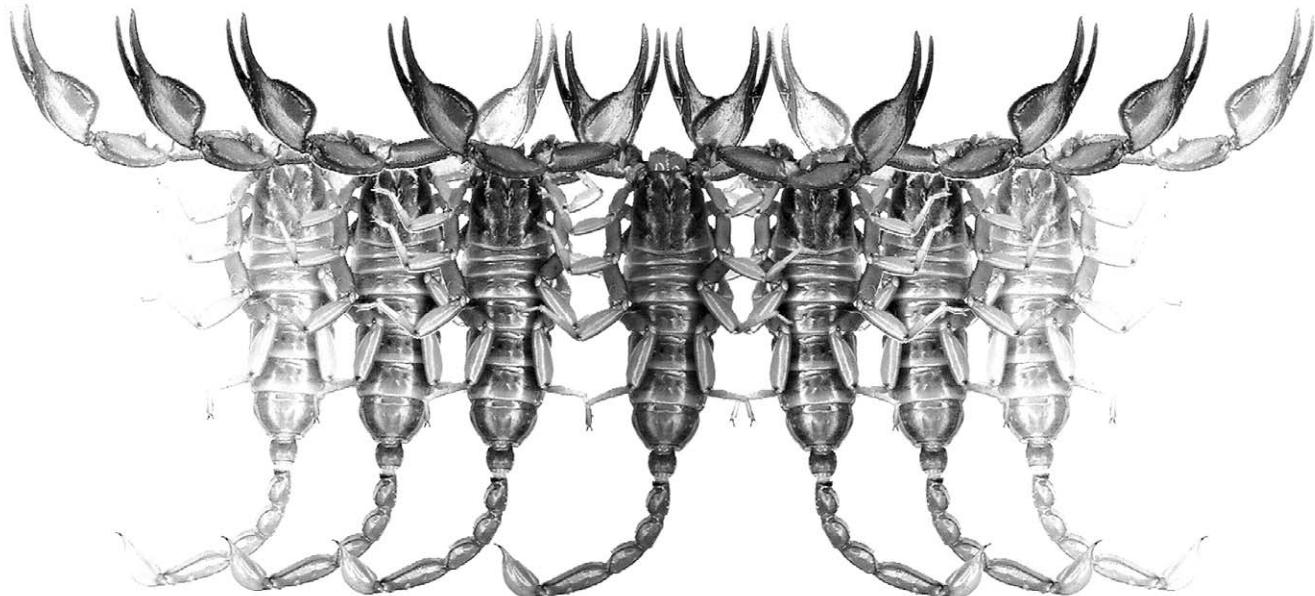


Euscorpius

Occasional Publications in Scorpiology



**Scorpions of the Horn of Africa (Arachnida: Scorpiones).
Part XIII. Review of *Pandinops hawkeri*, *P. peeli*,
P. platycheles, and *P. pugillator* (Scorpionidae)**

František Kovařík, Graeme Lowe & Hassan Sh Abdirahman Elmi

December 2017 – No. 254

Euscorpius

Occasional Publications in Scorpiology

EDITOR: **Victor Fet**, Marshall University, ‘fet@marshall.edu’
ASSOCIATE EDITOR: **Michael E. Soleglad**, ‘soleglad@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 at: <http://www.science.marshall.edu/fet/Euscorpius>

(Marshall University, Huntington, West Virginia 25755-2510, USA)

ICZN COMPLIANCE OF ELECTRONIC PUBLICATIONS:

Electronic (“e-only”) publications are fully compliant with ICZN ([International Code of Zoological Nomenclature](#)) (i.e. for the purposes of new names and new nomenclatural acts) when properly archived and registered. All ***Euscorpius*** issues starting from No. 156 (2013) are archived in two electronic archives:

- **Biotaxa**, <http://biotaxa.org/Euscorpius> (ICZN-approved and ZooBank-enabled)
- **Marshall Digital Scholar**, <http://mds.marshall.edu/euscorpius/>. (This website also archives all *Euscorpius* issues previously published on CD-ROMs.)

Between 2000 and 2013, ICZN did not accept online texts as "published work" (Article 9.8). At this time, ***Euscorpius*** was produced in two identical versions: online (ISSN 1536-9307) and CD-ROM (ISSN 1536-9293) (laser disk) in archive-quality, read-only format. Both versions had the identical date of publication, as well as identical page and figure numbers. Only copies distributed on a CD-ROM from ***Euscorpius*** in 2001-2012 represent published work in compliance with the ICZN, i.e. for the purposes of new names and new nomenclatural acts.

In September 2012, ICZN Article 8. *What constitutes published work*, has been amended and allowed for electronic publications, disallowing publication on optical discs. From January 2013, ***Euscorpius*** discontinued CD-ROM production; only online electronic version (ISSN 1536-9307) is published. For further details on the new ICZN amendment, see <http://www.pensoft.net/journals/zookeys/article/3944/>.

Scorpions of the Horn of Africa (Arachnida: Scorpiones). Part XIII. Review of *Pandinops hawkeri*, *P. peeli*, *P. platycheles*, and *P. pugilator* (Scorpionidae)

František Kovařík^{1,2}, Graeme Lowe³ & Hassan Sh Abdirahman Elmi⁴

¹ P.O. Box 27, CZ - 145 01 Praha 45, Czech Republic; www.scorpio.cz

² Department of Zoology, Charles University, Viničná 7, CZ-128 44 Praha 2, Czech Republic

³ Monell Chemical Senses Center, 3500 Market St., Philadelphia, PA 19104-3308, USA

⁴ Amoud University, Borama, Republic of Somaliland

<http://zoobank.org/urn:lsid:zoobank.org:pub:E65453D9-7B80-40FB-9AC8-48508E74E5BD>

Summary

Pandinops platycheles (Werner, 1916) is diagnosed and fully complemented with color photos of types, and *Pandinops pugilator* (Pocock, 1900) is diagnosed and fully complemented with color photos of live and preserved specimens, as well as its habitat. The hemispermatophore of *P. pugilator* is illustrated and described for the first time. *Pandinus hawkeri* Pocock, 1900 and *Pandinus peeli* Pocock, 1900 are synonymized with *Pandinops pugilator* (Pocock, 1900).

Methods, Material & Abbreviations

Nomenclature and measurements follow Stahnke (1971), Kovařík (2009), and Kovařík & Ojanguren Affilastro (2013), except for trichobothriotaxy (Vachon, 1974). Hemispermatophore terminology follows Kovařík et al. (2016). The terms ‘external’, ‘internal’, ‘dorsal’ and ‘ventral’ refer to somatic axes with the hemispermatophore *in situ*; the terms distal/ apical and proximal/ basal are relative to the foot as the basalmost structure. Nomenclature of most lobes follows Lamoral (1979), but following Stockwell (1988) we apply the term ‘internobasal reflection of sperm duct’ for the eversible sperm tube or valve (= ‘median transverse trough’ + ‘inner lobe’ of Lamoral), ‘proximal lobe’ refers to the rounded lobe at the proximal internal end of this structure, and ‘truncal flexure’ (= ‘median transverse cleavage’ of Lamoral) is where the distal lamina joins the trunk (c.f., Figs. 53–56). For biometrics, we define the distal lamina as starting at the truncal flexure, and we take the proximal base of the hook as the demarcation between proximal and distal sections of the distal lamina. L, length; W, width; D, depth. Terminology of tarsal armature follows Kovařík et al. (2017).

We intentionally use here the name Somaliland (Hargeisa) for the northern territory (Republic of So-

maliland) 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.

Specimens used for this study were collected and imported with permissions of Amoud University and Ministry of the Environment of the Republic of Somaliland.

Specimen Depositories: BMNH (The Natural History Museum, London, United Kingdom); FKCP (František Kovařík, private collection, Prague, Czech Republic); MWNH (Naturhistorischen Museum Wiesbaden, Germany).

Systematics

Family Scorpionidae Latreille, 1802

Pandinops Birula, 1913 (Figs. 1–60, 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.

