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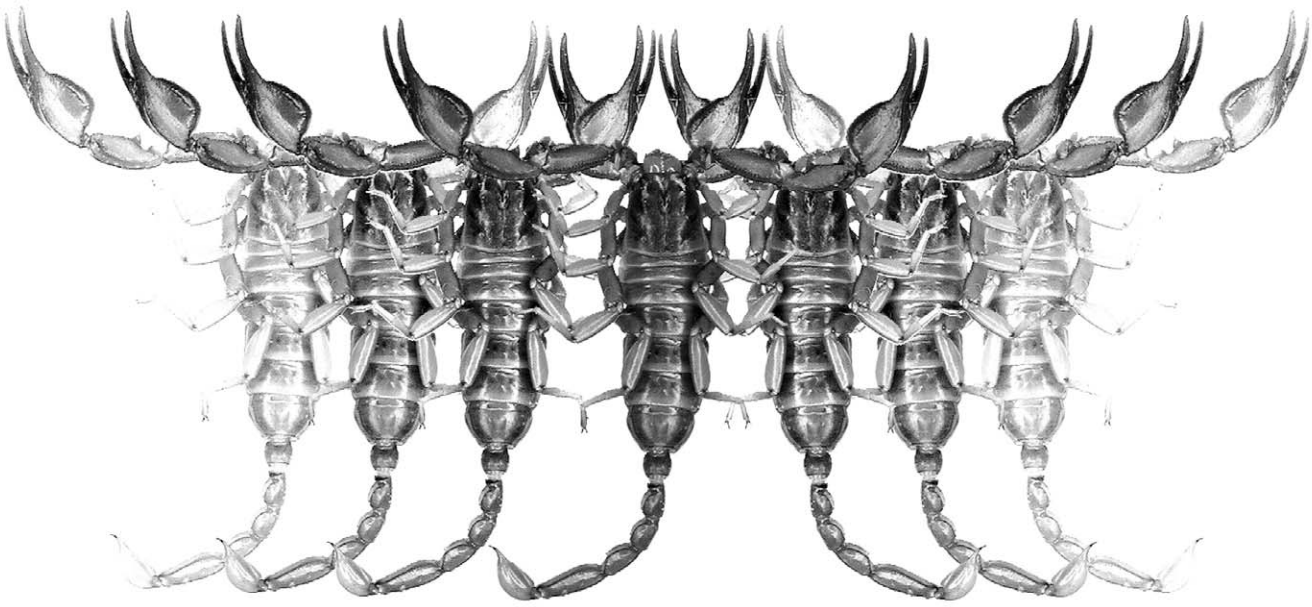

Scorpions of the Horn of Africa (Arachnida: Scorpiones). Part X. *Pandiborellius* stat. n. and *Pandinurus* (Scorpionidae) with Description of Four New Species from Eritrea and Ethiopia, and Review of *Pandinus* Sensu Lato Taxonomy

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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

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Summary

We introduce a new system of classification for the subfamily Scorpioninae Latreille, 1802 which includes genera *Heterometrus* Ehrenberg, 1828, *Opistophthalmus* C. L. Koch, 1837, *Pandiborellius* Rossi, 2015 **stat**. **n**., *Pandinoides* Fet, 1997, *Pandinops* Birula, 1913, *Pandinurus* Fet, 1997, *Pandinus* (*Pandinus*) Thorell, 1876, *Pandinus* (*Pandinopsis*) Vachon, 1974 **stat**. **n**., *Pandinus* (*Pandipalpus*) Rossi, 2015 **stat**. **n**., and *Scorpio* Linné, 1758. We provide a checklist of 41 valid species and their synonyms of *Pandinus* sensu lato. We revise Horn of Africa genera *Pandiborellius* **stat**. **n**. and *Pandinurus*; all species are fully complemented with color photos of live and preserved specimens, as well as their habitat. Included are morphological keys to the subfamily Scorpioninae and genera *Pandiborellius* **stat**. **n**. and *Pandinurus*. Several new characters in trichobothrial pattern, granulation of pedipalp movable and fixed fingers and spiniform formula of tarsomeres of legs are used and discussed. Described herein are *Pandiborellius igdu* **sp**. **n**. from Ethiopia, *Pandiborellius insularis* **sp**. **n**. from Eritrea, *Pandinurus afar* **sp**. **n**. from Ethiopia, and *Pandinurus oromo* **sp**. **n**. from Ethiopia. *Pandinurus citernii* (Borelli, 1919) **comb**. **n**. and *Pandinurus intermedius* (Borelli, 1919) **comb**. **n**. are restored from synonymy. *Pandinurus* (*Pandipavesius*) Rossi, 2015 is synonymized with *Pandiborellius* Rossi, 2015 **stat**. **n**.; *Pandinus* (*Pandinoirens*) Rossi, 2015 is synonymized with *Pandinurus* Fet, 1997; *Pandinurus* (*Pandiborellius*) *sabbadinii* Rossi, 2015 is synonymized with *Pandiborellius magrettii* (Borelli, 1901) **comb**. **n**.; *Pandinurus* (*Pandinurus*) *cianferonii* Rossi, 2015 is synonymized with *Pandinurus pallidus* (Kraepelin, 1894); *Pandinus* (*Pandinoirens*) *riccardoi* Rossi, 2015 and *Pandinus* (*Pandinoirens*) *bottegoi* Rossi, 2015 are synonymized with *Pandinurus platycheles* (Werner, 1916); *Pandinus* (*Pandinurus*) *vachoni* Rossi, 2014 is synonymized with *Pandinurus sudanicus* (Hirst, 1911); and *Pandinurus* (*Pandipalpus*) *pygmaeus* Rossi, 2015 is synonymized with *Pandinus* (*Pandipalpus*) *lowei* Kovařík, 2012 **comb**. **n**.. Hemispermatophores of *Pandiborellius insularis* **sp**. **n**., *Pandinurus afar* **sp**. **n**. and *Pandinurus oromo* **sp**. **n** are illustrated and described, and morphology of *Pandinus* sensu lato hemispermatophores is discussed.

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, figs. 113–118) divided the genus *Pandinus* Thorell, 1877 into five subgenera according to the 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.

Fet (1997: 248) observed that two of the subgenera created by Vachon in 1974 *Pandinurus* and *Pandinoides* were described incorrectly because their type species were not designated. According to Article 13(b) of the ICZN, these names are not available under Vachon´s authorship. Fet designated their type species and retained the generic names *P*. (*Pandinoides*) Fet, 1997 with type species *Pandinus militaris* Pocock, 1900 (in the original paper he designated the type species as *Scorpio exitialis* Pocock, 1888 in error and corrected it in a note in Fet, 2000: 468) and *P*. (*Pandinurus*) Fet, 1997

with type species *Scorpio exitialis* Pocock, 1888 (in the original paper he designated the type species as *Pandinus militaris* Pocock, 1900 in error and corrected it in a note in Fet, 2000: 468).

Kovařík (2009: 50–59, 114–133, figs. 284–420) revised the genus *Pandinus* sensu lato and on p. 50 wrote the following: "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. The adult male of *P*. (*Pandinoides*) *platycheles* is not known, which is most regrettable because it is crucial to deciphering its relationship to *P*. (*Pandinoides*) *cavimanus*, a species that has yet another unusual expression of sexual dimorphism."

In the years of 2011–2016, two of the authors (FK and JP) have had an 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 et Lowe, 2012, Kovařík et Mazuch, 2011, 2015, Kovařík et al., 2013, 2015, 2016a, 2016b, and Lowe et Kovařík, 2016). To date, 93 localities have been sampled, 31 of which have yielded specimens of the scorpionid genus *Pandinus* sensu lato. This has proven to be very important for addressing and solving taxonomic problems of *Pandinus* at the subgeneric and generic levels because the fresh material enabled us to perform DNA and karyotype analyses, and the availability of a large series of fresh specimens with original coloration patterns enabled us to better understand intraspecific variability. We found that Vachon´s subgeneric key is partly incorrect because variability in the number of internal chelal trichobothria invalidates the use of this character as a sole criterion for subgeneric or even generic level classification.

Meanwhile, Rossi (2014–2015) published several papers about *Pandinus* sensu lato in which he proposed numerous taxonomic changes at subgeneric and generic levels, but did not advance any new characters to support these changes. He merely copied characters published by Vachon (1974) and Kovařík (2011–2013) and, without phylogenetic analysis, speculated that Vachon was incorrect because his characters were not subgeneric, but generic level characters, and that Kovařík was incorrect because his characters were not specific, but subgeneric level characters, according to Rossi´s opinion. However, Rossi did not introduce any new taxonomic characters, but duplicated entire keys and text published by Vachon and Kovařík word-for-word without any citation of their origins (e.g. see Vachon, 1974: 953 vs. Rossi, 2015a: 14; and Kovařík, 2012: 17 vs. Rossi, 2014a: 20–21). Unfortunately, Rossi did not utilize all of the characters published by Kovařík, but only relied on a reduced set. He assumed that only the pedipalp chelal internal and ventral trichobothria are important for *Pandinus* sensu lato taxonomy, and ignored other important trichobothria, in particular the external and ventral trichobothria of the patella (Figs. 189–203). He did not cite numbers and positions of these other trichobothria, either for newly described species or even for his newly described/ designated subgenera/genera. Rossi´s primary error was in assuming that the numbers and positions of the chelal internal trichobothria are stable and invariant, and using them as main phylogenetic characters to anchor his selected genera, while excluding other characters from analysis that could be more informative about subgeneric/generic relationships. In this paper we demonstrate that the numbers and the positions of chelal internal trichobothria are variable even among siblings (Figs. 250–255, 377–382) and we create a new classification scheme that is supported not only by morphology but also by DNA and karyotype analysis. Our scheme organizes most of the Horn of Africa species into the genus *Pandinurus*, which includes species that Rossi (2015a, b, c, d) confused and placed under three different genera *Pandinurus*, *Pandinoides*, and *Pandinus* (*Pandinoirens*). This confusion in higher level taxonomy led Rossi to describe several new species which are in reality synonyms of species that Rossi had placed under other genera or subgenera (see e.g. our comments under *Pandinurus platycheles*).

Failure to take into account intraspecific variation compounds the problem of the very limited number of specimens upon which Rossi based his taxonomic conclusions. Rossi (2015a) divided *P. viatoris* into *P. viatoris*, *P. bartolozzii*, *P. flagellicauda*, *P. lorenzoi*, and *P. pantinii*; and *P. lowei* into *P. lowei* and *P. pygmaeus*. Three of these species were represented by only one specimen (*P. lorenzoi*, *P. pantinii*, and *P. pygmaeus*); *P. bartolozzii* is represented by two specimens and *P. flagellicauda* by six specimens. For comparative study, Rossi relied on only a single specimen of *P. viatoris* (the holotype) and two specimens of *P. lowei* (holotype and paratype). In total, he studied 14 specimens of this com-

plex and divided them into 7 species according to very minor differences which lie well within the scope of intraspecific variation, including for example the shape of the telson in males (c.f. Kovařík, 2012: 19–20), or represent ontogenetic differences between adults and juveniles. Prendini (2016) also criticized Rossi´s work and synonymized all five of the above cited *Pandinurus* (*Pandipalpus*) species described by Rossi (2015a) with *P. viatoris*. We generally concur with Prendini´s (2016) opinion, except for the taxonomic position of *P. pygmaeus* which is in reality a synonym of *P. lowei* (*Pandinurus* (*Pandipalpus*) *pygmaeus* Rossi, 2015 = *Pandinurus* (*Pandipalpus*) *lowei* Kovařík, 2012, **syn**. **n**.). However, these species do not inhabit the Horn of Africa so they are not the main focus of this paper.

Many of the scorpion specimens studied by Rossi are many decades old and hence susceptible to misplacement of locality labels during curation. However, Rossi apparently places absolute faith in the accuracy of museum labels, leading to some absurd conclusions. For example, the buthid scorpion *Buthus trinacrius* Lourenço & Rossi, 2013 was based on three specimens supposedly collected in Sicily (Italy) in 1870–1880, according to E. Simon´s notes. The authors of this species believed that these specimens were originally from Sicily, where *Buthus* is not known to be endemic. They discounted the likelihood of labeling error or exotic introduction, and speculated that the specimens represent an extinct Sicilian population. However, we note that Simon also described the bothriurid scorpion *Timogenes sumatranus* Simon, 1880 from Sumatra, which is generally accepted to be a labelling error, as this species is endemic to Argentina. Rossi also described *Pandinurus* (*Pandinurus*) *prendinii* Rossi, 2015 from a single juvenile specimen with type locality in the Republic of South Africa (RSA), disregarding the citation of this record by Kovařík (1997: 184) as a "labelling error or introduced specimen". This species is in fact a junior synonym of *Pandinurus sudanicus* (see Prendini, 2016: 57), and *Pandinus* sensu lato does not exist in RSA.

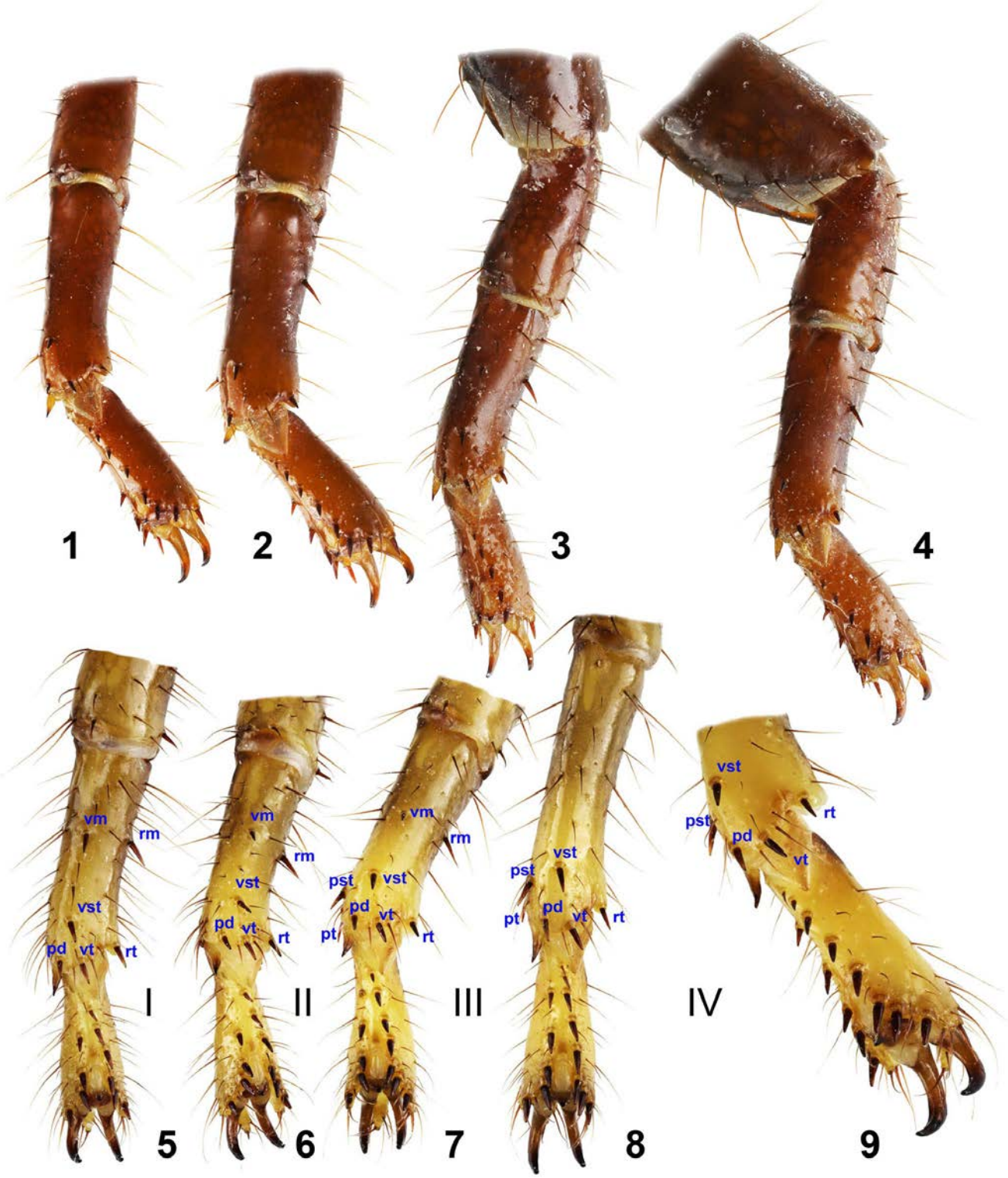
In a similar vein, we comment on another paper regarding this topic that was published in *Arachnides* (Rossi, 2014c). The main aim of that paper was presentation of illogical taxonomic and faunistic information. The author wrongly speculated that photos of specimens that he found on the Internet were of "*Pandinus* cf. *nistriae* (examined by photos)", and this was used to create a distribution map in that, and a subsequent, paper (Rossi, 2015a: 66, fig. 126). The specimens in photos that Rossi incorrectly determined are actually live females that reside in the first author´s collection (see Figs. 27–28), i.e. Kovařík collected and retained the females whose photos Rossi found on the Internet. Both herpetologists Vladimír Trailin and Tomáš Mazuch, whom Rossi mentioned in his paper (Rossi, 2014c: 3) visited the collection locality (Fig. 49) together with the first author on 20th November 2012, and assisted in the collection of scorpions. There is only a single unique locality and collection date, but Rossi erroneously interpreted them as two localities with different coordinates (see Rossi, 2014c: 3, 10, fig. 10). The fact that Rossi published data about specimens that he never studied indicates the superficial style of his work and again shows that his new taxa and taxonomic acts should not be accepted without careful scrutiny. Rossi (2014–2015) in total described 16 *Pandinus* sensu lato species of which 13 are invalid and synonymized either by Prendini (2016), or by us in this paper; two are probably valid but are transferred in this study to another genus; and *Pandinus ulderigoi* Rossi, 2014 needs to be revised. Rossi also described five subgenera of which three are invalid (synonymized by Prendini (2016) and by us in this study), and two are transferred in this study to other taxa.

In 2016, two genera of *Pandinus* sensu lato were revised. Kovařík (2016) revised the genus *Pandinops* Birula, 1913 and Prendini (2016) revised the genus *Pandinoides* Fet, 1997 and synonymized ten species that were described or reinstated by Lourenço and Rossi. In 2016, Rossi also announced via an Internet website publication of a book on the genus *Pandinoides* Fet, 1997 that contained descriptions of 10 new species, as a supplement of *Arachnida*, *Rivista Aracnologica Italiana*. However, this book is not yet publically accessible, and no library has been found that makes it available. Therefore, according to the rules of ICZN, the book has not yet been published.

Methods, Material & Abbreviations

Nomenclature and measurements follow Stahnke (1971), Kovařík (2009), and Kovařík & Ojanguren Affilastro (2013), except for trichobothriotaxy (Vachon, 1974). The ‘lobe’ of the pedipalp chela refers to the dorsointernal expansion of the manus that is commonly developed in scorpionids. The ‘inclined anteroventral surface’ of tarsomere II refers to the prolateral lateroapical margin of the segment, where the prolateral series of spiniform setae extends. Hemispermatophore terminology follows Kovařík et al. (2016b). 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.

We 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.



Figures 1–9: Spiniform setation of tarsomeres of right legs I–IV, ventral or retrolateral aspect. **Figures 1–4:** *Pandiborellius awashensis*, female paratype. **Figures 5–9:** *Pandinurus trailini*, male topotype. Abbreviations: *vm*, ventral medial; *vst*, ventral subterminal; *vt*, ventral terminal; *pd*, prolateral distal; *pt*, prolateral terminal; *pst*, prolateral subterminal; *rm*, retrolateral medial; *rt*, retrolateral terminal.

Figures 10–22: Spiniform setation of tarsomeres II of right leg IV, retrolateral aspect. **Figure 10**. *Pandinurus citernii*, male from locality 14EF. **Figure 11**. *Pandinurus exitialis*, male from locality 16EA. **Figure 12**. *Pandinurus intermedius*, male from locality 14EH. **Figure 13**. *Pandinurus mazuchi*, male paratype. **Figure 14**. *Pandinurus pallidus*, male from Somalia, Jubbada Hoose Province, Bilis Quoqaani env. **Figure 15**. *Pandinurus phillipsii*, male from Somaliland, 15 km N of Sheikh, Goolis Mts., 09°58.927'N 45°10.377'E. **Figure 16**. *Pandinurus smithi*, male from locality 11EV. **Figure 17**. *Pandinurus trailini*, male from locality 14EN. **Figure 18**. *Pandinurus gregoryi*, male from Kenya, Mt. Kenya. **Figure 19**. *Pandiborellius lanzai*, male topotype. **Figure 20**. *Pandiborellius meidensis*, female holotype. **Figure 21**. *Pandiborellius nistriae*, male holotype. **Figure 22**. *Pandinus imperator*, male from Ghana.

All collected material was preserved in 80% ethanol or is still alive. The live specimens contributed to the data we cite about trichobothrial patterns, pectinal tooth numbers and tarsomere spiniform seta formulae according to their exuviae (Figs. 181–184, 250–255, 377–382) which are deposited mounted dry in FKCP collection.

Specimens of *Pandinus imperator* used for this study were imported legally from Ghana in 2007 (permission no. 07CZ018316 of Ministry of the Environment of the Czech Republic).

Specimen Depositories: BMNH (The Natural History Museum, London, United Kingdom); FKCP (František Kovařík, private collection, Prague, Czech Republic); HNHM (Hungarian Natural History Museum, Budapest, Hungary); MCSN (Museo Civico de Storia Naturale "Giacomo Doria", Genoa, Italy); MZUF (Museo Zoologico de "La Specola", Firenze, Italy); ZMHB (Museum für Naturkunde der Humboldt-Universität, Berlin, Germany); ZMUH (Zoologisches Institut und Zoologisches Museum, Universität Hamburg, Germany); and ZSMC (Bavarian State Collection of Zoology, Munich, Germany).

Spiniform seta terminology 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 (Santibáñez López et. al., 2013a). *Spiniform seta terminology of tarsomere II of legs*: numeric formulae specify ranges of setal counts in the

format: 'retrolateral/prolateral' and may be listed in ascending order from leg I to leg IV. *Morphometrics*: D, depth; L, length; W, width.

Systematics

Family Scorpionidae Latreille, 1802
Subfamily Scorpioninae Latreille, 1802

KEY TO GENERA OF SCORPIONINAE

1. Pedipalp patella with 3 ventral trichobothria. 2
– Pedipalp patella with 22–59 ventral trichobothria (Fig. 121). 4

2. Stridulation organ located on pedipalp coxae and first pair of legs ..... ***Heterometrus*** Ehrenberg, 1828
– Stridulation organ absent 3

3. Pedipalp patella with 19 trichobothria, 13 of them on external surface. ..... ***Scorpio*** Linné, 1758
– Pedipalp patella with more than 19 trichobothria, always more than 13 on external surface ..... ***Opistophthalmus*** C. L. Koch, 1837

4. Internal trichobothria on chela number 6–8. ..... ***Pandinops*** Birula, 1913
– Internal trichobothria on chela number 1–5. 5

5. Spiniform formula of tarsomere II of 4th leg = 6-9/4-6 (Figs. 10–21); *Pandiborellius percivali* from Yemen can have formula 4-5/3. Male has slightly or strongly more pronounced median lobe on pedipalp movable finger than female (Figs. 126–167); other types of sexual dimorphism in shape of pedipalp are not present. 6
– Spiniform formula of tarsomere II of 4th leg = 4-5/2-3 (Fig. 22); does not occur in Yemen. Male has not more pronounced median lobe on pedipalp movable finger than female. 7

6. Patella externally with 3 or 4 trichobothria in *est* series (Figs. 194–203). Male has more strongly pronounced median lobe on pedipalp movable finger than female (Figs. 144–167). Dentate margin of pedipalp chela movable and fixed fingers with distinct granules in two parallel rows present in distal half of fingers (Figs. 185, 187). Proximal half of fingers almost without granules in males (Figs. 185, 187) and with distinct granules in a row in juveniles (Fig. 183) and females. These granules do not cover whole pronounced median lobe in males, usually are represented by only several granules on top (Fig. 185). Dorsoexternal carinae on pedipalp chela absent (Figs. 144–167). ..... ***Pandinurus*** Fet, 1997
– Patella externally with 1 or 2 trichobothria in *est* series (Figs. 189–193). Male has usually slightly more pronounced tooth on pedipalp movable finger than female (Figs. 126–143). Dentate margin of pedipalp chela movable and fixed fingers with distinct granules in a row which could be divided into 5–6 rows present in whole finger in both sexes and juveniles (Figs. 186, 188). These granules cover whole pronounced median lobe in males. Dorsoexternal carinae on pedipalp chela indicated or developed (Figs. 126–143). ..... ***Pandiborellius*** Rossi, 2015 **stat**. **n**.

7. Internal trichobothria on chela number 4–5. Adult male with a marked concave depression in the retrodorsal surface of the pedipalp chela manus. ..... ***Pandinoides*** Fet, 1997
– Internal trichobothria on chela number 2–3. Adult male without concave depression in the retrodorsal surface of the pedipalp chela manus. 8

8. Adults without sexual dimorphism in shape of pedipalp segments. 9
– Male with pedipalp chela, femur and patella narrower and longer than in female. ..... ***Pandinus*** **(*Pandinopalpus*)** Rossi, 2015 **stat**. **n**.

9. Internal trichobothria on chela number 3, ventral trichobothria on chela number 8–12. ..... ***Pandinus*** **(*Pandinus*)** Thorell, 1876
– Internal trichobothria on chela number 2, ventral trichobothria on chela number 4. ..... ***Pandinus*** **(*Pandinopsis*)** Vachon, 1974

Orthobothriotaxic Type C Pattern in *Pandinus* sensu lato

Below we discuss the 48 orthobothriotaxic trichobothria found in *Pandinus* sensu lato.

Chela (with 26 orthobothriotaxic trichobothria): trichobothria *ib–it* are positioned on palm at fixed finger juncture; *db–dt* are located more distally on the fixed finger than *eb–et*, *db* aligned with *esb*; *Db–Dt* alignment includes most of the palm, *Db* located quite basal and *Dt* positioned close to or adjacent to the *Et* series; Et_1–Et_5 are located on the extreme distal aspect of the palm, Et_2–Et_5 aligned roughly in a straight line below the movable finger juncture and Et_1 positioned on ventral surface just external to the distal aspect of the ventromedian carina and adjacent to trichobothrium V_1; *Est* is positioned distally, close to the *Et* series; *Eb* series is not aligned in a straight line, Eb_2 is located slightly distal of the other two trichobothria; petite trichobothrium *Esb* is located above Eb_2 and Eb_1; V_1 and V_2 are positioned in close proximity, the distance between V_2 and V_3 is at least twice as great as that between V_1 and V_2; V_4 is located basally, roughly adjacent to trichobothrium *Esb*. Tricho-

Figures 23–24: *Pandiborellius awashensis*, female paratype in vivo habitus in Ethiopia, locality 11EW (23) and the locality (24).

bothria *Esb* and Et_4 are petite. Patella (with 19 orthobothriotaxic trichobothria): trichobothrium d_2 is located on the internal surface along with *i*, d_1 is positioned on the dorsal surface; et_1–et_3 form a shallow V-pattern, et_1 and et_3 roughly aligned distally; *est* is positioned closer to et_1–et_3 than em_1–em_2; em_1–em_2 slants distally; esb_1–esb_2 is positioned equidistant between em_1–em_2 and eb_1–eb_5; eb_1 positioned proximal to eb_2–eb_5 which are roughly aligned parallel; based on the presence of *accessory* trichobothria on the ventral surface, trichobothria v_1–v_3 are not distinguishable. Trichobothrium esb_2 is petite. Femur (with three orthobothriotaxic trichobothria): trichobothrium *i* is positioned on the internal surface; *d* is located proximally to *i*, the two forming a V-pattern with the most distal trichobothrium *e*.

CHECK LIST OF *PANDINUS* SENSU LATO GENERA AND SPECIES

PANDIBORELLIUS Rossi, 2015 **stat**. **n**.
= *Pandinurus* (*Pandipavesius*) Rossi, 2015 **syn**. **n**.
= *Pandinurus* (*Pandicaporiaccous*) Rossi, 2015 (syn. by Prendini, 2016: 58)
Pandiborellius arabicus (Kraepelin, 1894)
Pandiborellius awashensis (Kovařík, 2012) **comb**. **n**.
Pandiborellius igdu **sp**. **n**.
Pandiborellius insularis **sp**. **n**.
Pandiborellius lanzai (Rossi, 2015) **comb**. **n**.
Pandiborellius magrettii (Borelli, 1901) **comb**. **n**.
= *Brotheas hirsutus* L. Koch, 1875 (syn. by Kraepelin, 1894: 70).
= *Scorpio africanus subtypicus* Kraepelin, 1894 (syn. by Kovařík, 2003: 151).
= *Pandinurus* (*Pandiborellius*) *sabbadinii* Rossi, 2015 **syn**. **n**.
Pandiborellius meidensis (Karsch, 1879) **comb**. **n**.
Pandiborellius nistriae (Rossi, 2014) **comb**. **n**.
Pandiborellius percivali (Pocock, 1902) **comb**. **n**.
= *Pandinurus* (*Pandicaporiaccous*) *janae* Rossi, 2015 (syn. by Prendini, 2016: 58)
Pandiborellius somalilandus (Kovařík, 2012) **comb**. **n**.

PANDINOIDES Fet, 1997
Pandinoides cavimanus (Pocock, 1888)
Pandinoides duffmackayi Prendini, 2016
Pandinus militaris Pocock, 1900

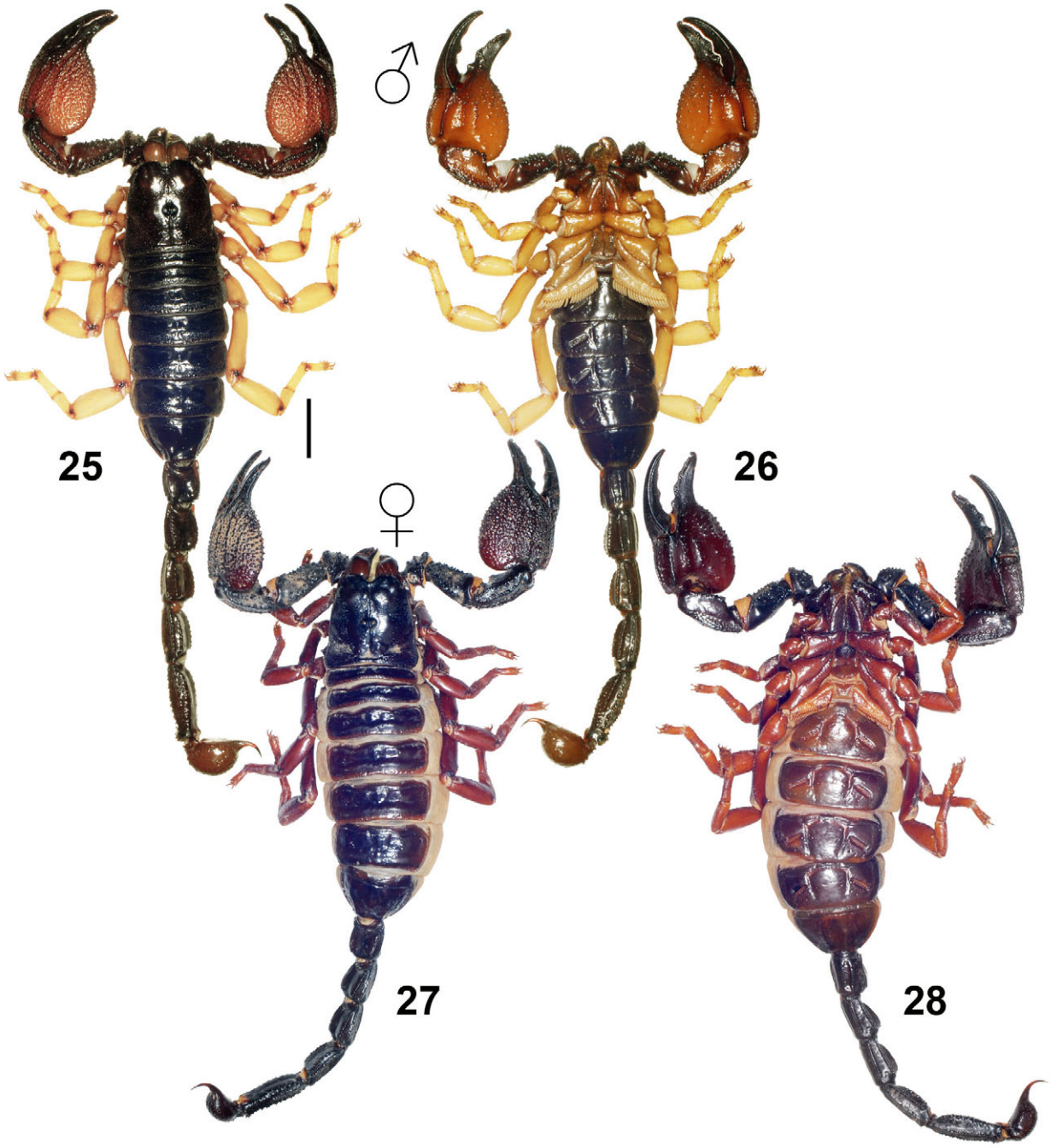
PANDINOPS Birula, 1913
Pandinops bellicosus (L. Koch, 1875)
Pandinops colei (Pocock, 1896)
Pandinops eritreaensis Kovařík, 2003
Pandinops friedrichi Kovařík, 2016
Pandinops hawkeri Pocock, 1900
= *Pandinus pugilator* Pocock, 1900
Pandinops peeli Pocock, 1900
Pandinops pococki Kovařík, 2000
Pandinops turieli Kovařík, 2016

PANDINURUS Fet, 1997
= *Pandinus* (*Pandinoirens*) Rossi, 2015 **syn**. **n**.
Pandinurus afar **sp**. **n**.
Pandinurus citernii (Borelli, 1919) **comb**. **n**.
Pandinurus exitialis (Pocock, 1888)
Pandinurus gregoryi (Pocock, 1896)
Pandinurus intermedius (Borelli, 1919) **comb**. **n**.
Pandinurus mazuchi (Kovařík, 2011) **comb**. **n**.
Pandinurus oromo **sp**. **n**.
Pandinurus pallidus (Kraepelin, 1894)
= *Pandinurus* (*Pandinurus*) *cianferonii* Rossi, 2015 **syn**. **n**.
Pandinurus phillipsii (Pocock, 1896) **comb**. **n**.
Pandinurus platycheles (Werner, 1916)
= *Pandinus* (*Pandinoirens*) *riccardoi* Rossi, 2015 **syn**. **n**.
= *Pandinus* (*Pandinoirens*) *bottegoi* Rossi, 2015 **syn**. **n**.
Pandinurus smithi (Pocock, 1897) **comb**. **n**.
Pandinurus sudanicus (Hirst, 1911)
= *Pandinus* (*Pandinurus*) *vachoni* Rossi, 2014 **syn**. **n**.
= *Pandinurus* (*Pandinurus*) *prendinii* Rossi, 2015 (syn. by Prendini, 2016: 57)
Pandinurus trailini (Kovařík, 2013) **comb**. **n**.

