prolateral distal; *pst*, prolateral subterminal; *rm*, retrolateral medial; *rt*, retrolateral terminal.

69) where it represents the southern limits of the genus *Pandinops* distribution.

Pandinops hawkeri (Pocock, 1900)
(Figs. 65, 69)

Pandinus hawkeri Pocock, 1900b: 60–61.
Pandinus (*Pandinops*) *hawkeri*: Birula, 1913: 422; Vachon, 1974: 921, 953, figs. 116–118; Fet, 2000: 469 (complete reference list until 2000); Kovařík, 2003: 150 (? in part); Kovařík, 2009: 53, 117, figs. 298, 317–320.
= *Pandinus pugilator* Pocock, 1900a: 52–53, figs.1–1a, plate IV. **Syn. n.**
Pandinus (*Pandinops*) *pugilator*: Vachon, 1974: 953; Fet, 2000: 469.
Pandinus (*Pandinops*) *bellicosus*: Kovařík, 2000: 4–6 (in part); Kovařík, 2009: 51 (in part).

TYPE LOCALITY AND TYPE REPOSITORY. Somaliland, Jifa Uri, inland from Zeyla (now Zeila, in Somali Saylac, 11°21'N 43°28'E), BMNH.

TYPE MATERIAL EXAMINED. **Somaliland**, Jifa Uri, inland from Zeyla (now Zeila, in Somali Saylac, 11°21'N 43° 28'E), leg. R. M. Hawker, 1♀ (holotype of *Pandinus hawkeri*, Fig. 69 and figs. 317–320 in Kovařík, 2009: 53, 117), BMNH No. 1898.4.25.4–6; Berbera, 16. April 1895 or Hargaisa, 25.–28. April. 1895, leg. C. V. A. Peel, 1 specimen (holotype of *Pandinus pugilator*, Fig. 65), BMNH No. 1900.0.3.15.1.

DIAGNOSIS. Total length 80–95 mm. Color uniformly reddish black, legs and telson yellow (only old specimens preserved for more than 100 years in alcohol were studied). Carapace smooth in the middle, several granules sparsely along margins. Internal trichobothria on chela number 6–8, ventral trichobothria on chela number 11–12. Pedipalp chela hirsute rather densely. Pedipalp chela dorsally smooth, without granules. Chela internal smooth with two longitudinal carinae rather smooth. Chela length/ width ratio is 1.76–1.82. Pectinal teeth number 12–13 in female, male unknown. Metasomal segments I–II ventrally smooth, III–V granulate, mainly on segment IV; metasomal segments I–IV with ventral carinae absent or indicated only. Spiniform formula of tarsomere II = 3/4: 3/4: 3/4-5: 3/4-5. Tarsomere II with 2 spines on inclined anteroventral surface.

COMMENTS. *Pandinus pugilator* was based by Pocock on a very damaged specimen (originally stuffed and kept dry, but currently is in alcohol), whose pectens are whol-

Figures 49–54: *Pandinops turieli* **sp. n.**, metasoma and telson. **Figures 49–51**. Male holotype, lateral (49), dorsal (50), and ventral (51) views. **Figures 52–54**. Female paratype, lateral (52), dorsal (53), and ventral (54) views. Scale bar: 10 mm.

ly lacking. Due to damage, sex cannot be ascertained. Kovařík (2000: 4) synonymized *Pandinus pugilator* with *Pandinops bellicosus*, but the current more detail study shows that *Pandinus pugilator* is a synonym with *P. hawkeri*.

Pandinops peeli (Pocock, 1900)
(Figs. 66, 69)

Pandinus peeli Pocock, 1900a: 53, fig. 2, plate IV.
Pandinus (*Pandinops*) *peeli*: Birula, 1913: 419–422, fig. b; Vachon, 1974: 953; Fet, 2000: 469 (complete reference list until 2000); Kovařík, 2003: 150 (in part); Kovařík, 2009: 53, 118, figs. 321–322 (in part).

TYPE LOCALITY AND TYPE REPOSITORY. Somaliland, Berbera or Hargaisa, BMNH.