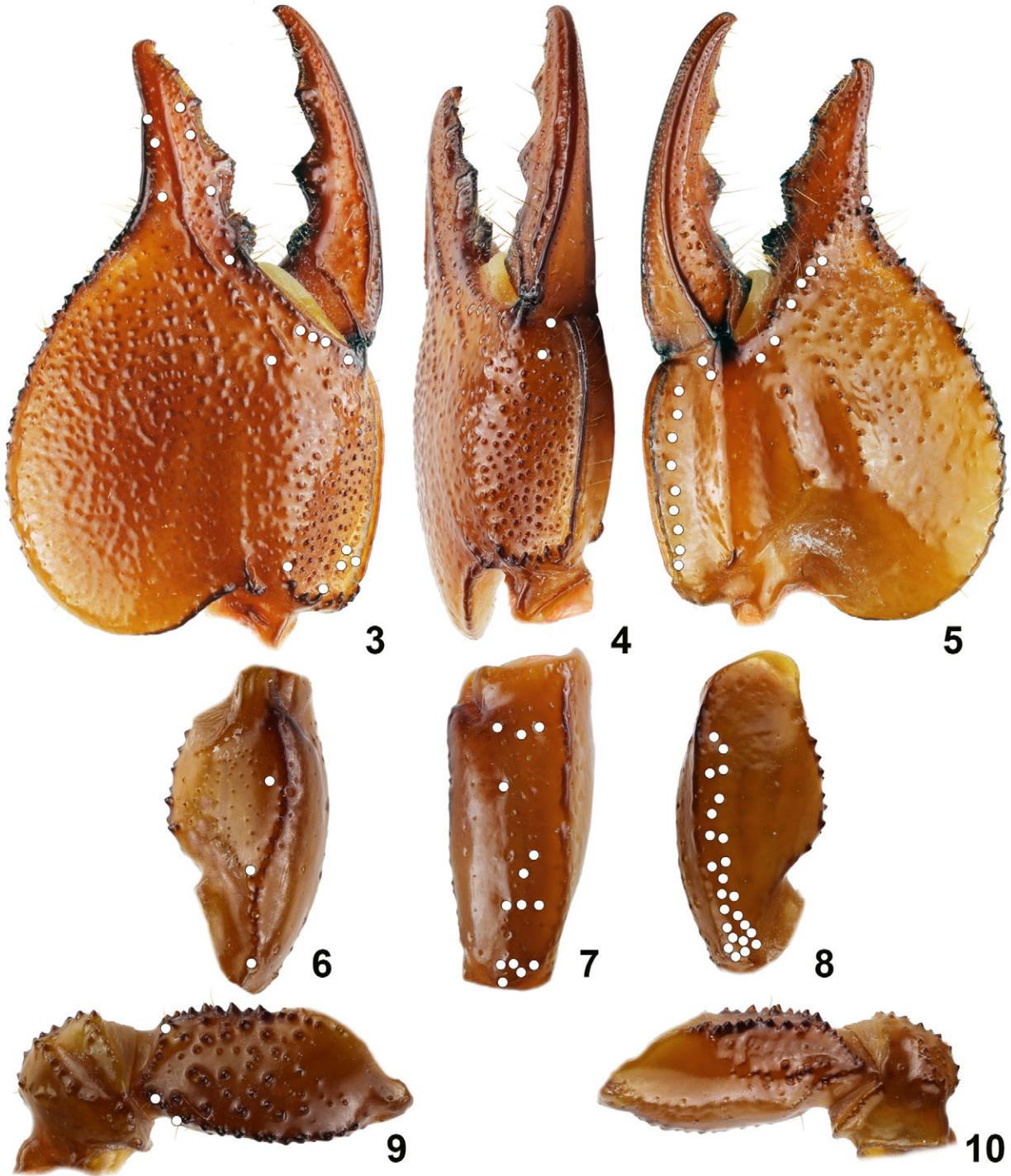


Figures 1–2: *Pandinops platycheles*, male holotype in dorsal (1) and ventral (2) aspects. In the plate there are also original labels. Scale bar: 10 mm.

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 sub-

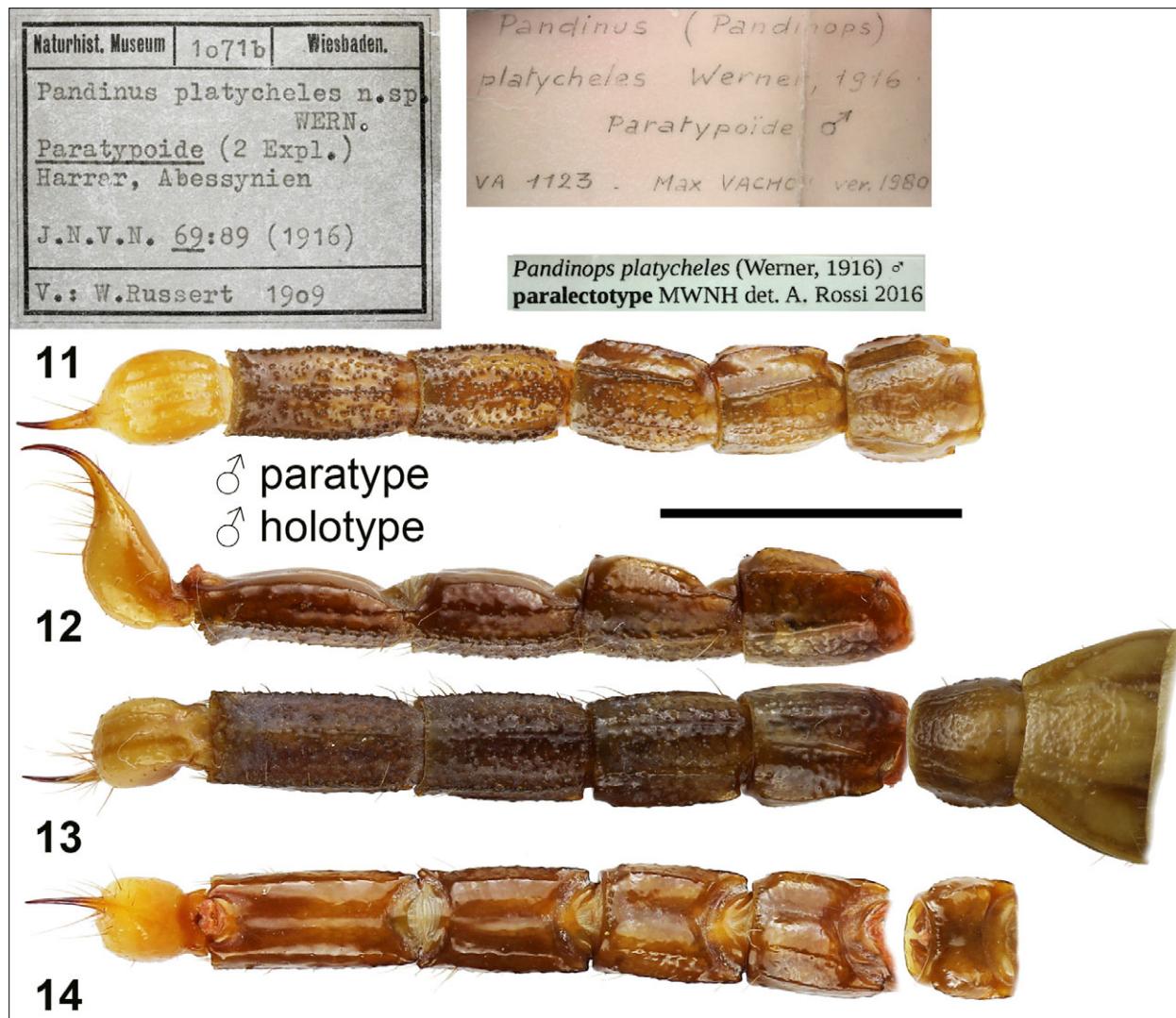
pentagonal, longer than wide. Carapace without distinct carinae. Dentate margin of pedipalp chela movable finger with distinct granules divided into 5–7 rows. Tergites I–VI of mesosoma bear one carina. Stridulation organ located on pedipalp coxae and first pair of legs, but can be reduced. Metasomal segments I–IV with paired parallel ventral median carinae or without carinae. Telson without subaculear tubercle. Legs with one pedal spur, retrolateral spur absent. *Tarsomere I of legs*. Spiniform macroseta *pd*, *vt*, *rt*, *vst* are present on legs I–IV, but *pd* can be replaced by seta as intraspecific



Figures 3–10: *Pandinops platycheles*, male holotype, pedipalp segments. Chela dorsoexternal (3), ventroexternal (4) and ventrointernal (5). Patella dorsal (6), external (7) and ventral (8). Femur and trochanter dorsal (9) and ventral (10). Trichobothrial pattern is indicated.

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. *Tarsomere II* of legs. Spiniform formula is 3/4: 3/4: 3/4–5: 3/4–5. *Tarsomere II*

with 2 spines on inclined anteroventral surface, but a seta on leg III can be transformed to "spiniform seta" which indicates a poorly developed third spine as intra-specific variability.



Figures 11–14: *Pandinops platycheles*. **Figure 11.** Male paratype, metasoma and telson ventral and original labels. **Figures 12–14.** Male holotype, metasoma and telson lateral (12), metasoma, telson ventral and sternite VII (13), and metasoma and telson dorsal (14) views. Scale bar: 10 mm.

***Pandinops platycheles* (Werner, 1916)**
(Figs. 1–14, 50, Table 1)

Pandinus platycheles Werner, 1916: 89–90; Lampe, 1917: 199; Birula, 1927: 88; Moriggi, 1941: 95; Jäger, 1998: 87.

Pandinus (Pandinoides) platycheles: Vachon, 1974: 953; Lamoral & Reynders, 1975: 564; El-Hennawy, 1992: 100, 136; Kovařík, 1997: 183; Fet, 2000: 468–469.