PANDINUS Thorell, 1876
***PANDINUS* (*PANDINUS*)** Thorell, 1876
Pandinus gambiensis Pocock, 1899
Pandinus imperator (C. L. Koch, 1841)
= *Heterometrus roeseli* Simon, 1872 (syn. by Thorell, 1893: 377 and Prendini, 2016: 53)
= *Pandinus africanus* Thorell, 1876 (syn. by Fet, 2000: 466)
= *Scorpio simoni* Becker, 1880 (syn. by Thorell, 1893: 377)
= *Pandinus camerounensis* Lourenco, 2014 (syn. by Prendini, 2016: 53)
Pandinus ugandaensis Kovařík, 2011
Pandinus ulderigoi Rossi, 2014

***PANDINUS* (*PANDINOPSIS*)** Vachon, 1974
Pandinus dictator (Pocock, 1888)

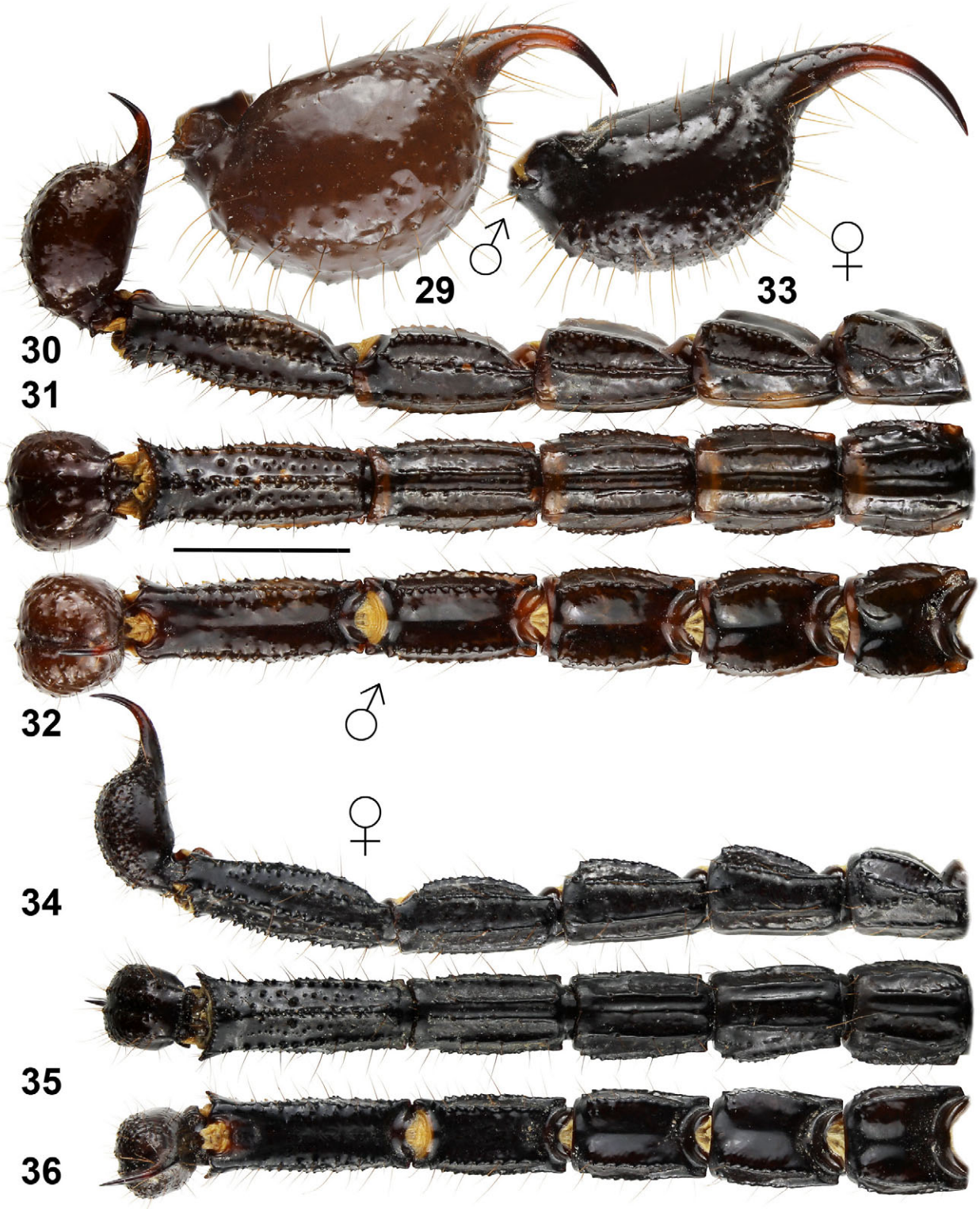
***PANDINUS* (*PANDIPALPUS*)** Rossi, 2015 **stat**. **n**.
Pandinus lowei Kovařík, 2012 **comb**. **n**.
= *Pandinurus* (*Pandipalpus*) *pygmaeus* Rossi, 2015 **syn**. **n**.
Pandinus viatoris (Pocock, 1890) **comb**. **n**.
= *Pandinurus* (*Pandipalpus*) *bartolozii* Rossi, 2015 (syn. by Prendini, 2016: 59)
= *Pandinurus* (*Pandipalpus*) *flagellicauda* Rossi, 2015 (syn. by Prendini, 2016: 59)
= *Pandinurus* (*Pandipalpus*) *lorenzoi* Rossi, 2015 (syn. by Prendini, 2016: 59)
= *Pandinurus* (*Pandipalpus*) *pantinii* Rossi, 2015 (syn. by Prendini, 2016: 59)



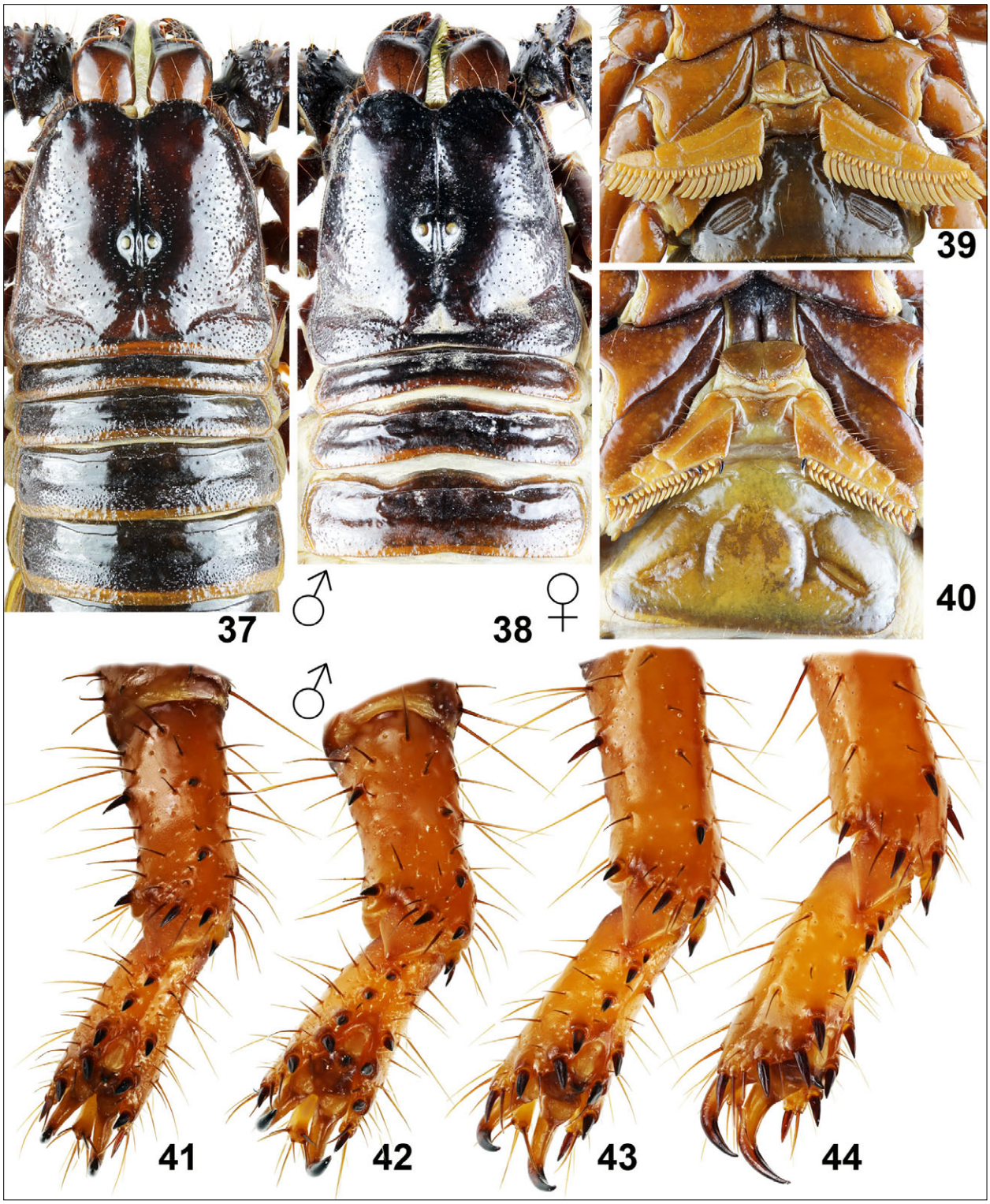
Figures 25–28: *Pandiborellius igdu* **sp**. **n**. **Figures 25–26**. Male holotype in dorsal (25) and ventral (26) aspects. **Figures 27–28**. Female from locality 12EK in dorsal (27) and ventral (28) aspects. Scale bar: 10 mm. Figures 25–26 show the original color of the specimen and figures 27–28 show color changing after two years in 80 % ethyl alcohol.

COMMENTS ON CHECK LIST OF GENERA AND SPECIES. The taxonomic positions at the generic level of the genera *Pandiborellius* Rossi, 2015, *Pandinoides* Fet, 1997, *Pandinops* Birula, 1913, *Pandinurus* Fet, 1997, and *Pandinus* (*Pandinus*) Thorell, 1876 have been supported by DNA and karyotype analysis (see Plíšková et al., in preparation). Subgenera *Pandinus* (*Pandinopsis*) Vachon, 1974 and *Pandinus* (*Pandipalpus*) Rossi, 2015 **stat**. **n**. have not yet been analyzed through DNA and karyotypes, and are differentiated from *Pandinus* sensu stricto only morphologically according to the trichobothrial pattern (*Pandinopsis*) and sexual dimorphism (*Pandipalpus*).

Pandinus (*Pandinurus*) *vachoni* Rossi, 2014 was based on a juvenile from Chad without an exact locality which Rossi initially cited as a subadult male (Rossi,



Figures 29–36: *Pandiborellius igdu* **sp**. **n**. **Figures 29**–**32**. Male holotype, telson lateral (29) and metasoma and telson lateral (30) ventral (31) and dorsal (32) views. **Figures 33**–**36**. Female paratype from locality 12EK, telson lateral (33) and metasoma and telson lateral (34) ventral (35) and dorsal (36) views.



Figures 37–44: *Pandiborellius igdu* **sp**. **n**. **Figures 37, 39, 41–44**. Male holotype, chelicerae, carapace and tergites I–IV (37), coxosternal area (39), right legs I–IV, ventral or retrolateral aspect (41–44). **Figures 38, 40**. Female paratype from locality 12EK, chelicerae, carapace and tergites I–III (38) and coxosternal area and sternite III (40).

2014b: 8) and later incorrectly as a male (Rossi, 2015b) and in that paper Rossi also transferred the species incorrectly to the subgenus *Pandiborellius*. Chad is outside the range of distribution of genus *Pandiborellius*, but it is near the localities of *Pandinurus sudanicus* in Sudan. Rossi (2014b) differentiated *P. vachoni* from *P.*

sudanicus according to a seta on the inclined anteroventral surface of tarsomere II of legs which could be defined as a "seta" in *P. sudanicus* or "spiniform seta" or "spine" in *P. vachoni*. In reality we found that this character displays intraspecific variability in three *Pandinurus* species (see Figs. 15–17 and comments under "Spiniform formula of tarsomeres of legs in Horn of Africa *Pandinurus*"). We examined the juvenile holotype of *Pandinus* (*Pandinurus*) *vachoni* Rossi, 2014 and we are convinced that it is a synonym of *Pandinurus sudanicus* (Hirst, 1911), **syn**. **n**.

Pandiborellius Rossi, 2015 **stat**. **n**.
(Figs. 1–4, 19–143, 168–174, 182, 184, 186, 188–193, 395–396, Tables 1–2)

Pandinus (*Pandinurus*) (in part): Vachon, 1974: 953; Fet, 2000: 470–473 (complete reference list until 2000); Rossi, 2014a: 11–15; Rossi, 2014b: 7–13.
Pandinurus: Rossi, 2015a: 13–66 (in part).
Pandinurus (*Pandiborellius*) Rossi, 2015a: 31–35, figs. 106–123 (in part); Rossi, 2015b: 7–32, figs. 1–21; Prendini, 2016: 58–59.
= *Pandinurus* (*Pandicaporiaccous*) Rossi, 2015a: 29–31, figs. 67–73 (syn. by Prendini, 2016: 58).
= *Pandinurus* (*Pandipavesius*) Rossi, 2015d, 43–44. **Syn**. **n**.

TYPE SPECIES. *Pandinus magrettii* Borelli, 1901.

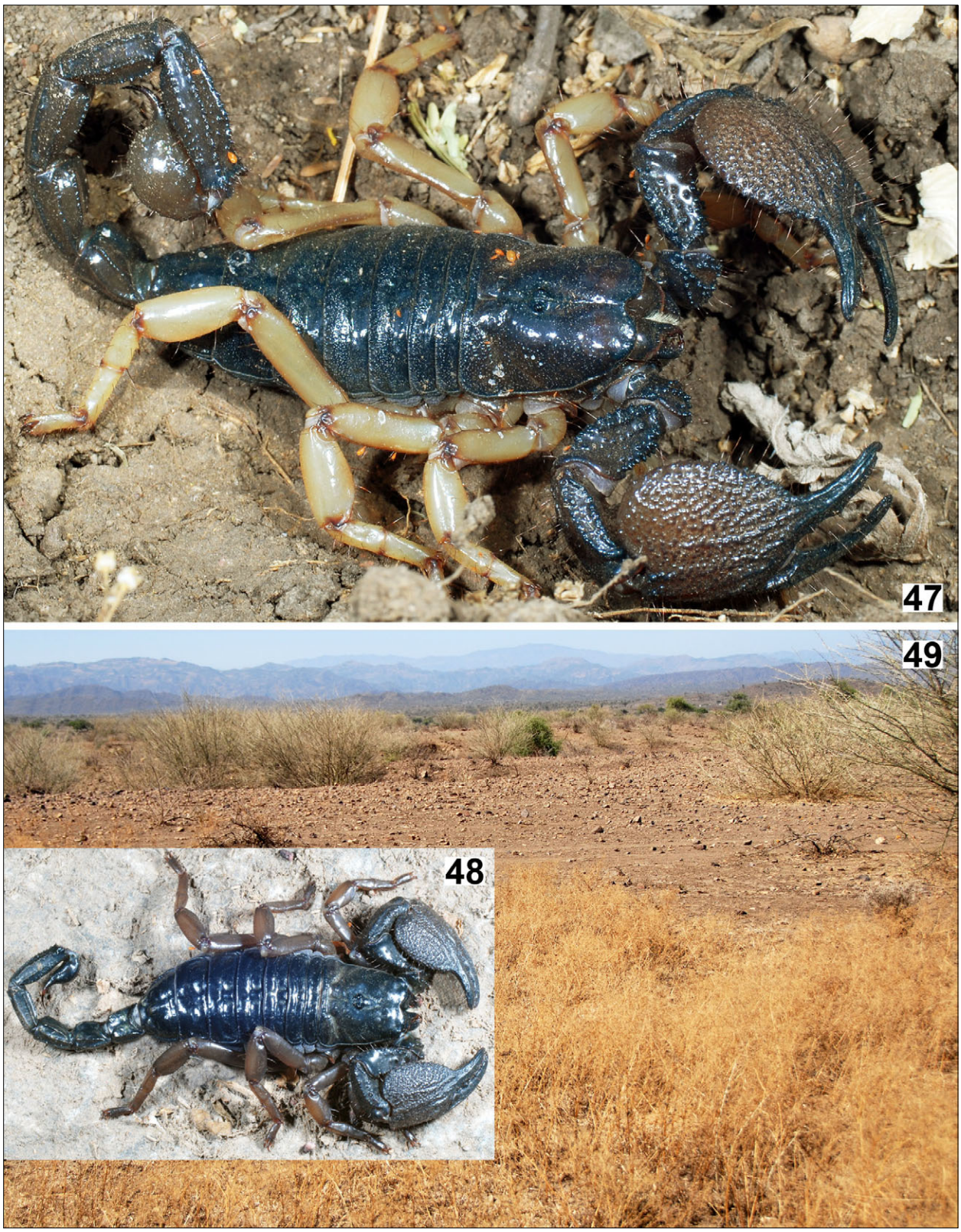
DIAGNOSIS. Total length 83–145 mm. External trichobothria on patella number 13–19 (4–7 *eb*, 3–7 *esb*, 2 *em*, 1–2 *est*, 3 *et*); ventral trichobothria on patella number 31–54; accessory external trichobothrium *ea* on chela absent, internal trichobothria on chela number 1–2; ventral trichobothria on chela number 6–15. Pedipalp chela manus lobiform. Dorsoexternal carinae on pedipalp chela indicated or developed. Male usually has more pronounced median lobe on movable finger of pedipalp and larger telson than female. Pectines with fulcra. Pectinal teeth number 18–25. Sternum subpentagonal, longer than wide. Carapace without distinct carinae. Dentate margin of pedipalp chela movable and fixed fingers with distinct granules in a row which could be divided into 5–6 rows present in almost whole finger in both sexes. These granules cover whole pronounced median lobe in males. 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 present. Telson without subaculear tubercle. Legs with one pedal spur, retrolateral spur absent.

Spiniform formula of tarsomeres of legs of *Pandiborellius* (Figs. 1–4).
Tarsomere I. There is greater variability than in the genus *Pandinurus,* only *pd* and *vst* are present on legs I–IV in all studied specimens; *vt* is sometimes missing (or replaced by seta) in *P. awashensis*; *rt* is sometimes replaced by seta on leg IV as intraspecific variability in *P. awashensis*, *P. meidensis*, and *P. magrettii*; presence or absence of *pt* and *pst* on all legs is common as intraspecific variability in *P. awashensis*, *P. igdu* **sp**. **n**., *P. insularis* **sp**. **n**., *P. lanzai*, *P. meidensis*, *P. somalilandus*, and *P. magrettii*; *vm* and *rm* are present on legs I–III, but both spina are often missing or replaced by seta on leg III as intraspecific variability in *P. igdu* **sp**. **n**., *P. insularis* **sp**. **n**., *P. magrettii* and on legs I–III in *P. awashensis* and *P. meidensis*.
Tarsomere II. Spiniform formula is 6-8/4-7: 6-9/4-6: 6-9/4-7: 6-9/4-7; tarsomere II with 3 spiniform setae on inclined anteroventral surface in all *Pandiborellius* species. However, *P. percivali* occasionally has the last spina transformed to "spiniform seta" which can indicate not well developed spina and change their spiniform formula to 4-5/3 on all legs.

COMMENTS. Rossi (2015a: 31–35) described the subgenus *Pandinurus* (*Pandiborellius*) but defined no characters to support this taxonomic act. He differentiated this subgenus in a key from other *Pandinurus* species according to "tarsomere II of legs with 3 spines on inclined anteroventral surface". In reality, we also found this same character in some species of the genus *Pandinurus* sensu stricto, and this character is not stable (Prendini, 2016; and this study). However, we have found that the genus *Pandiborellius* **stat**. **n**. is valid, and have defined solid diagnostic characters that allow its differentation from the genus *Pandinurus*, primarily involving the dentate margin of the pedipalp chela movable finger and the number of patellar external trichobothria in *est* series (see generic and subgeneric key and Figs. 189–193 versus 194–203).

Rossi (2015d, 43–44) isolated three species from the subgenus *Pandiborellius* by their pronounced sexual dimorphism in the tooth of the movable finger of the male pedipalp and placed them in a different subgenus, *Pandipavesius*, with type species *Pandinus* (*Pandipavesius*) *nistriae* Rossi, 2014. He speculated that the sexual dimorphism is also present in *P. meidensis*, whose male is unknown and ignored the fact that all other *Pandiborellius* species (Figs. 126–143) display the same sexual dimorphism. The sister species *P. nistriae* (type species of the subgenus *Pandipavesius*) and *P. magrettii* (type species of the subgenus *Pandiborellius*) both have the same sexual dimorphism in the shape of the median lobe of the movable finger of the pedipalp which can be more developed in some males within the population. It is evident that subgenera *Pandiborellius* and *Pandipavesius* are synonyms (more in comments under *P. nistriae*).

Figures 45–46: *Pandiborellius igdu* **sp**. **n**., in vivo habitus. Male and its exuvia (45) and female (46) in the type locality.



Figures 47–49: *Pandiborellius igdu* **sp. n. Figures 47–48**. Male (47) and juvenile (48) in vivo habitus in the type locality. **Figures 49**. Ethiopia, locality 14EK, the type locality.

Pandiborellius awashensis (Kovařík, 2012) **comb**. **n**.
(Figs. 1–4, 23–24, 94, 126–129, 170–171, 189, 396)

Pandinus (*Pandinurus*) *awashensis* Kovařík, 2012: 4–9, 17–20, figs. 9–28, 60–62, 64; Prendini, 2016: 52.
Pandinurus (*Pandiborellius*) *awashensis*: Rossi, 2015a: 32.

TYPE LOCALITY AND TYPE REPOSITORY. Ethiopia, Awash, Awash N. P., 08°52'35.15"N 40°05'39.8"E, 981 m a.s.l.; FKCP.

TYPE MATERIAL EXAMINED. Ethiopia, Awash, Awash N. P., 08°52'35.15"N 40°05'39.8"E, 981 m a.s.l., 20.VII. 2011 (figs. 25–26 in Kovařík, 2012: 8), 1♂ (holotype, Fig. 94, 126–127, 170, 189, and figs. 9–13, 19–21, 61 in Kovařík, 2012: 4–5, 18), leg. F. Kovařík; Awash, 09°00'34.5"N 40°17'56.5"E, 1012 m. a.s.l. (Locality No. **11EW**, Fig. 24 and figs. 27–28 in Kovařík, 2012: 8), 19.VII.2011, 1♀ (alotypic paratype, Figs. 1–4, 23, 129, 171 and figs. 14–18, 22–24, 60 in Kovařík, 2012: 4, 5, 7, 18) 5juvs. (paratypes, ecdysis 31.VII.2012 and 5.IX. 2013), leg. F. Kovařík and P. Novák. All types are in the author´s collection (FKCP).

ADDITIONAL MATERIAL EXAMINED. **Ethiopia**, Awash, 09°00'34.5"N 40°17'56.5"E, 1012 m. a.s.l. (Locality No. **12EW**), 25.XI.2012, 1im.♂ (DNA No. 661), leg. F. Kovařík, FKCP.

EMENDED DIAGNOSIS. Total length 83–110 mm. Color uniformly reddish black, only legs, telson and chela reddish brown, slightly lighter-colored than body. Chelicerae brown, reticulate, with black fingers and anterior margins. Carapace lacking carinae and granulated. External trichobothria on patella number 14–15 (5 *eb*, 3–4 *esb*, 2 *em*, 1 *est*, 3 *et*); ventral trichobothria on patella number 32–37; internal trichobothria on chela number 2, ventral trichobothria on chela number 9–11. Pedipalp chela densely hirsute. Pedipalp chela dorsally with evenly sized conspicuous granules (Figs. 126–129). Dorsoexternal surface of chela with four carinae present or indicated. Chela internally with two longitudinal carinae covered by granules. Chela of male length/ width ratio 2.1. Pectinal teeth number 18–22 in both sexes. Dorsal carinae on first through fourth metasomal segments granulate mainly on fourth segment, usually with smooth granules without discrete denticles. Spiniform formula of tarsomere II = 6-8/5: 7-8/5: 7-8/5: 7-8/5. Tarsomere II with 3 spiniform setae on inclined anteroventral surface. Length to width ratio of male 5th metasomal segment = 2.92. Male has only slightly more pronounced median lobe on movable finger of pedipalp and larger telson than female.

Pandiborellius igdu **sp**. **n**.
(Figs. 25–49, 77–81, 87–88, 138–141, 173–174, 396, Table 1)
http://www.zoobank.org/urn:lsid:zoobank.org:act:79257EA9-A0E0-4CE0-899D-B0A639167994

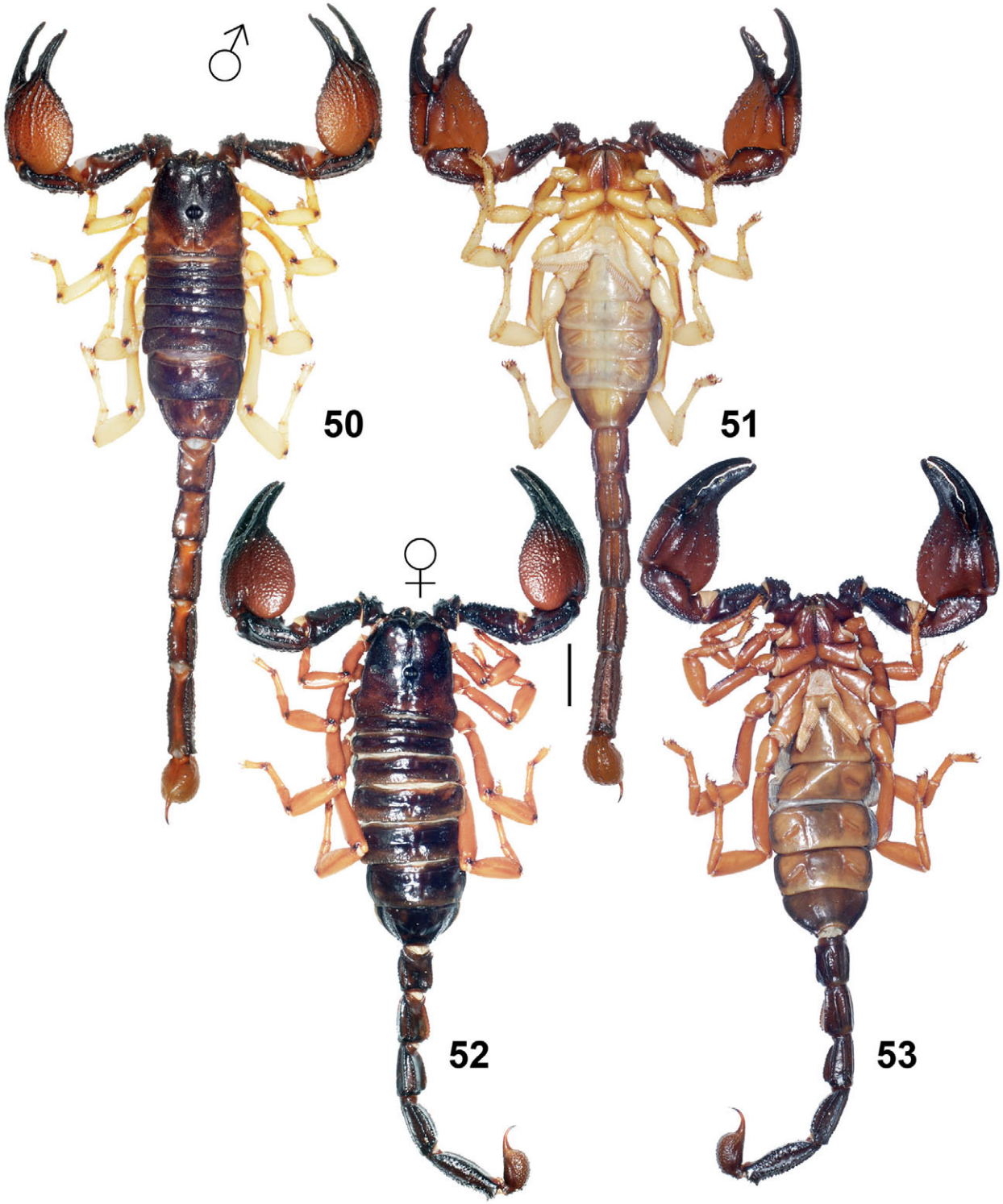
Pandinus (*Pandinurus*) *nistriae*: Rossi, 2014c: 3–5, fig. 10 (in part, see introduction).
Pandinurus (*Pandiborellius*) *nistriae*: Rossi, 2015a: 34 (in part); Rossi, 2015b: 9–10 (in part, see introduction).

TYPE LOCALITY AND TYPE REPOSITORY. Ethiopia, Afar State, 11°39'46"N 39°57'21"E, 1030 m a.s.l.; FKCP.

TYPE MATERIAL. **Ethiopia**, Afar State, 13°36'05"N 38°08'46"E, 1412 m a.s.l. (Locality No. **12EE**), 16.XI.2012, 1♀ (paratype), leg. F. Kovařík, FKCP; 11°39'46"N 39°57'21"E, 1030 m a.s.l. (Locality No. **12EK**, Fig. 49), 20.XI.2012, 2♂(holotype, Figs. 25–26, 29–32, 37, 39, 41–44, 79–81, 87–88, 138–139, 173, and paratype, DNA No. 495) 2♀(paratypes, Figs. 27–28, 33–36, 38, 40, 46, 77–78, 140–141, 174) 1♀ (paratype, ecdysis 27.VIII.2013, 26.VII.2015), leg. F. Kovařík, T. Mazuch, et P. Novák, FKCP.

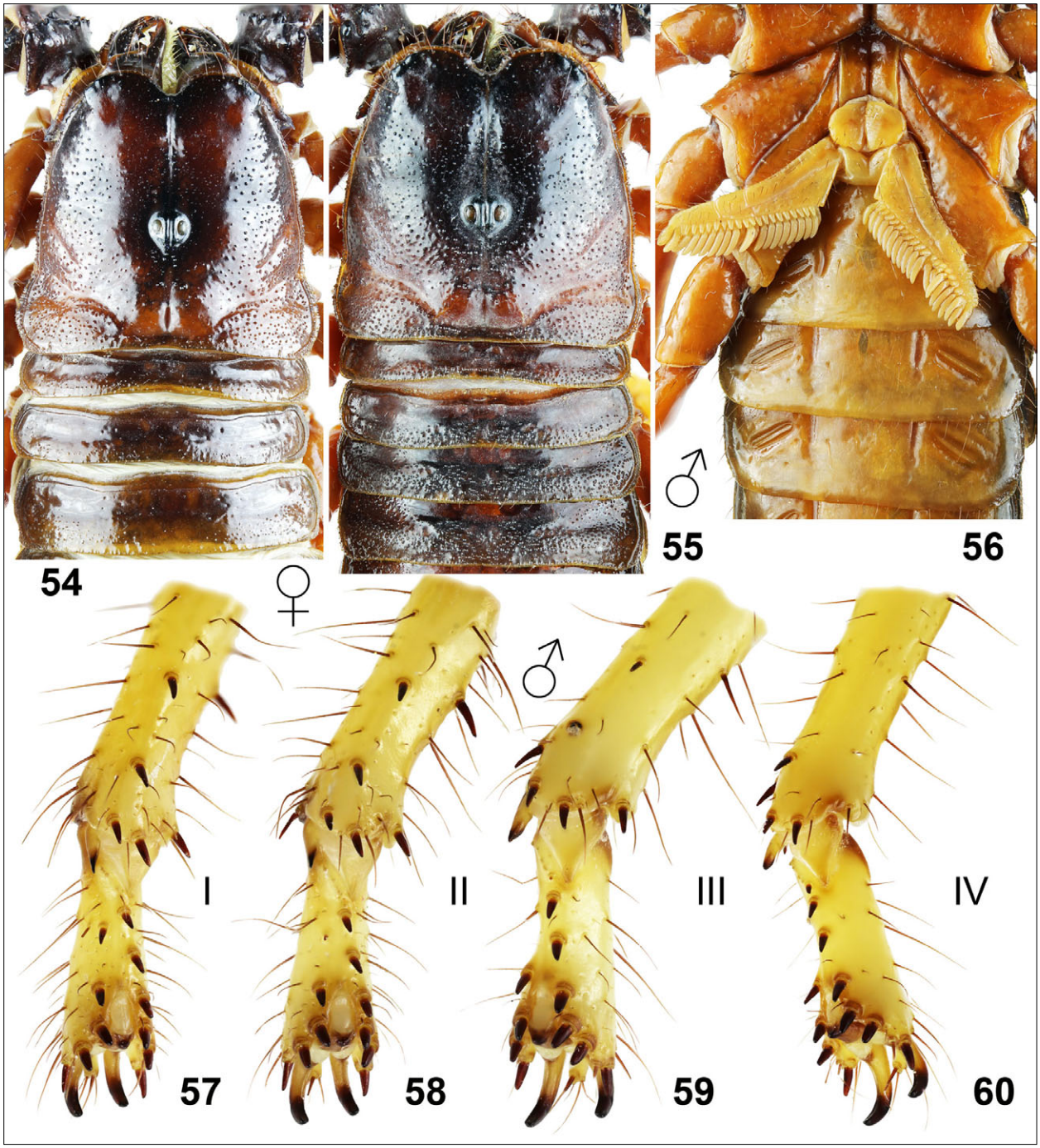
ETYMOLOGY. *Igdu* (masculine) means scorpion in Afar language, which is part of the Cushitic branch of the Aro-Asiatic family. For more information about Afar people and etymology of *Pandinurus afar* **sp**. **n**., see below.

DIAGNOSIS. Total length 95–125 mm. Color uniformly reddish brown to black; legs bright yellow; chela yellow to orange; telson yellowish brown to black. Chelicerae yellowish brown, reticulate, with black fingers and anterior margin. Carapace lacking carinae and sparsely granulated. External trichobothria on patella number 16–17 (5 *eb*, 4–5 *esb*, 2 *em*, 1–2 *est*, 3 *et*); ventral trichobothria on patella number 35–41; internal trichobothria on chela number 2, ventral trichobothria on chela number 8–10. Pedipalp chela rather densely hirsute. Pedipalp chela dorsally with evenly sized conspicuous granules. Dorsoexternal surface of chela with four carinae indicated only. Chela internally with two longitudinal carinae covered by several granules. Chela of male length/ width ratio is 1.62–1.75. Pectinal teeth number 19–22 in both sexes. Dorsal carinae on metasomal segments I–IV granulate mainly on fourth segment with usually smooth granules without discrete denticles. Spiniform formula of tarsomere II = 6/4-5: 6-7/4-5: 6-7/4-5: 7/5. Tarsomere II with 3 spiniform setae on inclined anteroventral surface. Length to width ratio of male 5th metasomal segment = 1.90–2.60. Male has slightly more pronounced median lobe on movable finger of pedipalp and larger telson than female.



Figures 50–53: *Pandiborellius insularis* **sp**. **n**. **Figures 50**–**51**. Male holotype in dorsal (50) and ventral (51) aspects. **Figures 52**–**53**. Female paratype in dorsal (52) and ventral (53) aspects. Scale bar: 10 mm.

DESCRIPTION. The adults are 95–125 mm long. The habitus is shown in Figs. 25–28. For position and distribution of trichobothria of pedipalps see Figs. 79–81. External trichobothria on the patella number 16–17 (5 *eb*, 4–5 *esb*, 2 *em*, 1–2 *est*, 3 *et*); accessory external trichobothrium *ea* on chela absent, ventral trichobothria on patella number 35–41; internal trichobothria on chela number 2, ventral trichobothria on chela number 8–10.



Figures 54–60: *Pandiborellius insularis* **sp**. **n**. **Figure 54**. Female paratype, chelicerae, carapace and tergites I–III. **Figures 55–60**. Male holotype, chelicerae, carapace and tergites I–IV (55), coxosternal area and sternites III–V (56), right legs I–IV, ventral or retrolateral aspects (57–60).

Coloration (Figs. 47). The base color is uniformly reddish brown to black, legs are bright yellow, pedipalp chela is yellow to orange, telson is yellowish brown to black. The chelicerae are yellowish brown, reticulate, with black fingers and anterior margin.

Carapace and mesosoma (Figs. 37–38). The entire carapace lacking carinae, sparsely covered by fine granules densely along posterior margin. 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. The pectinal tooth count is 19–22 in both sexes (males 1 x 20, 3 x 21, females 2 x 19, 1x 20, 2 x 21, 5 x 22). The pectine marginal tips extend to quarter of the fourth sternite in the male and three quarter of the third sternite in the female. The sternites are smooth, without carinae, but with two longitudinal furrows.

Metasoma and telson (Figs. 30–36). The metasomal segments I–IV bear a total of 8 carinae from which the ventral carinae on segments I–III are smooth, more granulated are on segments IV–V. Other carinae are sparsely granulated. The dorsal carinae on metasomal segments I–IV are granulated mainly on fourth segment, usually with smooth granules without discrete denticles. The fifth segment has five variously developed and granulated carinae. The dorsal and lateral surfaces of the segments are smooth/rugose. The entire metasoma and telson are sparsely hirsute with long macrosetae. The telson is tuberculate, bulbous, with the aculeus shorter than vesicle. The male has a larger telson than the female.

Pedipalps (Figs. 77–81). The pedipalps are rather densely hirsute, mainly on the chela. The femur is tuberculate dorsally and bears four carinae composed of several strong granules. The patella is smooth and rugose, internal surface is finely granulate, there are five rather smooth carinae, only the internal is composed from several big granules. The pedipalp chela dorsoexternally bears four carinae indicated only and with evenly sized conspicuous granules. The granules are not conical and pointed, their apices are often confluent and are present also on the lobe of the chela. The internal surface of chela is smooth, with several conical granules in the distal part and two longitudinal carinae covered by several granules. The dentate margin of movable finger with distinct granules in a wide row which could be divided into 5–7 rows present along almost the entire finger in both sexes. The male has slightly more pronounced median lobe on the movable finger of pedipalp.

Legs (Figs. 41–44). All legs with laterodistal lobes and a prolateral pedal spur, the retrolateral spur is absent. All legs are without distinct carinae and smooth. The tarsomeres are hirsute with setae and macrosetae. Spiniform formula of tarsomere II = 6/4-5: 6-7/4-5: 6-7/4-5: 7/5. Tarsomere II with 3 spiniform setae on inclined anteroventral surface.

Chelicerae (Figs. 87–88). Movable finger dorsal edge with one large subdistal (*sd*) denticle; ventral edge smooth; ventral distal (*vd*) denticle longer than prominent dorsal (*dd*) denticle. Fixed finger with four denticles, median (*m*) and basal (*b*) denticles conjoined on common trunk; no ventral accessory denticles present.

Measurements. See Table 1.

AFFINITIES. *Pandiborellius igdu* **sp**. **n**. is similar to *P. magrettii* and *P. somalilandus*. Morphologically it is possible to differentiate *P. igdu* **sp**. **n**. and *P. magrettii* according to the granulation of the pedipalp chela which is dorsally with evenly sized conspicuous granules in *P. igdu* **sp**. **n**. (Figs. 77–80) and tuberculate, without evenly sized granules in *P. magrettii* (Figs. 105–106). The chelal granulations related *P. igdu* **sp**. **n**. to *P. somalilandus* from Somaliland, but they differ in their areas of distribution and number of ventral trichobothria on patella which is 35–41 in *P. igdu* **sp**. **n**. and 42–46 in *P. somalilandus*.

Pandiborellius insularis **sp**. **n**.