TYPE MATERIAL EXAMINED. **Somaliland**, Berbera, 16. April 1895 or Hargaisa, 25.–28. April. 1895, leg. C. V. A. Peel, 1♂ (holotype, Fig. 66 and figs. 321–322 in Kovařík, 2009: 118), BMNH No. 1900.0.3.15.2.

DIAGNOSIS. Male holotype 88 mm long, female unknown. Base color uniformly reddish brown to black, legs and telson yellow. Carapace smooth in middle, several granules sparsely along margins only. Internal trichobothria on chela number 7, ventral trichobothria on chela number 9–11. Pedipalp chela hirsute rather sparse-

Figures 55–56: *Pandinops turieli* **sp. n.**, in vivo habitus. Female (55) and male (56) paratypes.

ly. Pedipalp chela dorsally tuberculated, without pointed granules. Chela internal smooth with two longitudinal carinae indicated by 4–6 granules. Chela of male length/ width ratio is 1.65. Pectinal teeth number 15 in male, female unknown. Sternite VII bears numerous granules without carinae. Metasomal segments I–IV ventrally without carinae; segments I–V ventrally granulated, segments III–V more densely and intensively than in segments I–II. Length to width ratio of male metasomal segment V is 1.92.

Pandinops pococki (Kovařík, 2000)
(Figs. 5–7, 67, 69)

Pandinus (*Pandinops*) *pococki* Kovařík, 2000: 2–4, figs. 1–2; Kovařík, 2003: 151; Kovařík, 2009: 53, 118, figs. 297, 325–327.

TYPE LOCALITY AND TYPE REPOSITORY. Somalia, near Geriban; FKCP.

TYPE MATERIAL EXAMINED. **Somalia**, near Geriban (Jirriiban), ca 7º20'N 48º39'E (in description coordinates given incorrectly), VI.1980, 1♂ (holotype, Figs. 5–7, 67), FKCP.

DIAGNOSIS: Male holotype 93 mm long, female unknown. Base color uniformly reddish brown to black. Carapace covered by large granules, only middle part is smooth. External trichobothria on patella number 13–14 (5 *eb*, 2–3 *esb*, 2 *em*, 1 *est*, 3 *et*); ventral trichobothria on patella number 31–33; internal trichobothria on chela number 8, ventral trichobothria on chela number 12–13. Pedipalp chela hirsute densely. Pedipalp chela dorsally covered by tubercles/granules which locally indicated carinae but do not attain shape of pointed granules. Chela internal bumpy, sparsely granulated with two longitudinal carinae indicated by 8–10 granules. Chela of male length/ width ratio is 1.92. Pectinal teeth number 16–17 in male holotype, female unknown. Sternite VII bears numerous granules without carinae. Metasomal segments I–V ventrally densely granulated; metasomal segments I–IV ventrally without carinae. Spiniform formula of tarsomere II = 3/4: 3/4: 3/5: 3/5. Tarsomere II with 2 spines on inclined anteroventral surface. Length to width ratio of male metasomal segment V is 2.28.

Pandinops turieli Kovařík, **sp. n.**
(Figs. 22–60, 68–69, Table 1)
http://zoobank.org/urn:lsid:zoobank.org:act:2C59165E-1764-4CC0-B272-D49173E44C99

Pandinus (*Pandinops*) *bellicosus*: Kovařík, 2009: 51, 116, figs. 307–308 (in part).

TYPE LOCALITY AND TYPE REPOSITORY. Ethiopia, Oromia State, Sidamo Province, Wachile, 04°32'33"N 39° 03'07"E, 1051 m a.s.l., FKCP.

TYPE MATERIAL EXAMINED. **Ethiopia**, Oromia State, Sidamo Province, Wachile, 04°32'33"N 39°03'07"E, 1051 m a.s.l. (Locality No. **16EH**), 16.-17.IV.2016, 1♂ (holotype, Figs. 22–23, 26, 28, 32–35, 49–51, 68) 1♂ 7♀1♀juv. (paratypes, Figs. 24–25, 27, 29–31, 36–48, 52–57, 5♀ alive), leg. F. Kovařík, FKCP. **Kenya**, NE Province, El Wak, 1.V.2001, 1♀ (paratype), leg. Werner & Smrž, FKCP.