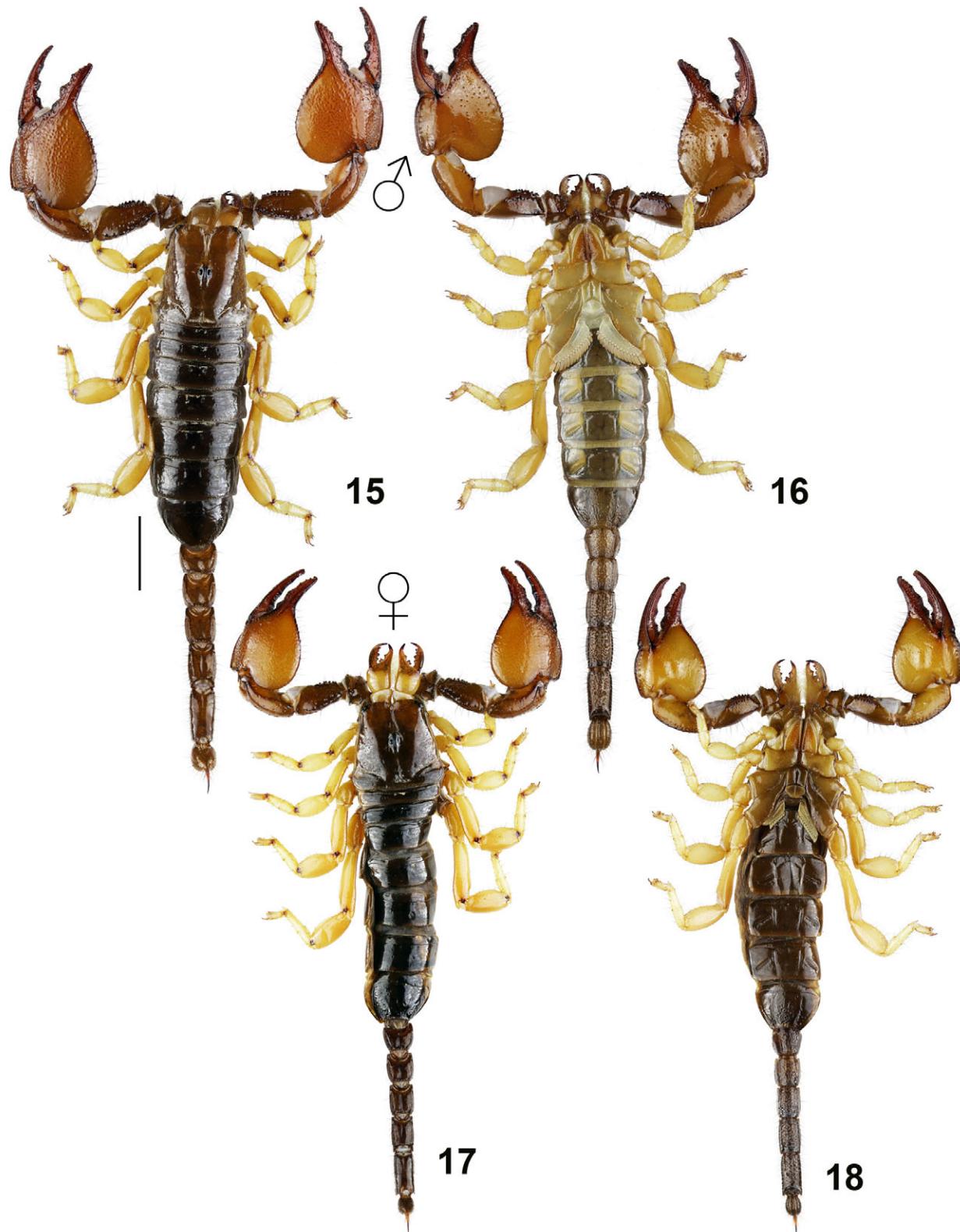
Pandinoides platycheles Rossi, 2015: 13.

Pandinus (Pandinoriens) platycheles Prendini, 2016: 8.

TYPE LOCALITY AND TYPE REPOSITORY. Abyssinia (now Ethiopia), Harrar; MWNH.

TYPE MATERIAL EXAMINED. **Ethiopia**, Harrar, 1909, 3♂ (holotype No. 1071a and paratypes No. 1071b, Figs. 1–14), leg. W. Russert, MWNH.

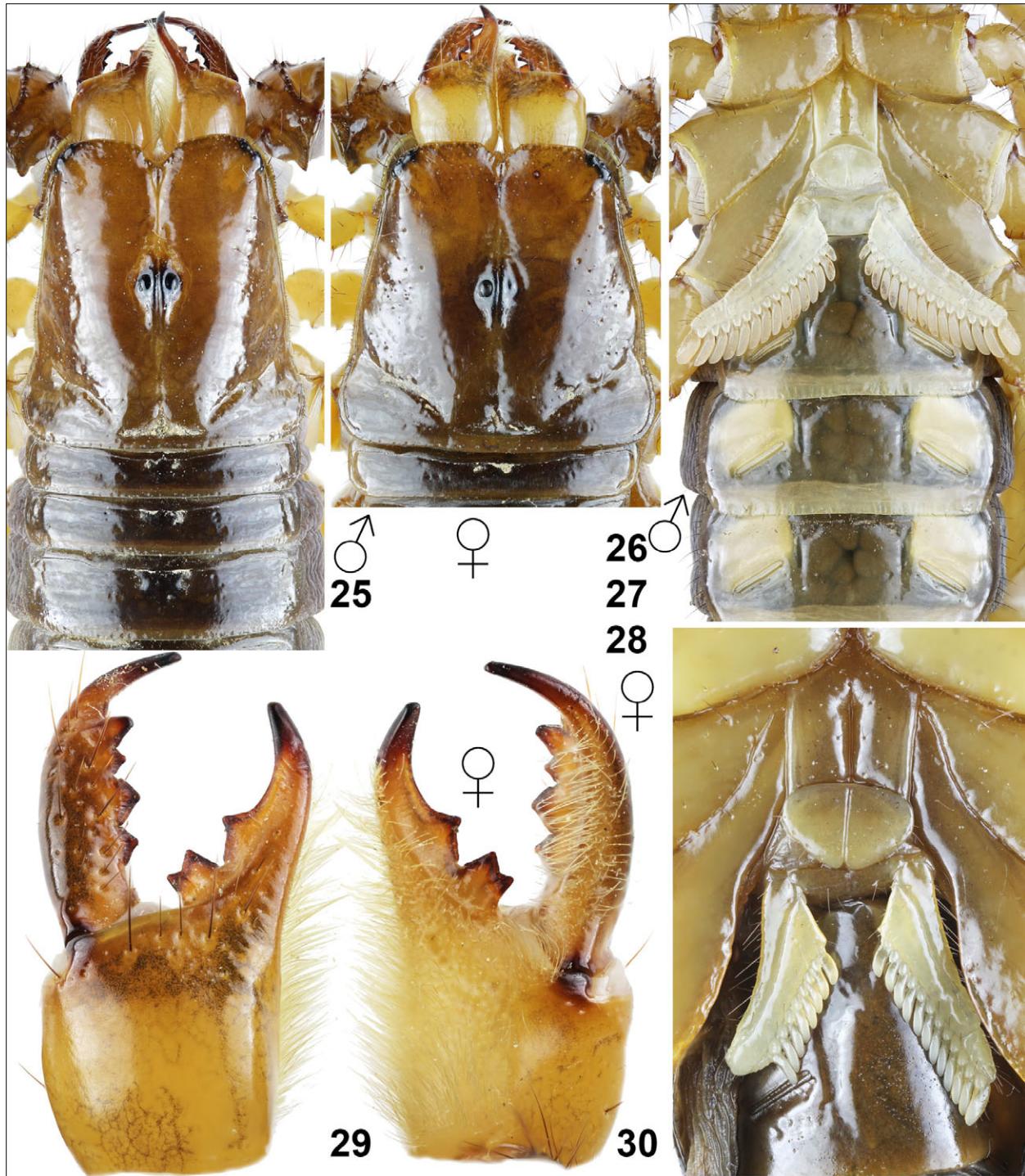
DIAGNOSIS. Total length of males 67–70.3 mm, female unknown. Base color uniformly reddish brown/orange, legs yellow or orange and telson yellow, pedipalp chela orange to reddish brown. Carapace smooth in middle, several granules distributed sparsely along margins only. External trichobothria on patella number 14 (5 eb, 3 esb, 2 em, 1 est, 3 et); ventral trichobothria on patella number 24–27; internal trichobothria on chela number 6–7, ventral trichobothria on chela number 10–11. Pedipalp chela hirsute. Pedipalp chela dorsally tuberculated/granulated, without pointed granules. Chela internally smooth, sparsely granulated mainly in anterior



Figures 15–18: *Pandinops pugilator* from locality No. 17SR. **Figures 15–16.** Male in dorsal (15) and ventral (16) views. **Figures 17–18.** Female in dorsal (17) and ventral (18) views. Scale bar: 10 mm.