(Figs. 50–68, 72–76, 82–86, 89–90, 132–135, 395–396, Table 1)

http://www.zoobank.org/urn:lsid:zoobank.org:act:00108 18B-5E10-482A-9882-35620BA1E2B3

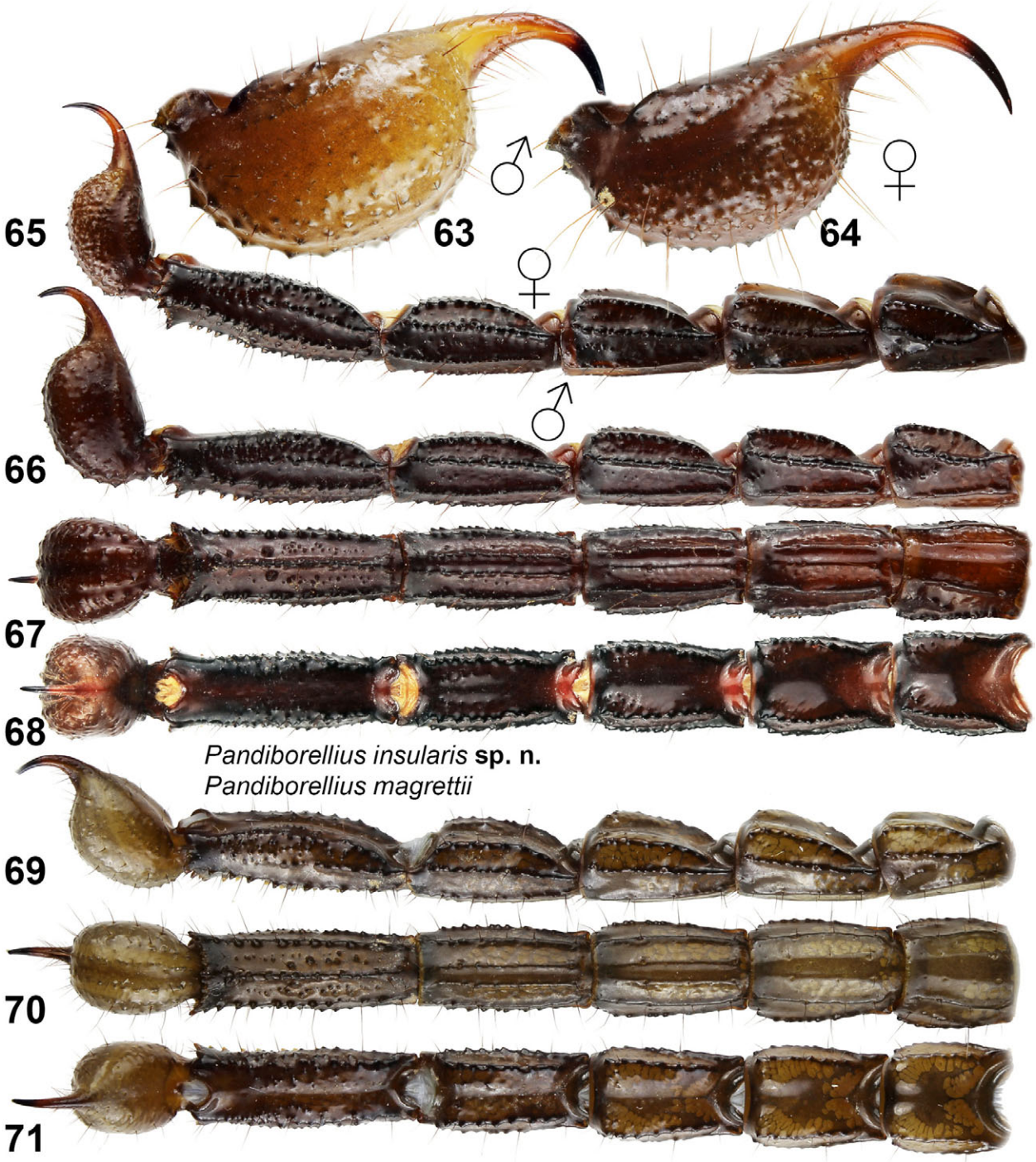
TYPE LOCALITY AND TYPE REPOSITORY. Eritrea, Dese Island, 15°26'39.2"N 39°45'32.7"E, 8 m a.s.l.; FKCP.

TYPE MATERIAL. **Eritrea**, Dese Island, 15°26'39.2"N 39°45'32.7"E, 8 m a.s.l., 5.-7.XI.2015, (Figs. 85–86, Locality No. **15EJ**), 1♂ (holotype, Figs. 50–51, 55–63, 66–68, 74–76, 82, 89–90, 132–133, 395, DNA No. 872) 1♀1juv. (paratypes, Figs. 52–54, 64–65, 72–73, 83–84, 134–135), leg. F. Kovařík, FKCP.

ETYMOLOGY. Named after the occurence on the island.

DIAGNOSIS. Total length 106–116 mm. Color uniformly reddish brown to black; legs bright yellow; chela yellowish brown to orange; yellowish brown to black. Chelicerae yellowish brown, reticulate, with black fingers and anterior margin. Carapace lacking carinae and sparsely granulated. External trichobothria on patella number 16–17 (5–6 *eb*, 4 *esb*, 2 *em*, 2 *est*, 3 *et*); ventral trichobothria on patella number 47–52; internal trichobothria on chela number 2, ventral trichobothria on chela number 10–11. Pedipalp chela sparsely hirsute. Dorsal and external surfaces of pedipalp chela tuberculate or granulate with non-conical granules, their apices may be confluent. Lobe of chela without granules, only rugose. Dorsoexternal surface of chela with four carinae partly developed in distal part. Chela internally with two longitudinal carinae covered by several granules. Chela of male length/ width ratio is 1.74. Pectinal teeth number 20–22 in both sexes. Dorsal carinae on metasomal segments I–IV granulate mainly on fourth segment by usually smooth granules without discrete denticles. Spiniform formula of tarsomere II = 6/4-5: 6/4-5: 6/4-5: 6-7/4-5. Tarsomere II with 3 spiniform setae on inclined anteroventral surface. Length to width ratio of male 5th metasomal segment = 2.90. Male has slightly more pronounced median lobe on movable finger of pedipalp and larger telson than female.

Figures 61–62: *Pandiborellius insularis* **sp**. **n**. Male holotype, left hemispermatophore. **Figure 61**. Dorsal aspect. **Figure 62**. Ventral aspect. Scale bar: 2 mm. Note: the left hemispermatophore is displayed as mirror image for visual comparison to other figures of right hemispermatophores.



Figures 63–71: Figures 63–68: *Pandiborellius insularis* **sp. n. Figures 63–64**. Telson lateral, male holotype (63) and female paratype (64). **Figure 65**. Female paratype, metasoma and telson lateral. **Figures 66–68**. Male holotype, metasoma and telson lateral (66), ventral (67), and dorsal (68) views. **Figures 69–71**. *Pandiborellius magrettii*, male topotype from locality 15EF, metasoma and telson lateral (69), ventral (70), and dorsal (71) views.

DESCRIPTION. The adults are 106–116 mm long. The habitus is shown in Figs. 50–53. For position and distribution of trichobothria of pedipalps see Figs. 74–76. External trichobothria on the patella number 16–17 (5–6 *eb*, 4 *esb*, 2 *em*, 2 *est*, 3 *et*); accessory external trichobothrium *ea* on chela absent, ventral trichobothria on patella number 47–52; internal trichobothria on chela number 2, ventral trichobothria on chela number 10–11.

Coloration (Figs. 82–84). The base color is uniformly reddish brown to black, legs are bright yellow, pedipalp

Figures 72–81: **Figures 72–76:** *Pandiborellius insularis* **sp**. **n**., pedipalp chela and patella. **Figures 72–73**. Female paratype, dorsal (72) and external (73). **Figures 74–76**. Male holotype, dorsal (74), external (75), and ventrointernal (76). **Figures 77–81:** *Pandiborellius igdu* **sp**. **n**., pedipalp chela and patella. **Figures 77–78**. Female paratype from locality 12EK, dorsal (77) and external (78). **Figures 79–81**. Male holotype, dorsal (79), external (80), and ventrointernal (81). Trichobothrial pattern is indicated in Figures 74–76 and 79–81.

chela is yellowish brown to orange, telson is yellowish brown to black. The chelicerae are yellowish brown, reticulate, with black fingers and anterior margin.

Carapace and mesosoma (Figs. 54–55). The entire carapace lacking carinae, sparsely covered by fine granules, densely along posterior margin. The anterior mar-

Figures 82–84: *Pandiborellius insularis* **sp**. **n**., male holotype (82), female (83) and juvenile (84) paratypes in vivo habitus in type locality.

Figures 85–86: *Pandiborellius insularis* **sp. n.**, type locality, Eritrea, Dese Island, 15°26'39.2"N 39°45'32.7"E, 8 m a.s.l.

DIMENSIONS (MM)		*Pandiborellius igdu* **sp. n.** ♂ **holotype**	♀ **paratype**	*Pandiborellius insularis* **sp. n.** ♂ **holotype**	♀ **paratype**
Carapace	L / W	15.6 / 16.5	15.2 / 15.9	15.7 / 16.2	16.7 / 17.8
Mesosoma	L	35.2	44.6	28.5	40.6
Tergite VII	L / W	8.10 / 12.6	8.45 / 13.4	6.45 / 11.9	7.60 / 14.9
Metasoma & telson	L	59.85	53.31	62.15	58.80
Segment I	L / W / D	7.00 / 6.85 / 5.20	6.70 / 6.10 / 4.93	7.70 / 6.36 / 5.10	7.15 / 6.60 / 5.70
Segment II	L / W / D	8.10 / 6.45 / 5.15	7.23 / 5.62 / 4.40	8.50 / 5.85 / 4.65	8.15 / 5.93 / 5.25
Segment III	L / W / D	8.95 / 6.10 / 4.95	7.78 / 5.15 / 4.25	9.55 / 5.53 / 4.50	8.95 / 5.50 / 4.75
Segment IV	L / W / D	9.90 / 5.42 / 4.85	8.80 / 4.65 / 3.93	10.7 / 4.95 / 4.65	9.95 / 5.00 / 4.60
Segment V	L / W / D	13.2 / 4.95 / 4.56	11.7 / 4.25 / 4.23	13.5 / 4.65 / 4.70	12.9 / 4.83 / 4.60
Telson	L / W / D	12.7 / 6.93 / 6.60	11.1 / 4.80 / 4.25	12.2 / 6.25 / 5.96	11.7 / 5.25 / 4.85
Pedipalp	L	45.7	45.9	46.6	51.3
Femur	L / W	11.3 / 5.45	10.7 / 5.35	11.6 / 5.48	11.8 / 6.05
Patella	L / W	11.3 / 5.90	11.3 / 5.45	11.8 / 5.73	12.7 / 6.05
Chela	L	23.1	23.9	23.2	26.8
Manus	W / D	14.2 / 7.02	13.4 / 6.75	13.3 / 6.65	14.4 / 7.23
Movable finger	L	15.2	14.5	15.05	16.8
Total	**L**	**110.65**	**113.11**	**106.35**	**116.10**

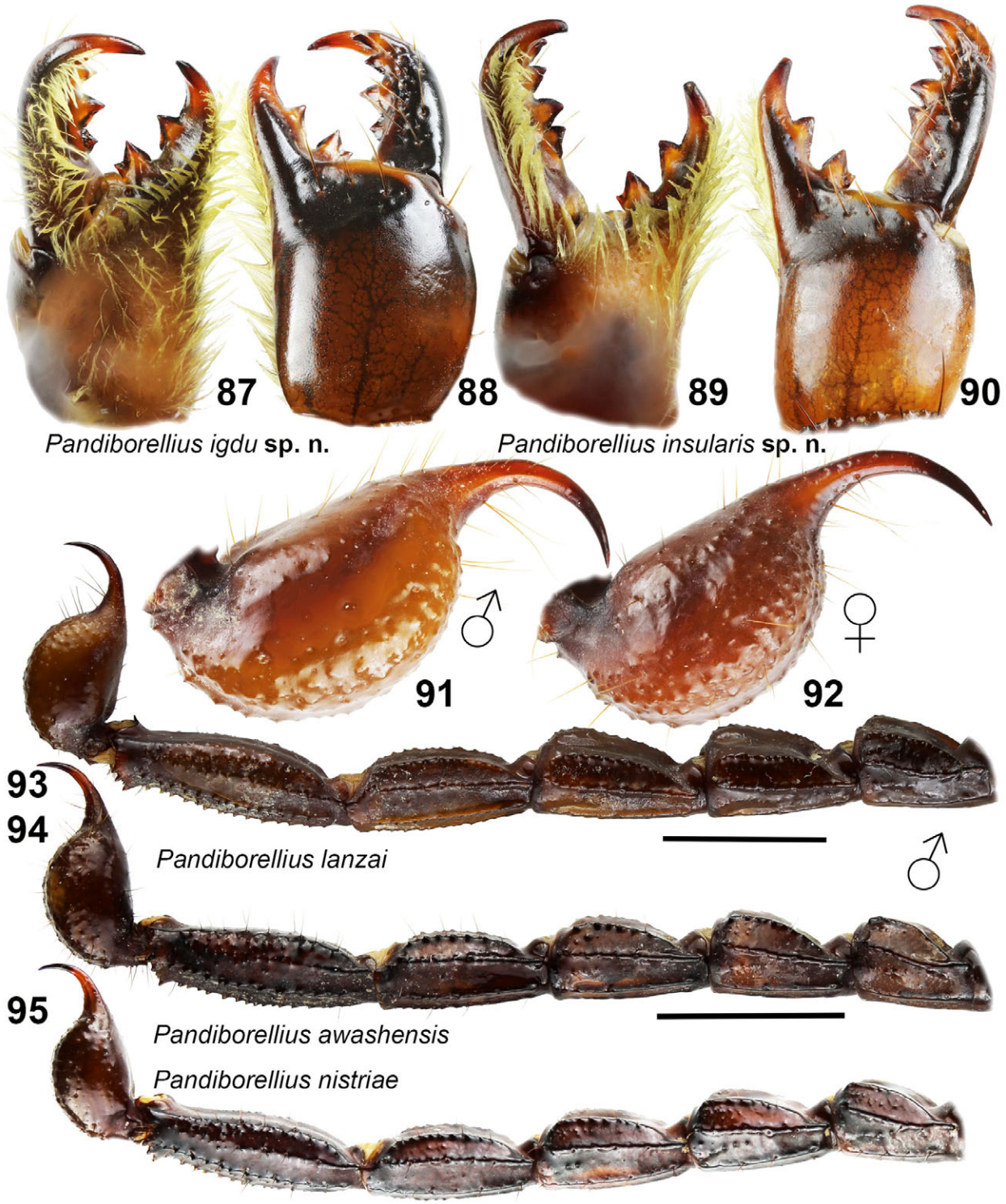
Table 1: Comparative measurements of adults of *Pandiborellius igdu* **sp**. **n**. and *Pandiborellius insularis* **sp**. **n**. Abbreviations: length (L), width (W, in carapace corresponds to posterior width), depth (D).

gin of the carapace is symmetrically concave, medially strongly convex, and it bears several macrosetae. The tergites are smooth and can be finely granulated in female and strongly granulated in males. The pectinal tooth count is 20–22 in both sexes. The pectine marginal tips extend to a quarter of the fourth sternite in the male and three quarters of the third sternite in the female. The sternites are smooth, without carinae, but with two longitudinal furrows.

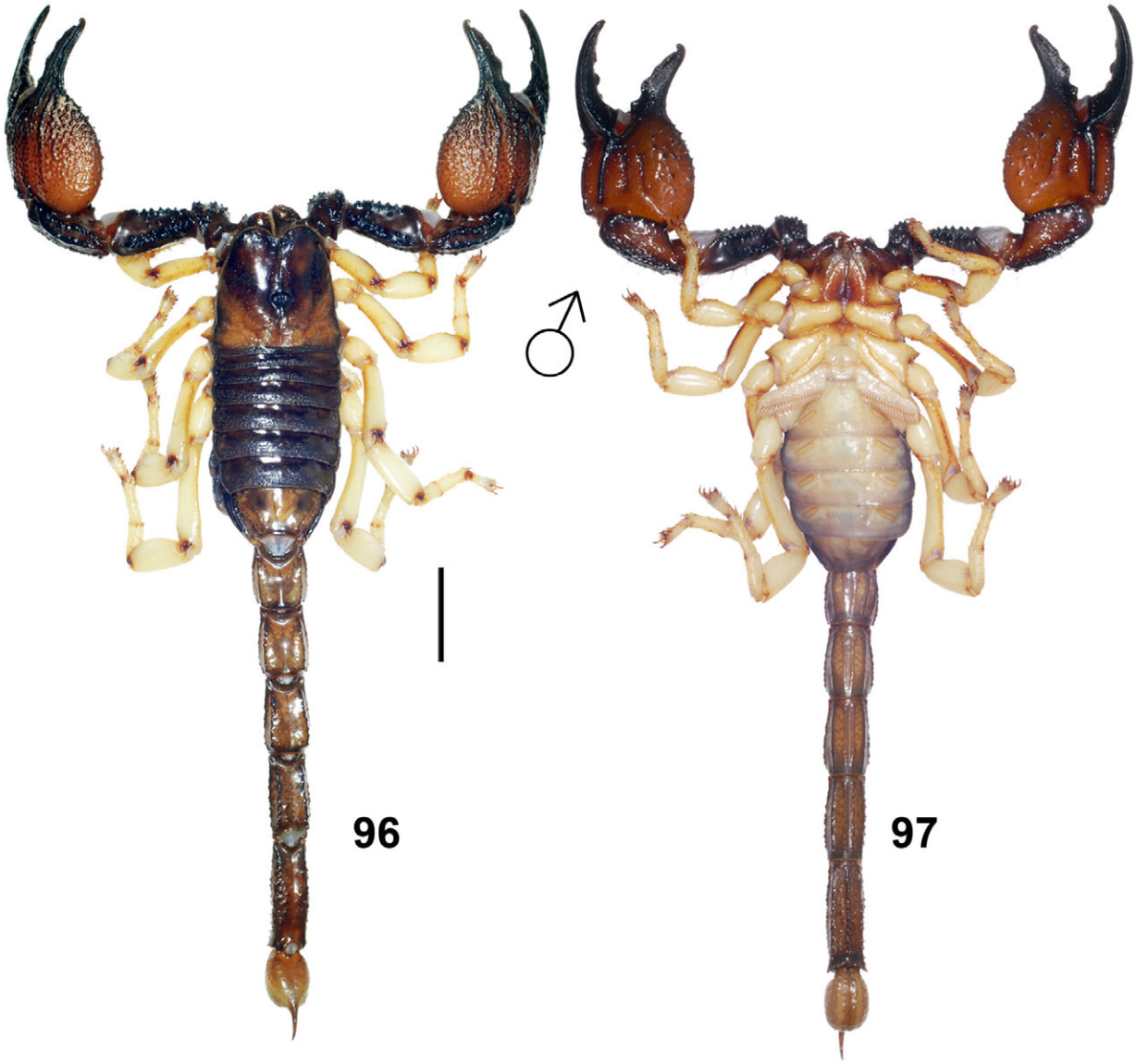
Hemispermatophore. (Figs. 61–62). Lamelliform. Distal lamina long, narrow, proximal half straight, untapered, distal half gently tapered, curved like an S-shaped hook with a blunt, rounded terminus pointed in external direction. Hook strong, stout located near base of internal margin of distal lamina. Proximal section of distal lamina below hook much shorter than distal section above it, with a broadly rounded concave dorsal trough. Median lobe weak, only slightly convex. Internobasal reflection of sperm duct with broad tubular trough terminating in wide, truncate inner lobe. Proximal lobe large, broad, parabolic. Basal lobe smaller, triangular with blunt apex in ventral aspect. Trunk short, broad, basally tapered, with slightly sclerotized diagonal axial rib. *Dimensions* (mm): length of distal lamina above hook base 10.61; maximum width of distal lamina above hook base 0.91; length of proximal part of distal lamina (truncal flexure to hook base) 2.05; trunk length 3.56, width 2.08. *Morphometric ratios*: distal lamina above hook L/W 11.66; distal lamina above hook L/ truncal flexure to hook base L 5.18; total distal lamina L/ trunk L 3.56.

Metasoma and telson (Figs. 63–68). The metasomal segments I–IV bear a total of 8 carinae of which the ventrosubmedian carinae on segments I–III are smooth, more granulated on segments IV–V. Other carinae are sparsely granulated. The dorsal carinae on metasomal segments I–IV are granulated mainly on fourth segment by usually smooth granules without discrete denticles. The fifth segment has five variously developed and granulated carinae. The dorsal and lateral surfaces of the segments are smooth/rugose. The entire metasoma and telson are sparsely hirsute with long macrosetae. The telson is tuberculate, bulbous, with the aculeus shorter than vesicle. The male has a larger telson than the female.

Pedipalps (Figs. 72–76). The pedipalps are sparsely hirsute. The femur is tuberculate dorsally and bears four carinae composed of several strong granules. The patella is smooth and rugose, internal surface is finely granulate, there are five rather smooth carinae, only the internal one is composed of several big granules. The pedipalp chela dorsoexternally with four carinae partly developed in distal part and tuberculate or granulate with non-conical granules, their apices may be confluent. Lobe of chela without granules, only rugose. The internal surface of chela smooth, with several conical granules in distal part and two longitudinal carinae covered by several granules. The dentate margin of movable finger with distinct granules in a wide row which could be divided into 5–7 rows present in almost whole finger in both sexes. The male has slightly more pronounced median lobe on the movable finger of pedipalp.



Figures 87–95: *Pandiborellius*. **Figures 87–88:** *Pandiborellius igdu* **sp. n.**, male holotype, right chelicera ventral (87) and dorsal (88) views. **Figures 89–90:** *Pandiborellius insularis* **sp. n.**, male holotype, right chelicera ventral (89) and dorsal (90) views. **Figures 91–92:** *Pandiborellius lanzai*, telson lateral of male (91) and female (92) topotypes. **Figures 93–95:** Metasoma and telson lateral views of males. **Figure 93**. *Pandiborellius lanzai*, topotype. **Figure 94**. *Pandiborellius awashensis*, male holotype. **Figure 95**. *Pandiborellius nistriae*, male holotype. Scale bars: 10 mm (93–95).



Figures 96–97: *Pandiborellius magrettii*. **Figures 96–97**. Male topotype from locality 15EF in dorsal (96) and ventral (97) aspects. Scale bar: 10 mm.

Legs (Figs. 57–60). All legs with laterodistal lobes and a prolateral pedal spur, the retrolateral spur is absent. All legs are without distinct carinae and smooth. The tarsomeres are hirsute by setae and macrosetae. Spiniform formula of tarsomere II = 6/4-5: 6/4-5: 6/4-5: 6-7/4-5. Tarsomere II with 3 spiniform setae on inclined anteroventral surface.

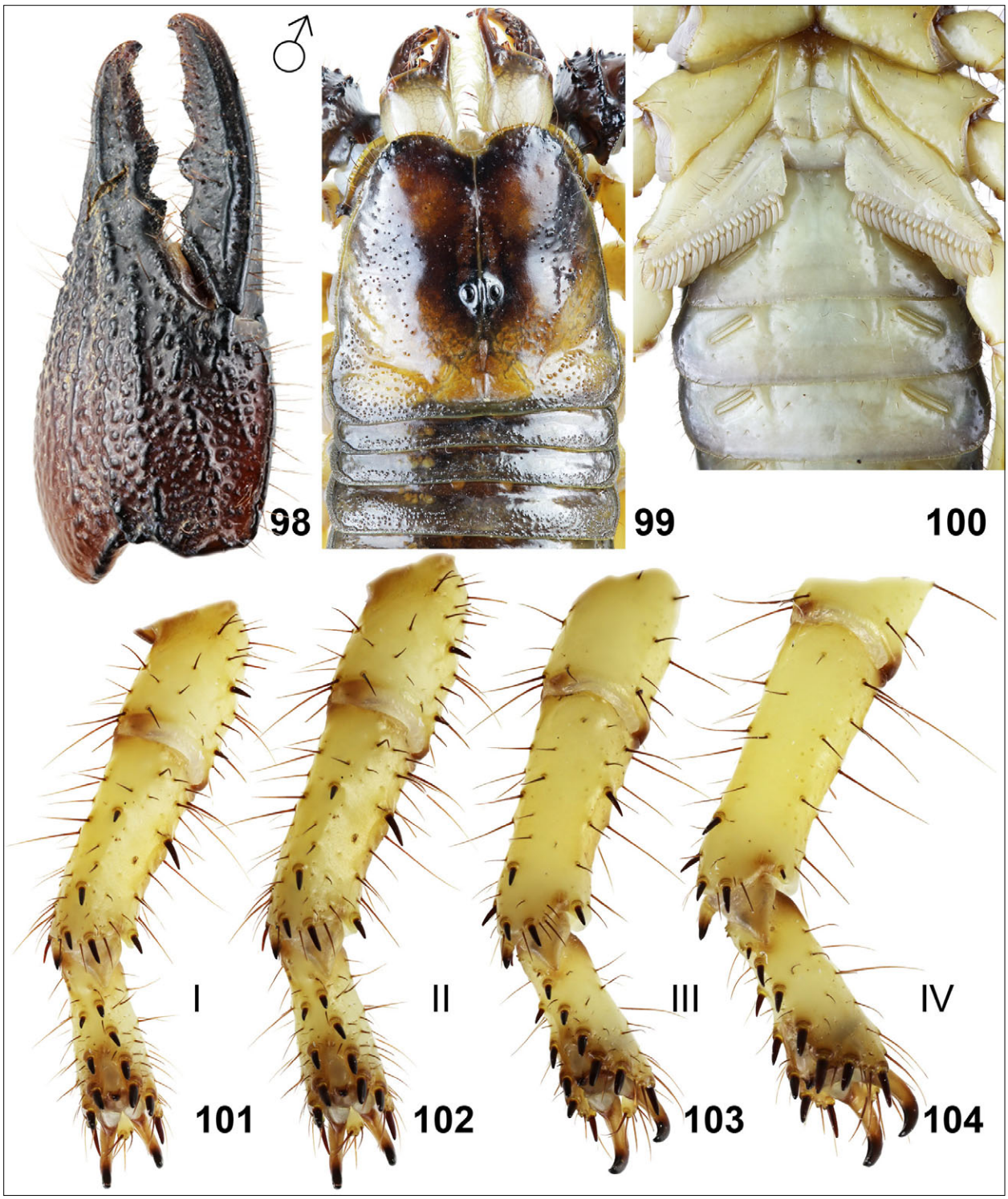
Chelicerae (Figs. 89–90). Movable finger dorsal edge with one large subdistal (*sd*) denticle; ventral edge smooth; ventral distal (*vd*) denticle longer than prominent dorsal (*dd*) denticle. Fixed finger with four denticles, median (*m*) and basal (*b*) denticles conjoined on common trunk; no ventral accessory denticles present.

Measurements. See Table 1.

AFFINITIES. *Pandiborellius insularis* **sp**. **n**. is similar to *P. magrettii*. Morphologically we can differentiate these two species according to the number of ventral trichobothria on patella which is 47–52 in *P. insularis* **sp**. **n**. and 31–40 (one male without the exact locality has 45) in *P. magrettii*. However, these two species are differentiated also according to DNA analysis (see Plíšková et al., in preparation).

Pandiborellius lanzai (Rossi, 2015) **comb**. **n**.
(Figs. 19, 91–93, 142–143, 172, 193, 396)

Pandinus (*Pandinurus*) *meidensis*: Kovařík, 2003: 152 (in part); Kovařík & Whitman, 2005: 114 (in part); Kovařík, 2009: 55–56, 123 (in part, figs. 302, 365–



Figures 98–104: *Pandiborellius magrettii*, male topotype from locality 15EF, pedipalp chela external (98), chelicerae, carapace and tergites I–III (99), coxosternal area and sternites III–V (100), right legs I–IV, ventral or retrolateral aspects (101–104).

370); Rossi, 2014a: 12–13, figs. 2–3, 5b, 10 (in part).

Pandinurus (*Pandiborellius*) *meidensis*: Rossi, 2015a: 33–34, 62 (in part, figs. 106–108).

Pandinurus (*Pandiborellius*) *lanzai* Rossi, 2015b: 10–15, 17–18, 20, 29, figs. 1–6, 11–12.

Pandinurus (*Pandipavesius*) *lanzai*: Rossi, 2015d, 42–44.

Figures 105–107: *Pandiborellius magrettii*, pedipalp chela and patella, male from locality 15EF, dorsal (105), external (106), and ventrointernal (107). Trichobothrial pattern is indicated.

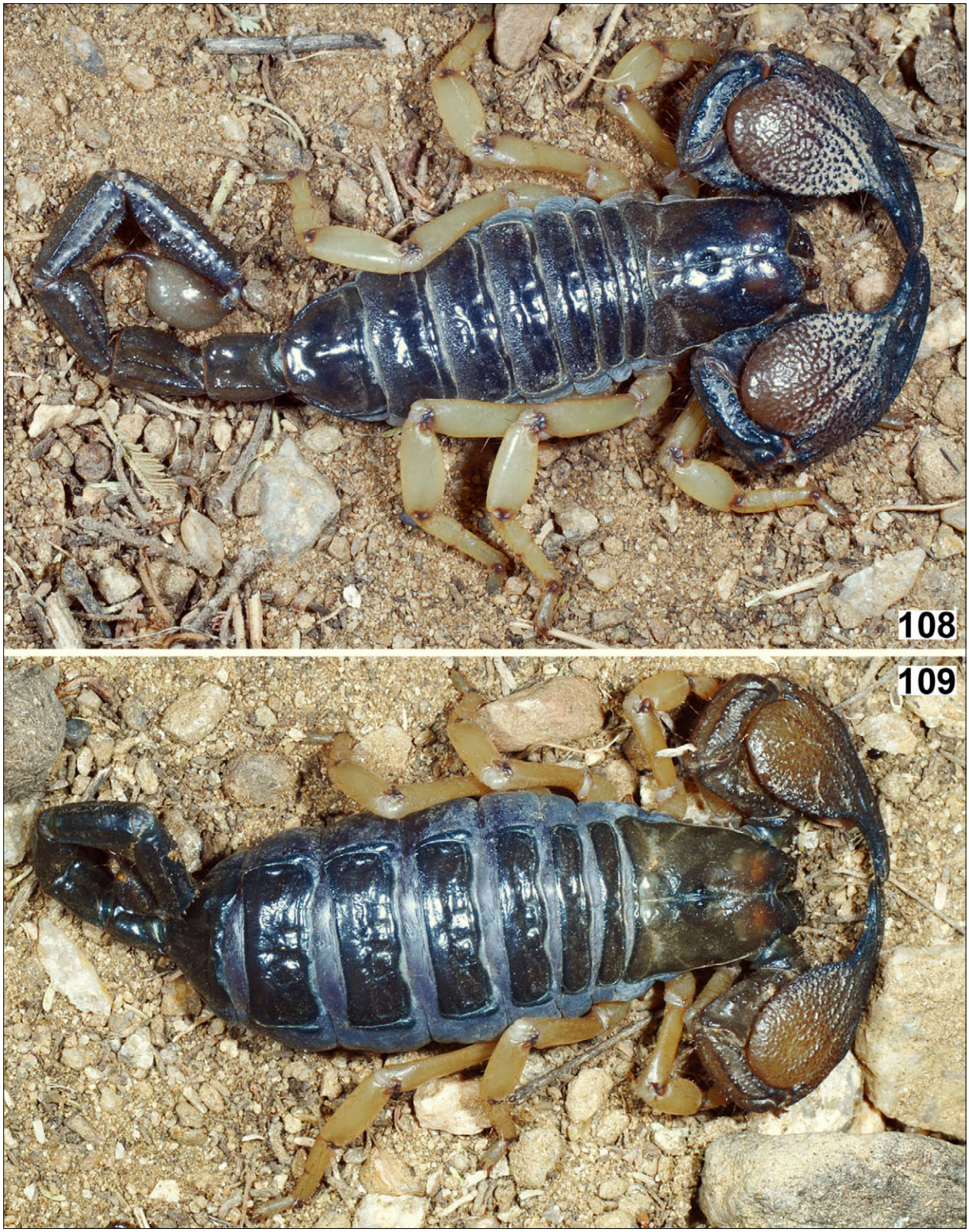
TYPE LOCALITY AND TYPE REPOSITORY. Somalia, (Puntland), Oasi di Galgala, Migiurtina; MZUF No. 1026.

MATERIAL EXAMINED. **Somalia** (Puntland), Oasi di Galgala, Migiurtina, X.1973, 1♂2♀1♂im. (topotypes, Figs. 19, 91–93, 142–143, 172, 193), FKCP.

EMENDED DIAGNOSIS. Total length 110–145 mm. Color uniformly reddish black, only legs, telson and chela reddish brown, slightly lighter-colored than body. Chelicerae brown, reticulate, with black fingers and anterior margins. Carapace lacking carinae and finely granulated. External trichobothria on patella number 17–19 (5–6 *eb*, 5–6 *esb*, 2 *em*, 2 *est*, 3 *et*); ventral trichobothria on patella number 44–49; internal trichobothria on chela number 2, ventral trichobothria on chela number 11–15. Pedipalp chela rather densely hirsute. Pedipalp chela dorsally smooth without granules (Figs. 142–143). Dorsoexternal surface of chela with five smooth carinae present or well indicated. Chela internally with two longitudinal carinae covered by granules. Chela of male length/ width ratio is 1.75–1.88. Pectinal teeth number 18–25 (18–25 in males and 18–21 in females) in both sexes. Dorsal carinae on first through fourth metasomal segments granulate, usually with smooth granules without discrete denticles. Spiniform formula of tarsomere II = 7-8/5-7: 7-8/5-6: 7-9/5-7: 8-9/6-7. Tarsomere II with 3 spiniform setae on inclined anteroventral surface. Length to width ratio of male 5th metasomal segment = 2.70–2.82. Male has only slightly more pronounced median lobe on movable finger of pedipalp and larger telson than female.

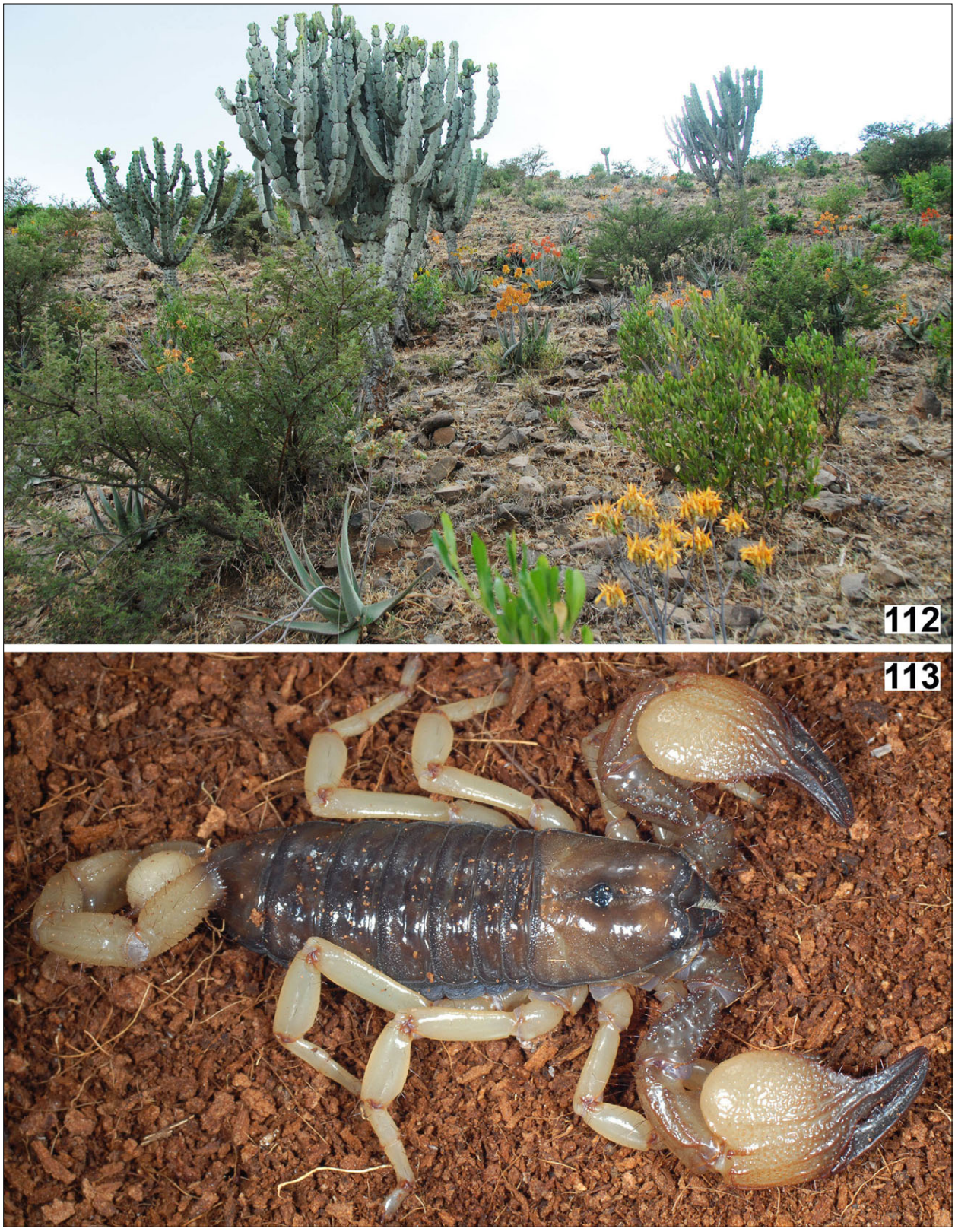
Pandiborellius magrettii (Borelli, 1901) **comb**. **n**.
(Figs. 69–71, 96–113, 168–169, 182, 184, 186, 188, 190, 395–396, Table 2)

Heterometrus bellicosus: Pavesi, 1884: 97 (misidentification, Pavesi probably cited directly types of *P. magrettii*).



Figures 108–109: *Pandiborellius magrettii*, male (108) and female immature before maturity ecdysis (109) in vivo habitus in locality 15EF.