ETYMOLOGY. It is a pleasure to name this species after a young scorpiologist Carlos Turiel (Neuss, Germany).

DIAGNOSIS. Total length 55–72 mm. Base color uniformly reddish brown/orange to black, legs yellow or orange and telson yellow or white, pedipalp chela orange to reddish brown. Carapace smooth in middle, several granules sparsely along margins only. External trichobothria on patella number 13–16 (5 *eb*, 2–4 *esb*, 2 *em*, 1–2 *est*, 3 *et*); ventral trichobothria on patella number 22–27; internal trichobothria on chela number 6–8, ventral trichobothria on chela number 10–12. Pedipalp chela hirsute. Pedipalp chela dorsally tuberculated/granulated, without pointed granules, lobe almost smooth. Chela internal smooth, sparsely granulated mainly in anterior part, with two smooth short longitudinal carinae. Chela of male length/ width ratio is 1.68–1.71. Pectinal teeth number 11–15 in both sexes. Sternite VII bumpy without granules. Metasomal segments I–II ventrally smooth, III–V granulated, mainly on segment IV; metasomal segments I–IV with ventral carinae absent or indicated only. Spiniform formula of tarsomere II = 3/4: 3/4: 3/4-5: 3/4-5. Tarsomere II with 2 spines on inclined anteroventral surface. Length to width ratio of male metasomal segment V is 1.90–1.93.

DESCRIPTION. The adults are 55–68 mm long. The habitus is shown in Figs. 22–25. For position and distribution of the trichobothria of pedipalps see Figs. 35–41. External trichobothria on patella number 13–16 (5 *eb*, 2–4 *esb*, 2 *em*, 1–2 *est*, 3 *et*); ventral trichobothria on patella number 22–27; internal trichobothria on chela number 6–8, ventral trichobothria on chela number 10–12. Sexual dimorphism: adult male has bigger pectines (Figs 28–29); there are differences neither in the shape of pedipalps chela (Figs. 32 and 36) nor in metasoma length (Figs. 49–54).

Coloration (Figs. 22–27, 55–56). The base color is uniformly reddish brown/orange to black, legs are yellow or orange, telson is yellow or white, pedipalp chela is orange to reddish brown, chelicerae are yellow to orange, and carapace is yellow or orange in the anterior part and rather reddish brown in the posterior part.

Carapace and mesosoma (Figs. 26–27). The entire carapace is smooth in the middle, covered by granules sparsely along margins. The anterior margin of the carapace is symmetrically concave, medially strongly convex, and it bears several macrosetae. The tergites are smooth and can be finely granulated mainly in male. The pectinal tooth count is 14 in males, 11–13 (1x11, 3x12, 2x13) in females from Ethiopia and 15 in the female from Kenya. The pectine marginal tips extend to quarter of the fourth sternite in the male, and to three quarters of the third sternite in the female. All sternites are smooth,

Figures 57–58: *Pandinops turieli* **sp. n.**, female paratype eating cricket in laboratory (57) and the type locality (58).

without granules or carinae, but with two longitudinal furrows. Sternite VII is bumpy without granules.

Metasoma and telson (Figs. 49–54). The metasomal segments I–IV bear a total of 6 smooth carinae, only the carinae on the fourth segment can be partly granulated. The ventral carinae are absent or indicated only. The fifth segment has seven variously developed and granulated carinae. The dorsal and lateral surfaces of the segments are smooth without granules. The segments I–II are ventrally smooth, III–V are granulated, mainly on

Figures 59–60: *Pandinops turieli* **sp. n.**, burrows at the type locality.

segment IV. The entire metasoma is sparsely hirsute, more on the third to fifth segments, and the telson. The telson is smooth, elongate, with the aculeus approximately as long as the vesicle.