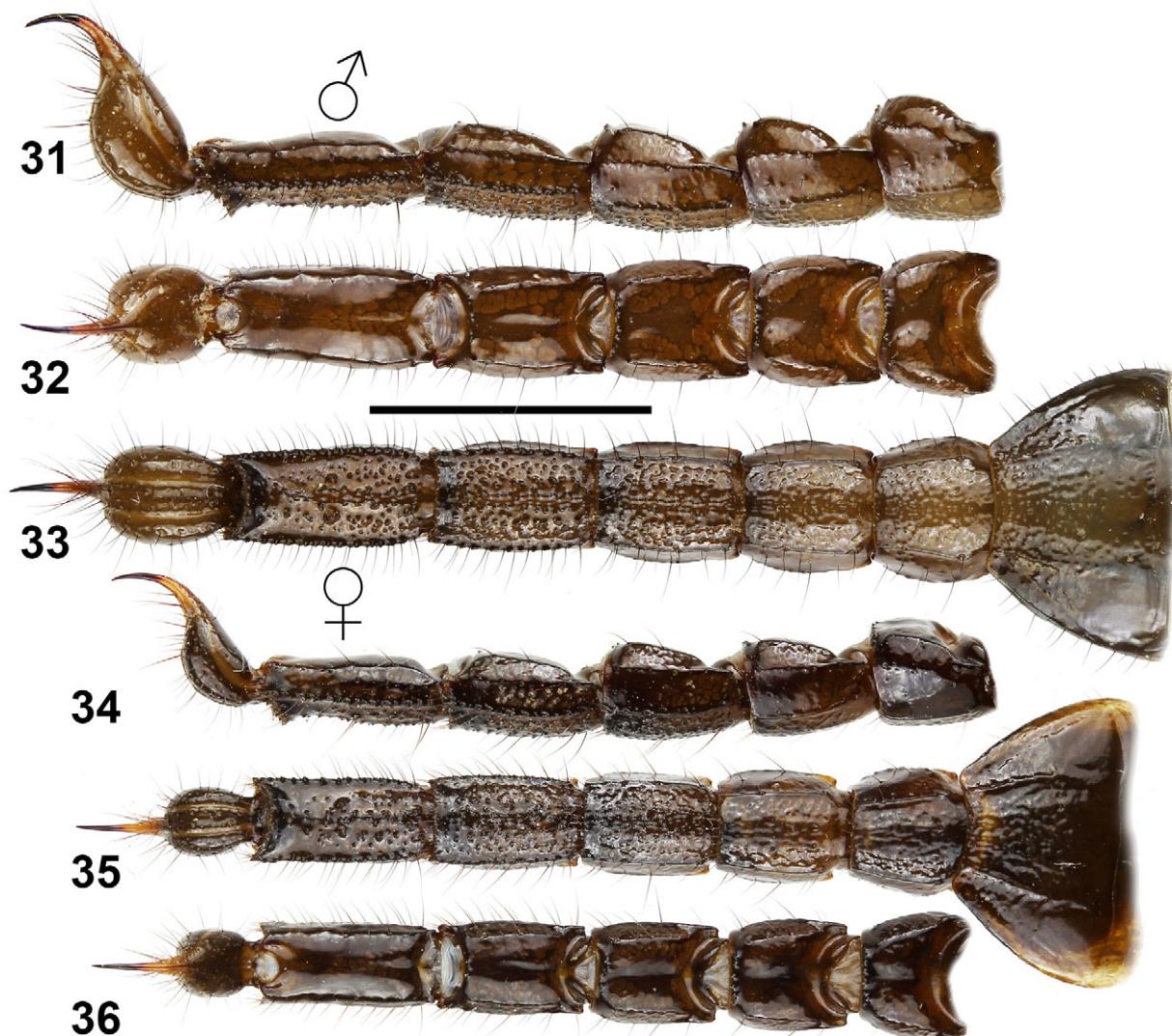
Figures 19–24: *Pandinops pugilator* from locality No. 17SR. **Figures 19–21.** Female, pedipalp chela dorsoexternal (19), ventroexternal (20), and ventrointernal (21). **Figures 22–24.** Male, pedipalp chela and patella dorsoexternal (22), ventroexternal (23), and ventrointernal (24). Trichobothrial pattern is indicated in Figures 22–24.



Figures 25–30: *Pandinops pugilator* from locality No. 17SR. **Figures 25, 27.** Male, carapace and tergites I–III (25) and coxosternal area and sternites III–V (27). **Figures 26, 28–30.** Female, Carapace and tergite I (26), coxosternal area and sternite III (30), right chelicera dorsal (29) and ventral (30).

part, with two smooth short longitudinal carinae indicated by several solitary granules. Chela of male length/width ratio is 1.60–1.63. Pectinal teeth number 13–14 in males. Sternite VII tuberculate to granulate. Metasomal

segments I–II ventrally tuberculate, III–V granulated; metasomal segments I–IV with ventral carinae absent or indicated only. Length to width ratio of male metasomal segment V is 1.94–2.14.



Figures 31–36: *Pandinops pugilator* from locality No. 17SR, metasoma, telson, and sternite VII. **Figures 31–33.** Male, lateral (31), dorsal (32), and ventral (33) views. **Figures 34–36.** Female, lateral (34), dorsal (35), and ventral (36) views. Scale bar: 10 mm.

COMMENTS. Werner (1916: 89–90) based *Pandinus platycheles* on three males from which, according to the labels, one was designated as "typus, No. 1071a" (holotype, Figs. 1–2) and two as "paratypoide, No. 1071b" (paratypes, Fig. 11). Vachon incorrectly placed this species in subgenus *Pandinoides* (Vachon, 1974: 953), but when he personally studied the types in 1980, he labeled them correctly as members of subgenus *Pandinops* (see Figs. 1–2, 11). Unfortunately Vachon never published this taxonomic conclusion. Subsequent authors kept the species in *Pandinus* (*Pandinoides*), but recently Prendini (2016) transferred it to *Pandinus* (*Pandinoriens*). In 2016, Rossi studied these types and labels and added two labels in which he incorrectly designated the holotype as the lectotype, and paratypes

as paralectotypes (see Figs. 1–2, 11). Rossi may have published that *Pandinus platycheles* belongs to the genus *Pandinops*, in his own private journal *Arachnida, Rivista Aracnologica Italiana* which is not publically accessible to the scorpion research community (see Rein, 2017), so we were unable to review and discuss it.

When the first author (FK) prepared the revisions of *Pandinus* sensu lato (Kovařík, 2009; Kovařík, 2016; Kovařík et al., 2017), he was not permitted to personally study the types of *P. platycheles* and according to incorrectly determined non-type specimens from a museum collection, he cited a population which belongs to another species as *P. platycheles*. It is now evident that *Pandinus platycheles* Werner, 1916 is *Pandinops platycheles* (Werner, 1916) and the specimens which



Figures 37–40: *Pandinops pugilator* from locality No. 17SR, female, tarsomeres I and II of left legs I–IV, retrolateral aspects.

DIMENSIONS (MM)	<i>P. platycheles</i>		<i>P. turieli</i>	
	♂ holotype	♂ paratype	♂ holotype	♀ paratype
Carapace	L / W	11.70 / 10.10	11.80 / 9.70	9.65 / 9.60
Mesosoma	L	23.30	23.20	19.60
Tergite VII	L / W	5.30 / 8.23	5.25 / 8.20	4.10 / 7.10
Metasoma et telson	L	35.30	32.2	25.70
Segment I	L / W / D	3.85 / 4.40 / 3.53	3.80 / 4.45 / 3.65	3.10 / 3.90 / 3.13
Segment II	L / W / D	4.85 / 4.42 / 3.70	4.25 / 3.95 / 3.75	3.45 / 3.40 / 2.90
Segment III	L / W / D	5.25 / 4.10 / 3.65	4.70 / 3.80 / 3.60	3.70 / 3.15 / 2.65
Segment IV	L / W / D	6.02 / 3.35 / 3.30	5.35 / 3.50 / 2.85	4.20 / 3.00 / 2.40
Segment V	L / W / D	7.20 / 3.35 / 2.70	6.50 / 3.35 / 2.55	5.25 / 2.75 / 2.05
Telson	L / W / D	8.13 / 2.95 / 2.70	7.60 / 3.30 / 3.10	6.00 / 2.60 / 2.25
Pedipalp	L	32.55	33.05	27.00
Femur	L / W	7.60 / 3.65	7.55 / 3.65	6.25 / 3.00
Patella	L / W	8.60 / 4.15	9.00 / 4.50	7.05 / 3.45
Chela	L / W	16.35 / 10.20	16.50 / 10.10	13.70 / 8.00
Movable finger	L	9.90	10.60	8.30
Total	L	70.30	67.20	54.95
				67.10

Table 1: Comparative measurements of adults of *Pandinops platycheles* and *P. turieli* Kovařík, 2016. Abbreviations: length (L), width (W, in carapace it corresponds to posterior width), depth (D).

were cited as *Pandinurus platycheles* (Werner, 1916) in Kovařík et al. (2017: 86–89, figs. 158–159, 179, 200, 357–389, 394, 396) belong to the species *Pandinurus riccardoi* (Rossi, 2015) (= *Pandinus (Pandinoriens) bottegoi* Rossi, 2015, syn. by Kovařík et al., 2017: 87).

AFFINITIES. The described features distinguish *Pandinops platycheles* from all other species of the genus. *P. platycheles* is morphologically similar to *P. turieli*