Figures 110–111: *Pandiborellius magrettii*, localities. **Figure 110**. Eritrea, route Halibaret to Keren, 15°43'31.4"N 38°36'02.7"E, 1457 m a.s.l. (Locality 15EF). **Figure 111**. Eritrea, Ghinda, 15°27'35.3"N 39°06'05.4"E, 971 m a.s.l., (Locality 15EM).



Figures 112–113: *Pandiborellius magrettii*. **Figure 112**. Eritrea, locality 15EC. **Figure 113**. Male from locality 15EM two weeks after maturity ecdysis.

Pandinus magrettii Borelli, 1901: 1–5.

Pandinus (*Pandinurus*) *magrettii*: Vachon, 1974: 953; Kovařík & Whitman, 2005: 114; Kovařík, 2009: 54, figs. 300, 339–346, 418–419 (in part); Kovařík, 2012: 3, figs. 1–8, 64; Rossi, 2014a: 11–12; Rossi, 2014b: 7; Rossi, 2014c: 8–11, figs. 7–8, 10.

Pandinus (*Pandinurus*) *magretti* (sic): Fet, 2000: 471 (in part) (complete reference list until 2000);

Pandinurus (*Pandiborellius*) *magrettii*: Rossi, 2015a: 32–33, figs. 109–113; Rossi, 2015b: 21–22.

= *Brotheas hirsutus* L. Koch, 1875: 8 (syn. by Kraepelin, 1894: 70; Kovařík, 2003: 151).

= *Scorpio africanus subtypicus* Kraepelin, 1894: 69 (syn. by Kovařík, 2003: 151).

= *Pandinurus* (*Pandiborellius*) *sabbadinii* Rossi, 2015b: 23–26, 28, figs. 12, 19–21. **Syn**. **n**.

TYPE LOCALITY AND TYPE REPOSITORY. Eritrea, Keren (see comments below); MCSN (probably lost)

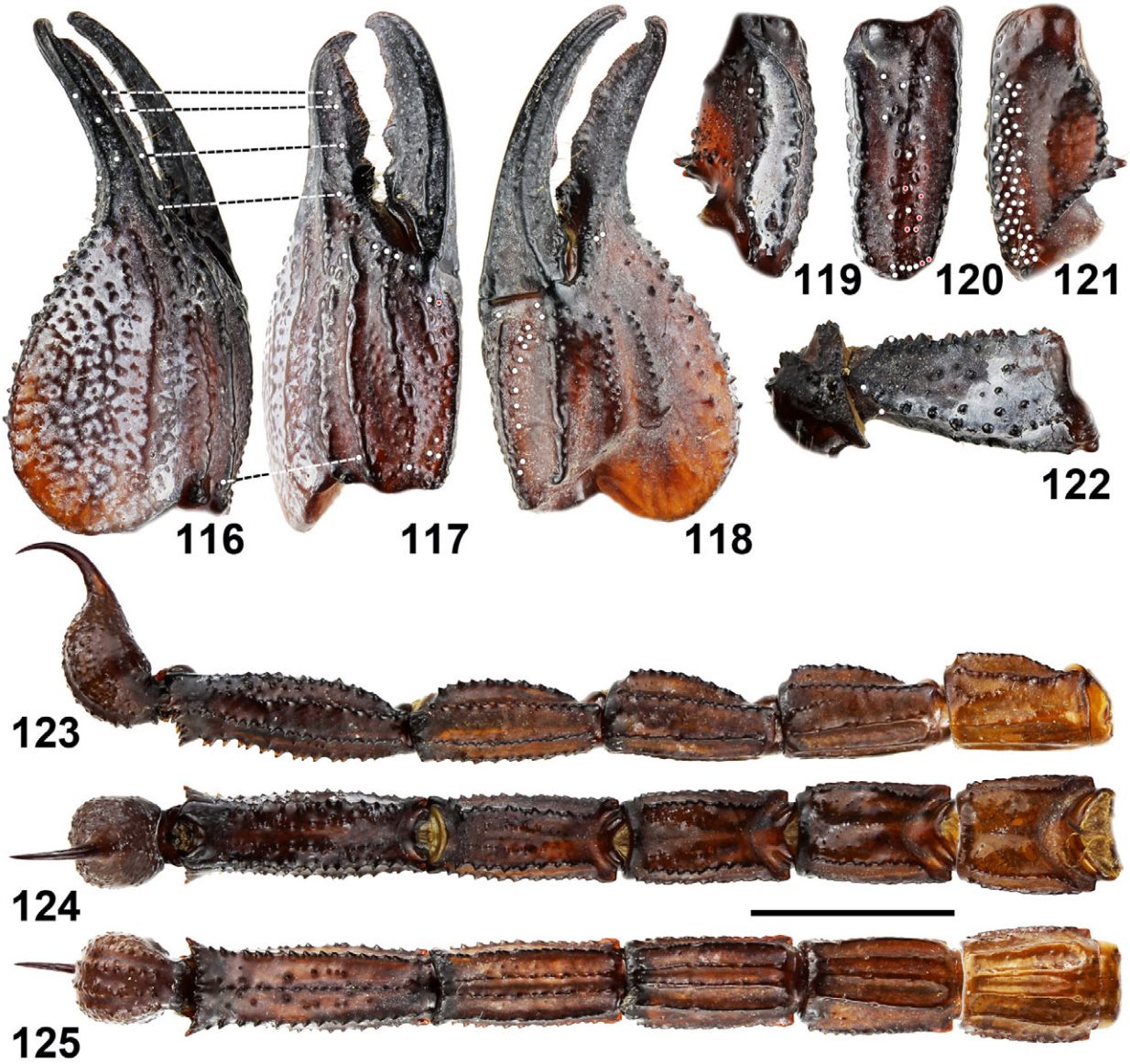
MATERIAL EXAMINED. **Eritrea**, 1♂, ecdysis 6.X.2004, dead VIII.2008; near Mendefera, 14°53'53.1"N 38°46' 07.2"E, 2014 m a.s.l., 28.-29.X.2015 (Locality No. **15EC**, Fig. 112), 2 juvs alive, (ecdysis 5.II. and 14.II. 2016), leg. F. Kovařík; route Halibaret to Keren, 15°43'31.4"N 38°36'02.7"E, 1457 m a.s.l., 1.-2.XI.2015, (Locality No. **15EF**, Fig. 110), 1♂ (topotype, Figs. 69–71, 96–108, 169, 190, 395, DNA No. 873), leg. F. Kovařík; Keren, 15°48'33"N 38°28'14.6"E, 1328 m a.s.l., 2.XI.2015, (Locality No. **15EG**), 1♀ alive (topotype, Fig. 109 before maturity ecdysis 20.II.2016), ecdysis 20.II.2016, leg. F. Kovařík; Ghinda, 15°27' 35.3"N 39°06'05.4"E, 971 m a.s.l., 9.XI.2015, (Locality No. **15EM**, Fig. 111), 1♂ (ecdysis VIII.2015, 24.VI. 2016, Fig. 113, 168, 182, 184, 186, 188, 395, DNA No. 1136), leg. F. Kovařík. All specimens are in the first author´s collection (FKCP).

EMENDED DIAGNOSIS. Total length 87.5–130 mm. Color uniformly brown to reddish black; legs bright yellow; chela yellow to orange; telson yellow to yellowish brown; metasoma yellow or reddish black. Chelicerae yellowish brown, reticulate, with black fingers and anterior margin. Carapace lacking carinae and sparsely granulated. External trichobothria on patella number 15–17 (4–6 *eb*, 5 *esb*, 2 *em*, 1 *est*, 3 *et*); ventral trichobothria on patella number 31–40(45); internal trichobothria on chela number 2, ventral trichobothria on chela number 9(8)–11. Pedipalp chela sparsely to densely hirsute. Dorsal and external surfaces of pedipalp chela tuberculate or granulate by not conical granules, their apices may be confluent. Lobe of chela without granules, only rugose. Dorsoexternal surface of chela with four carinae present or indicated. Chela internally with two longitudinal carinae covered by several granules. Chela of male length/ width ratio is 1.62–1.91. Pectinal teeth number 18–22 in both sexes. Dorsal carinae on metasomal segments I–IV granulate mainly on fourth segment by usually smooth granules without discrete denticles. Spiniform formula of tarsomere II = 6/4-5: 6-7/4-5: 6-7/4-5: 6-7/4-5. Tarsomere II with 3 spiniform setae on inclined anteroventral surface. Length to width ratio of male 5th metasomal segment = 2.60(2.50)–2.98. Male has slightly more pronounced median lobe on movable finger of pedipalp and larger telson than female.

COMMENTS. The information that a neotype of *P. magrettii* exists was first disclosed in Rossi, 2015a: 33, but there is neither a statement that it is a designation with the expressed purpose of clarifying the taxonomic status or the type locality of a nominal taxon according to ICZN, 75.3.1; nor "a statement of the characters that the author regards as differentiating from other taxa the nominal species-group taxon for which the neotype is designated" according to 75.3.2; nor "description sufficient to ensure recognition of the specimen designated" according to 75.3.3, there are no morphological or morphometric characters of the specimen cited as a neotype; there is no explanation according to 75.3.4; and recommendation 75B of ICZN is ignored. Rossi only cited in Italian language that the neotype was designated according to ICZN, article 75, but without concrete taxonomic characters about the "neotype" which changed the type locality. The valid description of *P. magrettii* "neotype" still has not been published. The first author visited the original type locality of *P. magrettii* (Eritrea, Keren, see localities Nos. 15EF and 15EG, Fig. 110) in 2015 and there he collected male and female topotypes which we also used for DNA and karyotype analysis for the taxonomic stability of the species (see Plíšková et al., in preparation). We do not accept the change of the type locality and the existence of a neotype which was described (in reality only cited) without compliance with ICZN recomendations and we consider the analyzed specimens from Eritrea, vicinity of Keren as topotypes. The locality of the neotype incorrectly designated by Rossi (Rossi, 2015a: 33) is "Eritrea, Nefasit, Ghinda". The first author also visited this locality (locality No. 15EM, Fig. 111) and collected a male (Fig. 113).

Rossi studied three specimens labelled "Eritrea, Tessenei, Gasc Barca, IX.1939, leg. Remedelli". Two of them he determined as a pair of *P. magrettii* (Rossi, 2015b: 22) and the third specimen as a male holotype of *Pandinurus* (*Pandiborellius*) *sabbadinii* (Rossi, 2015b: 23–26, 28, figs. 12, 19–21). Rossi differentiated these two species according to two characters in the key: **1)** ventral trichobothria on pedipalp chela number 8 in *P. sabbadinii* and 10–11 in *P. magrettii* (we found also *P. magrettii* with 9 of these trichobothria); **2)** length to width ratio of male 5th metasomal segment 2.50 in *P. sabbadinii* and 2.65–2.80 in *P. magrettii* (we found this

Figures 114–115: *Pandiborellius meidensis*, female holotype in dorsal (114) and ventral (115) aspects.



Figures 116–125: *Pandiborellius meidensis*, female holotype. **Figures 116–122**. Pedipalp segments, chela dorsal (116), external (117) and ventointernal (118). Patella dorsal (119), external (120) and ventral (121). Femur dorsal (122). Trichobothrial pattern is indicated in Figures 116–122, accessory trichobothria on Figures 117 and 120 are marked by red points. **Figures 123–125**. Metasoma and telson lateral (123) dorsal (124) and ventral (125) views. Scale bar: 10 mm.

ratio in examined males of *P. magrettii* 2.60–2.98). Rossi believed that these minor differences were sufficient to differentiate the taxa at the species level. On the contrary, we are sure that there exist intraspecific variabilities (see also introduction and comments under *Pandinurus platycheles*). The differences cited by Rossi lie well within the expected scope of intraspecific variation that is common in these scorpions, and we consider all three specimens labeled "Eritrea, Tessenei, Gasc Barca, IX.1939, leg. Remedelli" to belong to the same species, *Pandiborellius magrettii*.

Pandiborellius meidensis (Karsch, 1879) **comb. n.**
(Figs. 20, 114–125, 396)

Pandinus meidensis Karsch, 1879: 127.
Pandinus (*Pandinurus*) *meidensis*: Vachon, 1974: 953; Fet, 2000: 472 (complete reference list until 2000); Kovařík, 2003: 152 (in part); Kovařík, 2009: 55 (in part); Rossi, 2014a: 12–13 (in part).
Pandinurus (*Pandiborellius*) *meidensis*: Rossi, 2015a: 33–34 (in part); Rossi, 2015b: 7–9, 19, figs. 7–9.
Pandinurus (*Pandipavesius*) *meidensis*: Rossi, 2015d, 42–44.

TYPE LOCALITY AND TYPE REPOSITORY. Somalia, Meid; ZMHB.

TYPE MATERIAL EXAMINED. **Somalia**, Meid, 1♀ (holotype, Figs. 20, 114–125), ZMHB No. 3018.

ADDITIONAL MATERIAL EXAMINED. **Somalia**, near Chisimayo, 00°30'26"S 42°24'12"E, III.1986, 1♀, FKCP.

EMENDED DIAGNOSIS. Total length 90–110 mm. Color uniformly reddish black, only legs, telson and chela yellowish brown, lighter-colored than body. Chelicerae brown, reticulate, with black fingers and anterior margins. Carapace lacking carinae and finely granulated. External trichobothria on patella number 16–19 (5–7 *eb*, 5–7 *esb*, 2 *em*, 1 *est*, 3 *et*); ventral trichobothria on patella number 48–54; internal trichobothria on chela number 2, ventral trichobothria on chela number 13–14. Pedipalp chela dorsally tuberculate (Figs. 116). Dorsoexternal surface of chela with five smooth carinae present. Chela internally with two longitudinal carinae covered by granules. Pectinal teeth number 22–24 in female. Dorsal carinae on first through fourth metasomal segments granulate and terminate in a larger tooth most conspicuous on fourth segment. Spiniform formula of tarsomere II = 8/6: 8-9/6: 8-9/7: 9/7. Tarsomere II with 3 spiniform setae on inclined anteroventral surface.

Pandiborellius nistriae (Rossi, 2014) **comb**. **n**.
(Figs. 21, 95, 130–131, 191, 396)

Pandinus (*Pandinurus*) *nistriae* Rossi, 2014a: 13–15, figs. 3, 5a, 6–9; Rossi, 2014b: 7; Rossi, 2014c: 3–11, figs. 1–6, 9–10 (in part).
Pandinurus (*Pandiborellius*) *nistriae*: Rossi, 2015a: 34, 63, figs. 114–118 (in part); Rossi, 2015b: 9–10 (in part).
Pandinurus (*Pandipavesius*) *nistriae*: Rossi, 2015d, 42–44.

TYPE LOCALITY AND TYPE REPOSITORY. Djibouti, Obock District, Medeho, 11°58'15"N 43°01'30"E; MZUF.

TYPE MATERIAL EXAMINED. **Djibouti**, Obock District, Medeho, 11°58'15"N 43°01'30"E, 1♂ (holotype, Figs. 21, 95, 130–131, 191), 25.II.2013, leg. P. Agnelli, A. Nistri et A. Ugolini, MZUF No. 4133.

EMENDED DIAGNOSIS. Total length 107 mm. Color uniformly brown to reddish black; legs bright yellow; chela yellow to orange; telson yellowish brown. Chelicerae yellowish brown, reticulate, with black fingers and anterior margin. Carapace lacking carinae and sparsely granulated. External trichobothria on patella number 15 (5 *eb*, 4 *esb*, 2 *em*, 1 *est*, 3 *et*); ventral trichobothria on patella number 40; internal trichobothria on chela number 2, ventral trichobothria on chela number 11–12. Pedipalp chela sparsely hirsute. Dorsal and external surfaces of pedipalp chela tuberculate or granulate with non-conical granules, their apices may be confluent. Lobe of chela without granules, only rugose. Dorsoexternal surface of chela with four carinae present or indicated. Chela internally with two longitudinal carinae covered by several granules. Chela of male length/ width ratio is 1.82. Pectinal teeth number 20–21 in male holotype. Dorsal carinae on first through fourth metasomal segments granulate mainly on fourth segment by usually smooth granules without discrete denticles. Spiniform formula of tarsomere II = 7/5: 7/5: 7/6: 8/6. Tarsomere II with 3 spiniform setae on inclined anteroventral surface. Length to width ratio of male 5th metasomal segment = 2.86. Male has pronounced median lobe on movable finger of pedipalp.

COMMENTS. The taxonomic position of the species is not clear. Rossi (2014a: 14) differentiated *P. nistriae* and *P. magrettii* in the original description according to three characters. Two of them: **1)** minor differences in spiniform formula of tarsomeres II; and **2)** different numbers of ventral trichobothria on pedipalp chela (11–12 in *P. nistriae* and 10–11 in *P. magrettii*) lie within the expected range of intraspecific variation. The third character is sexual dimorphism in shape of movable finger of pedipalp. It is true that, in the past, it was incorrectly stated that in *P. magrettii* there is no sexual dimorphism in the pronounced tooth on the movable finger of the pedipalp in the male (Kovařík, 2012: 3, Rossi, 2014a: 14). However, in reality this sexual dimorphism is present in all species of *Pandiborellius* but it is not usually as strong as it is in Horn of Africa *Pandinurus* (Figs. 126–167). Males of *Pandiborellius* usually have only a slightly more pronounced median lobe on the movable finger of the pedipalp than females (see Figs. 126–143). It is evident that both species *P. nistriae* and *P. magrettii* have the same sexual dimorphism in the shape of the median lobe on movable finger of the pedipalp, and that this can be more strongly developed in some males within the population. In another paper, Rossi (2014c: 11) cited other very minor differences which do not provide convincing evidence that these two populations are really two separate species. Because these two taxa have separate ranges of distribution, we prefer not to synonymize them. We hope that in the future it will be possible to study more specimens and analyze DNA of the population from Djibouti to elucidate its taxonomic status.

Pandiborellius somalilandus (Kovařík, 2012) **comb**. **n**.
(Figs. 136–137, 192, 396)

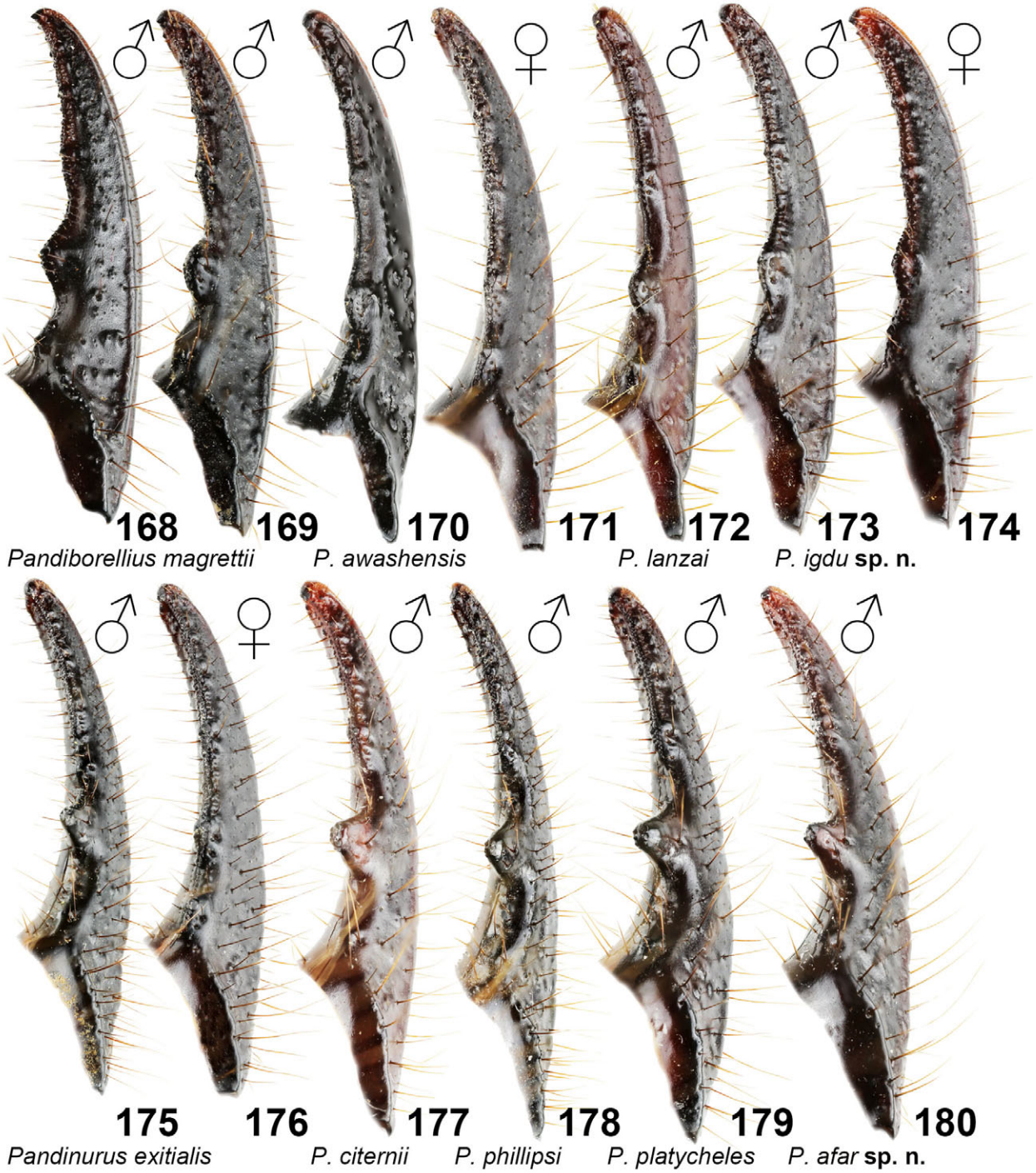
Pandinus (*Pandinurus*) *somalilandus* Kovařík, 2012: 9–13, 17–20, figs. 29–37, 59, 64; Prendini, 2016: 52.
Pandinurus (*Pandiborellius*) *somalilandus*: Rossi, 2015a: 35.

Figures 126–143: *Pandiborellius*, pedipalp chela, dorsal and external aspects. **Figures 126–129**. *P. awashensis*, male holotype (126–127), and female alotype (128–129). **Figures 130–131**. *P. nistriae*, male holotype. **Figures 132–135**. *P. insularis* **sp. n.**, male holotype (132–133), and female paratype (134–135). **Figures 136–137**. *P. somalilandus*, female holotype. **Figures 138–141**. *P. igdu* **sp. n.**, male holotype (138–139), and female paratype (140–141) from type locality. **Figures 142–143**. *P. lanzai*, male topotype.

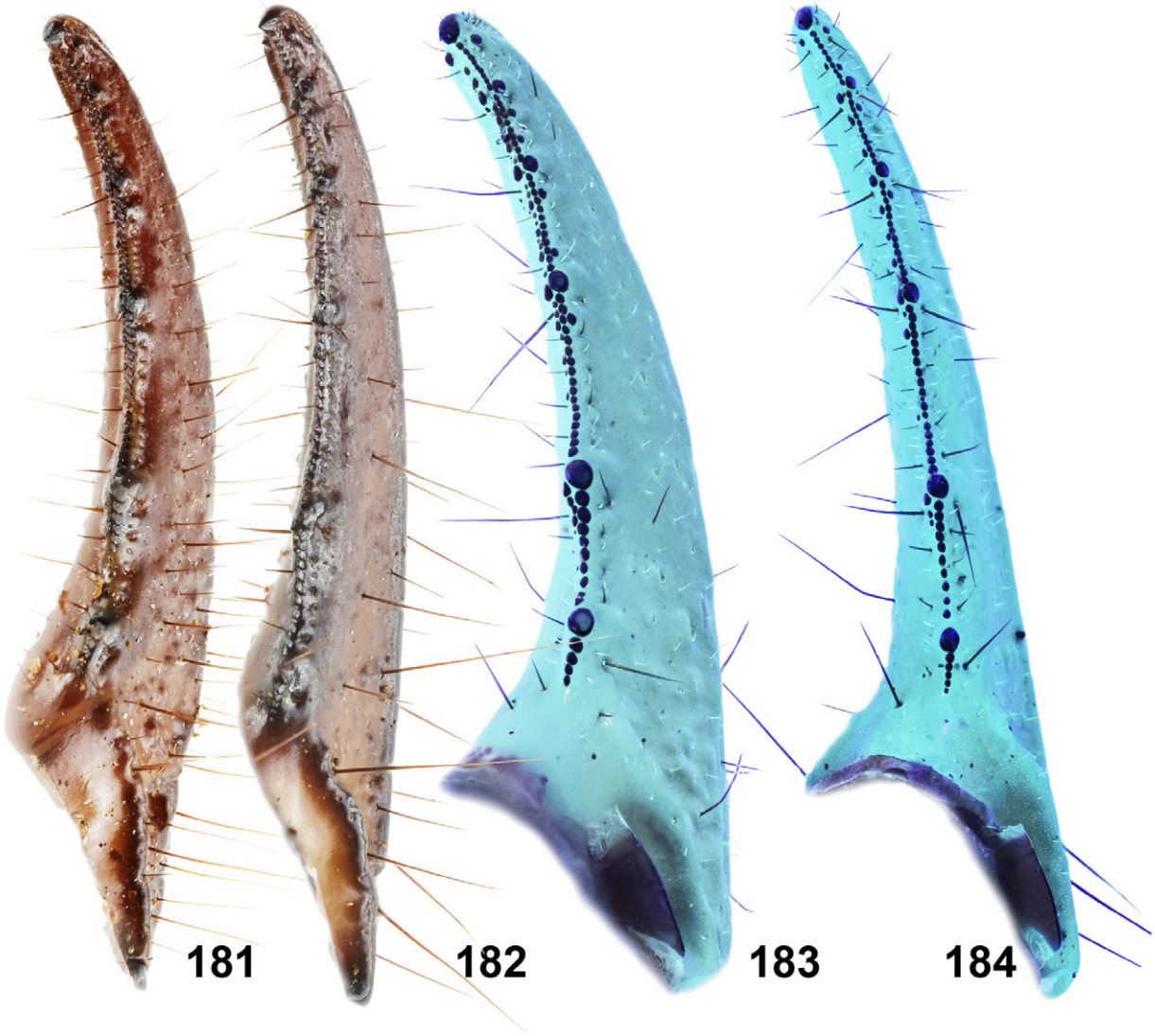
TYPE LOCALITY AND TYPE REPOSITORY. Somaliland, 25 km N of Sheikh, 10°02.001'N 45°09.589'E, 763 m a.s.l.; FKCP.

TYPE MATERIAL EXAMINED. **Somaliland**, 25 km N of Sheikh, 10°02.001'N 45°09.589'E, 763 m a.s.l. (fig. 37 in Kovařík, 2012: 11), 1♀ (pregnant, holotype, Figs. 136–137, 192, and figs. 29–34, 36, 59 in Kovařík, 2012: 10–11, 18), XI.2010, leg. T. Mazuch and P. Novák, FKCP; 70 km from Berbera to Hargeysa, 1♀ (paratype), XI.2010, leg. T. Mazuch and P. Novák; near Sheikh, foothills of Goolis Mts., 09°59.881'N 45°09.762'E, 896 m a.s.l. (fig. 35 in

Figures 144–167: *Pandinurus*, pedipalp chela, dorsal and external aspects of males. **Figures 144–145**. *P. citernii*, locality 14EF. **Figures 146–147**. *P. exitialis*, locality 16EA. **Figures 148–149**. *P. gregoryi*, Kenya, Mt. Kenya. **Figures 150–151**. *P. intermedius*, locality 14EH. **Figures 152–153**. *P. mazuchi*, paratype. **Figures 154–155**. *P. pallidus*, Somalia, Jubbada Hoose Province, Bilis Quoqaani env. **Figures 156–157**. *P. phillipsii*, Somaliland, 15 km N of Sheikh, Goolis Mts., 09°58.927'N 45°10.377'E. **Figures 158–159**. *P. platycheles*, locality 14EP. **Figures 160–161**. *P. smithi*, locality 11EV. **Figures 162–163**. *P. trailini*, locality 14EN. **Figures 164–165**. *P. afar* **sp. n.**, holotype. **Figures 166–167**. *P. oromo* **sp. n.**, holotype.



Figures 168–180: Pedipalp movable finger. **Figures 168–174**: *Pandiborellius*. **Figures 168–169**. *Pandiborellius magrettii*, male from locality 15EM (168), and male topotype from locality 15EF (169). **Figures 170–171**. *Pandiborellius awashensis*, male holotype (170), and female alotype (171). **Figure 172**. *Pandiborellius lanzai*, male topotype. **Figures 173–174**. *P. igdu* **sp. n.**, male holotype (173), and female paratype (174) from type locality. **Figures 175–180:** *Pandinurus*. **Figures 175–176**. *P. exitialis*, male (175) and female (176) from locality 16EA. **Figure 177**. *Pandinurus citernii*, male from locality 14EF. **Figure 178**. *Pandinurus phillipsii*, male from Somaliland, 15 km N of Sheikh, Goolis Mts., 09°58.927'N 45°10.377'E. **Figure 179**. *Pandinurus platycheles*, male from locality 14EP. **Figure 180**. *Pandinurus afar* **sp. n.**, male holotype.

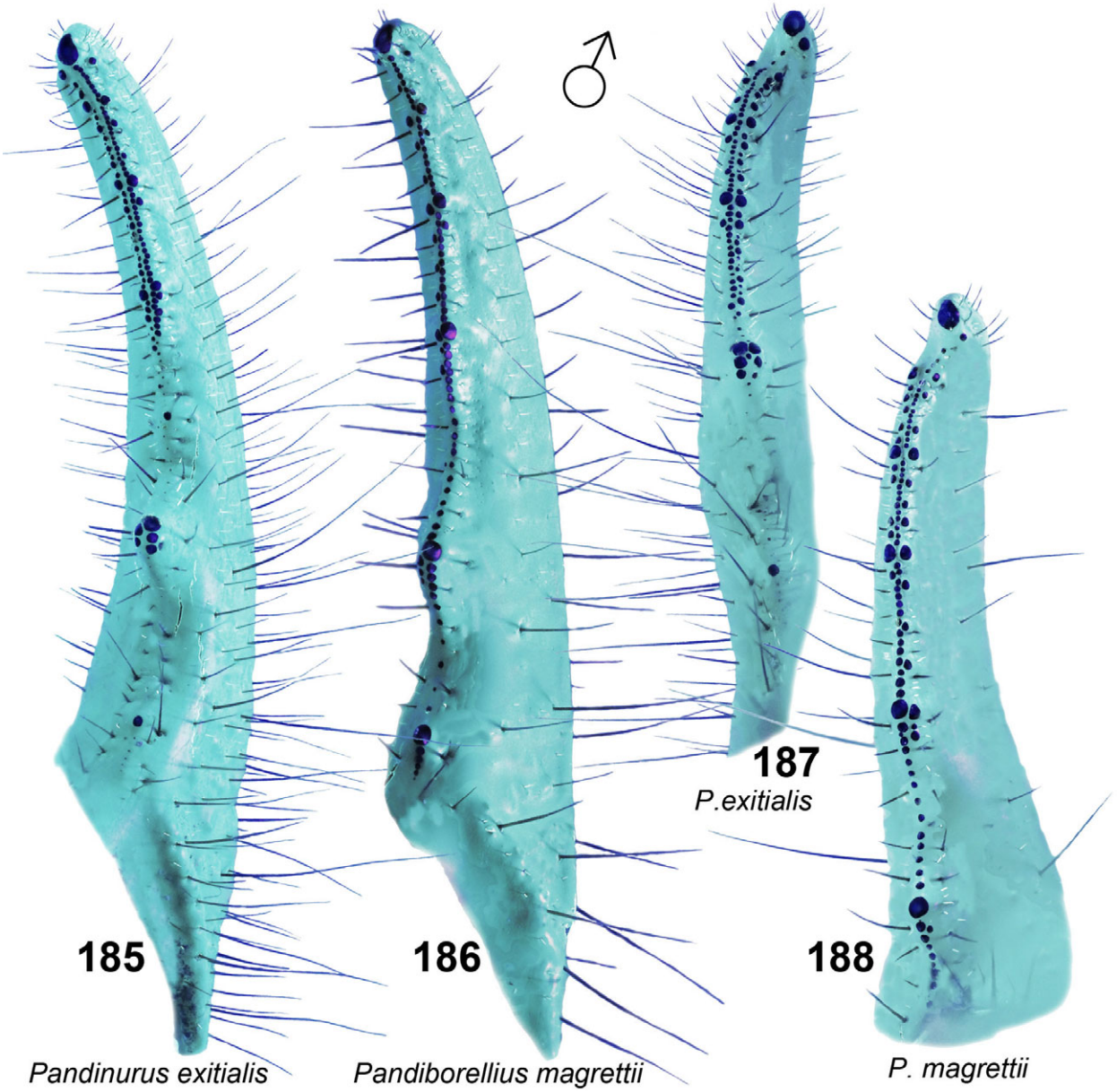


Figures 181–184: Differences in granulation of pedipalp movable fingers between *Pandinurus* and *Pandiborellius* in juveniles. **Figure 181**. *Pandinurus intermedius*, maturity exuvia of male from locality 14EH. **Figure 183**. *Pandinurus exitialis*, exuvia of female from locality 16EB under UV light.**Figures 182 and 184** (UV light). *Pandiborellius magrettii*, maturity exuvia of male from locality 15EM.

Kovařík, 2012: 11), 1juvenile 40 mm long (paratype), XI.2010, leg. T. Mazuch, FKCP.

DIAGNOSIS. Total length 95–110 mm. Color uniformly reddish brown to black, only legs yellow. Chelicerae brown, reticulate, with black fingers and anterior margins. Carapace lacking carinae and finely granulated. External trichobothria on patella number 15 (5 *eb*, 3 *esb*, 2 *em*, 1 *est*, 3 *et*); ventral trichobothria on patella number 42–46; internal trichobothria on chela number 2, ventral trichobothria on chela number 10–11. Pedipalp chela densely hirsute. Pedipalp chela dorsally with evenly sized conspicuous granules (Figs. 136–137). Dorso-external surface of chela with four carinae indicated by rows of granules. Chela internally with two longitudinal carinae covered by granules. Pectinal teeth number 20–23 in females (male is unknown). Dorsal carinae on first through fourth metasomal segments granulate, usually with smooth granules without discrete denticles. Spiniform formula of tarsomere II = 6-7/5: 6-7/5: 7/5: 7/5. Tarsomere II with 3 spiniform setae on inclined antero-ventral surface.

NOTE. For photos of the female holotype and photos of the type locality see figs. 29–37, 59 in Kovařík, 2012: 9–13, 17–20.



Figures 185–188: Differences in granulation of pedipalp movable and fixed fingers between males *Pandinurus* (granules in two parallel rows present in distal half of fingers) and *Pandiborellius* (granules in a row present in whole finger) under UV light. **Figures 185 and 187**. *Pandinurus exitialis*, male from locality 16EA, movable (185) and fixed (187) fingers. **Figures 186 and 188**. *Pandiborellius magrettii*, male from locality 15EM, movable (186) and fixed (188) fingers.