Pedipalps (Figs. 32–44). The pedipalps are hirsute by long setae. The femur is granulated dorsally and bears

DIMENSIONS (MM)		*P. friedrichi* **sp. n.** ♂ **holotype**	*P. friedrichi* **sp. n.** ♂ **paratype**	*P. terueli* **sp. n.** ♂ **holotype**	*P. terueli* **sp. n.** ♀ **paratype**
Carapace	L / W	13.70 / 12.20	12.40 / 10.70	9.65 / 9.60	12.15 / 11.60
Mesosoma	L	24.10	21.70	19.60	24.90
Tergite VII	L / W	6.10 / 10.5	5.70 / 9.30	4.10 / 7.10	7.30 / 10.10
Metasoma & telson	L	38.45	27.43	25.70	30.05
Segment I	L / W / D	4.95 / 4.75 / 4.40	4.20 / 4.15 / 4.15	3.10 / 3.90 / 3.13	4.05 / 4.60 / 3.85
Segment II	L / W / D	5.35 / 4.50 / 4.00	4.95 / 3.95 / 3.55	3.45 / 3.40 / 2.90	4.20 / 4.05 / 3.60
Segment III	L / W / D	5.55 / 4.25 / 3.68	5.10 / 3.65 / 3.30	3.70 / 3.15 / 2.65	4.35 / 3.80 / 3.20
Segment IV	L / W / D	6.50 / 3.85 / 3.40	5.80 / 3.50 / 3.05	4.20 / 3.00 / 2.40	5.05 / 3.50 / 2.90
Segment V	L / W / D	8.05 / 3.70 / 2.55	7.30 / 3.40 / 2.45	5.25 / 2.75 / 2.05	6.05 / 3.25 / 2.55
Telson	L / W / D	8.55 / 3.35 / 3.00	7.60 / 3.05 / 2.75	6.00 / 2.60 / 2.25	6.35 / 2.65 / 2.20
Pedipalp	L	40.10	36.45	27.00	31.30
Femur	L / W	9.60 / 4.50	8.70 / 4.15	6.25 / 3.00	7.30 / 3.58
Patella	L / W	10.70 / 5.55	9.75 / 4.55	7.05 / 3.45	8.10 / 3.85
Chela	L / W	19.80 / 12.20	18.00 / 10.65	13.70 / 8.00	15.90 / 9.45
Movable finger	L	12.50	11.00	8.30	9.80
Total	**L**	**76.25**	**61.53**	**54.95**	**67.10**

Table 1: Comparative measurements of adults of *Pandinops friedrichi* **sp. n.**, and *P. turieli* **sp. n.** Abbreviations: length (L), width (W, in carapace it corresponds to posterior width), depth (D).

four carinae composed of solitary strong granules. The patella is smooth, finely granulated on internal surface only, there are two externo lateral smooth carinae and one internal carina is indicated by 3–5 big granules. Pedipalp chela is dorsally tuberculated/granulated, without carinae and pointed granules, lobe almost smooth. Several well defined granules are present on external suface. The chela internal is smooth, sparsely granulated mainly in anterior part, with two short characteristic smooth longitudinal carinae in the middle. The movable and fixed fingers of the pedipalp with distinct granules in a row divided into 5–7 rows by big concave granules.

Legs (Figs. 45–48). All legs are without distinct carinae and smooth. The tarsomeres are hirsute by setae and macrosetae more densely on legs I–II. For spiniform formula of tarsomeres of legs see paragraph under *Pandinops* section.

Measurements. See Table 1.