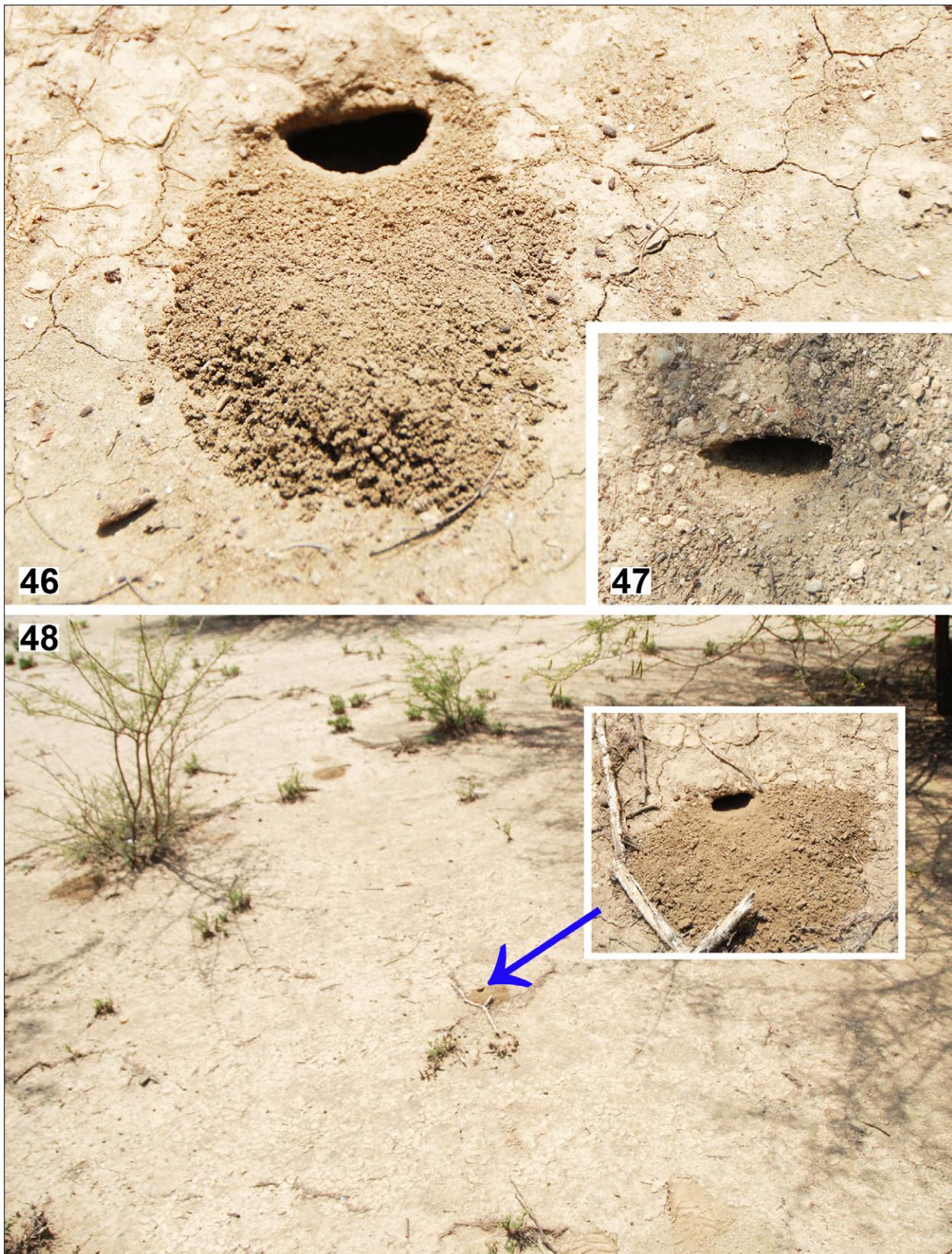
Kovařík, 2016 but these two species occur in remote areas separated by montane massifs (Fig. 50) which act as vicariant barriers between all known widespread scorpion species found in the region (e. g. *Parabuthus abyssinicus* Pocock, 1901 versus *P. hamar* Kovařík et al., 2016 and *P. pallidus* Pocock, 1895, see fig. 204 in Kovařík et al., 2016: 55; or *Hottentotta minax* (L. Koch, 1875) versus *H. trilineatus* (Peters, 1861), see fig. 158 in Kovařík et al., 2015: 35). These two species can be



Figures 41–42: *Pandinops pugilator* from locality No. 17SR, *in vivo* habitus. **Figure 41.** Male. **Figure 42.** Female.



Figures 43–45: *Pandinops pugilator*. **Figure 43.** Juvenile topotype of *P. hawkeri* from locality No. 17SP, *in vivo* habitus. **Figure 44.** Locality No. 17SP, Somaliland, near Jifa Uri hill, $09^{\circ}43'35''\text{N}$ $43^{\circ}24'51''\text{E}$. **Figure 45.** Locality No. 17SR, Somaliland, Borama, campus Amoud University, $09^{\circ}56'49''\text{N}$ $43^{\circ}13'23''\text{E}$.



Figures 46–48: *Pandinops pugilator*, burrows at locality No. 17SR.



Figure 49: Somaliland, Jifa Uri hill (09°43'19"N 43°23'33"E), the type locality of *P. hawkeri*.

morphologically unequivocally separated by: 1) metasomal segments I-II ventrally tuberculate in *P. platycheles* vs. smooth in *P. turieli*; 2) sternite VII tuberculate to granulate in *P. platycheles* vs. bumpy without granules in *P. turieli*; 3) chela of male length/ width ratio is 1.60–1.63 in *P. platycheles* vs. 1.68–1.71 in *P. turieli*; 4) length to width ratio of male metasomal segment V is 1.94–2.14 in *P. platycheles* vs. 1.90–1.93 in *P. turieli*.

***Pandinops pugilator* (Pocock, 1900)**
(Figs. 15–60)

Pandinus pugilator Pocock, 1900a: 52–53, figs. 1–1a, plate IV.

Pandinus (Pandinops) pugilator: Vachon, 1974: 953; Fet, 2000: 469.

Pandinus (Pandinops) bellicosus: Kovařík, 2000: 4–6 (in part); Kovařík, 2009: 51 (in part).

= *Pandinus peeli* Pocock, 1900a: 53, fig. 2, plate IV.
Syn. n. (see comments below)

Pandinus (Pandinops) peeli: Birula, 1913: 419–422, fig. b; Vachon, 1974: 953; Fet, 2000: 469 (complete reference list until 2000); Kovařík, 2009: 53, 118, figs. 321–322.

Pandinops peeli: Kovařík, 2016: 11–12, 16–18, figs. 66, 69.

= *Pandinus hawkeri* Pocock, 1900b: 60–61. **Syn. n.** (see comments below)

Pandinus (Pandinops) hawkeri: Birula, 1913: 422; Vachon, 1974: 921, 953, figs. 116–118; Fet, 2000: 469 (complete reference list until 2000); Kovařík, 2009: 53, 117, figs. 298, 317–320; Kovařík, 2016: 10–11, 17–18, figs. 65, 69.

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

TYPE MATERIAL EXAMINED. **Somaliland**, Berbera, 16 April 1895 or Hargeisa, 25–28 April 1895, leg. C. V. A. Peel, 1♀ (holotype of *Pandinus pugilator*), BMNH No. 1900.0.3.15.1, 1♂ (holotype of *Pandinus peeli*, figs. 321–322 in Kovařík, 2009: 118), BMNH No. 1900.0.3.15.2; Jifa Uri (Fig. 49, 09°43'19"N 43°23'33"E), inland from Zeyla (now Zeila, in Somali Saylac), leg. R. M. Hawker, 1♀ (holotype of *Pandinus hawkeri*, Fig. 50 and figs. 317–320 in Kovařík, 2009: 53, 117), BMNH No. 1898.4.25.4–6.

RECENTLY COLLECTED MATERIAL EXAMINED. **Somaliland**, between Hargeisa and Borama, near Jifa Uri hill, 09°43'35"N 43°24'51"E, 1577 m a.s.l (Fig. 44, Locality No. 17SP), 9.IX.2017, 1juv. (topotype of *Pan-*