KEY TO SPECIES OF *PANDIBORELLIUS*

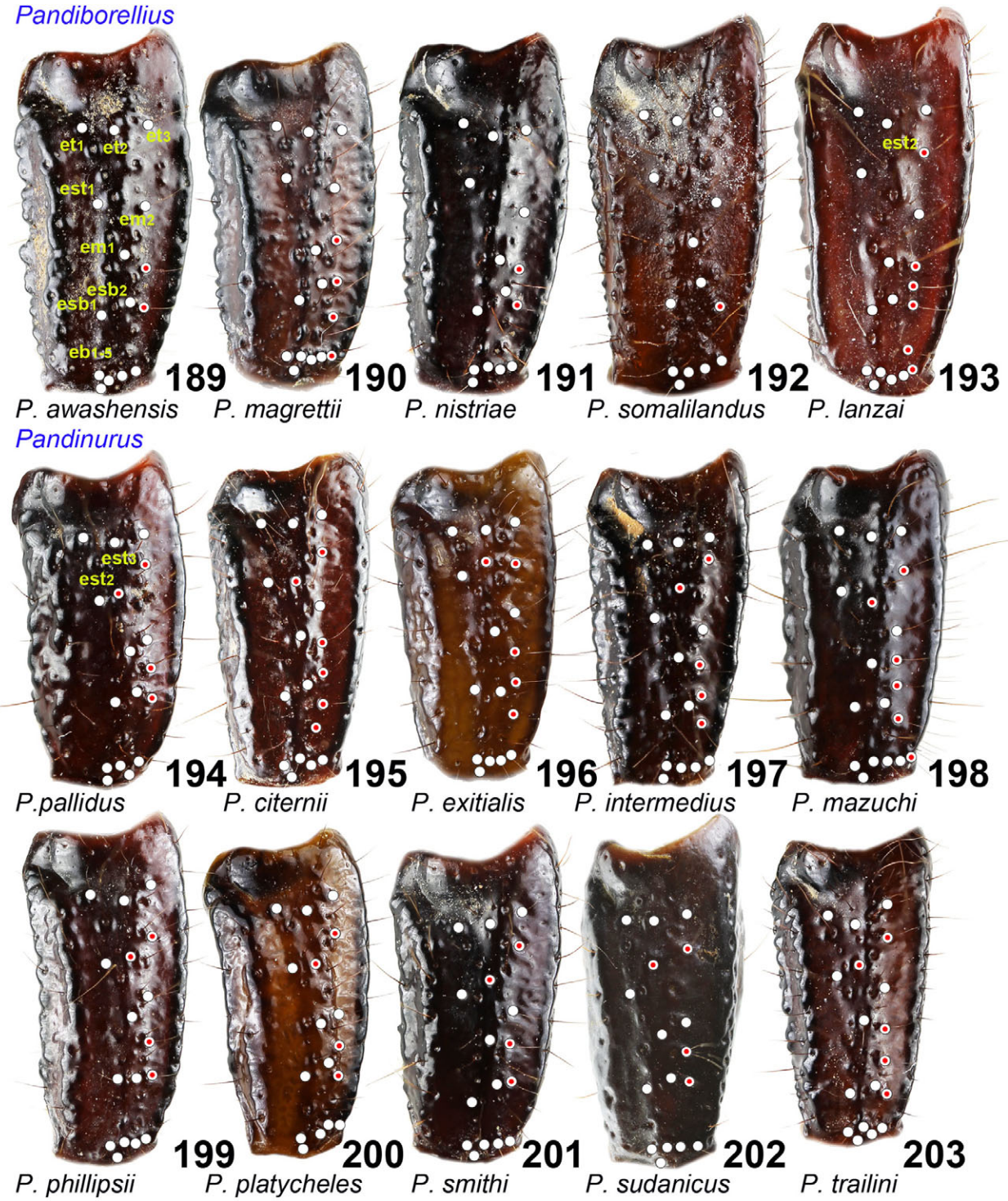
1. Pedipalp chela dorsally smooth without granules, usually shine (Figs. 142–143). 2
– Pedipalp chela dorsally granulate or tuberculate (Figs. 126–141). 3

2. Ventral trichobothria on pedipalp chela number 11–15. ..... ***P. lanzai*** Rossi, 2015
– ventral trichobothria on pedipalp chela number 6–9. ..... ***P. percivali*** (Pocock, 1902)

3. Pedipalp chela dorsally with evenly sized conspicuous granules (Figs. 126–129).. 4
– Dorsal surface of pedipalp chela of adults more or less tuberculate, without evenly sized granules; lobe of chela almost smooth (Figs. 132–135). 6

4. Legs of adults yellow (Fig. 47). 5
– Legs of adults reddish brown (Fig. 23). ..... ***P. awashensis*** (Kovařík, 2012)

5. External trichobothria on patella number 15 (5 *eb*, 3 *esb*, 2 *em*, 1 *est*, 3 *et*); ventral trichobothria on patella



Figures 189–203: Pedipalp patella external, trichobothrial pattern; accessory trichobothria are marked by red points. **Figures 189–193**: *Pandiborellius*. **Figures 189**. *P. awashensis*, male holotype. **Figures 190**. *P. magrettii*, male topotype from locality 15EF. **Figure 191**. *P. nistriae*, male holotype. **Figures 192**. *P. somalilandus*, female holotype. **Figure 193**. *P. lanzai*, male topotype. **Figures 194–203:** *Pandinurus*. **Figure 194**. *P. pallidus*, male from Somalia, Jubbada Hoose Province, Bilis Quoqaani env. **Figure 195**. *P. citernii*, female from locality 14EK. **Figure 196**. *P. exitialis*, male from locality 16EA. **Figures 197**. *P. intermedius*, male from locality 14EI. **Figure 198**. *P. mazuchi*, male paratype. **Figure 199**. *P. phillipsii*, male from Somaliland, 15 km N of Sheikh, Goolis Mts., 09°58.927'N 45°10.377'E. **Figure 200**. *P. platycheles*, male from locality 14EP. **Figure 201**. *P. smithi*, male from locality 11EV. **Figure 202**. *P. sudanicus*, male from Sudan, Kordofan Province, Lagowa. **Figure 203**. *P. trailini*, male topotype from locality 14EN.

number 42–46. ...…..... ***P. somalilandus*** (Kovařík, 2012)
– External trichobothria on patella number 16–17 (5 *eb*, 4–5 *esb*, 2 *em*, 2 *est*, 3 *et*); ventral trichobothria on patella number 35–41. .....…….... ***P. igdu*** **sp. n.**

6. Dorsolateral carinae on pedipalp chela well developed as pronounced smooth carina (Fig. 117). Dorsal carinae on metasomal segments I–IV granulate and terminate in a larger tooth most conspicuous on fourth segment. Spiniform formula of tarsomere II = 8/6: 8-9/6: 8-9/7: 9/7. .....…..... ***P. meidensis*** (Karsch, 1879)
– Dorsolateral carinae on pedipalp chela developed usually in distal part only (Figs. 130–135). Dorsal carinae on metasomal segments I–IV granulate mainly on fourth segment, usually with smooth granules without discrete denticles. Spiniform formula of tarsomere II = 6-7/4-5: 6-7/4-5: 6-7/4-6: 6-8/4-6. .....…….... 7

7. Male has strongly pronounced median lobe on movable finger of pedipalp. …. ***P. nistriae*** (Rossi, 2014)
– Male has only slightly more pronounced median lobe on movable finger of pedipalp than female. ...……... 8

8. Pectinal teeth number 22–24 in female holotype. Occurs in Yemen. ...…..... ***P. arabicus*** (Kraepelin, 1894)
– Pectinal teeth number 18–22 in both sexes. Occurs in Eritrea. 9

9. Ventral trichobothria on patella number 47–52. …… .....……..... ***P. insularis*** **sp. n.**
– Ventral trichobothria on patella number 31–40 (45). ..... ***P. magrettii*** (Borelli, 1901)

Pandinurus Fet, 1997
(Figs. 5–18, 144–167, 175–181, 183, 185, 187, 194–394, 396, Table 2)

Pandinus (*Pandinurus*) Vachon, 1974: 953 (*nomen nudum*, type species not designated); Fet, 1997: 248; Fet, 2000: 470–473 (in part) (complete reference list until 2000).
Pandinurus: Rossi, 2015a: 13–66 (in part).
Pandinurus (*Pandinurus*): Prendini, 2016: 57–58.
Pandinus (*Pandinoides*) (in part): Vachon, 1974: 953; Fet, 2000: 468; Kovařík, 2009: 51, 115, figs. 291–293.
Pandinoides (in part): Rossi, 2015a: 13.
Pandinus (*Pandinus*) (in part): Vachon, 1974: 953; Fet, 2000: 466–468; Kovařík, 2011: 1–17, 14, figs. 1–22, 35, 39–42.
Pandinus (in part): Rossi, 2015a: 12.
= *Pandinus* (*Pandinoirens*) Rossi, 2015c: 40–48, figs. 1–14, 24–26 (type species *Pandinus riccardoi* Rossi, 2015 = *Pandinurus platycheles* (Werner, 1916) **syn. n.**); Prendini, 2016: 8. **Syn. n.**

TYPE SPECIES. *Scorpio exitialis* Pocock, 1888.

DIAGNOSIS. Total length 70–135 mm. External trichobothria on patella number 17–20 (5–6 *eb*, 3–6 *esb*, 2 *em*, 3–4 *est*, 3 *et*); ventral trichobothria on patella number 29–59; accessory external trichobothrium *ea* on chela absent or present, internal trichobothria on chela number 1–4; ventral trichobothria on chela number 10–19. Pedipalp chela manus lobiform. Dorsoexternal carinae on pedipalp chela absent. Male has strongly pronounced median lobe on movable finger of pedipalp and larger telson than female. Pectines with fulcra. Pectinal teeth number 12–22. Sternum subpentagonal, longer than wide. Carapace without distinct carinae. Dentate margin of pedipalp chela movable and fixed fingers with distinct granules in two parallel rows present in distal half of fingers. Proximal half of fingers almost without granules in males and with distinct granules in a row in juveniles and females. These granules do not cover whole pronounced median lobe in males, but are usually represented by only several granules on top. 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 present. Telson without subaculear tubercle. Legs with one pedal spur, retrolateral spur absent.

Spiniform formula of tarsomeres of legs in Horn of Africa *Pandinurus* (Figs. 5–9).
Tarsomere I. Spiniform macrosetae *pd*, *vt*, *rt*, and *vst* are present on legs I–IV; *pst* and *pt* are present on legs III–IV, but *pt* is often missing or replaced by seta mainly on leg III as intraspecific variability; *vm* and *rm* are present on legs I–III, but both spiniform macrosetae are often missing or replaced by setae mainly on leg III as intraspecific variability (in *P. citernii* is sometimes missing *rm* also on leg I).
Tarsomere II. Spiniform formula is 6-7/4: 6-8/4-5: 7-9/4-6: 7-9/4-6. *P. smithi* has tarsomere II with 3 spiniform setae on inclined anteroventral surface (Fig. 16), all other examined species usually have 2 spiniform setae and the third is replaced by a non-spiniform seta. However, three species *P. phillipsii*, *P. sudanicus* and *P. trailini* often have the last spine transformed to "spiniform seta" which usually indicates a not well developed spine (Figs. 15 and 17) but could be also transformed to a well developed spiniform seta (*P. sudanicus*).

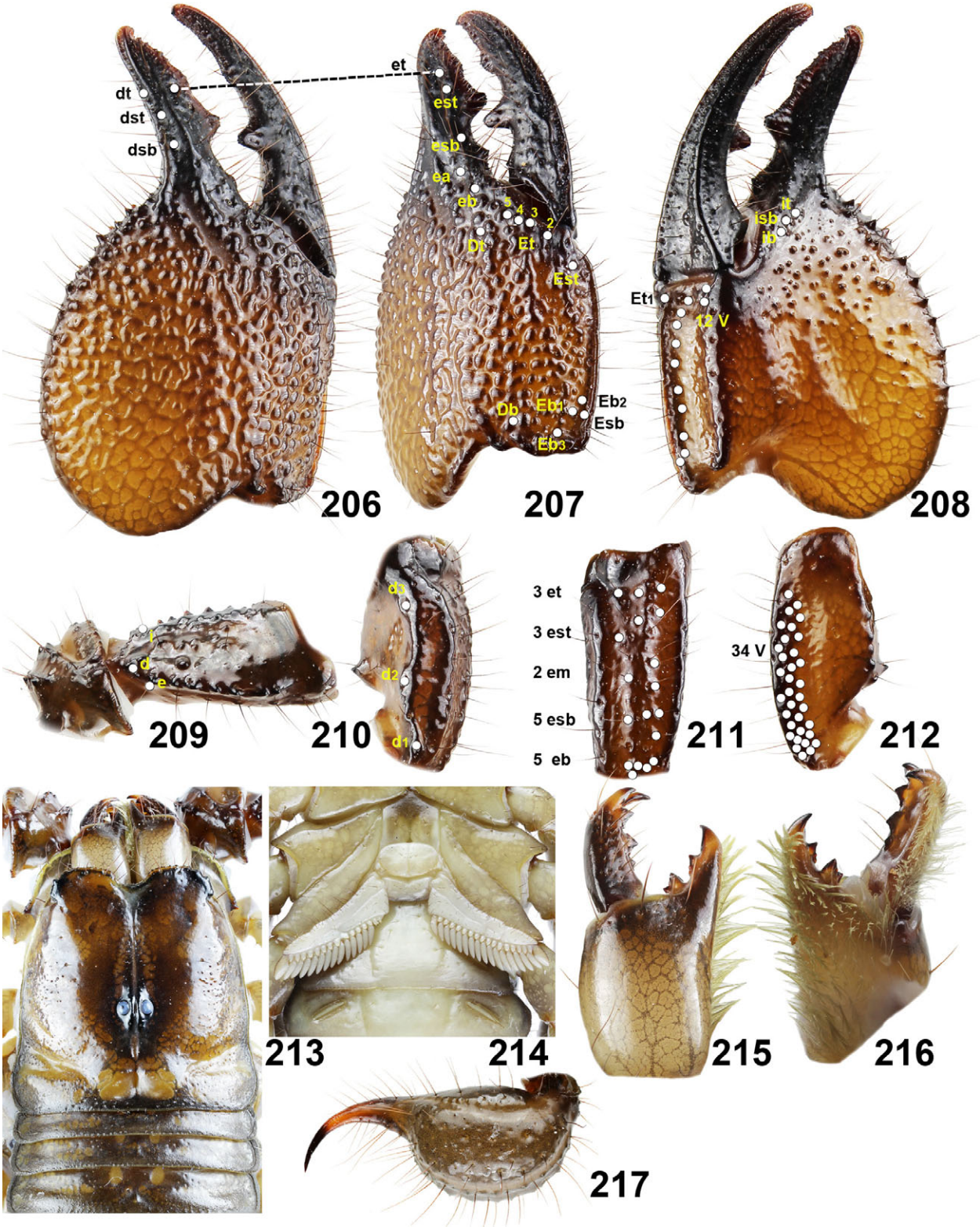
Pandinurus afar **sp. n.**
(Figs. 164–165, 180, 396, 204–219, 223–232, 394, 396, Table 2)
http://www.zoobank.org/urn:lsid:zoobank.org:act:FA1CADD6-1245-4C67-A38D-AD1211281CE7

TYPE LOCALITY AND TYPE REPOSITORY. Ethiopia, Afar State, Awash, 09°09'03.6"N 40°31'38.8"E, 1378 m a.s.l.; FKCP.

Figures 204–205: *Pandinurus afar* **sp**. **n**., male holotype in dorsal (204) and ventral (205) aspects. Scale bar: 10 mm.

TYPE MATERIAL. **Ethiopia**, Afar State, Awash, 09°09' 03.6"N 40°31'38.8"E, 1378 m a.s.l. (Locality No. **14ES**, Fig. 232), 26.XI.2014, 1♂ adult bred by F. Kovařík (holotype, Figs. 164–165, 180, 204–219, 223–230, 394, DNA No. 948 ecdysis 23.II.2016), 1♀im. alive in bred (ecdysis 3.IV.2015 and 5.II.2016, Fig. 231), leg. F. Kovařík, FKCP.

ETYMOLOGY. Named after the Afar (Afar: *Qafár*) people, also known as the Danakil and Adal, an ethnic group inhabiting the Horn of Africa. They reside primarily in the Afar Region of Ethiopia and northern Djibouti, although some also live in the southern end of Eritrea. The Afars speak the Afar language, which is part of the Cushitic branch of the Afro-Asiatic family. The



Figures 206–217: *Pandinurus afar* **sp. n.**, male holotype. **Figures 206–212**. Pedipalp segments, chela dorsal (206), external (207) and ventrointernal (208). Femur dorsal (209). Patella dorsal (210), external (211) and ventral (212). Trichobothrial pattern is indicated. **Figure 213**. Chelicerae, carapace and tergites I–III. **Figure 214**. coxosternal area. **Figures 215–216**. Chelicera dorsal (215) and ventral (216) aspects. **Figure 217**. Telson lateral.

Figures 218–221: **Figures 218–219:** *Pandinurus afar* **sp**. **n**. Male holotype, right hemispermatophore. **Figure 218**. Dorsal aspect. **Figure 219**. Ventral aspect. **Figures 220–221:** *Pandinurus oromo* **sp**. **n**. Male holotype, left hemispermatophore. **Figure 220**. Dorsal aspect. **Figure 221**. Ventral aspect. Note: the left hemispermatophore is displayed as mirror image for visual comparison to other figures of right hemispermatophores. Scale bars: 2 mm.

recorded type locality of this species is within their territory.

DIAGNOSIS. Total length 75 mm. Color uniformly yellowish brown to black, legs and telson are marbled. Chelicerae yellowish brown, reticulate, with black fingers and anterior margin. Carapace lacking carinae and sparsely granulated. External trichobothria on patella number 16–18 (5 *eb*, 4-5 *esb*, 1-2 *em*, 3 *est*, 3 *et*); ventral trichobothria on patella number 31–34; internal trichobothria on chela number 3, accessory external trichobothrium *ea* on chela present and located between trichobothria *esb* and *eb* on base of fixed finger, ventral trichobothria on chela number 11–12. Pedipalp densely hirsute, mainly on chela. Granules on dorsal surface of chela of pedipalp not conical and pointed, their apices often confluent. Lobe of chela without granules, only rugose. Internal surface of chela smooth, with several conical granules in distal part and two smooth carina. Chela of male length/width ratio is 1.73. Pectinal teeth number 16–17 in both sexes. Dorsal carinae on metasomal segments I–IV are not granulate by large pointed

Figures 222–225: Metasoma and telson lateral (222–223) ventral (224) and dorsal (225) views. **Figure 222**. *Pandinurus mazuchi*, male paratype. **Figures 223**–**225**. *Pandinurus afar* **sp**. **n**., male holotype.

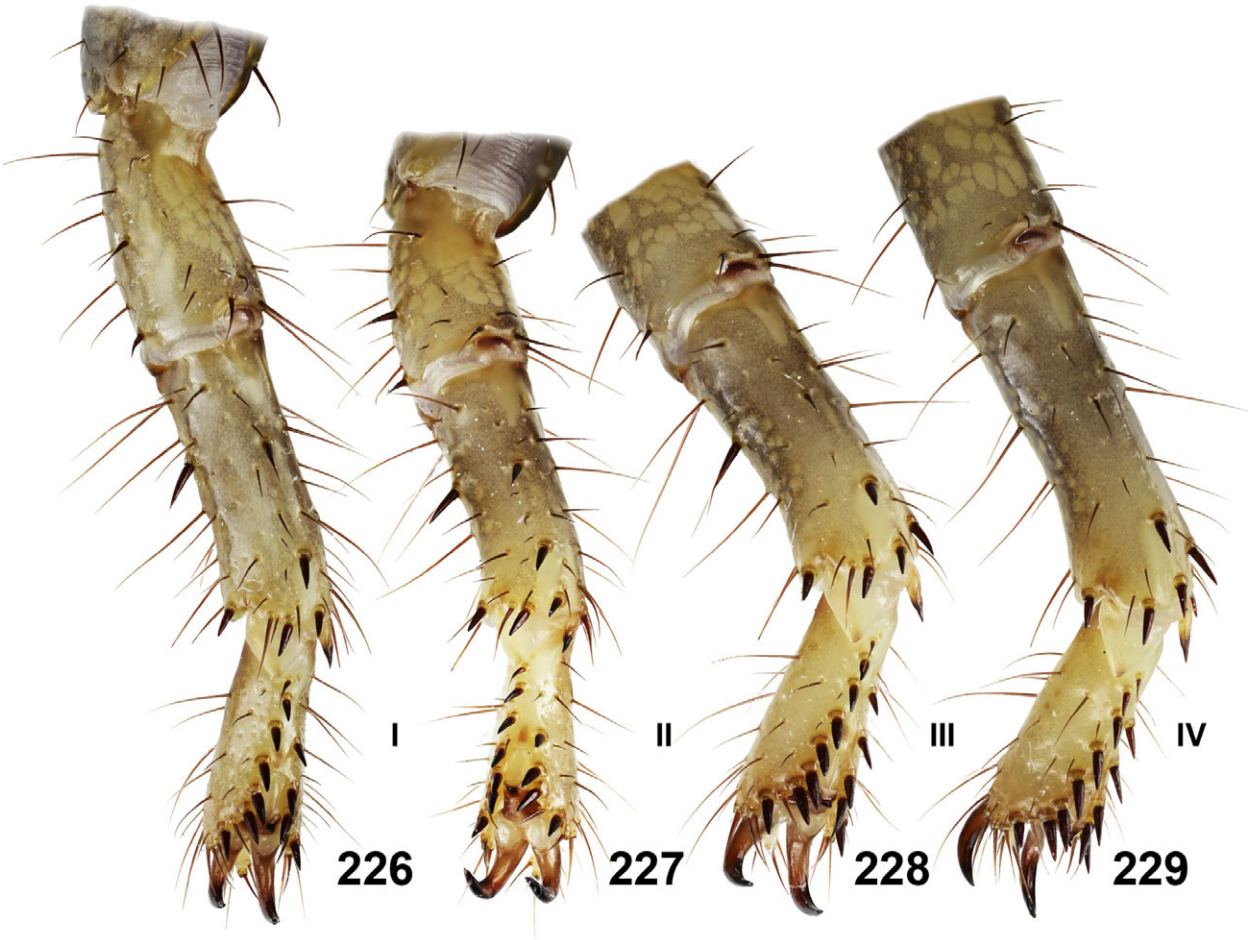
tooth. Spiniform formula of tarsomere II = 6-7/4: 6-7/4: 7-8/5: 7-8/5. Tarsomere II with 2 spiniform setae on inclined anteroventral surface. Length to width ratio of male 5th metasomal segment = 2.36.

DESCRIPTION. The adult male holotype is 74.6 mm long. The habitus is shown in Figs. 204–205. For position and distribution of trichobothria of pedipalps see Figs. 206–212. External trichobothria on the patella number 16–18 (5 *eb*, 4-5 *esb*, 1-2 *em*, 3 *est*, 3 *et*); accessory external trichobothrium *ea* on chela present and located between trichobothria *esb* and *eb* on base of fixed finger, ventral trichobothria on patella number 31–34; internal trichobothria on chela number 3, ventral trichobothria on chela number 11–12.

Coloration (Figs. 230–231). The base color is uniformly yellowish brown to black, legs and telson are marble, pedipalp chela is orange to reddish brown, chelicerae are yellow in base.

Carapace and mesosoma (Figs. 213–214). The entire carapace is smooth in the middle, sparsely covered by granules 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. The pectinal tooth count is 17–16 in male, 16 in female. 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.

Hemispermatophore (Figs. 218–219). Lamelliform. Distal lamina long, slightly constricted above hook, broader and slightly internally angled through most of its length. Distal end of lamina strongly curved in external drection, quickly tapering to an acuminate apex. Long hook projecting near base of internal margin of distal lamina. Proximal section of distal lamina below hook much shorter than distal section above it, with a deep, elongate longitudinal dorsal trough. Median lobe broadly rounded. Internobasal reflection of sperm duct with trough wider basally, narrowing distally to an inner lobe with rounded end. Proximal lobe large, broad, semicircular. Basal lobe subtriangular with rounded apex in ventral aspect. Trunk short, broad, gradually tapered towards base, with slightly sclerotized diagonal axial rib. *Dimensions* (mm): length of distal lamina above hook base 6.95; maximum width of distal lamina above hook base 0.92; length of proximal part of distal lamina (truncal flexure to hook base) 2.10; trunk length 3.80, width 2.21. *Morphometric ratios*: distal lamina above hook L/W 7.55; distal lamina above hook L/ truncal



Figures 226–229: *Pandinurus afar* **sp**. **n**., male holotype, left legs I–IV, retrolateral aspects.

flexure to hook base L 3.31; total distal lamina L/ trunk L 2.37.

Metasoma and telson (Figs. 223–225). The metasomal segments I–IV bear a total of 8 carinae of which the ventrosubmedian on segment I are obsolete to missing; ventrosubmedian carinae on segments I–III are smooth. Other carinae are sparsely granulated. The fifth segment has five variously developed and granulated carinae. The dorsal and lateral surfaces of the segments are rugose/ tuberculate with several granules, with segments IV–V being more granulated. The entire metasoma and telson are sparsely hirsute with long macrosetae. The telson is tuberculate, bulbous, with the aculeus shorter than vesicle.

Pedipalps (Figs. 206–212). The pedipalps are densely hirsute, mainly on the chela. The femur is tuberculate dorsally and bears four carinae composed of several strong granules. The patella is smooth and rugose, there are five rather smooth carinae, only the internal is composed of several big granules. The granules on dorsoexternal surface of chela of pedipalp are not conical and pointed, their apices often confluent. The lobe of chela without granules, only rugose. The internal surface of chela is smooth, with several conical granules in distal part and two smooth carinae. The movable and fixed fingers of the pedipalp with distinct granules in a two parallel rows present in distal half of the fingers. Proximal half of fingers almost without granules in male and with distinct granules in a row in juvenile.

Legs (Figs. 226–229). All legs with laterodistal lobes and a prolateral pedal spur, the retrolateral spur is absent. All legs are without distinct carinae and smooth. The tarsomeres are hirsute with setae and macrosetae. Spiniform formula of tarsomere II = 6-7/4: 6-7/4: 7-8/5: 7-8/5. Tarsomere II with 2 spiniform setae on inclined anteroventral surface.

Chelicerae (Figs. 215–216). Movable finger dorsal edge with one large subdistal (*sd*) denticle; ventral edge smooth; ventral distal (*vd*) denticle longer than prominent dorsal (*dd*) denticle. Fixed finger with four denticles, median (*m*) and basal (*b*) denticles conjoined on common trunk; no ventral accessory denticles present.

Measurements. See Table 1.

Figures 230–231: *Pandinurus afar* **sp**. **n**., in vivo habitus. Male holotype (230) and female immature paratype (231).

Figure 232: *Pandinurus afar* **sp**. **n**., the type locality.

AFFINITIES. *Pandinurus afar* **sp**. **n**. is similar to *P. mazuchi*. Morphologically it is possible to differentiate these two sister species according to granulation of dorsal and dorsolateral carinae of metasomal segments I–IV which are more granulate and terminate in a larger tooth most conspicuous on fourth segment in *P. mazuchi* than in *P. afar* **sp**. **n**. (Figs. 222 and 223). Moreover, these two species with separate ranges of distribution (Fig. 396) possess highly different species-specific karyotypes (see Plíšková et al., in preparation).

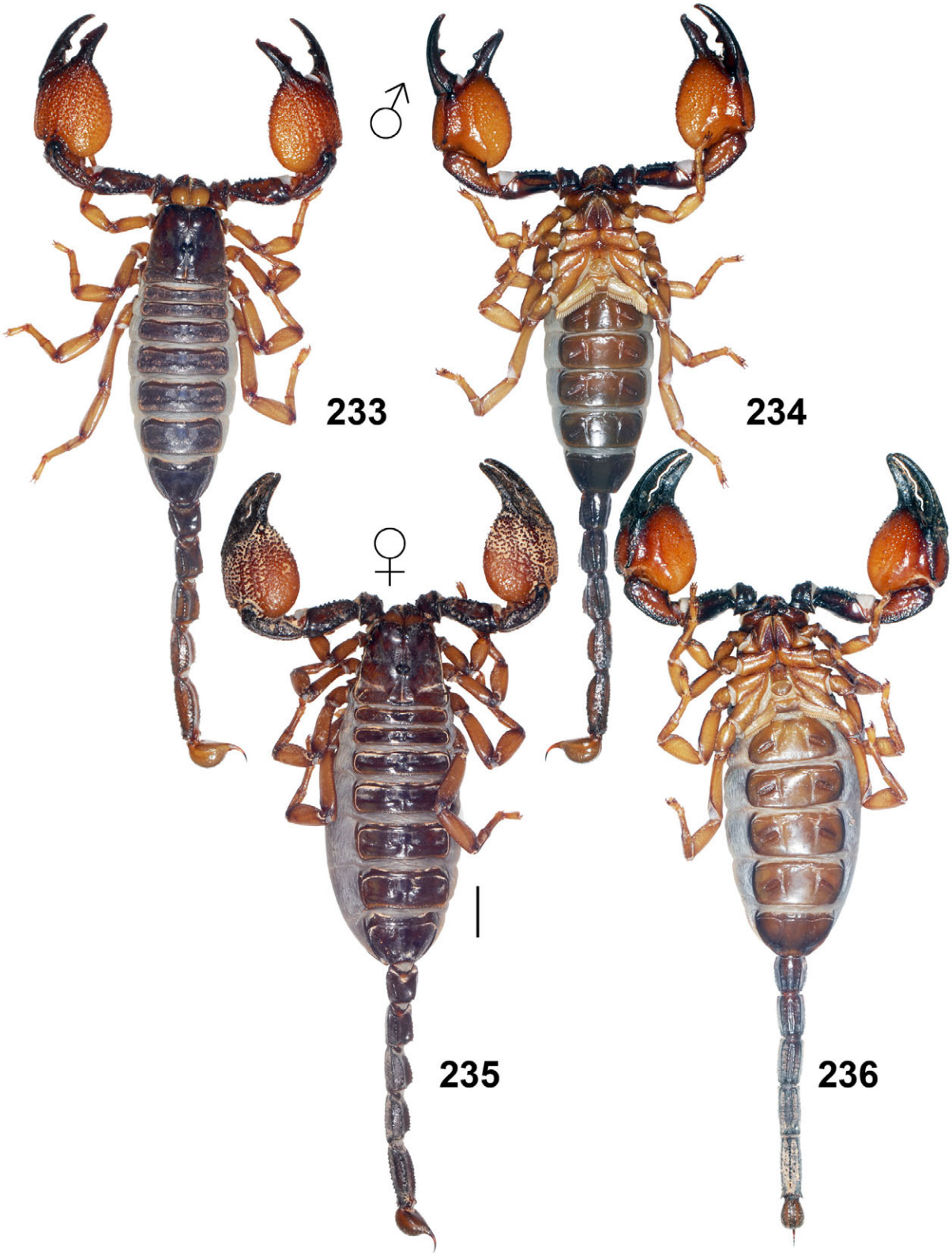
Pandinurus citernii (Borelli, 1919) **stat**. **n**.
(Figs. 10, 144–145, 177, 195, 233–244, 246–253, 256–259, 264–278, 396)

Pandinus citernii Borelli, 1919: 378–381.
Pandinus (*Pandinurus*) *citernii*: Vachon, 1974: 953; 140; Fet, 2000: 471 (complete reference list until 2000).
Pandinus (*Pandinus*) *phillipsii* (in part): Kovařík, 2003: 152; Kovařík, 2009: 57, 128, figs. 398–399.

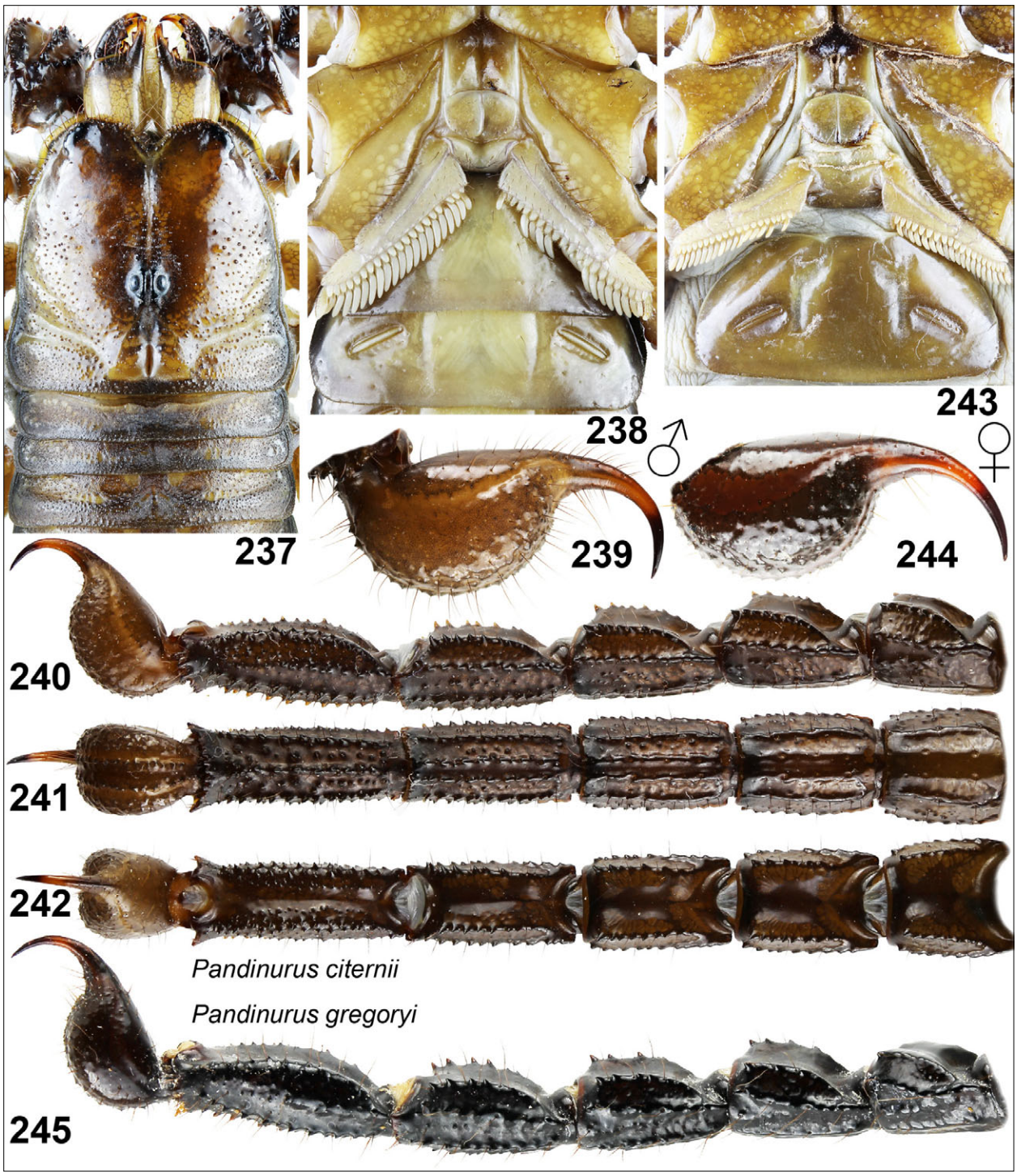
TYPE LOCALITY AND TYPE REPOSITORY. Somalia, Dolo, rive del Ganale Doria; MCSN.

TYPE MATERIAL EXAMINED. **Somalia**, Dolo, rive del Ganale Doria, III–IV.1911, 1♂ (holotype, figs. 398–399 in Kovařík, 2009: 128); MCSN.

ADDITIONAL MATERIAL EXAMINED. **Ethiopia**, Somali State, Liben region, between Negele and Filtu, 05°11'09.3"N 40°09'42"E, 1132 m a.s.l. (Locality No. **14EF**, Fig. 277), 19.XI.2014, 1♂ (Figs. 10, 144–145, 177, 237–242, 246–249, 257–259, 275, 394, DNA No. 654), leg. F. Kovařík; Somali State, Liben region, between Filtu and Negele, 05°10'22.9"N 40°19'16.9"E, 1209 m a.s.l. (Locality No. **14EJ**), 21.XI.2014, 2♂ (DNA No. 964, ecdysis 2.X.2015, 13.II.2016, Figs. 233–234, 250–253, 394), leg. F. Kovařík; Somali State, Liben region, between Filtu and Negele, 05°11'29.4"N 40° 07'19.9"E, 1168 m a.s.l. (Locality No. **14EK**, Fig. 278), 21.XI.2014, 1♂2♀ (Figs. 196, 235–236, 243–244, 256, 276) 3juvs., leg. F. Kovařík, 1♂ adult bred by F. Kovařík (Figs. 264–274, ecdysis 22.II.2015, 1.VIII. 2015, 18.III.2016), 1♂ adult bred by F. Kovařík (DNA No. 868, ecdysis 27.II.2015, 25.VIII.2015, Fig. 394), 1♂ adult bred by F. Kovařík (DNA No. 966, ecdysis 26.IV.2015, 7.VIII.2015, 11.III.2016, Fig. 394), 1♂ adult bred by F. Kovařík (DNA No. 986, ecdysis 20.III.2015, 20.IV.2016, Fig. 394), 1♂ adult bred by F. Kovařík (DNA No. 988, ecdysis 26.IV.2015, ecdysis



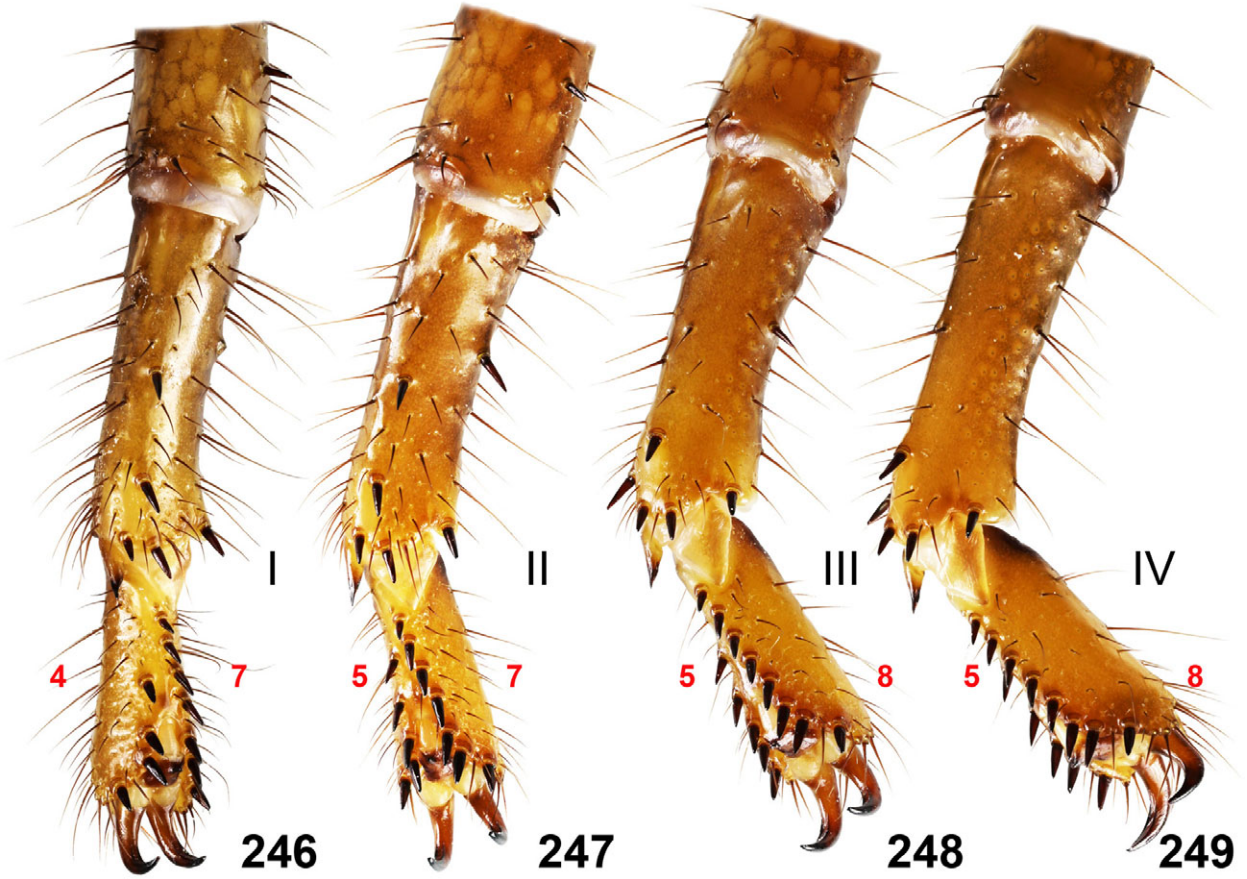
Figures 233–236: *Pandinurus citernii*. **Figures 233–234**. Male from locality 14EJ in dorsal (233) and ventral (234) aspects. **Figures 235–236**. Female from locality 14EK in dorsal (235) and ventral (236) aspects. Scale bar: 10 mm.