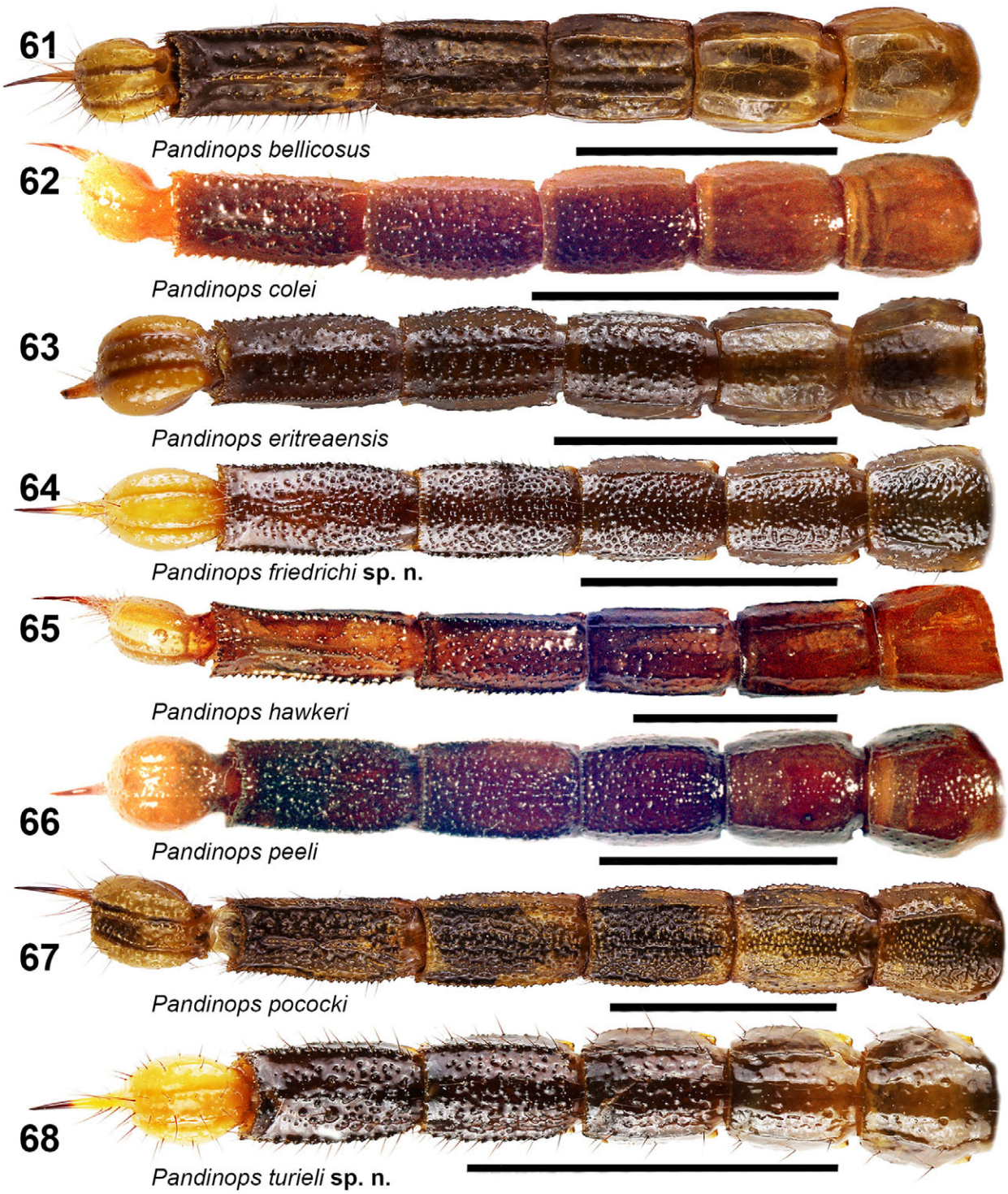
AFFINITIES. The described features distinguish *P. turieli* **sp. n.** from all other species of the genus. They are recounted in the key below. *P. turieli* **sp. n.** is the smallest species of the genus. Kovařík (2009: 51, 116, figs. 307–308) missidentified the sole female from Kenya as *P. bellicosus* which can be unequivocally separated from *P. turieli* **sp. n.** by: **1**) dorsal surface of pedipalp chela entirely smooth to bumpy, without granules or tubercles in *P. bellicosus* (Fig. 8) versus tuberculated/granulated in *P. turieli* **sp. n.** (Fig. 32); **2**) total length 80–95 mm in *P. bellicosus*, versus total length 55–72 mm in *P. turieli* **sp. n.**; **3**) pectinal teeth number 19–21 in males of *P. bellicosus*, and 11–15 in both sexes of *P. turieli* **sp. n.**