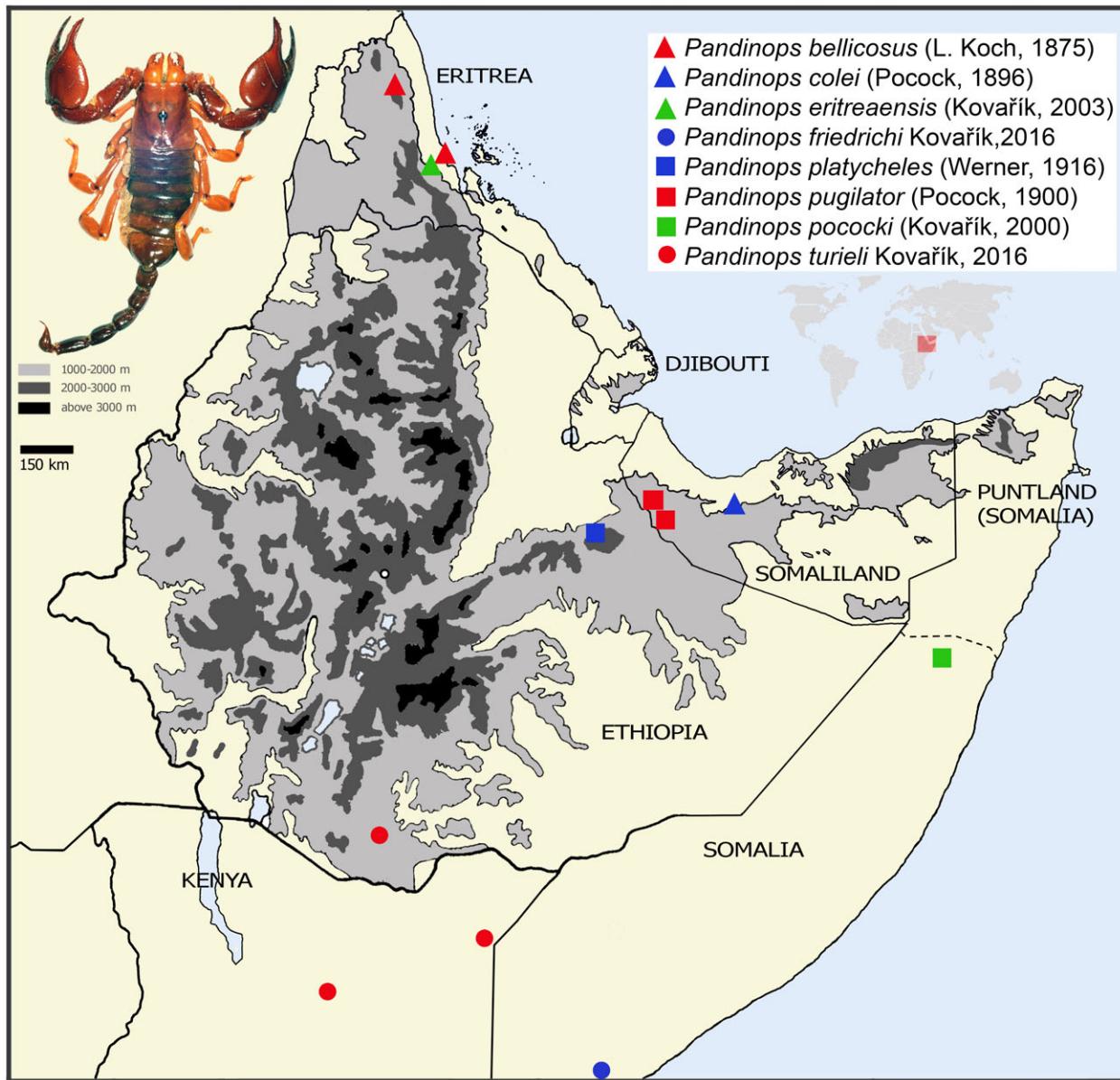
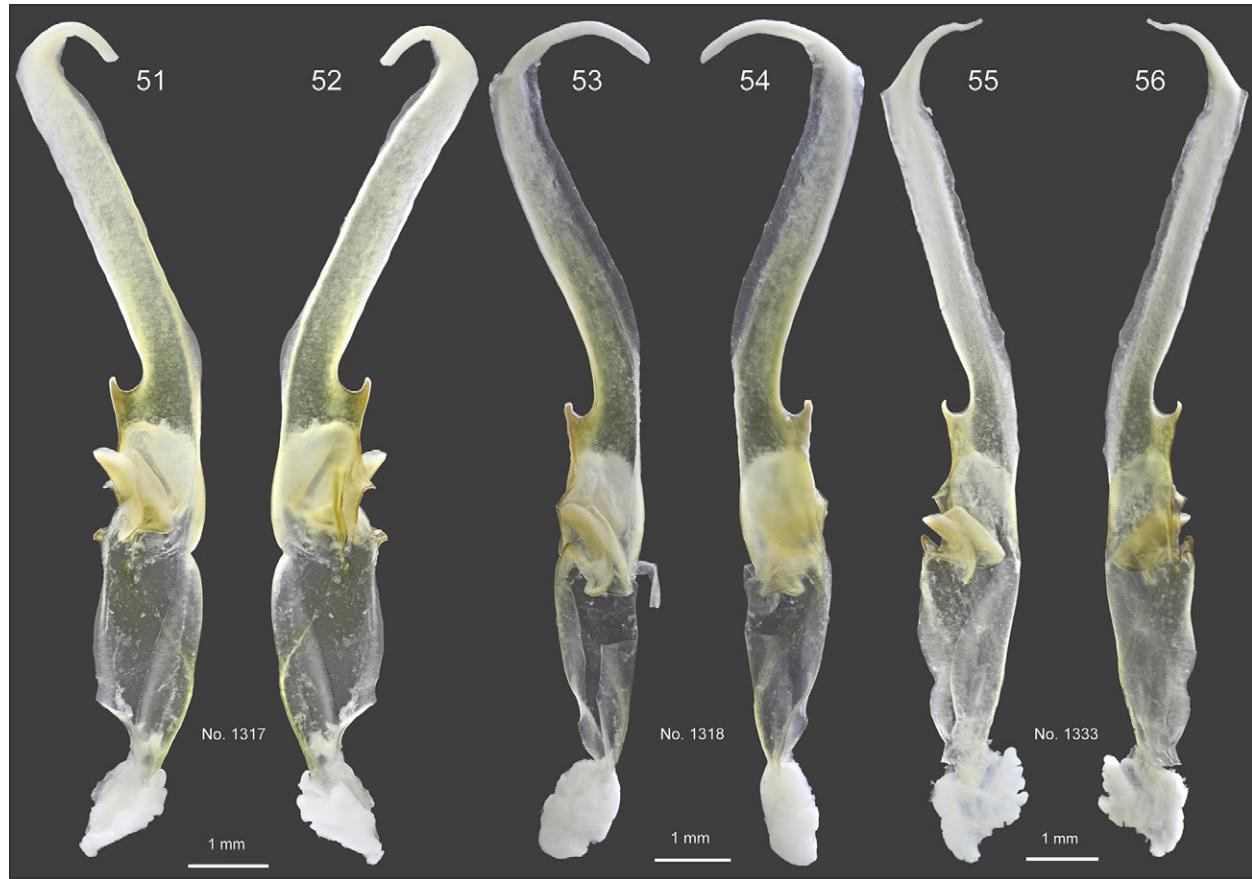


Figure 50: Map showing distribution of *Pandinops* spp. with corrected confirmed distribution of *Pandinops pugilator*. Scorpion in photos inside map is the holotype of *P. hawkeri*.

dinus hawkeri, Fig. 43, alive), leg. F. Kovařík, FKCP; Borama, campus Amoud University, 09°56'49"N 43°13'23"E, 1394 m a.s.l. (Figs. 45–48, Locality No. 17SR =17SA), 9–13.IX.2017, 8♂9♀2♀juvs.3juvs. from which 2♂6♀3juvs. are still alive (Figs. 15–42, 51–60, DNA Nos. 1317, 1318, 1333), leg. F. Kovařík et P. Just, FKCP.

EMENDED DIAGNOSIS. Total length 65–95 mm. Color reddish black, carapace and chela orange to reddish brown, legs yellow. Carapace smooth in the middle, several granules distributed very sparsely along margins only. External trichobothria on patella number 14 (5 eb,

3 esb, 2 em, 1 est, 3 et); ventral trichobothria on patella number 24–30. Internal trichobothria on chela number 6–8, ventral trichobothria on chela number 9–12. Pedipalp chela hirsute. Pedipalp chela dorsally smooth, tuberculated or finely granulated without pointed granules. Chela internally smooth with two longitudinal carinae rather smooth or indicated by 4–6 granules. Chela length/ width ratio is 1.65–1.82. Pectinal teeth number 12–17 in female, 14–17 in male. Sternite VII tuberculated to granulated with two carinae indicated or present. Metasomal segments I–IV ventrally without carinae; segments III–V ventrally densely and intensively granulated; segments I–II rather tuberculated in



Figures 51–56: *Pandinops pugilator*, hemispermatophores from 3 specimens (Nos. 1317, 1318, 1333). Ventral (concave) (51, 53, 55) and dorsal (convex) (52, 54, 56) views. No. 1317 is left hemispermatophore shown in mirror image for comparison to others, Nos. 1318, 1333 are right hemispermatophores. Scale bars: 1 mm.

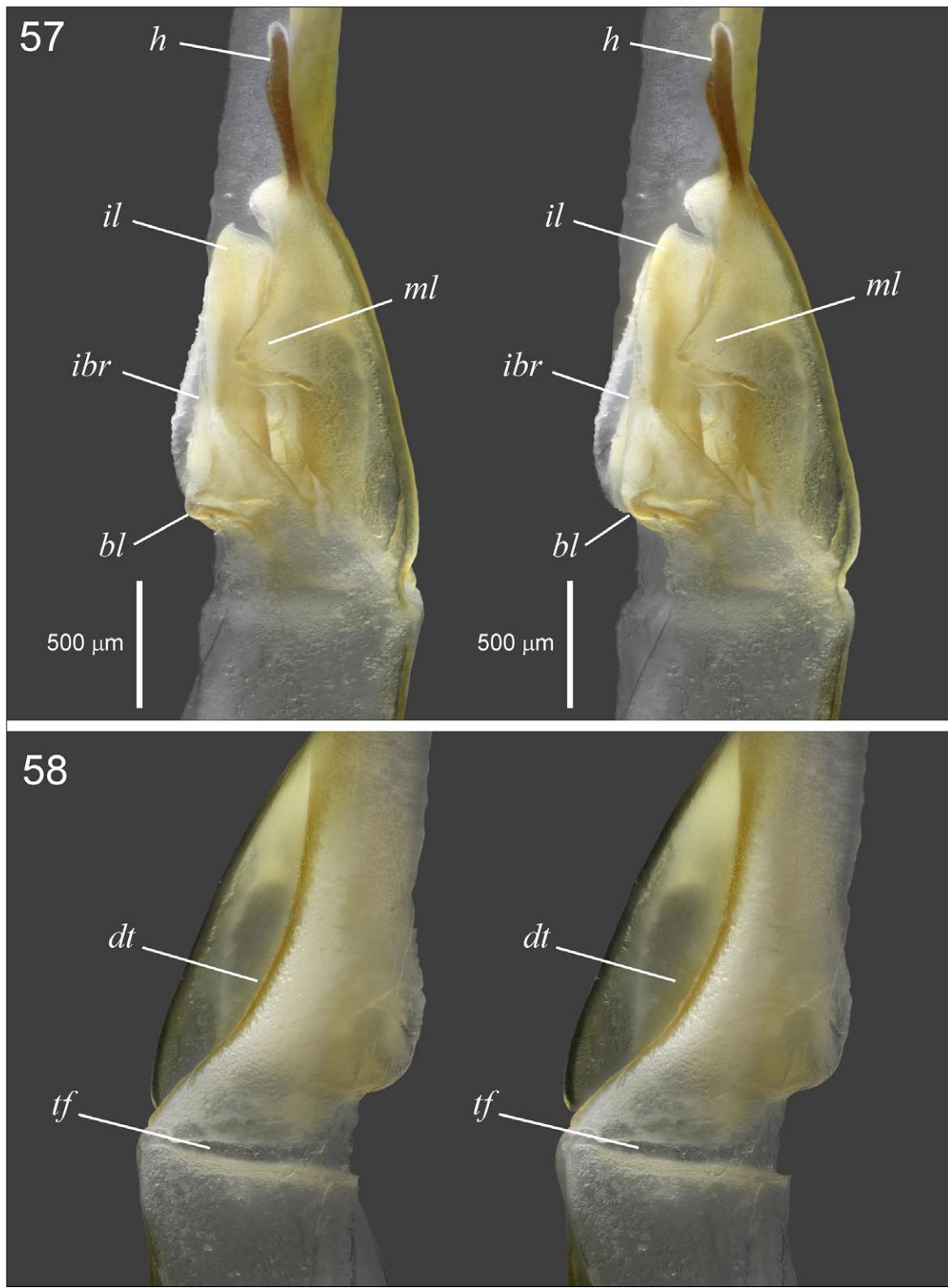
males or almost smooth in juveniles and females. Spini-form formula of tarsomere II = 3/4: 3/4: 3/4-5: 3/4-5. Tarsomere II with 2 spines on inclined anteroventral surface. Length to width ratio of male metasomal segment V is 1.92–2.02.