Figures 237–245: **Figures 237–244:** *Pandinurus citernii*. **Figures 237–242**. Male from locality 14EF, chelicerae, carapace and tergites I–III (237), coxosternal area and sternite III–IV (238), telson lateral (239), and metasoma and telson lateral (240), ventral (241), and dorsal (242) views. **Figures 243–244**. Female from locality 14EK, coxosternal area and sternite III (243), and telson lateral (244). **Figure 245**. *Pandinurus gregoryi*, male from Kenya, Mt. Kenya, metasoma and telson lateral.

21.III.2016, Fig. 394), 1im♂ bred by F. Kovařík (ecdysis 17.I.2015, 9.III.2015, 2.IX.2015, dead 10.XI.2016 one ecdysis before maturity), 1♂2♀3ims. alive. All specimens are in the first author´s collection (FKCP).

DIAGNOSIS. Total length 90–135 mm. Color uniformly brown to reddish black; legs brown, usually lighter than body; chela usually orange to brown. Chelicerae yellowish brown, reticulate, with black fingers and anterior



Figures 246–249: *Pandinurus citernii*, male from locality 14EF, right legs I–IV, retrolateral aspect.

margin. Carapace lacking carinae and sparsely granulated. External trichobothria on patella number 18–20 (5–6 *eb*, 5–6 *esb*, 2 *em*, 3 *est*, 3 *et*); ventral trichobothria on patella number 42–59; internal trichobothria on chela number 3–4, accessory external trichobothrium *ea* on chela absent, ventral trichobothria on chela number 15–19. Pedipalp densely hirsute, mainly on chela. Granules on dorsal surface of chela of pedipalp not conical and pointed, their apices may be confluent. Lobe of chela without granules, only rugose. External surface of chela granulated and without carinae. Chela of male length/width ratio is 1.62–1.76. Pectinal teeth number 18–22 in both sexes. Dorsal carinae on first through fourth metasomal segments granulate and terminate in a larger tooth most conspicuous on fourth segment. Spiniform formula of tarsomere II = 6-7/4: 6-8/4-5: 8/5: 8-9/5. Tarsomere II with 2 spiniform setae on inclined anteroventral surface. Length to width ratio of male 5th metasomal segment = 2.60–2.82.

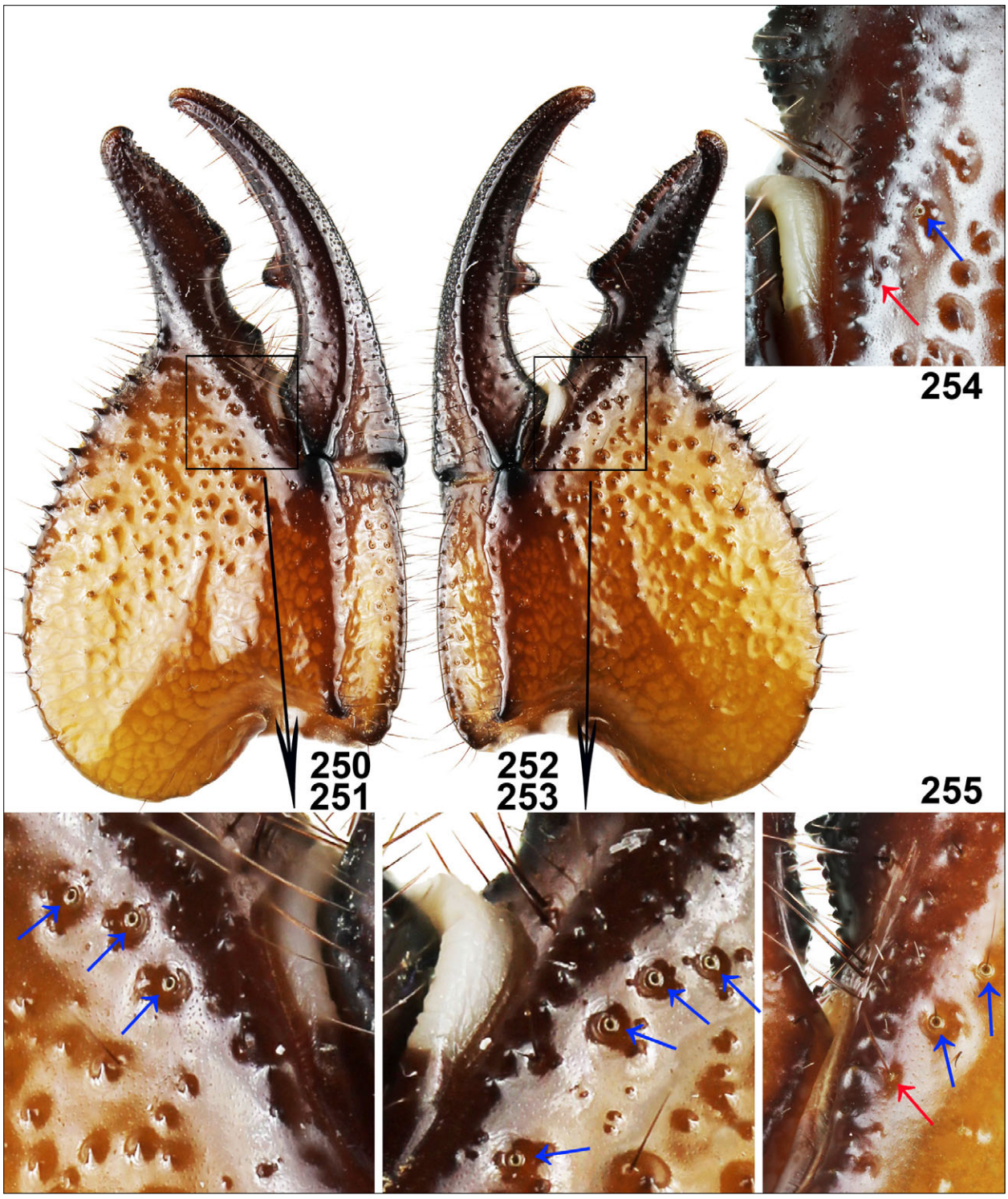
COMMENTS. Kovařík (2003) studied the male holotype of *P. citernii* and after comparison with two female syntypes of *P. phillipsii*, he synonymized these two species. During the expedition to Horn of Africa in 2014, the first author collected more specimens in three Ethiopean localities. Studying these specimens and comparing them with recently collected *P. phillipsii* specimens from Somaliland showed that the previous synonymization was invalid, and we have restored the species.

Pandinurus exitialis (Pocock, 1888)
(Figs. 11, 146–147, 175–176, 183, 185, 187, 196, 254–255, 279–293, 394, 396)

Scorpio exitialis Pocock, 1888: 249–251.
Pandinus (*Pandinurus*) *exitialis*: Vachon, 1974: 953.
Pandinus (*Pandinurus*) *exitialis* (in part): Fet, 2000: 471 (complete reference list until 2000); Kovařík, 2003: 151; Kovařík & Whitman, 2005: 114; Kovařík, 2009: 54, 121 figs. 347–348.
Pandinurus (*Pandinurus*) *exitialis*: Rossi, 2015a: 18–19 (in part).
Pandinurus exitialis: Kovařík et al., 2016: 34.

TYPE LOCALITY AND TYPE REPOSITORY. Abyssinia (now Ethiopia), Shoa; BMNH.

TYPE MATERIAL EXAMINED. **Ethiopia**, Abyssinia, Shoa, 1♂ (holotype, figs. 347–348 in Kovařík, 2009: 121); BMNH.



Figures 250–255: **Figures 250–253:** *Pandinurus citernii*, Pedipalp chelae left (250–251) and right (252–253) ventrointernal views of male from locality 14EJ. **Figures 254–255:** *Pandinurus exitialis*, exuvia of male (254) and female (255) both from locality 16EA, pedipalp chelae internal. Blue arrows show pedipalp chelal internal trichobothria, red arrows show setae.

ADDITIONAL MATERIAL EXAMINED. **Ethiopia**, Southern Nationalities and Peoples Region Federal State (SNNPR), Hammar, E of Turmi, 04°52'17"N 36°38'44 "E, 385 m a.s.l. (Locality No. **13EV**, Fig. 290), 5.VII. 2013, 1♀ (Figs. 281–282, 289), leg. F. Kovařík et P. Novák, FKCP; SNNPR, Turmi, 4°57'54"N 36° 29'

Figures 256–263: Pedipalp chela and patella. **Figures 256–259:** *Pandinurus citernii*, female from locality 14EK, chela dorsal (256), male from locality 14EF, chela and patella dorsal (257), external (258) and ventrointernal (259). **Figures 260–263:** *Pandinurus trailini*, topotypes, female, chela and patella dorsal (260), male, chela and patella dorsal (261), external (262) and ventrointernal (263).

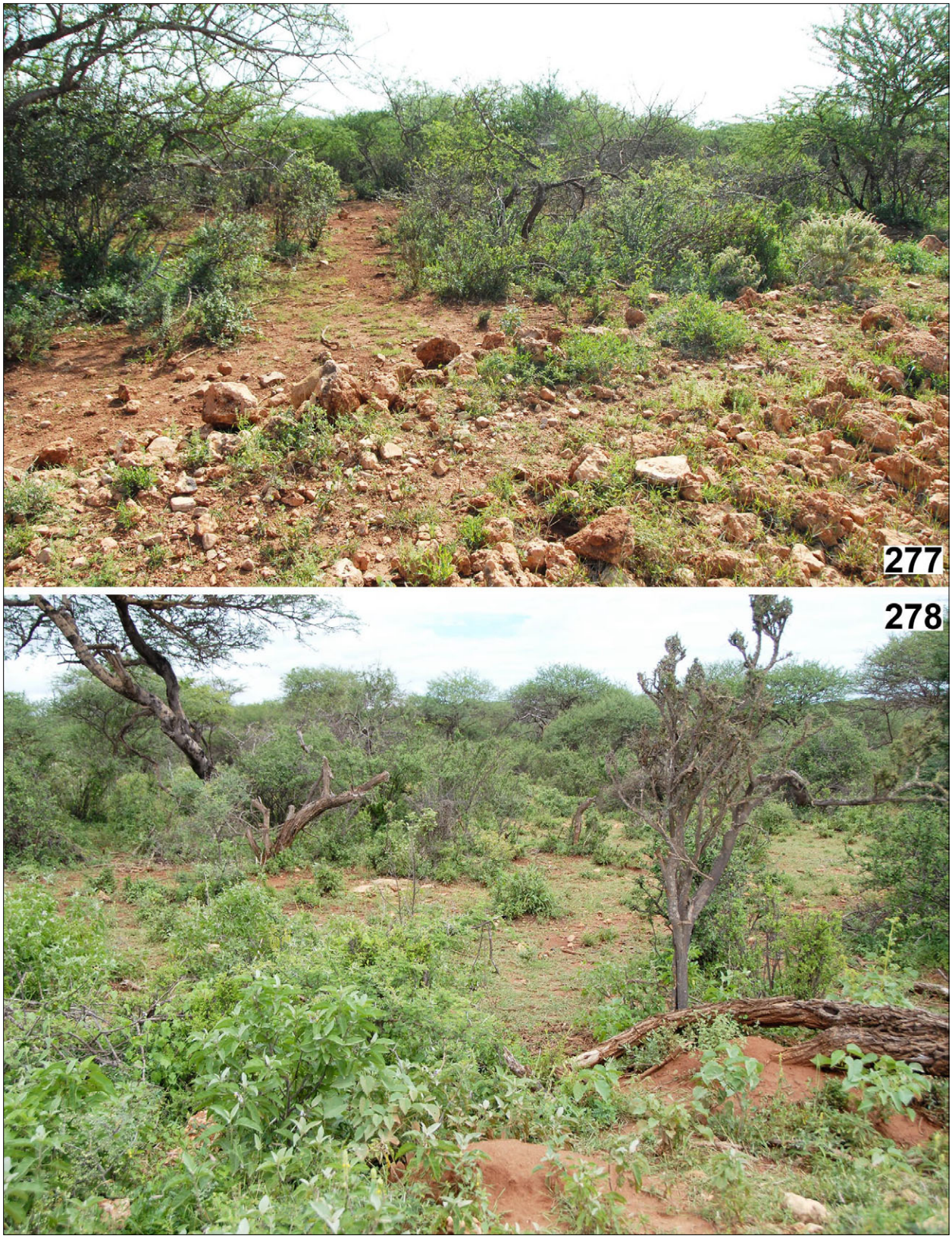
Figures 264–271: *Pandinurus citernii*. **Figures 264**–**265**. Juvenile male from locality 14EK before (264) and after (265) fourth ecdysis. **Figures 266**–**271**. Regeneration of several damaged teeth of pectines (colored arrows) during progress of male from locality 14EK, exuvia from 1.VIII.2015 (266–267), exuvia from maturity ecdysis 18.III.2016 (268–269), adult male after the ecdysis 18.III.2016 (270–271). Scale bars: 5 mm.

00"E, 915 m a.s.l., 20.VII.2015, 1♂1♀, ZSMC, leg. R. Wanninger & R. Beck, 04°58'32"N 36°30'53"E, 908 m a.s.l. (Locality No. **16EA**, Fig. 292), 9.-11.IV.2016, 3♂ (Figs. 11, 146–147, 175, 185, 187, 196, 279–280, 283–287, 394, DNA Nos. 965, 975) 3♀ (Figs. 176, 291) 1juv. (ecdysis 23.V.2016 and 26.VII,2016), 1♂4♀5ims. alive (Figs. 254–255, 288), leg. F. Kovařík, FKCP; SNNPR, near Turmi, 04°45'20"N 36°22'14"E, 663 m a.s.l. (Locality No. **16EB**, Fig. 293), 11.IV.2016, 2ims. alive (Fig. 183), leg. F. Kovařík, FKCP.

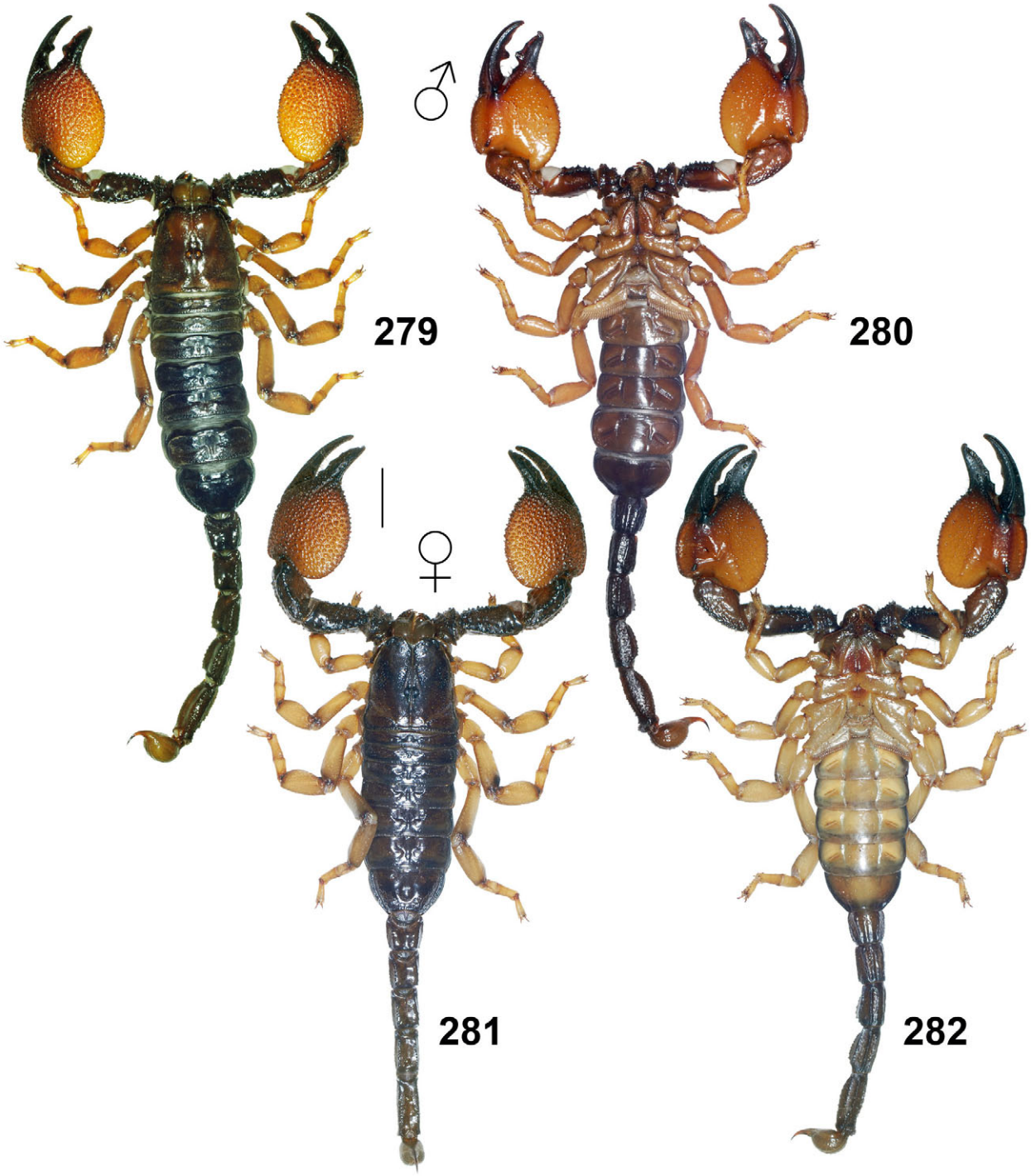
Figures 272–274: *Pandinurus citernii*, male from locality 14EK in phases seventh (maturity) ecdysis (272–273) and shortly after the ecdysis (274).

EMENDED DIAGNOSIS. Total length 85–130 mm. Color uniformly reddish brown to black; legs yellowish brown, lighter than body; chela usually orange. Chelicerae yellowish brown, reticulate, with black fingers and anterior margin. Carapace lacking carinae and granulated. External trichobothria on patella number 18–20 (5–6 *eb*, 5–6 *esb*, 2 *em*, 3 *est*, 3 *et*); ventral trichobothria on patella number 33–44; internal trichobothria on chela number 1–3, accessory external trichobothrium *ea* on chela absent, ventral trichobothria on chela number 12–

Figures 275–276: *Pandinurus citernii*, in vivo habitus. Male and its damaged exuvia (275) in Ethiopia, locality 14EF and female (276) in Ethiopia, locality 14EK.

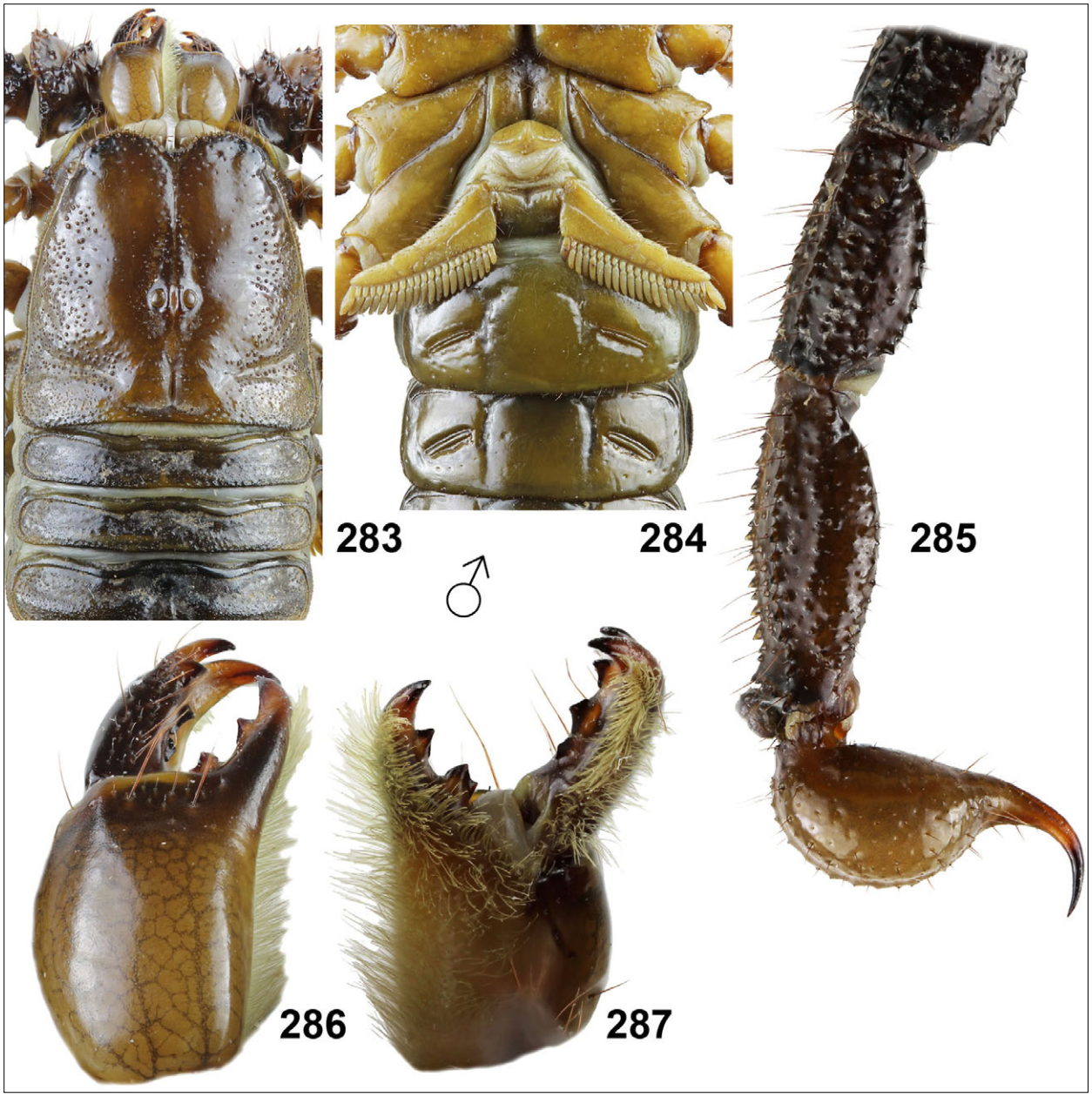


Figures 277–278: *Pandinurus citernii*, localities 14EF (277) and 14EK (278), Ethiopia, Somali State, Liben region, between Negele and Filtu.



Figures 279–282: *Pandinurus exitialis*. **Figures 279**–**280**. Male from locality 16EA in dorsal (279) and ventral (280) aspects. **Figures 281**–**282**. Female from locality 13EV in dorsal (281) and ventral (282) aspects. Scale bar: 10 mm.

16. Pedipalp densely hirsute, mainly on chela. Granules on dorsal surface of chela of pedipalp are usually conical but not pointed. Lobe of chela rugose. External surface of chela granulated and without carinae. Chela of male length/ width ratio is 1.59–1.62. Pectinal teeth number 17–22 in both sexes. Dorsal carinae on first through fourth metasomal segments sparsely granulate. Spiniform formula of tarsomere II = 6-7/4: 6-7/4-5: 7-8/5:



Figures 283–287: *Pandinurus exitialis*, male from locality 16EA, chelicerae, carapace and tergites I–III (283), coxosternal area and sternites III–IV (284), metasomal segments IV–V and telson lateral (285), left chelicera dorsal (286) and ventral (287).

8/5-6. Tarsomere II with 2 spiniform setae on inclined anteroventral surface. Length to width ratio of male 5th metasomal segment = 2.60–2.71.

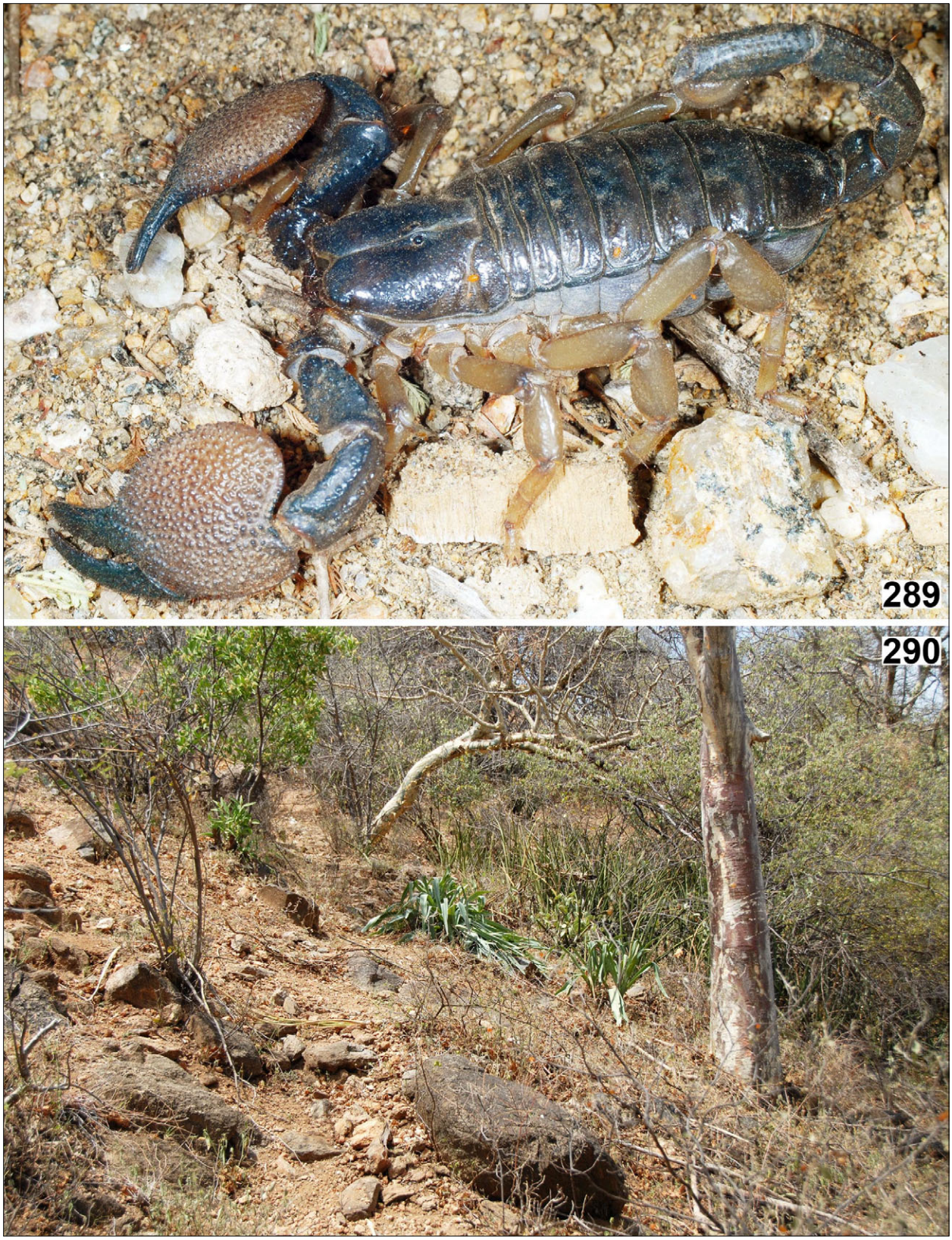
Pandinurus gregoryi (Pocock, 1896)
(Figs. 18, 148–149, 245, 351, 396)

Scorpio gregorii Pocock, 1896a: 432–435, figs. 3, 3a.
Pandinus (*Pandinurus*) *gregoryi*: Vachon, 1974: 953; Fet, 2000: 471 (complete reference list until 2000); Kovařík, 2009: 55, 122, 131, figs. 301, 356–364, 410–413; Kovařík, 2012: 17, 19.
Pandinus (*Pandinurus*) *exitialis*: Kovařík, 2003: 151 (in part).
Pandinurus (*Pandinurus*) *gregoryi*: Rossi, 2015a: 19, figs. 26–28.

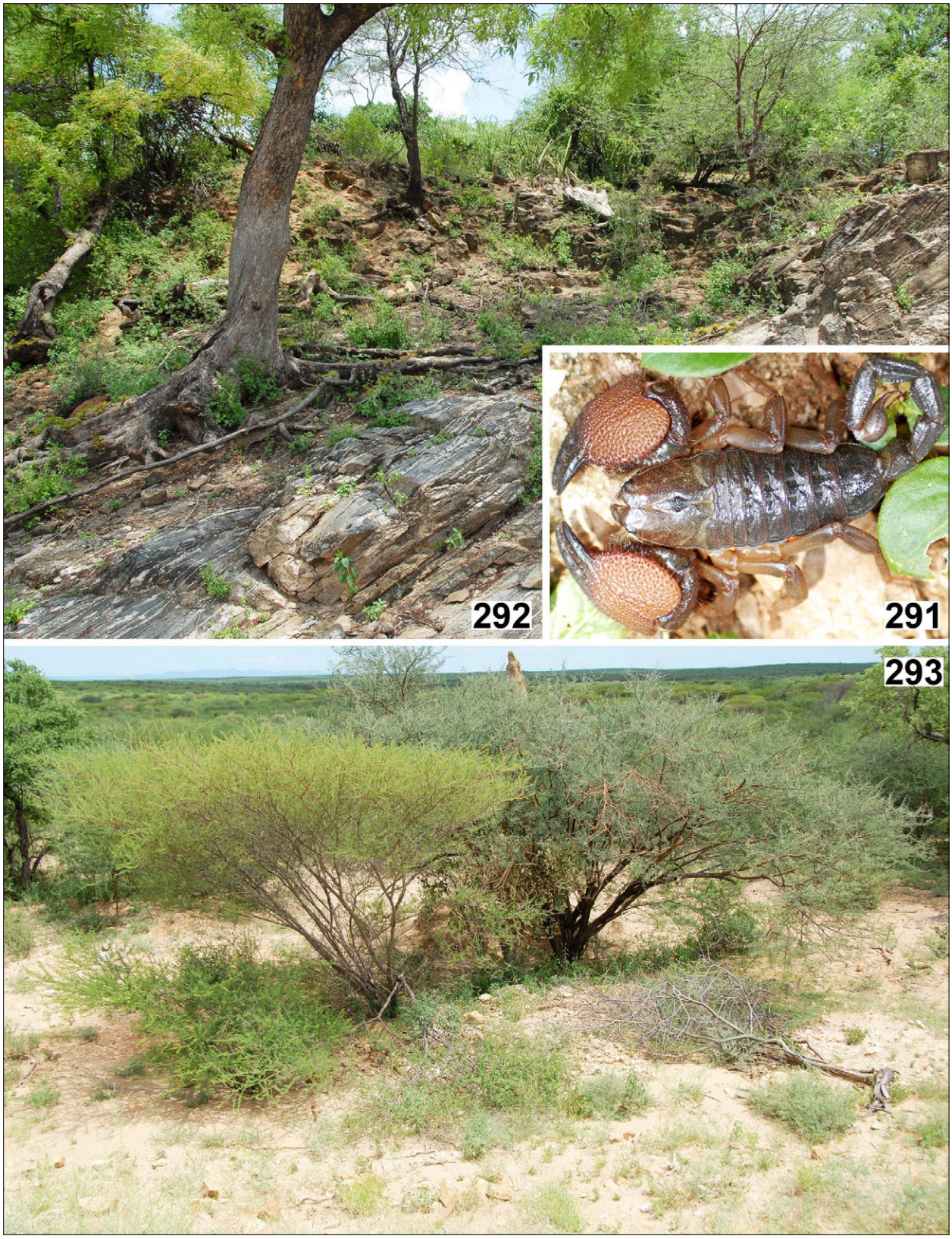
TYPE LOCALITY AND TYPE REPOSITORY. Kenya, Kinani; BMNH.

MATERIAL EXAMINED. **Kenya,** Lake Baringo, 10. XI.1996, 4juvs., leg. J. Bačovský, FKCP; Maramtu Hill, Maramtu village, Garissa, 24. VIII.2005, 1♀, leg. T.

Figure 288: *Pandinurus exitialis*, Male shortly after maturity ecdysis (top) and female immature before maturity ecdysis (down), both are from locality 16EA.



Figures 289–290: *Pandinurus exitialis*, female in vivo habitus (289) in locality 13EV (290).



Figures 291–293: *Pandinurus exitialis*. **Figure 291**. Female in vivo habitus in locality 16EA. **Figures 292–293**. Localities 16EA (292) and 16EB (293).

Mazuch, FKCP; Mt. Kenya, 6♂11♀5juvs. (Figs. 18, 148–149, 245, 351), 2008, FKCP.

DIAGNOSIS: Total length 90–130 mm. Color uniformly brown to reddish black; legs and chela reddish brown. Chelicerae brown, reticulate, with black fingers and anterior margin. Carapace lacking carinae and rather densely granulated. External trichobothria on patella number 17–19 (5–6 *eb*, 4–5 *esb*, 2 *em*, 3 *est*, 3 *et*); ventral trichobothria on patella number 33–41; internal trichobothria on chela number 2, accessory external trichobothrium *ea* on chela absent, ventral trichobothria on chela number 10–14 ventral trichobothria. Pedipalp densely hirsute, mainly on chela. Granules on dorsal surface of chela of pedipalp not conical and pointed, their apices may be confluent; lobe rugose, amost smooth. Chela internally granulated mainly in distal part, with two longitudinal carinae covered by several granules. Chela of male length/ width ratio is 1.70–1.78. Pectinal teeth number 17–20 in male and 16–18 in female. Dorsal carinae on first through fourth metasomal segments granulate and terminate in a larger tooth most conspicuous on fourth segment. Spiniform formula of tarsomere II = 6-7/4: 6-7/4: 7-8/5-6: 7-9/5-6. Tarsomere II with 2 spiniform setae on inclined anteroventral surface. Length to width ratio of male 5th metasomal segment = 2.54–2.58.

Pandinurus intermedius (Borelli, 1919) **stat**. **n**.
(Figs. 12, 150–151, 181, 197, 294–319, 394, 396)

Pandinus intermedius Borelli, 1919: 375–378.
Pandinus (*Pandinus*) *intermedius*: Birula, 1928: 88; Vachon, 1974: 953; Fet, 2000: 471 (complete reference list until 2000).
Pandinus (*Pandinus*) *phillipsii* (in part): Kovařík, 2003: 152; Kovařík, 2009: 57.

TYPE LOCALITY AND TYPE REPOSITORY. Somalia, Dolo, rive del Ganale Doria, MCSN.

TYPE MATERIAL EXAMINED. **Somalia**, Dolo, rive del Ganale Doria, III–IV.1911, 1♂1♀ (lectotype and paralectotype), MCSN.

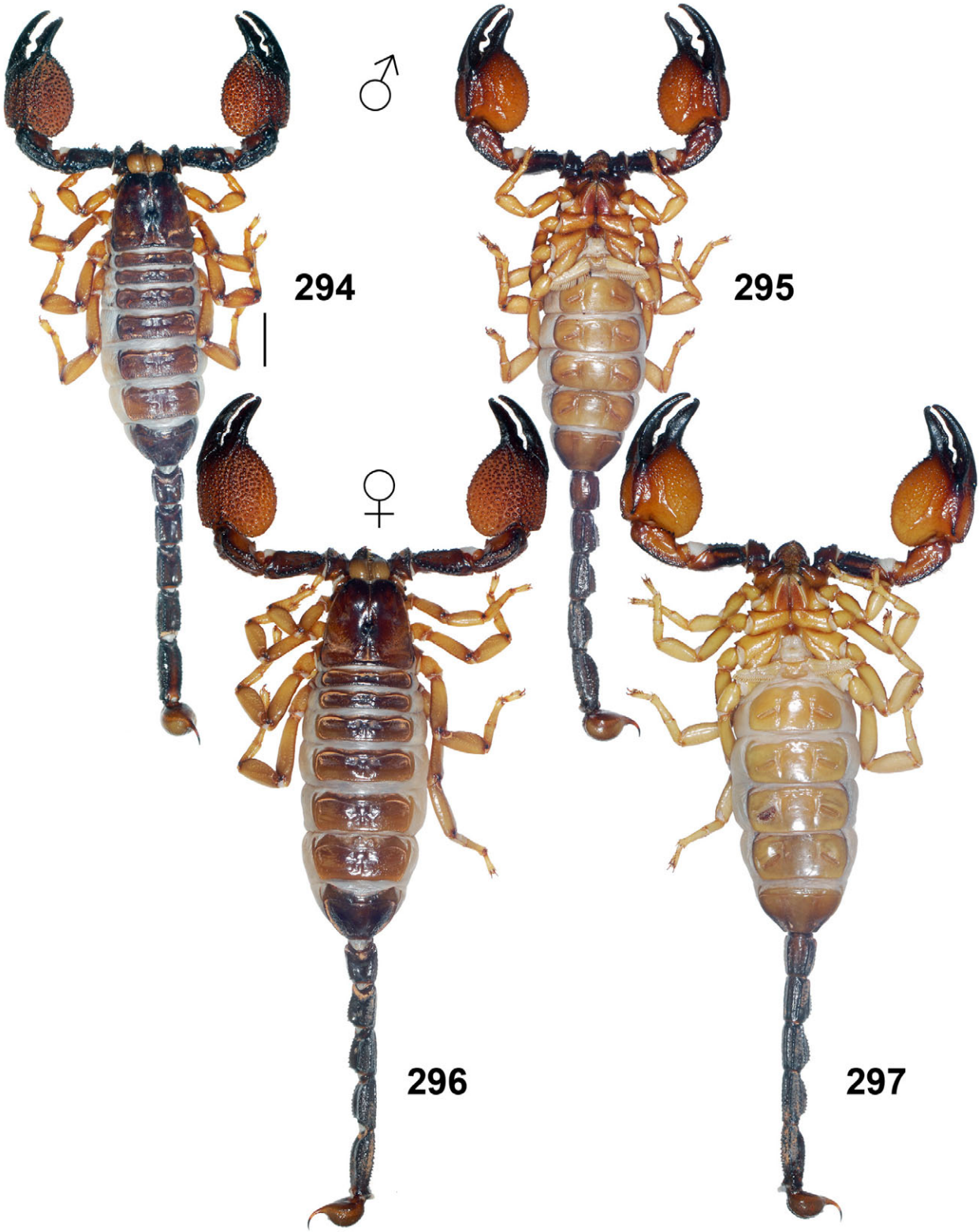
ADDITIONAL MATERIAL EXAMINED. **Ethiopia**, Somali State, Liben Region, between Filtu and Dolo Odo, 04°50'18.1"N 40°56'23.5"E, 885 m a.s.l. (Locality No. **14EH**, Fig. 318), 20.XI.2014, 2♂5♀ (Figs. 12, 150–151, 294–308, 310–311, 394, DNA No. 653) 5juvs. (Fig. 309), leg. F. Kovařík, 1♂ adult bred by F. Kovařík (Figs. 181, 394, DNA No. 854, ecdysis 26.III.2015, 12.VIII. 2015), 1♂ adult bred by F. Kovařík (Fig. 394, DNA No. 867**,** ecdysis 3.IX.2015), 1♂ adult bred by F. Kovařík (Fig. 394, DNA No. 946, ecdysis 11.VI.2015, 2.IX.2015, 21.II.2016), 1♂ adult bred by F. Kovařík (DNA No. 984, ecdysis 6.IV.2015, 12.VIII.2015, 1.I.2016), 1♂ adult bred by F. Kovařík (ecdysis 20.III.2015, 3.IX.2015, 29.VIII.2016), 1♂4♀4juvs. alive (Figs. 312–317); Somali State, Liben region, between Filtu and Dolo Odo, 04°50'07.5"N 40°55'13.5"E, 912 m a.s.l. (Locality No. **14EI**, Fig. 319), 20.XI.2014, 1♂1♀im. (Fig. 197, DNA No. 890, ecdysis 20.III.2015, 29.VIII.2015), leg. F. Kovařík. All specimens are in the first author´s collection (FKCP).