COMMENTS ON LOCALITIES AND LIFE STRATEGY. I visited the type locality (Fig. 58) on 16–17 April 2016. All types were in ca. 40 cm deep borrows with the entrance in open terrain (Figs. 59–60). At this locality, I recorded a maximum daytime temperature 30.5 ºC, and nighttime temperatures of 25.0 ºC shortly after sunset, dropping to 17.8 ºC (minimum temperature) before sunrise, and humidity varied between 46% and 99% (raining season). No specimen of *P. turieli* **sp. n.** was recorded at night outside burrows (UV detection). During the night collecting there were recorded *Gint gaitako* Kovařík et al., 2013, *Hottentotta trilineatus* (Peters, 1861), *Parabuthus hamar* Kovařík et al., 2016, and *Parabuthus pallidus* Pocock, 1895 at this locality.

Key to Species of *Pandinops*

1. Metasomal segments I–II ventrally granulated (Figs. 64, 66–67). .....……..... 2
– Metasomal segments I–II ventrally smooth or tuberculated (Figs. 61–63). ...……..... 4

2. Metasomal segments I–V ventrally densely granulated with the same intensity on all segments (Figs. 64 and 67). …… 3
– Metasomal segments III–V ventrally granulated more densely and intensively than in segments I–II (Fig. 66). ……...…….. ***P. peeli***



Figures 61–68: *Pandinops* spp., metasoma and telson ventral. **Figure 61**. *Pandinops bellicosus*, male from "Abyssinia or Egypt", possibly Eritrea. **Figure 62**. *Pandinops colei*, female holotype. **Figure 63**. *Pandinops eritreaensis*, male holotype. **Figure 64**. *Pandinops friedrichi*, **sp. n.**, male holotype. **Figure 65**. *Pandinops hawkeri*, holotype of *Pandinus pugilator*. **Figure 66**. *Pandinops peeli*, male holotype. **Figure 67**. *Pandinops pococki*, male holotype. **Figure 68**. *Pandinops turieli* **sp. n**., female paratype. Scale bars: 10 mm.