COMMENTS. Pocock (1900a: 52–53) based *Pandinus pugilator* and *Pandinus peeli* on two specimens collected probably together at the same place by C. V. A. Peel. Pocock erroneously took certain ontogenetic and sexually dimorphic differences of these scorpions to be interspecific characters: (i) juveniles and females have chelae rather smooth (Fig. 19), but males have chelae rather tuberculated to finely granulated (Fig. 22); and (ii) ventral surfaces of metasomal segments I–II are almost smooth in juveniles and females, but rather tuberculated in males. This led him to describe the female as *Pandinus pugilator*, and the conspecific male as *Pandinus peeli*. Understanding the life strategy of this species enabled the first author (FK), together with Pavel Just, to collect additional specimens, and further study has revealed its true coloration and sexual dimorphism. We can now recognize that the holotype of *Pandinus pug-*

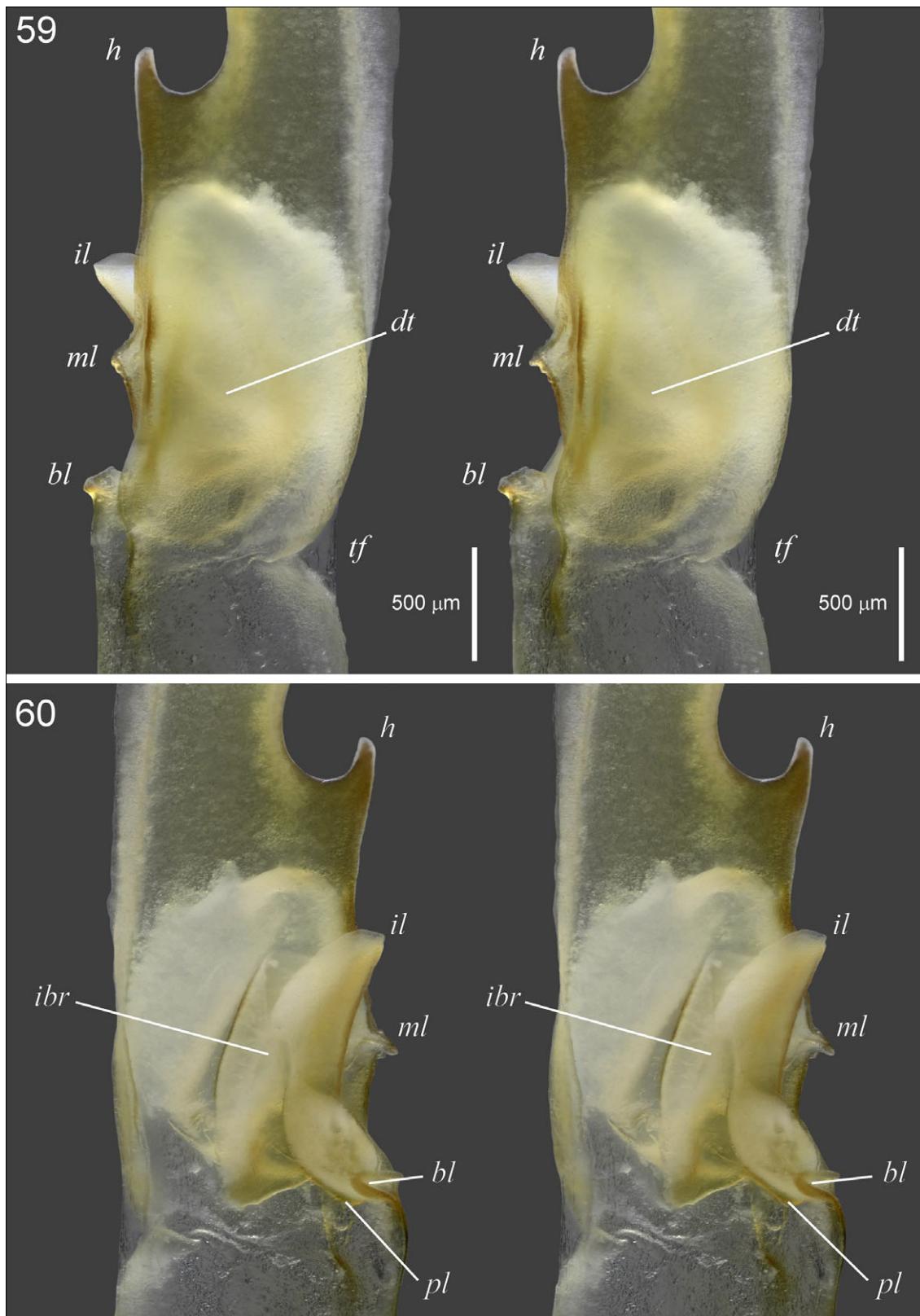
ilator is a female, whereas previously the sex of the specimen was cited as being indeterminate (Pocock, 1900a: 52–53; Kovařík, 2016: 10–11).

The three species, *Pandinus pugilator*, *P. peeli*, and *P. hawkeri* were described by Pocock (1900a, 1900b) in two papers in the *Proceedings of the Zoological Society of London*, both published on 23 January 1900. *P. pugilator* (pp. 52–53) and *P. peeli* (p. 53) were described in the first paper, and *P. hawkeri* (pp. 60–61), in the second paper. Therefore, both *Pandinus peeli* Pocock, 1900 and *Pandinus hawkeri* Pocock, 1900 are junior synonyms of *Pandinops pugilator* (Pocock, 1900).

Hemispermatophore. (Figs. 51–60). Lamelliform. Distal lamina long, section distal to hook constricted, straight throughout most of its length, internally angled 22°–26° relative to trunk axis. Apex of distal lamina with a short, curved section starting with an abrupt deflection in external direction at 42°–61° relative to axis of straight section, tapering to a narrow tip. Short, robust hook projecting distally near base of internal margin of distal lamina. Proximal section of distal lamina below hook much shorter than distal section



Figures 57–58: *Pandinops pugilator*, left hemispermatophore, capsule region (No. 1317). Internal (sperm duct margin) (57) and external (distal lamina margin) (58) cross-stereoscopic views. Scale bar: 500 μm . Label abbreviations: *bl*, basal lobe; *dt*, dorsal trough; *h*, hook; *ibr*, internobasal reflection of sperm duct (= median transverse trough); *il*, inner lobe, *ml*, median lobe; *tf*, truncal flexure (= median transverse cleavage).



Figures 59–60: *Pandinops pugilator*, left hemispermatophore, capsule region (No. 1317). Dorsal (convex) (59) and ventral (concave) (60) cross-stereoscopic views. Scale bar: 500 µm. Label abbreviations: see legend for Figs. 57–58.

above it, with deep dorsal trough bordered internally by a strong, prominent ridge. Median lobe sharply angled, bearing a narrow thickened ridge. Internobasal reflection of sperm duct relatively short, slightly narrowing distally into a broad inner lobe with truncated end. Proximal lobe semicircular in profile. Basal lobe a smaller but distinct, flattened process, asymmetric in profile, angled towards proximal direction. Trunk relatively long, broad, gradually tapered towards base, with weak, but well defined diagonal axial rib. This description is based on examination of both right and left hemispermatophores from 3 males (Nos. 1317, 1318, 1333), all of which displayed consistently similar morphologies (Figs. 51–56). Measurements (mm) (No. 1318): distal lamina: total L 7.11; oblique L distal to hook 5.16; straight section L 4.60, W 0.78; proximal section (truncal flexure to hook base) L 2.00, W 0.95; trunk L 2.55; foot L 1.38. Morphometric ratios (ranges from Nos. 1317, 1318, 1333): distal lamina straight section L/W 5.90–6.75; distal lamina ratio of L distal to hook/ L proximal to hook 2.31–2.64, W distal to hook/ W proximal to hook 0.67–0.82; distal lamina total L/ trunk L 2.41–2.79.