DIAGNOSIS. Total length 87 (male) –135 (female) mm. Color uniformly brown to reddish black; legs yellowish brown to brown, usually lighter than body. Chelicerae brown, reticulate, with black fingers and anterior margin. Carapace lacking carinae and with very fine sparse granules. External trichobothria on patella number 18–19 (5–6 *eb*, 5 *esb*, 2 *em*, 3 *est*, 3 *et*); ventral trichobothria on patella number 41–52; internal trichobothria on chela number 3–4, accessory external trichobothrium *ea* on chela present and located between trichobothria *esb* and *eb* on base of fixed finger, ventral trichobothria on chela number 13–17. Pedipalp densely hirsute, mainly on chela. Granules on dorsal surface of chela conical, conspicuous but not pointed. Lobe of chela granulated with the same intensity as whole dorsal surface of chela. External surface of chela with conical granules in distal part and without carinae. Chela of male length/ width ratio is 1.65 (bigger males) –1.96 (smaller males). Pectinal teeth number 16–21 in both sexes. Dorsal carinae on first through fourth metasomal segments granulate and terminate in a larger tooth most conspicuous on fourth segment. Spiniform formula of tarsomere II = 6-7/4: 6-7/4-5: 7-8/5: 7-9/5-6. Tarsomere II with 2 spiniform setae on inclined anteroventral surface. Length to width ratio of male 5th metasomal segment = 2.38–2.75.

COMMENTS. Kovařík (2003) studied the male and female lectotype of *P. intermedius* and after comparison with two female syntypes of *P. phillipsii*, he synonymized these two species. During the expedition to Horn of Africa in 2014 the first author collected more specimens from two Ethiopean localities. Studying these specimens and comparing them with recently collected *P. phillipsii* specimens in Somaliland shows that the previous synonymization was invalid, and we have restored this species.

Pandinurus mazuchi (Kovařík, 2011) **comb**. **n**.
(Figs. 13, 152–153, 198, 222, 320–331, 396)

Pandinus (*Pandinus*) *mazuchi* Kovařík, 2011: 2–4, 14, figs. 1–9, 35, 39, 42; Kovařík, 2013: 13, fig. 36.
Pandinus mazuchi: Rossi, 2015a: 12.
Pandinus (*Pandinoirens*) *mazuchi*: Rossi, 2015c: 46–48.



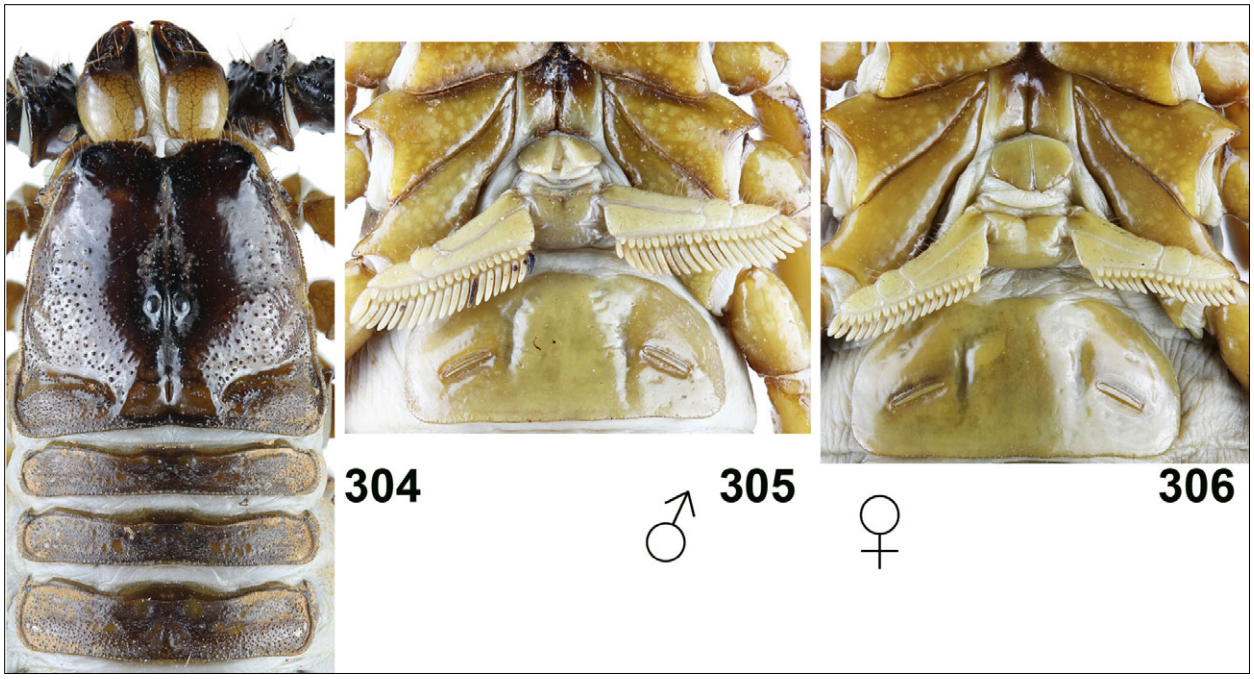
Figures 294–297: *Pandinurus intermedius* from locality 14EH. **Figures 294–295**. Male in dorsal (294) and ventral (295) aspects. **Figures 296–297**. Female in dorsal (296) and ventral (297) aspects. Scale bar: 10 mm.

Figures 298–303: *Pandinurus intermedius* from locality 14EH. **Figures 298**–**300**. Male, metasoma and telson lateral (298), ventral (299), and dorsal (300) views. **Figures 301**–**303**. Female, metasoma and telson lateral (301), ventral (302), and dorsal (303) views.

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

TYPE MATERIAL EXAMINED. **Ethiopia**, Jijiga env., 09°20' 15.8"N 42°42'17.5"E, 2100 m a.s.l. (Locality No. **11ET**, figs. 8–9 in Kovařík, 2011: 4), 16.VII.2011, 1♀ (holotype, figs. 1–7, 35, and 39 in Kovařík, 2011: 2–4, 14) 1♀7"juvs.", from which 2♂ (paratypes) are adults bred by F. Kovařík (Figs. 13, 152–153, 198, 222, 320–331, ecdysis 20.IX.2011, 17.III.2012, and 2.II.2013, DNA No. 514; and second male ecdysis 13.IV.2013), leg. F. Kovařík and D. Hegner, FKCP.

EMENDED DIAGNOSIS. Total length 70–93 mm. Color uniformly dark brown to reddish black, only legs, telson and chela reddish brown. Chelicerae brown, reticulate, with black fingers and anterior margin. Carapace lacking carinae and sparsely granulated. External trichobothria on patella number 16–19 (5–6 *eb*, 3–5 *esb*, 2 *em*, 3 *est*, 3 *et*); ventral trichobothria on patella number 29–35; internal trichobothria on chela number 3–4, accessory external trichobothrium *ea* on chela present and located between trichobothria *esb* and *eb* on base of fixed finger, ventral trichobothria on chela number 10–11. Pedipalp sparsely hirsute, mainly on chela. Granules on dorsal surface of chela of pedipalp not conical and pointed, their apices often confluent. Lobe of chela without granules, only rugose. Internal surface of chela smooth, with several conical granules in distal part and without carinae. Chela of male length/ width ratio is 1.64–1.65. Pectinal teeth number 15–17. Dorsal carinae on first through fourth metasomal segments sparsely granulate and terminate in a larger tooth most conspicuous on fourth segment. Spiniform formula of tarsomere II = 6-



Figures 304–306: *Pandinurus intermedius* from locality 14EH. **Figures 304**–**305**. Male, chelicerae, carapace and tergites I–III (304), and coxosternal area and sternite III (305). **Figure 306**. Female, coxosternal area and sternite III.

7/4: 6-7/4: 6-8/5-6: 7-8/5. Tarsomere II with 2 spiniform setae on inclined anteroventral surface. Length to width ratio of male 5th metasomal segment = 2.32–2.51.

NOTE. For photos of female holotype and photos of type locality see figs. 1–9, 35, and 39 in Kovařík, 2011: 2–4, 14.

***Pandinurus oromo* sp. n.**
(Figs. 166–167, 220–221, 332–350, 394, 396, Table 2)
http://www.zoobank.org/urn:lsid:zoobank.org:act:00F1F4DE-EFFC-4882-A1D9-71178D8380D7

TYPE LOCALITY AND TYPE REPOSITORY. Ethiopia, Oromia State, Bale region, 05°59'49.7"N 39°42'23"E, 1513 m a.s.l.; FKCP.

TYPE MATERIAL. **Ethiopia**, Oromia State, Bale region, 05°59'49.7"N 39°42'23"E, 1513 m a.s.l. (Locality No. **14EM**, Figs. 349–350), 22.XI.2014, 2♂ adults bred by F. Kovařík (Figs. 166–167, 220–221, 332–346, 348, 394, holotype, DNA No. 874, ecdysis 16.III.2015 and 14.IX.2015, and paratype, DNA No. 987) 1juv., 3♀ims. alive (Fig. 347), leg. F. Kovařík, FKCP.

ETYMOLOGY. Named after the Oromo people, an ethnic group inhabiting Ethiopia, who are also found in northern Kenya and Somalia. They are the largest ethnic group in Ethiopia and the wider Horn of Africa. Oromos speak the Oromo language as a mother tongue (also called *Afaan Oromoo* and *Oromiffa*), which is part of the Cushitic branch of the Afro-Asiatic family. The name was given as *Ilm' Orma* ("Sons of Men" or an eponymous 'Orma') in the 19th century.

DIAGNOSIS. Total length 90–100 mm. Color uniformly brown to reddish black; legs yellowish brown, usually lighter than body; chela orange to brown. Chelicerae yellowish brown, reticulate, with black fingers and anterior margin. Carapace lacking carinae and sparsely granulated. External trichobothria on patella number 18–20 (5 *eb*, 5–6 *esb*, 2 *em*, 3–4 *est*, 3 *et*); accessory external trichobothrium *ea* on chela absent, internal trichobothria on chela number 3–4, ventral trichobothria on chela number 14–17. Pedipalp densely hirsute, mainly on chela. Granules on dorsal surface of chela of pedipalp not conical and pointed, their apices may be confluent. Margin of lobe of chela rugose with the same intensity as whole lobe of chela. Internal surface of chela granulated without carinae. Chela of male length/ width ratio is 1.68–1.80. Pectinal teeth number 17–19 in both sexes. Dorsal carinae on first through fourth metasomal segments granulate and terminate in a larger tooth most conspicuous on fourth segment. Spiniform formula of tarsomere II = 6-7/4: 7/4: 7/5: 7-8/5. Tarsomere II with 2 spiniform setae on inclined anteroventral surface. Length to width ratio of male 5th metasomal segment = 2.52.

DESCRIPTION. The adult males are 90–100 mm long. The habitus is shown in Figs. 332–333. For position and dis-

Figures 307–309: *Pandinurus intermedius*, two adult females (307–308) and juvenile (309) in vivo habitus in locality 14EH.

Figures 310–311: *Pandinurus intermedius*, two adult males in vivo habitus in locality 14EH.

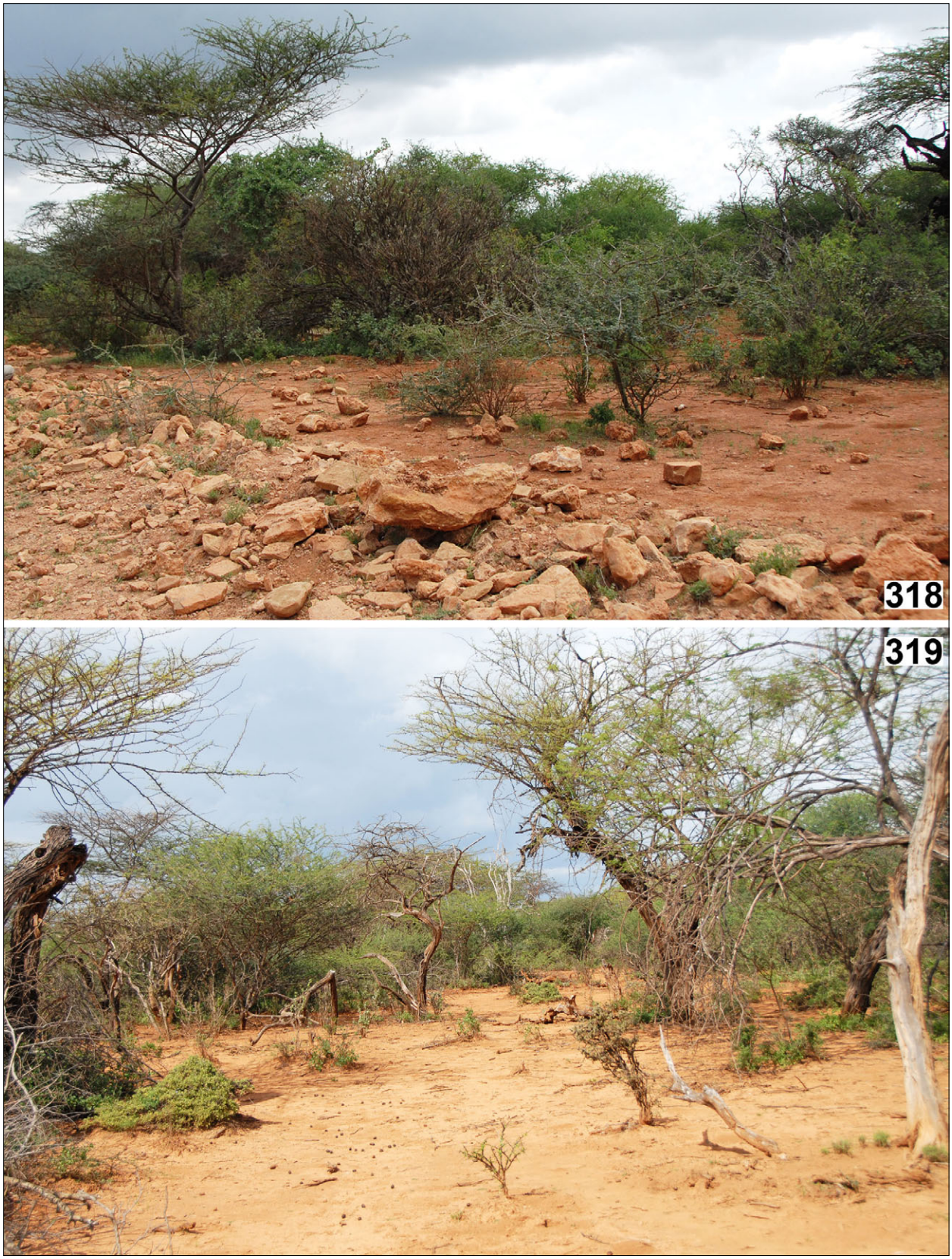
Figures 312–315: *Pandinurus intermedius* from locality 14EH. **Figure 312**. Juvenile male after third ecdysis. **Figure 313**. Juvenile male after fourth ecdysis. **Figures 314–315**. Juvenile male in phases fifth ecdysis.

tribution of trichobothria of pedipalps see Figs. 340–342. External trichobothria on the patella number 18–20 (5 *eb*, 5–6 *esb*, 2 *em*, 3–4 *est*, 3 *et*); accessory external trichobothrium *ea* on chela absent, ventral trichobothria on patella number 40–43; internal trichobothria on chela number 3–4, ventral trichobothria on chela number 14–17.

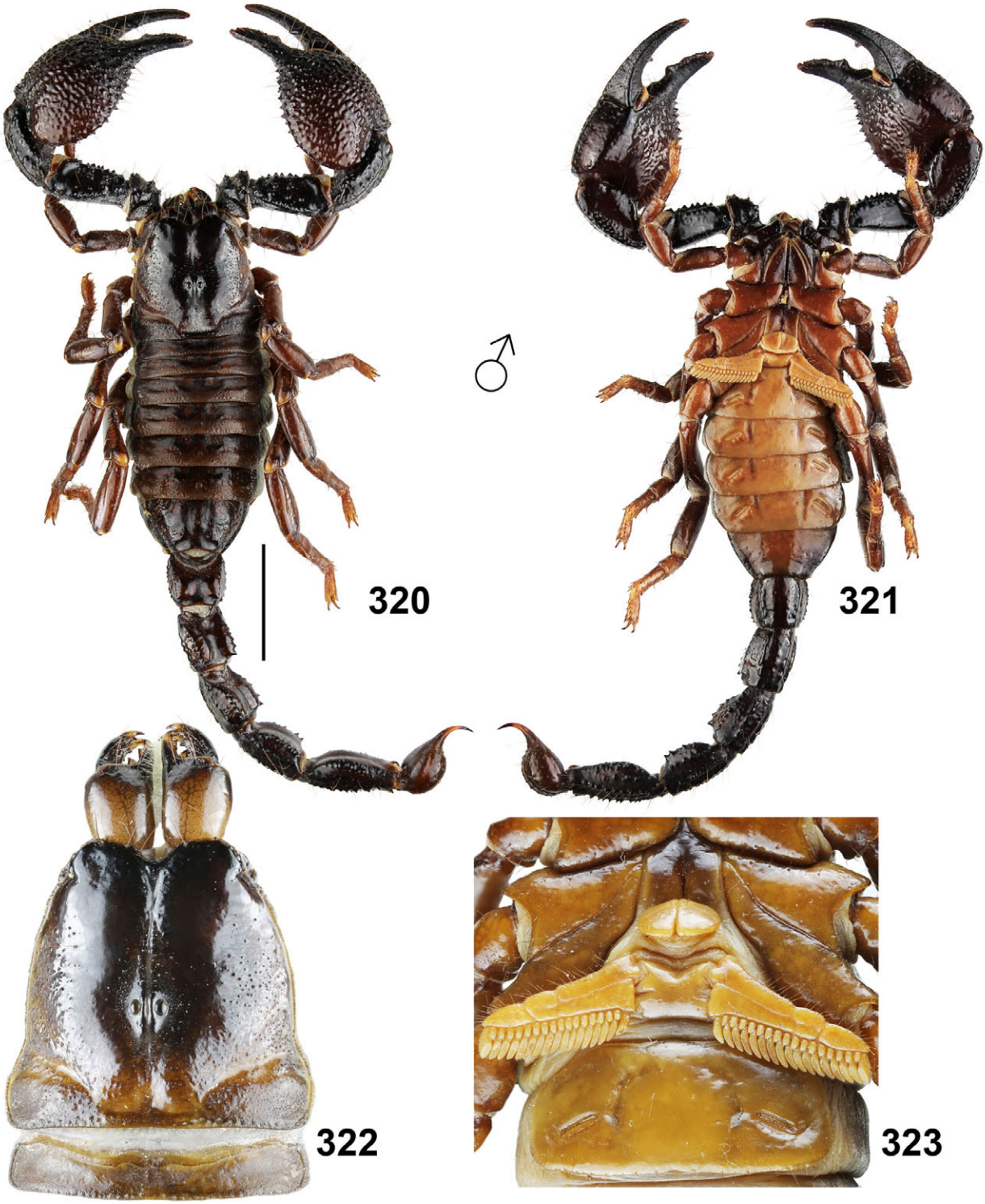
Coloration (Figs. 347–348). The base color is uniformly brown to reddish black, legs and telson are lighter and marble, pedipalp chela is orange to reddish brown, chelicerae are yellow in the base.

Carapace and mesosoma (Figs. 334–335). The entire carapace is smooth in the middle, sparsely covered by granules posteriorly. The anterior margin of the carapace is symmetrically concave, medially strongly convex, and it bears several macrosetae. The tergites are finely granulated. The pectinal tooth count is 17–19 in both sexes. The pectine marginal tips extend to quarter of the fourth

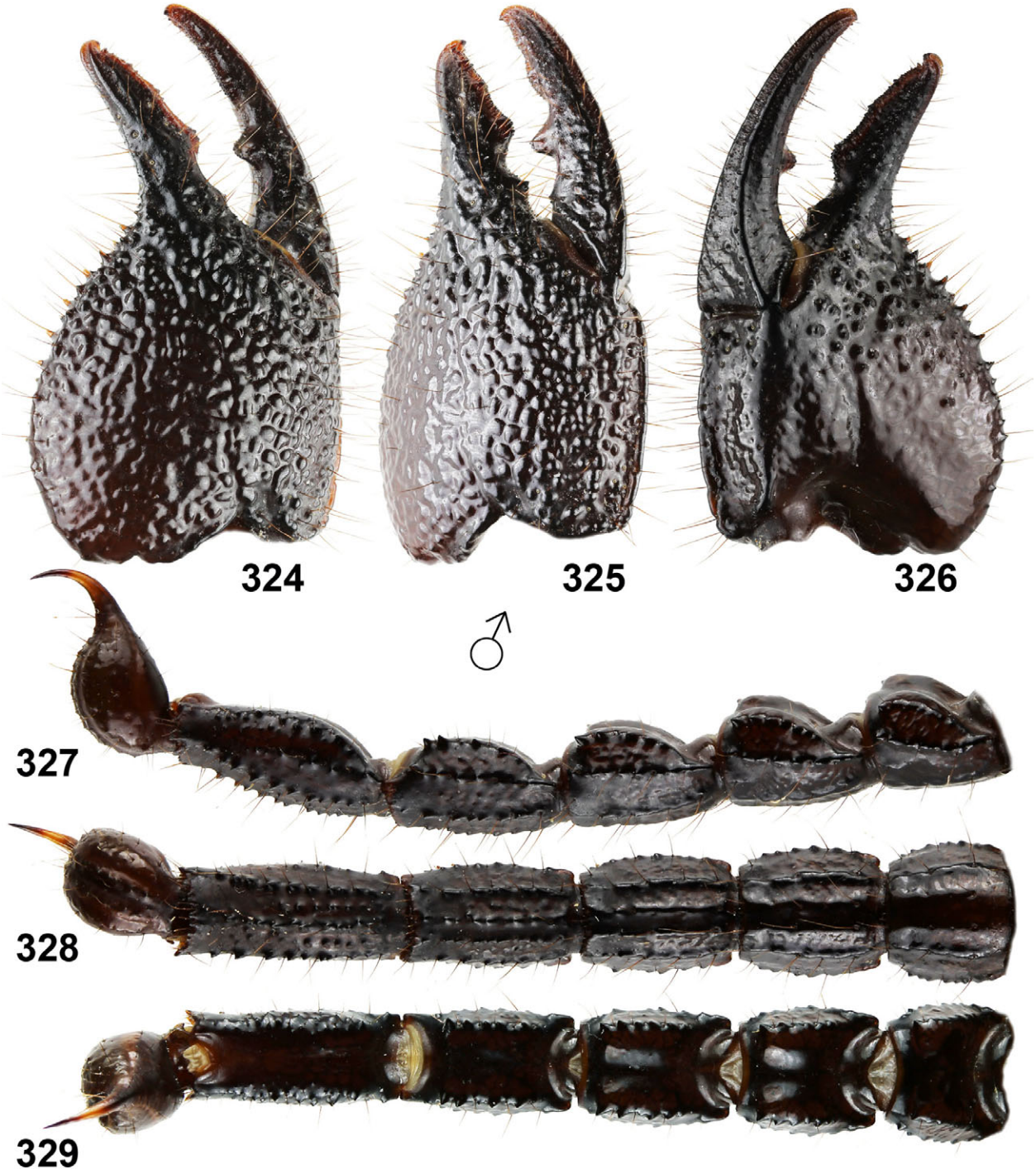
Figures 316–317: *Pandinurus intermedius* from locality 14EH, adult female (316) and male (317) after sixth ecdysis.



Figures 318–319: *Pandinurus intermedius*, localities 14EH (318) and 14EI (319).



Figures 320–323: *Pandinurus mazuchi*, male paratype in dorsal (320) and ventral (321) aspects, chelicerae, carapace and tergite I (322), and coxosternal area and sternite III (323). Scale bar: 10 mm (Figs. 320–321).

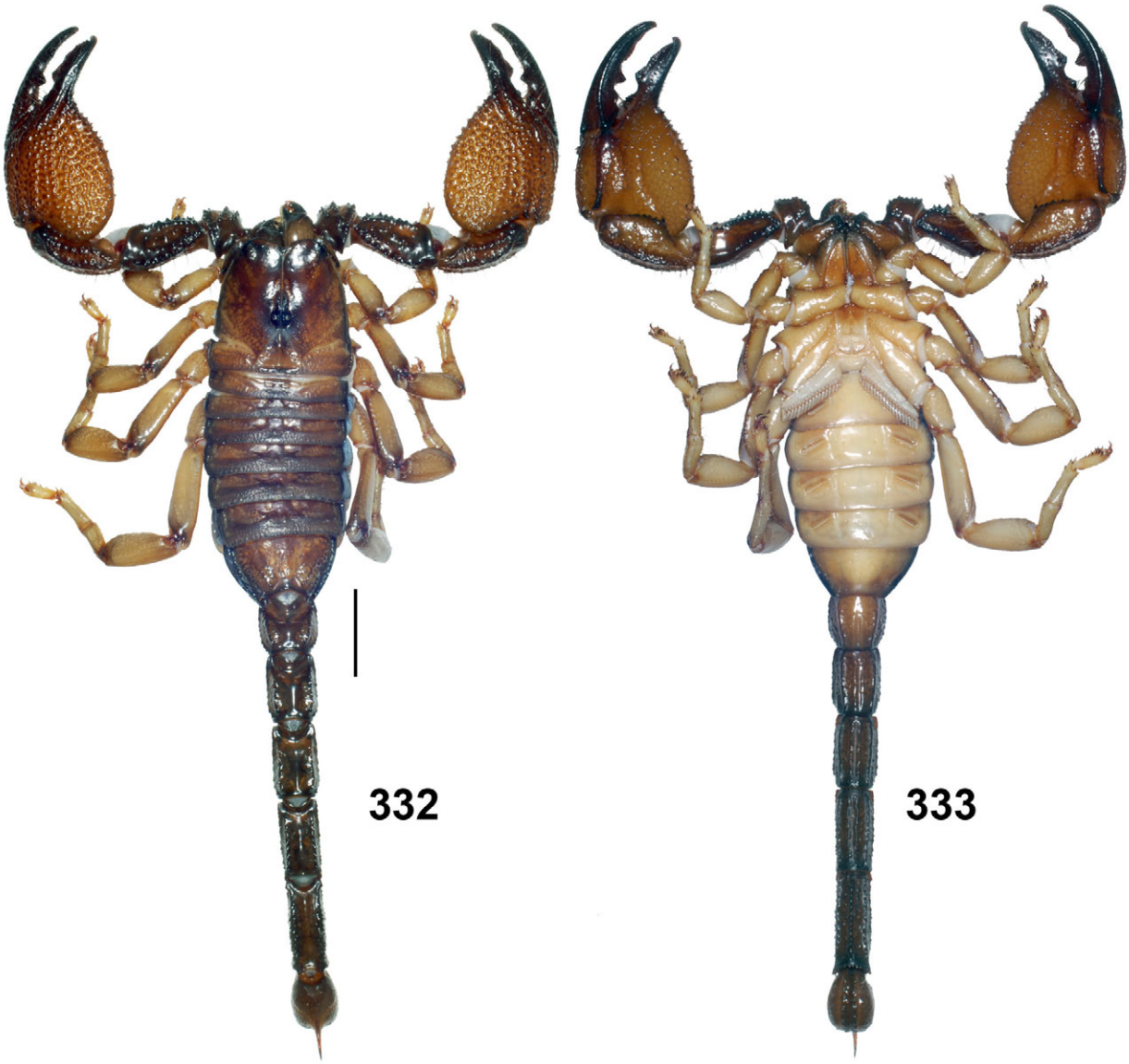


Figures 324–329: *Pandinurus mazuchi*, male paratype. **Figures 324**–**326**. Pedipalp chela dorsal (324), external (325), and ventrointernal (326) views. **Figures 327**–**329**. Metasoma and telson lateral (327), ventral (328), and dorsal (329) views.

sternite in the male. The sternites are smooth, without carinae, but with two longitudinal furrows.

Hemispermatophore (Figs. 220–221). Lamelliform. Distal lamina long, slightly constricted above hook, straight through most if its length, not internally angled. Distal end of lamina abruptly deflected at 30° angle in external drection, quickly tapering to an acuminate apex. Short, robust hook projecting near base of internal margin of distal lamina. Proximal section of distal lamina below hook much shorter than distal section above it, with a deep, elongate longitudinal dorsal trough. Median lobe broadly rounded with translucent ridge. Interno-

Figures 330–331: *Pandinurus mazuchi*, male paratype shortly after maturity ecdysis (330) and three weeks after the ecdysis (331).

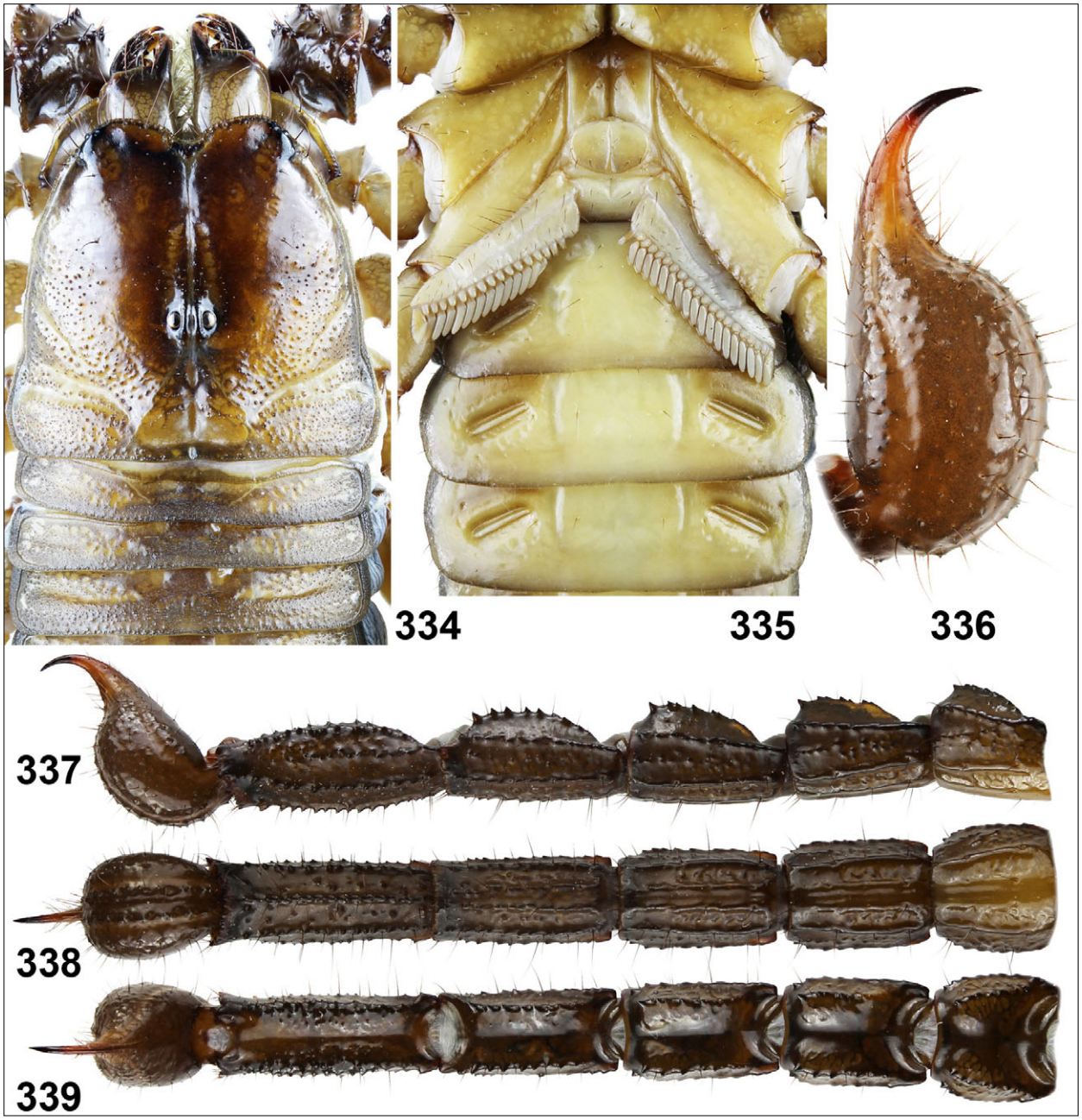


Figures 332–333: *Pandinurus oromo* **sp**. **n**., male holotype in dorsal (332) and ventral (333) aspects. Scale bar: 10 mm.

basal reflection of sperm duct with tubular trough wider basally, narrowing distally to an inner lobe with truncated end. Proximal lobe large, parabolic. Basal lobe broad, rounded in ventral aspect. Trunk short, broad, gradually tapered towards base, with slightly sclerotized diagonal axial rib. *Dimensions* (mm): length of distal lamina above hook base 8.51; maximum width of distal lamina above hook base 1.17; length of proximal part of distal lamina (truncal flexure to hook base) 2.73; trunk length 3.60, width 1.95. *Morphometric ratios*: distal lamina above hook L/W 7.27; distal lamina above hook L/ truncal flexure to hook base L 3.12; total distal lamina L/ trunk L 3.12.

Metasoma and telson (Figs. 336–339). The metasomal segments I–IV bear a total of 8 carinae from which the ventralo median on segment I are obsolete to missing; ventral carinae on segments I–III are smooth. Other carinae are sparsely granulated. The fifth segment has five developed and granulated carinae. The dorsal and lateral surfaces of the segments are rugose with several granules, more granulated are segments IV–V. The dorsal carinae on segments I–IV sparsely granulate and terminate in a larger tooth most conspicuous on fourth segment. The entire metasoma and telson are sparsely hirsute by long hirsutes. The telson is rugose, bulbous, with the aculeus shorter than vesicle.