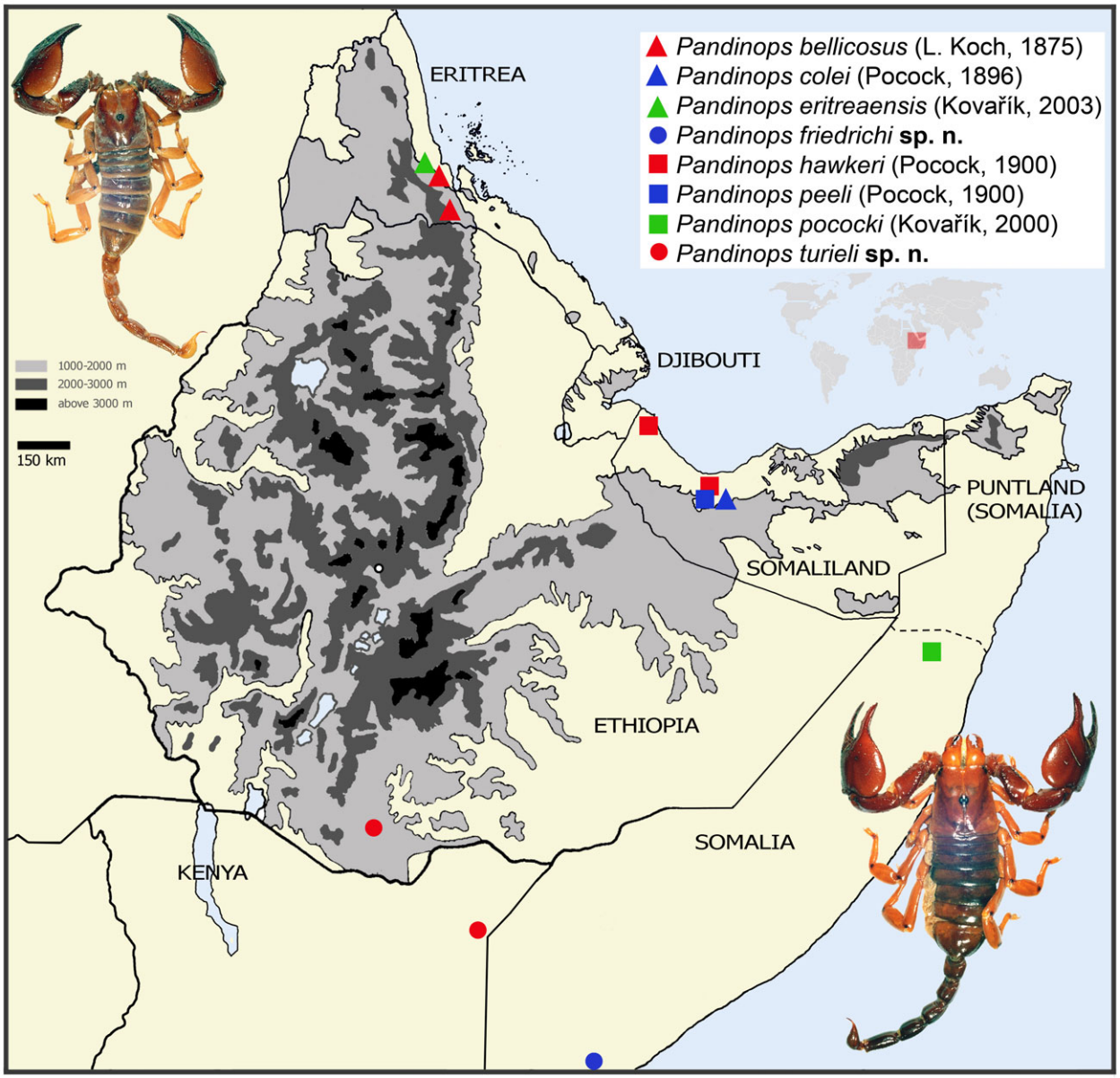


Figure 69: Map showing confirmed distribution of *Pandinops* spp. There are not included locality datas for all old specimens deposited mainly in Italian museums (for example Borelli, 1919: 374; Borelli, 1925: 16; and Kovařík & Whitman, 2005: 114) that include large collections from this region, because taxonomical position of these old specimens and validity of their locality datas were not checked. Scorpions in photos inside map are holotype of *Pandinops bellicosus* (above) and holotype of *Pandinops hawkeri* (bottom).

3. Dorsal surface of pedipalp chela smooth to bumpy (Fig. 14). ..... ***P. friedrichi* sp. n.**
– Dorsal surface of pedipalp chela covered by tubercles/granules (Fig. 5). ..... ***P. pococki***

4. Pedipalp chela strongly lobated, length/ width ratio is 1.56 (Fig. 1). ..... ***P. eritreaensis***
– Pedipalp chela length/ width ratio is 1.68–1.85 (Figs. 8, 32, 36). 5

5. Dorsal surface of pedipalp chela entirely smooth to bumpy, without granules or tubercles (Fig. 8). 6
– Dorsal surface of pedipalp chela granulated or tuberculated (Figs. 14–15). 7

6. Pectinal teeth number 19–21 in males, female unknown. Metasomal segments III–V ventrally tuberculated with several granules on metasomal segment V only; two smooth ventral carinae on metasomal segments I–IV well developed (Fig. 61). ..... ***P. bellicosus***
– Pectinal teeth number 12–13 in female, male unknown. Metasomal segments III–V ventrally granulated, mainly on segment IV; metasomal segments I–IV with ventral carinae absent or indicated only (Fig. 65). ..... ***P. hawkeri***

7. Dorsal surface of pedipalp chela entirely granulated by well defined granules, conical and pointed (fig. 309 in Kovařík, 2009: 116). ……..... ***P. colei*** – Granules on dorsal surface of pedipalp chela not conical and pointed, their summits may be confluent, lobe of manus almost smooth (Fig. 14). ..... ***P. turieli* sp. n.**

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