COMMENTS ON LOCALITIES AND LIFE STRATEGY. Locality 17SP is a large steppe near Jifa Uri hill used by farmers and can be reckoned to be the type locality of *P. hawkeri* (Fig. 44); locality 17SR is a riverbed of an occasional river (Figs. 45–48). The second locality lies in the grounds of Amoud University Campus and is a site of detailed research. *P. pugilator* were in ca. 40 cm deep burrows with the entrance in open terrain (Figs. 46–48). In each burrow there were a juvenile; a female; a female with juveniles after first ecdysis; or a female or an immature female with a male. No male was found in a burrow alone. During night collecting with UV light, there was recorded only one male, but no females or juveniles had emerged outside burrows in open terrain. Other scorpions also recorded at the site were: *Gint* sp. n., *Neobuthus* sp. n., and *Parabuthus abyssinicus* Pocock, 1901, during night collecting. On a margin of the riverbed there is an area of rocky terrain (fig. 45 in Kovařík et al., 2017: 11) where the first author recorded *Pandinurus kmoniceki* Kovařík et al., 2017, *Babycurus somalicus* Hirst, 1907, *Hottentotta polystictus* (Pocock, 1896), *Neobuthus* sp. n., and *Parabuthus abyssinicus* Pocock, 1901.

At this locality, the first author recorded maximum daytime temperatures of 29.1 °C (10th September 2017) and 31.8 °C (12th September 2017), and a minimum nighttime temperature of 19.6 °C. The recorded humidity was between 31% (minimum at night) and 79% (maximum at day).

Acknowledgments

Thanks are due to Marcel Bednář, Petra Frýdlová, Daniel Frynta, Martin Häckel, Hynek Kmoníček, David Král (Czech Republic), Abdillahi Ibraahim Habane (Minister of Education & High Studies, Republic of Somaliland), Abdirasid A. Hassan (Office of the Minister, Education & High Studies, Republic of Somaliland), Ahmed A. Boqore (Vice President, Academic Affairs of Amoud University), and Yesuf Ahmed Ali (Director General of Higher Education, Hargeisa, Republic of Somaliland) for their help. Thanks to Dr. Fritz Geller-Grimm (MWNH) for the loan of *P. platycheles* types. Special thanks to Abdiqaadir Abdilahi and Abdissaan Shabele; Pavel Just for help with collecting; Tomáš Mazuch for help with geographic data and Fig. 49; Stefan Friedrich for help with *P. platycheles* types; Victor Fet and Michael Soleglad for their help in processing the manuscript. Further, we thank two anonymous reviewers for their comments to the manuscript.

References

- BIRULA, A. A. 1913. Arachnologische Beiträge. II.–IV. II. Ueber einige *Scorpiops*-Arten von dem Südabhang des Himalaya. III. Ueber *Pandinus* (*Pandinops*) *peeli* Poc. und seine Verwandten. *Revue Russ Entom.* 13(3–4): 416–423.
- BIRULA, A. A. 1927. Wissenschaftliche Ergebnisse der mit Unterstützung der Akademie der Wissenschaften in Wien aus der Erbschaft Treitl von F. Wernerunternommenen zoologischen Expedition nach dem Anglo-Aegyptischen Sudan (Kodofan) 1914. XXV. Skorpione. *Denkschriften der Akademie der Wissenschaften in Wien. Mathematisch-naturwissenschaftliche Klasse*, 101: 79–88.
- EL-HENNAWY, H. K. 1992. A catalogue of the scorpions described from the Arab countries (1758–1990) (Arachnida: Scorpionida). *Serket*, 2(4): 95–153.
- FET, V. 2000. Family Scorpionidae Latreille, 1802. Pp. 427–486 in Fet, V., W. D. Sissom, G. Lowe & M. E. Braunwalder. *Catalog of the Scorpions of the World (1758–1998)*. New York: The New York Entomological Society, 689 pp.
- JÄGER, P. 1998. Das Typenmaterial der Spinnentiere (Arachnida: Acari, Amblypygi, Aranea, Opiliones, Pseudoscorpiones, Scorpiones, Uropygi) aus dem

- Museum Wiesbaden. *Jahrbücher des Nassauischen Verein für Naturkunde*, 119: 81–91.
- KOVAŘÍK, F. 1997. A check-list of scorpions (Arachnida) in the collection of the Hungarian Natural History Museum, Budapest. *Annales Historico-Naturales Musei Nationalis Hungarici*, 89: 177–185.
- KOVAŘÍK, F. 2000. *Pandinus (Pandinops) pococki* sp. n. from Somalia, and *Pandinus pugillator*, a junior synonym of *Pandinus (Pandinops) bellicosus* comb. n. (Scorpiones, Scorpionidae). *Serket*, 7(1): 1–7.
- 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. 2016. Scorpions of the Horn of Africa (Arachnida: Scorpiones). Part VIII. *Pandinops* Birula, 1913 (Scorpionidae) with Description of two new species from Ethiopia and Somalia. *Euscorpius*, 229: 1–20.
- KOVAŘÍK, F., G. LOWE, K. B. RANAWANA, D. HOFEREK, V. A. SANJEEWA JAYARATHNE, J. PLÍŠKOVÁ & F. ŠTÁHLAVSKÝ. 2016. Scorpions of Sri Lanka (Arachnida, Scorpiones: Buthidae, Chaerilidae, Scorpionidae) with description of four new species of the genera *Charmus* Karsch, 1879 and *Reddyanus* Vachon, 1972 stat. n.. *Euscorpius*, 220: 1–133.
- KOVAŘÍK F., G. LOWE, M. E. SOLEGLAD & J. PLÍŠKOVÁ. 2017. Scorpions of the Horn of Africa (Arachnida, Scorpiones). Part X. *Pandiborellius* stat. n. and *Pandinurus* (Scorpionidae) with description of four new species from Eritrea and Ethiopia, and review of *Pandinus* sensu lato taxonomy. *Euscorpius*, 238: 1–103.
- KOVAŘÍK, F. & A. A. OJANGUREN AFFILASTRO. 2013. *Illustrated catalog of scorpions. Part II. Bothriuridae; Chaerilidae; Buthidae I. Genera Compsobuthus, Hottentotta, Isometrus, Lychas, and Sassanidotus*. Prague: Clairon Production, 400 pp.
- LAMORAL, B. H. 1979. The scorpions of Namibia (Arachnida: Scorpionida). *Annals of the Natal Museum*, 23 (3): 497–784.
- LAMORAL, B. H. & S. C. REYNERS. 1975. A catalogue of the scorpions described from the Ethiopian faunal region up to December 1973. *Annals of the Natal Museum*, 22: 489–576.
- LAMPE, E. 1917. Katalog der Skorpione, Pedipalpen und Solifugen des Naturhistorischen Museums der Residenzstadt Wiesbaden. *Jahrbücher des Nassauischen Verein für Naturkunde*, 70(1): 185–203.
- MORIGGI, M. 1941. Gli scorpioni dell'Africa Orientale Italiana. *Rivista di Biologia Coloniale*, 4(1-2): 77–103.
- POCOCK, R. I. 1900a. On a collection of insects and arachnids made in 1895 and 1897 by Mr. C. A. V. Peel, F. Z. S. in Somaliland, with descriptions of new species. 9. Chilopoda and Arachnida. *Proceedings of the Zoological Society of London*, 1900: 48–55.
- POCOCK, R. I. 1900b. On a collection of insects and arachnids made in 1895 and 1897 by Mr. C. A. V. Peel, F. Z. S. in Somaliland, with descriptions of new species. 10. General list of the scorpions of Somaliland and the Boran Country. *Proceedings of the Zoological Society of London*, 1900: 55–63.
- PRENDINI, L. 2016. Redefinition and systematic revision of the East African scorpion genus *Pandinoides* (Scorpiones, Scorpionidae) with critique of the taxonomy of *Pandinus*, sensu lato. *Bulletin of the American Museum of Natural History*, 407: 1–66.
- REIN, J. O. 2017. The scorpion files. <http://www.ntnu.no/ub/scorpion-files/>.
- ROSSI, A. 2015. Sui sottogeneri di *Pandinus* Thorell, 1876 con revisione del genere *Pandinurus* Fet, 1997 stat. n. e descrizione di sette nuove specie e tre nuovi sottogeneri (Scorpiones: Scorpionidae). *Onychium*, 11: 10–66.
- STAHNKE, H. L. 1971. Scorpion nomenclature and mensuration. *Entomological News*, 81: 297–316.
- STOCKWELL, S. A. 1989. *Revision of the Phylogeny and Higher Classification of Scorpions (Cheliceraata)*. Ph.D. Dissertation, University of Berkeley, Berkeley, California. 319 pp. (unpublished).

- University Microfilms International, Ann Arbor,
Michigan.
- VACHON, M. 1974. Études des caractères utilisés pour
classer les familles et les genres des scorpions
(Arachnides). 1. La trichobothriotaxie en arach-
nologie. Sigles trichobothriaux et types de tricho-
bothriotaxie chez les Scorpions. *Bulletin du Mus-
éum national d'Histoire naturelle*, 3e série, 140
(Zoologie, 104): 857–958.
- WERNER, F. 1916. Über einige Skorpione und Gli-
derspinnen des Naturhistorischen Museum in
Wiesbaden. *Jahrbücher des Nassauischen Verein
für Naturkunde*, 69: 79–97.