Pedipalps (Figs. 340–342). The pedipalps are hirsute, mainly on chela. The femur is tuberculate dorsally and bears four carinae composed of several strong granules. The patella is smooth and rugose, there are five rather smooth carinae, only the internal is composed from several big granules. The granules on dorsoexternal sur-

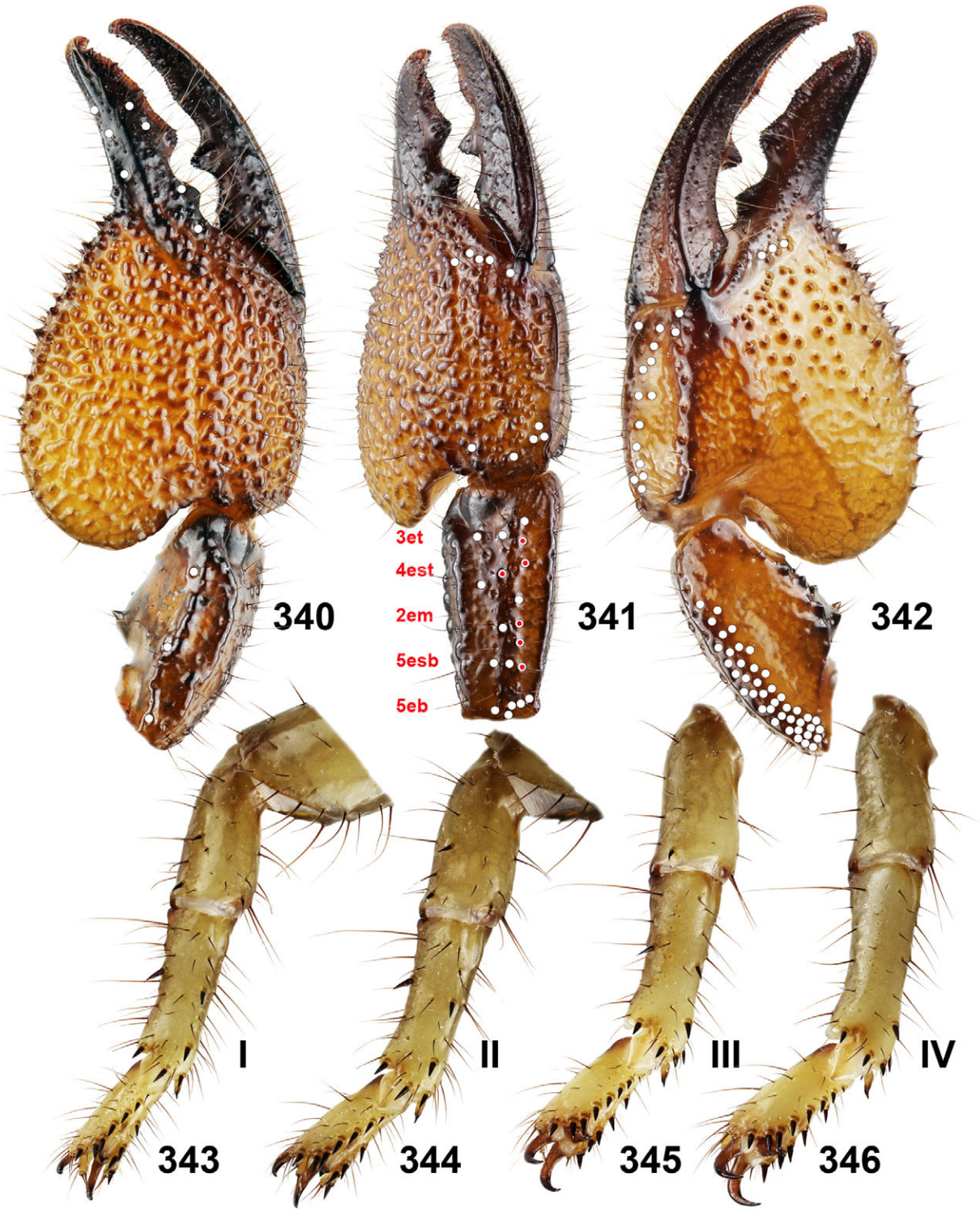


Figures 334–339: *Pandinurus oromo* **sp. n.**, male holotype. Chelicerae, carapace and tergites I–III (334), coxosternal area and sternites III–V (335), telson lateral (336), metasoma and telson lateral (337) ventral (338) and dorsal (339) views.

face of chela of pedipalp are not conical and pointed, their apices often confluent. The margin of lobe of chela rugose with the same intensity as the whole lobe of chela. The internal surface of chela smooth, with several conical granules in distal part and two smooth carina. The movable and fixed fingers of the pedipalp with distinct granules in a two parallel rows present in distal half of the fingers. Proximal half of fingers almost without granules in males and with distinct granules in a row in juveniles.

Legs (Figs. 343–346). All legs with laterodistal lobes and a prolateral pedal spur, the retrolateral spur is absent. All legs are without distinct carinae and smooth. The tarsomeres are hirsute by setae and macrosetae. Spiniform formula of tarsomere II = 6-7/4: 7/4: 7/5: 7-8/5. Tarsomere II with 2 spiniform setae on inclined anteroventral surface.

Chelicerae (Fig. 334). Movable finger dorsal edge with one large subdistal (*sd*) denticle; ventral edge smooth; ventral distal (*vd*) denticle longer than prominent dorsal



Figures 340–346: *Pandinurus oromo* **sp**. **n**., male holotype. **Figures 340**–**342**. Pedipalp chela and patella dorsal (340), external (341) and ventrointernal (342). Trichobothrial pattern is indicated. **Figures 343**–**346**. Left legs I–IV, retrolateral aspects.

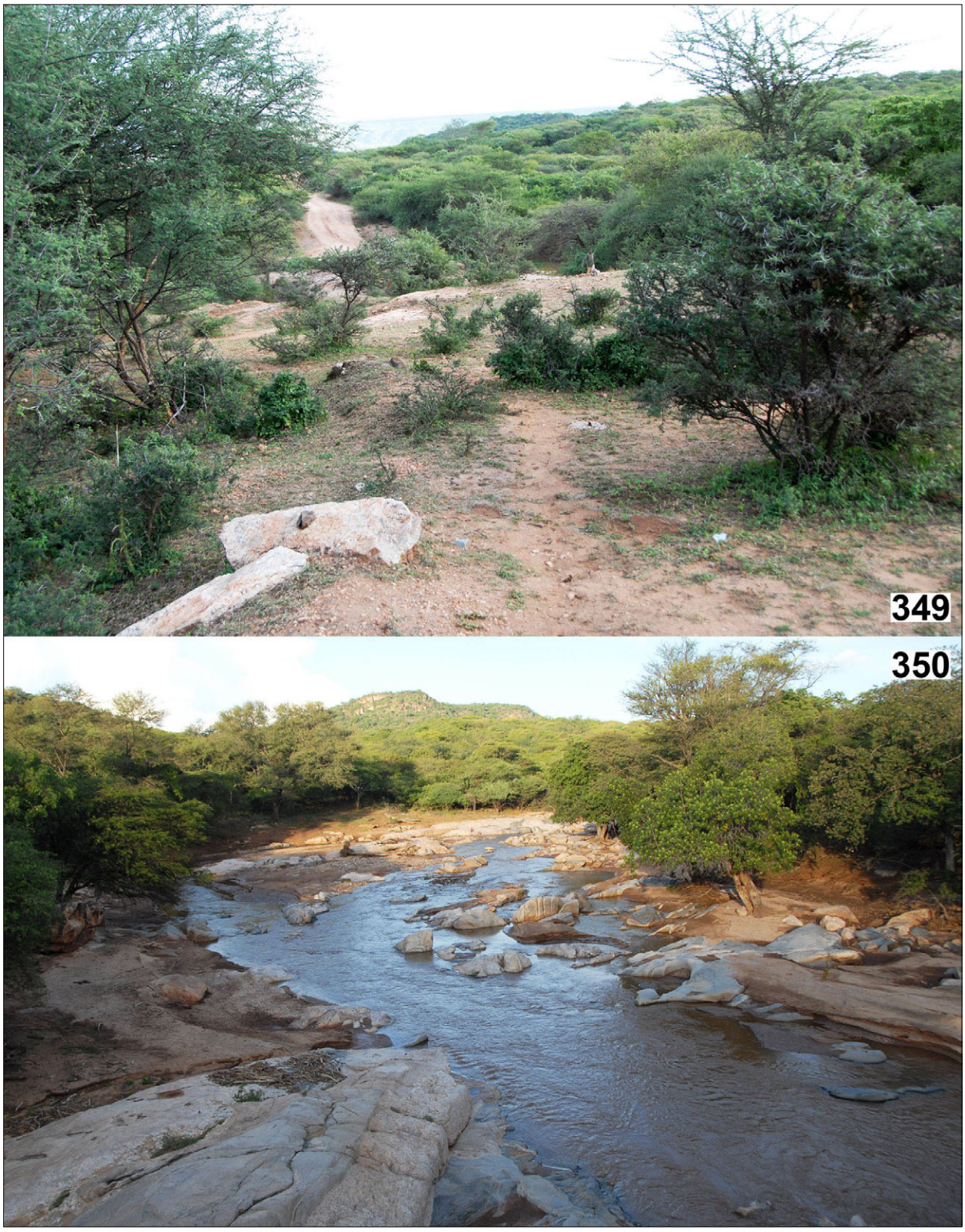
(*dd*) denticle. Fixed finger with four denticles, median (*m*) and basal (*b*) denticles conjoined on common trunk; no ventral accessory denticles present.

Measurements. See Table 2.

AFFINITIES. *Pandinurus oromo* **sp**. **n**. is similar to *P. citernii*. Morphologically it is possible to differentiate these two species according to the surface of chelal lobe which in adults of *P. oromo* **sp**. **n**. is tuberculate with the

Figures 347–348: *Pandinurus oromo* **sp**. **n**., in vivo habitus, female immature paratype (347) and male holotype (348).

same density as whole lobe of the chela (Fig. 340) while in adults of *P. citernii* the lobe of the chela almost smooth (Figs. 256–257). Moreover, the validity of these two species was confirmed by DNA analysis and species-specific karyotypes (see Plíšková et al., in preparation).



Figures 349–350: *Pandinurus oromo* **sp**. **n**., the type locality.

DIMENSIONS (MM)		*Pandiborellius magrettii* **comb. n** ♂ **15EF**	*Pandinurus afar* **sp. n.** ♂ **holotype**	*Pandinurus oromo* **sp. n.** ♂ **holotype**
Carapace	L / W	13.7 / 13.7	12.10 / 12.10	15.30 / 16.30
Mesosoma	L	19.8	18.40	26.0
Tergite VII	L / W	5.80 / 10.9	5.20 / 9.90	7.20 / 12.1
Metasoma & telson	L	54.08	44.10	55.45
Segment I	L / W / D	6.80 / 6.00 / 4.66	5.15 / 5.55 / 4.65	6.05 / 6.90 / 5.15
Segment II	L / W / D	7.45 / 5.45 / 4.65	5.80 / 4.90 / 4.50	7.90 / 5.85 / 4.90
Segment III	L / W / D	8.43 / 5.03 / 4.75	6.55 / 4.50 / 4.45	8.45 / 5.35 / 5.30
Segment IV	L / W / D	9.30 / 4.55 / 4.55	7.40 / 4.05 / 4.20	9.55 / 4.75 / 4.95
Segment V	L / W / D	11.8 / 4.45 / 4.25	9.35 / 3.95 / 3.80	11.6 / 4.60 / 4.85
Telson	L / W / D	10.3 / 5.03 / 5.00	9.85 / 4.50 / 4.30	11.9 / 5.70 / 5.33
Pedipalp	L	41.75	38.45	45.40
Femur	L / W	9.95 / 5.05	8.85 / 4.20	10.7 / 4.95
Patella	L / W	10.6 / 5.10	9.50 / 4.50	11.0 / 5.95
Chela	L	21.2	20.1	23.7
Manus	W / D	12.3 / 6.05	11.6 / 5.40	13.2 / 6.75
Movable finger	L	13.9	11.2	15.6
Total	**L**	**87.58**	**74.60**	**96.75**

Table 2: Comparative measurements of males of *Pandiborellius magrettii* **comb**. **n**., *Pandinurus afar* **sp**. **n**., and *Pandinurus oromo* **sp**. **n**. Abbreviations: length (L), width (W, in carapace it corresponds to posterior width), depth (D).

Pandinurus pallidus (Kraepelin, 1894)
(Figs. 14, 154–155, 194, 352, 396)

Scorpio pallidus Kraepelin, 1894: 60.
Pandinus (*Pandinurus*) *pallidus*: Vachon, 1974: 953; Fet, 2000: 472 (complete reference list until 2000); Kovařík, 2003: 152; Kovařík, 2009: 56, 124, figs. 371–375; Rossi, 2015d: 51, figs. 8, 11.
Pandinurus (*Pandinurus*) *pallidus*: Rossi, 2015a: 19–20.
Pandinus (*Pandinurus*) *exitialis* (in part): Kovařík, 2003: 151; Kovařík & Whitman, 2005: 114; Kovařík, 2009: 54, 121, 130, figs. 349–355, 406.
Pandinurus (*Pandinurus*) *exitialis*: Rossi, 2015a: 18–19 (in part).
= *Pandinurus* (*Pandinurus*) *cianferonii* Rossi, 2015d: 44–47, 51, figs. 1–7. **Syn**. **n**.

TYPE LOCALITY AND TYPE REPOSITORY. Somalia, Barawa (see comment about the type locality in Fet, 2000: 472); ZMUH.

TYPE MATERIAL EXAMINED. **Somalia**, Barawa, 2.III. 1891, 2juvs. (lectotype and paralectotype 60 and 50 mm long, figs. 371–375 in Kovařík, 2009: 124), ZMUH; Giohar (Villagio Duca degli Abruzzi), 29.VIII.1964, 1♂ (holotype of *Pandinurus cianferonii* Rossi, 2015), MZUF No. 1037.

ADDITIONAL MATERIAL EXAMINED. **Somalia**, Afgoi, 1.III.1960, 1juv., leg. A. Sammicheli, MZUF No. 1018, 13.I.1977, 1♂, leg. A. Simonetta, MZUF No. 1041, 1978, 1♂, leg. A. Simonetta, MZUF No. 1047; Belet Amin, VII.1934, 1♀1juv., leg. S. Patrizi, MZUF No. 1029 (cited by Rossi, 2015b: 19–20 as *Pandinurus pallidus*); Bud Bud, 15-16.VIII.1968, leg. S.B.S., 1♂8 ♀9juvs., MZUF Nos. 1039-40, 1075-6; Bur Dinsor, 1962, 1juv. leg. B. Lanza, MZUF No. 1034, 3.VI.1978, 1juv., leg. S.B.S., MZUF No. 1043; Giohar (Villagio Duca degli Abruzzi), V.1928, 1♀, MZUF No. 1030, 27.IV.1968, 1♀, leg. B. Lanza, MZUF No. 1038; Mogadiscio, 1924, 1♀ leg. G. Stefanini & N. Puccioni, MZUF No. 1033; Jubbada Hoose Province, Bilis Quoqaani env., IX.2008, 2♂2♀5ims. (Figs. 14, 154–155, 194, 352), FKCP.

EMENDED DIAGNOSIS. Total length 95–120 mm. Color of adults uniformly reddish black, legs yellow in adults; chela usually orange to reddish brown. Chelicerae yellowish brown, reticulate, with black fingers and anterior margin. Carapace lacking carinae and sparsely finely granulated. External trichobothria on patella number 18–20 (5–6 *eb*, 5–6 *esb*, 2 *em*, 3 *est*, 3 *et*); ventral trichobothria on patella number 32–38; internal trichobothria on chela number 2 from which one can be missing, accessory external trichobothrium *ea* on chela absent, ventral trichobothria on chela number 10–16. Pedipalp densely hirsute, mainly on chela. Granules on dorsal surface of chela often almost conical, conspicuous but not pointed, their apices may be confluent. Lobe of chela granulated with similar intensity as whole dorsal

Figures 351–352: Figures 351. *Pandinurus gregoryi*, male from Kenya, Mt. Kenya. **Figure 352**. *Pandinurus pallidus*, male from Somalia, Jubbada Hoose Province, Bilis Quoqaani env.

Figures 353–354: *Pandinurus phillipsii*, adult female (353) in vivo habitus in locality 11SN (354).

Figures 355–356: *Pandinurus phillipsii*. **Figure 355**. Subadult from Somaliland, Gaan Libah, 9°52'08"N 44°49'12"E one week after ecdysis. The subadult needs another ecdysis to its maturity. **Figure 356**. Adult male from Somaliland, 15 km N of Sheikh, Goolis Mts., 09°58.927'N 45°10.377'E.

surface of chela, sometimes rugose. Chela of male length/width ratio is 1.64–1.76. Pectinal teeth number 17–20 in both sexes. Dorsal carinae on first through fourth metasomal segments granulate and terminate in a larger tooth most conspicuous on fourth segment. Spiniform formula of tarsomere II = 5-6/4: 5-6/4: 7/4-5: 7-8/4-5. Tarsomere II with 2 spiniform setae on inclined anteroventral surface. Length to width ratio of male 5th metasomal segment = 2.45–2.66. Male has more pronounced tooth on movable finger of pedipalp and slightly larger telson than female.

COMMENTS. *Pandinus pallidus* was based on two juveniles incorrectly cited as adults, a male and a female (Kraepelin, 1894: 60, Kovařík, 2009: 56). Kovařík (2012: 20) wrote that "taxonomical position of *P. pallidus* is questionable and invites the possibility that the types are juveniles of another species". According to the published map (fig. 64 in Kovařík, 2012: 19) it is evident that in the vicinity of Barawa, the type locality of *P. pallidus*, there were commonly collected specimens which Kovařík in 2012 incorrectly considered to be *P. exitialis* and assumed that further research could certify that these two species were synonyms. In the years of 2011–2016, the first author (FK) during Horn of Africa expeditions localized the true area of distribution of *P. exitialis* in the southwestern part of Ethiopia (Fig. 396) and collected fresh specimens which can be used for differentiation from the Somali specimens collected around Barawa. Meanwhile, Rossi selected a specimen from Belet Amin collected in 1934 and determined it as *P. pallidus* (Rossi, 2015b: 19–20). Later, he selected three other specimens from Giohar collected in 1964 and designated them as the types of a new species, *Pandinurus cianferonii* Rossi, 2015 (Rossi, 2015d: 44). Giohar is located midway between the localities of Belet Amin and Barawa. It is true that the dorsal granulation of the chela is variable in the species. In general, it is difficult to compare species when one of them is represented by juvenile types, because of ontogenetic changes in morphometric and morphological characters as individuals mature. For example, the chela surface is different after each ecdysis. This difference is clearly visible in the photos of *P. citernii* after the third (Fig. 264), the fourth (Fig. 265) and the seventh (Fig. 274) ecdysis. We are certain that the types of *P. pallidus* are juveniles, probably after the fourth ecdysis, and we consider *P. cianferonii* to be a junior synonym of *P. pallidus*.

P. pallidus and *P. exitialis* are almost identical morphologically, but it is possible to differentiate these two species according to the shape of pedipalp chela, which in males is larger and more lobate in *P. exitialis* than in *P. pallidus* (Figs. 146 versus 154).

Pandinurus phillipsii (Pocock, 1896) **comb. n.**
(Figs. 15, 156–157, 178, 199, 353–356, 396)

Scorpio phillipsii Pocock, 1896b: 181–182, pl. XI, figs. 3, 3a.

Pandinus (*Pandinus*) *phillipsi*: Birula, 1928: 88; Vachon, 1974: 953; Fet, 2000: 467 (complete reference list until 2000); Kovařík, 2003: 152 (in part); Kovařík, 2009: 57, 128, figs. 401–402 (in part); Kovařík, 2011b: 5–6, 8, 10, 14–15, figs. 10–19, 40, 42; Kovařík, 2013: 13, fig. 13.

Pandinus phillipsii: Rossi, 2015a: 12.

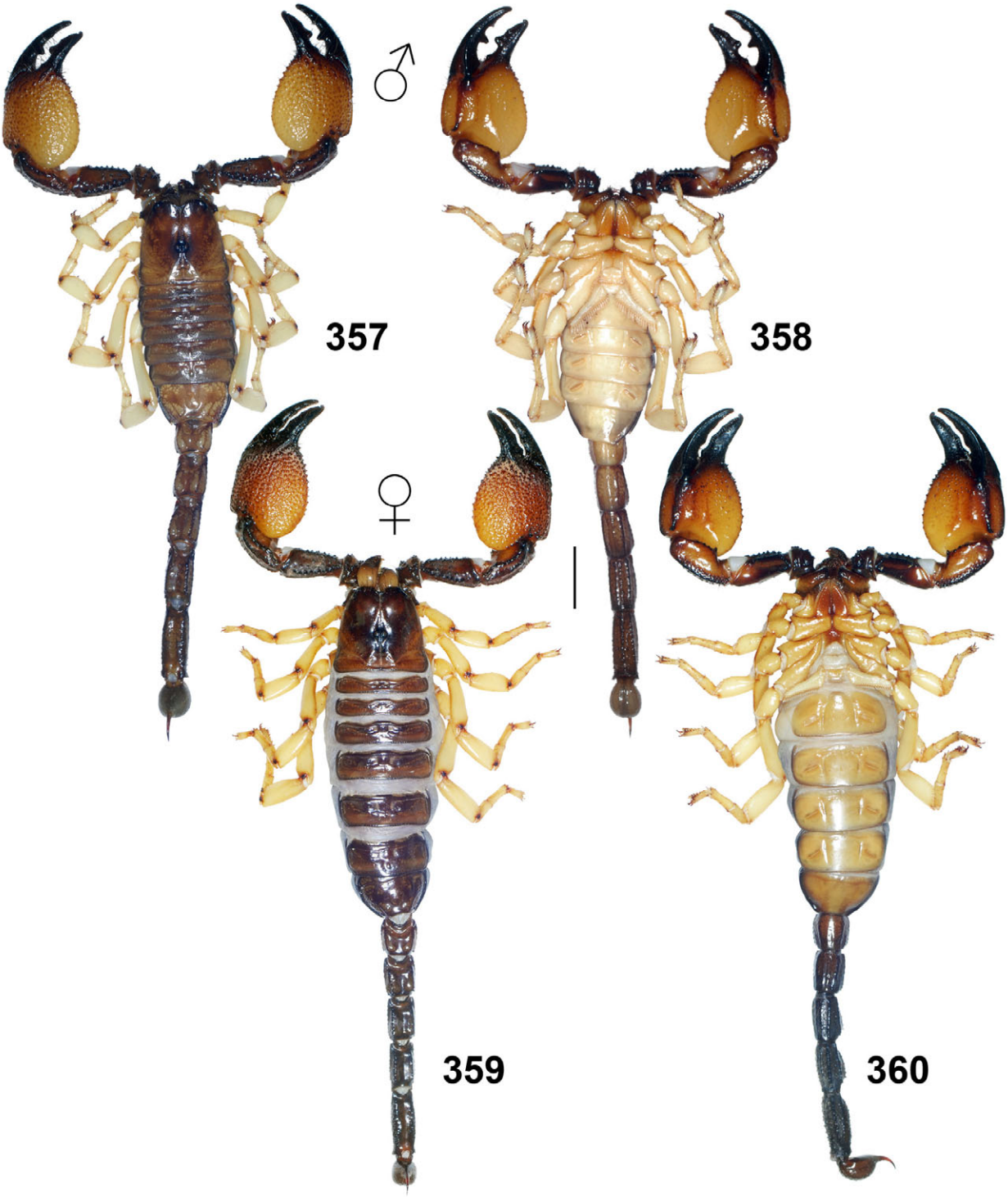
Pandinus (*Pandinoirens*) *phillipsii* Rossi, 2015c: 47.

TYPE LOCALITY AND TYPE REPOSITORY. Somaliland, Doolob, inland of Berbera; BMNH.

TYPE MATERIAL EXAMINED. **Somaliland**, Doolob, inland of Berbera, 2♀ (syntypes, figs. 400–402 in Kovařík, 2009: 128), BMNH No. 1895.6.1.49-50.

ADDITIONAL MATERIAL EXAMINED. **Somaliland**, 15 km N of Sheikh, Goolis Mts., 09°58.927'N 45°10.377'E, 1247 m a.s.l., 1♂ (Figs. 15, 156–157, 178, 199, 356, and figs. 10–11, 19 in Kovařík, 2011: 5–8), XI.2010, leg. T. Mazuch, FKCP; Sheikh, Goolis mts., 09°56'23"N 45°11'14.2"E, 1439 m a.s.l., 11.VII.2011, 1im. (figs. 14–16 in Kovařík, 2011: 6), leg. F. Kovařík, FKCP; Sheikh, 09°57'25.9"N 45°09'52.2"E, 1492 m a.s.l. (Locality No. **11SN**, Fig. 354 and fig. 18 in Kovařík, 2011: 8), 12.VII.2011, 1♀ (Fig. 353 and figs. 12–13, 17–18 in Kovařík, 2011: 5–8), leg. F. Kovařík, FKCP; Gaan Libah, 9°52'08"N 44°49'12"E, I.2015, 2ims. alive (Fig. 355), FKCP.

EMENDED DIAGNOSIS. Total length 100–128 mm. Color uniformly brown to reddish brown; legs bright yellow; chela orange. Chelicerae yellowish brown, reticulate, with black fingers and anterior margin. Carapace lacking carinae and with very fine sparse granules. External trichobothria on patella number 17–18 (5 *eb*, 4–5 *esb*, 2 *em*, 3 *est*, 3 *et*); ventral trichobothria on patella number 39–47; internal trichobothria on chela number 3, accessory external trichobothrium *ea* on chela present and located between trichobothria *esb* and *eb* on base of fixed finger, ventral trichobothria on chela number 11–15. Pedipalp densely hirsute, mainly on chela. Granules on dorsal surface of chela of pedipalp not conical and pointed, their apices may be confluent. Lobe of chela without granules, only rugose. External surface of chela with granules and without carinae. Chela of male length/width ratio is 1.84. Pectinal teeth number 15–20 in both sexes. Dorsal carinae on first through fourth metasomal segments sparsely granulate and usually terminate in a larger tooth most conspicuous on fourth segment. Spiniform formula of tarsomere II = 6-7/4: 7/4: 7-8/5: 7-8/5. Tarsomere II with 2 spiniform setae on inclined anteroventral surface but there could be an additional macroseta on external margin indicated by another not well developed spiniform seta. Length to width ratio of male 5th metasomal segment = 2.65.



Figures 357–360: *Pandinurus platycheles*. **Figures 357–358**. Male from locality 14EP in dorsal (357) and ventral (358) aspects. **Figures 359–360**. Female from locality 14ER in dorsal (359) and ventral (360) aspects. Scale bar: 10 mm.

NOTE. For habitus of both sexes and other photos of *Pandinurus phillipsii* specimens and localities see figs. 10–19 in Kovařík, 2011: 5–8.

Pandinurus platycheles (Werner, 1916)
(Figs. 158–159, 179, 200, 357–389, 394, 396)

Pandinus platycheles Werner, 1916: 89.

Pandinus (*Pandinoides*) *platycheles*: Vachon, 1974: 953; Fet, 2000: 468–469 (complete reference list until 2000); Kovařík, 2003: 149; Kovařík, 2009: 51, 115, figs. 291–293.

Pandinurus platycheles: Kovařík et al., 2016: 41.

Figures 361–366: *Pandinurus platycheles*, metasoma and telson. **Figures 361**–**363**. Male from locality 14EP, lateral (361), ventral (362), and dorsal (363) views. **364**–**366**. Female from locality 14EQ, lateral (364), ventral (365), and dorsal (366) views.

? *Pandinus pallidus gregoryi*: Werner, 1916: 90 (misidentification).

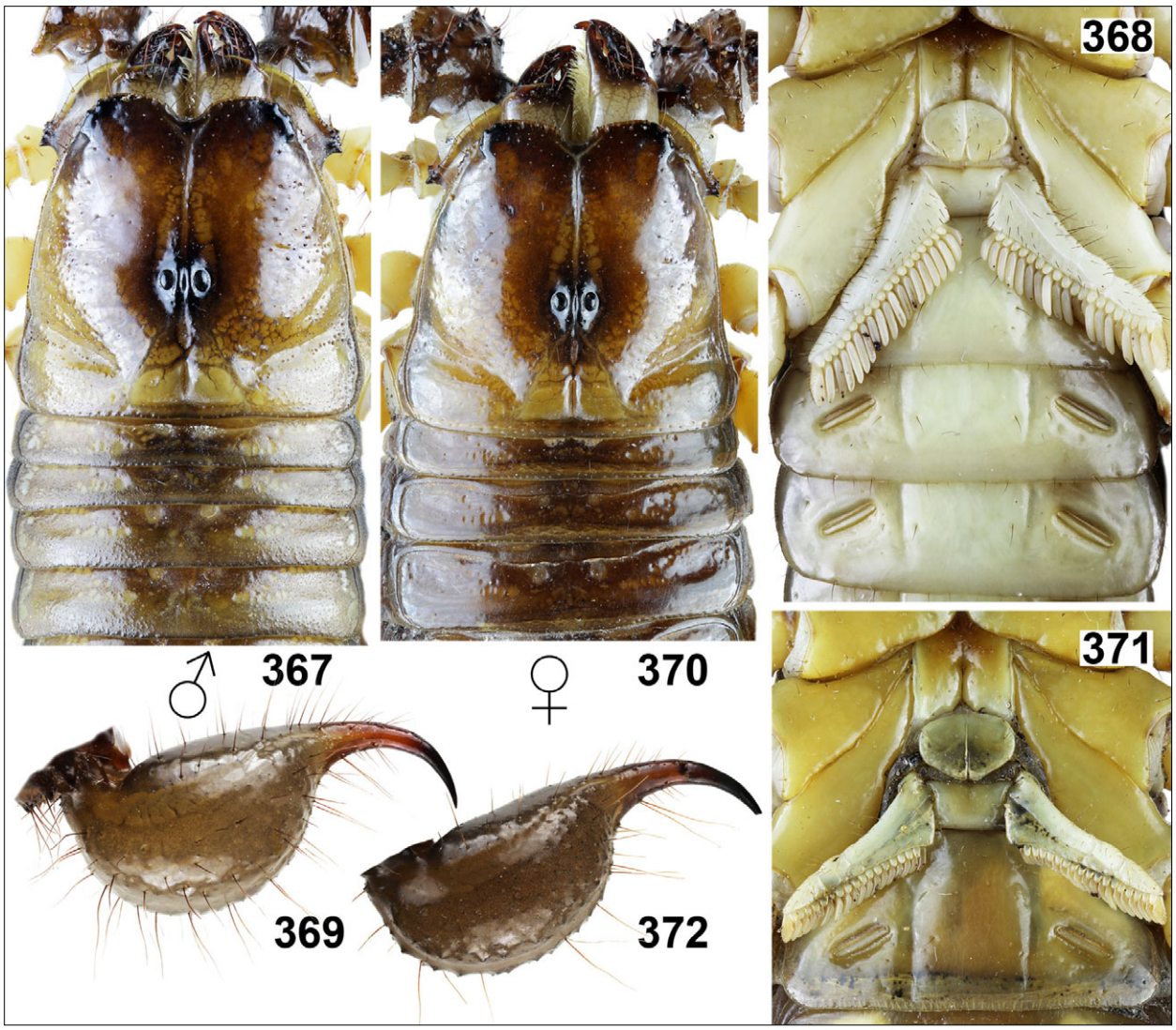
= *Pandinus* (*Pandinoirens*) *riccardoi* Rossi, 2015c: 40, 42–43, 50, figs. 1–7, 24. **Syn**. **n**.

= *Pandinus* (*Pandinoirens*) *bottegoi* Rossi, 2015c: 46–47, 50, figs. 8–14, 24. **Syn**. **n**.

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

MATERIAL EXAMINED. **Ethiopia**, Jerrer valley (vallis), 3♀10juvs., 12.VI.1911, leg. Ö. Kovács, HNHM, VI. 1965, 3♀2juvs., FKCP; Oromia State, West Harerge, 07°46'39.7"N 40°37'12.4"E, 800 m a.s.l. (Locality No. 1**4EP**, fig. 97 in Kovařík et al., 2015: 21), 25.XI.2014, 1♂ (Figs. 158–159, 179, 200, 357–358, 361–363, 367–369, 373–376, 384, 394, DNA No. 660) 1juv., leg. F. Kovařík, FKCP; West Harerge, 07°45'42.1"N 40°32' 30.9"E, 1425 m a.s.l. (Locality No. **14EQ**, Figs. 388–389 and fig. 149 in Kovařík et Mazuch, 2015: 32), 25.XI.2014, 1♀ (Figs, 364–366, 370–372, 383) 2juvs., 2 juvs. alive (Figs. 385–387), leg. F. Kovařík, FKCP; West Harerge, 07°49'12.6"N 40°31'54"E, 918 m a.s.l. (Locality No. **14ER**), 25.XI.2014, 1♀ (Figs. 359–360, 21.-22.IV.2016 (Locality No. **16EJ** =14ER, figs. 142–143 in Kovařík et al., 2016: 40), 6 juvs. alive (Figs. 377–382), leg. F. Kovařík, FKCP; West Harerge, 07°49'06"N 40°31'52"E, 886m a.s.l., 2.VI.2015, 1♀, leg. P. Kučera, FKCP.

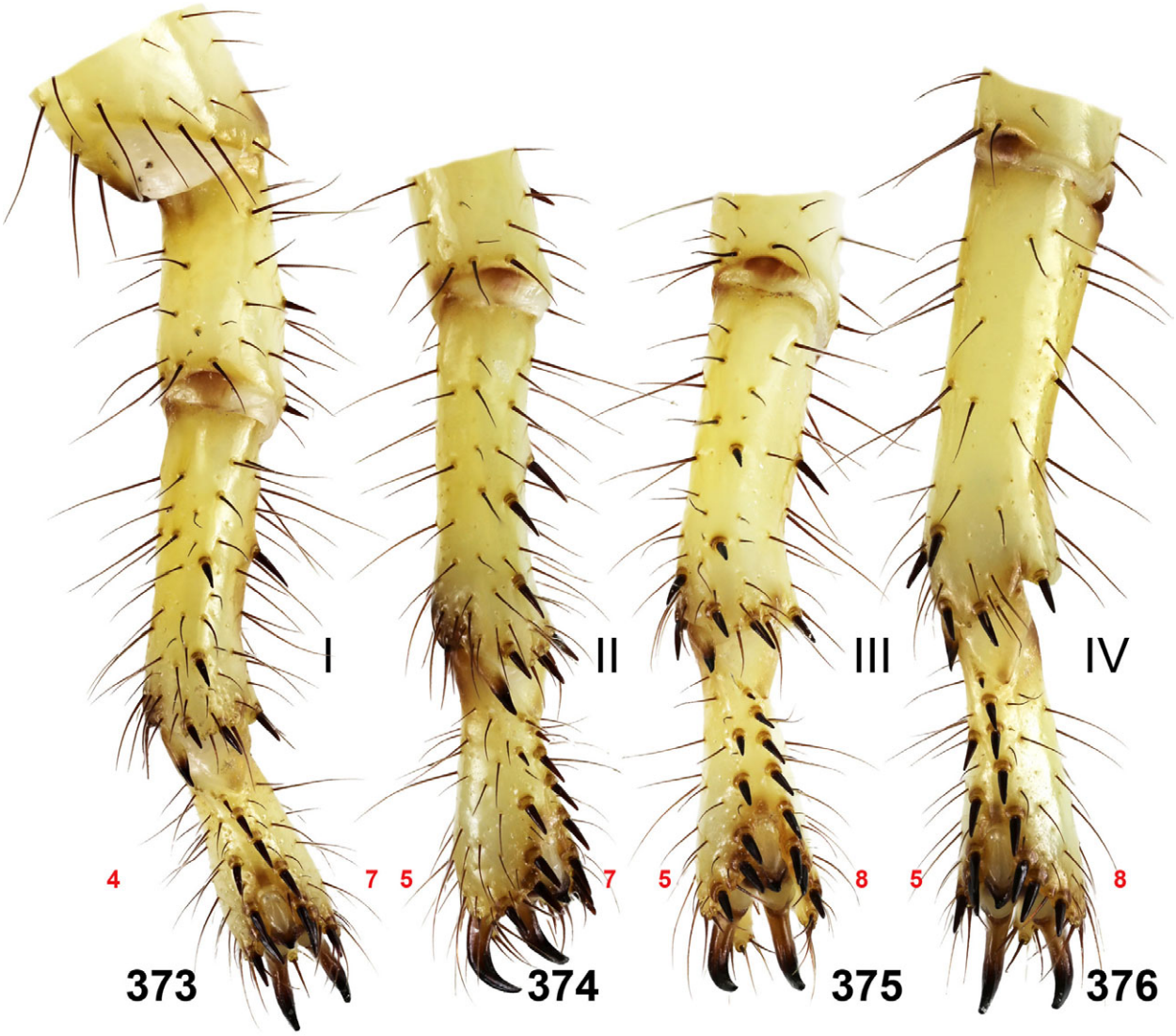
EMENDED DIAGNOSIS. Total length 85–110 mm. Color uniformly brown to reddish brown; legs bright yellow;



Figures 367–372: *Pandinurus platycheles*. **Figures 367–369**. Male from locality 14EP, carapace and tergites I–IV (367), coxosternal area and sternites III–V (368), and telson lateral (369). **Figures 370–372**. Female from locality 14EQ, carapace and tergites I–III (370), coxosternal area and sternite III (371), and telson lateral (372).

chela yellow to orange. Chelicerae yellowish brown, reticulate, with black fingers and anterior margin. Carapace lacking carinae and with very fine sparse granules almost missing in females. External trichobothria on patella number 17–18 (5 *eb*, 4–5 *esb*, 2 *em*, 3 *est*, 3 *et*); ventral trichobothria on patella number 40–45; internal trichobothria on chela number 3–4, accessory external trichobothrium *ea* on chela present and located between trichobothria *esb* and *eb* on base of fixed finger,ventral trichobothria on chela number 11–17. Pedipalp densely hirsute, mainly on chela. Granules on dorsal surface of chela of pedipalp not conical and pointed, their apices may be confluent. Lobe of chela without granules, only rugose. External surface of chela with granules and without carinae. Chela of male length/ width ratio 1.68. Pectinal teeth number 12–20 in both sexes. Dorsal carinae on first through fourth metasomal segments sparsely granulate and usually terminate in a larger tooth most conspicuous on fourth segment. Spiniform formula of tarsomere II = 6-7/4: 6-7/4-5: 7-8/5: 7-8/5. Tarsomere II with 2 spiniform setae on inclined anteroventral surface. Length to width ratio of male 5th metasomal segment = 2.55.

COMMENTS. *Pandinus* (*Pandinoirens*) *riccardoi* Rossi, 2015 and *Pandinus* (*Pandinoirens*) *bottegoi* Rossi, 2015 were each based on unique males collected in 1893 and 1911 respectively. The type localities of these two species are located within the area of distribution of *P. platycheles* (Fig. 396 and fig. 24 in Rossi, 2015c: 50), a fact that Rossi ignored because he wrongly believed that a number of 3 or 4 chelal internal trichobothria is con-



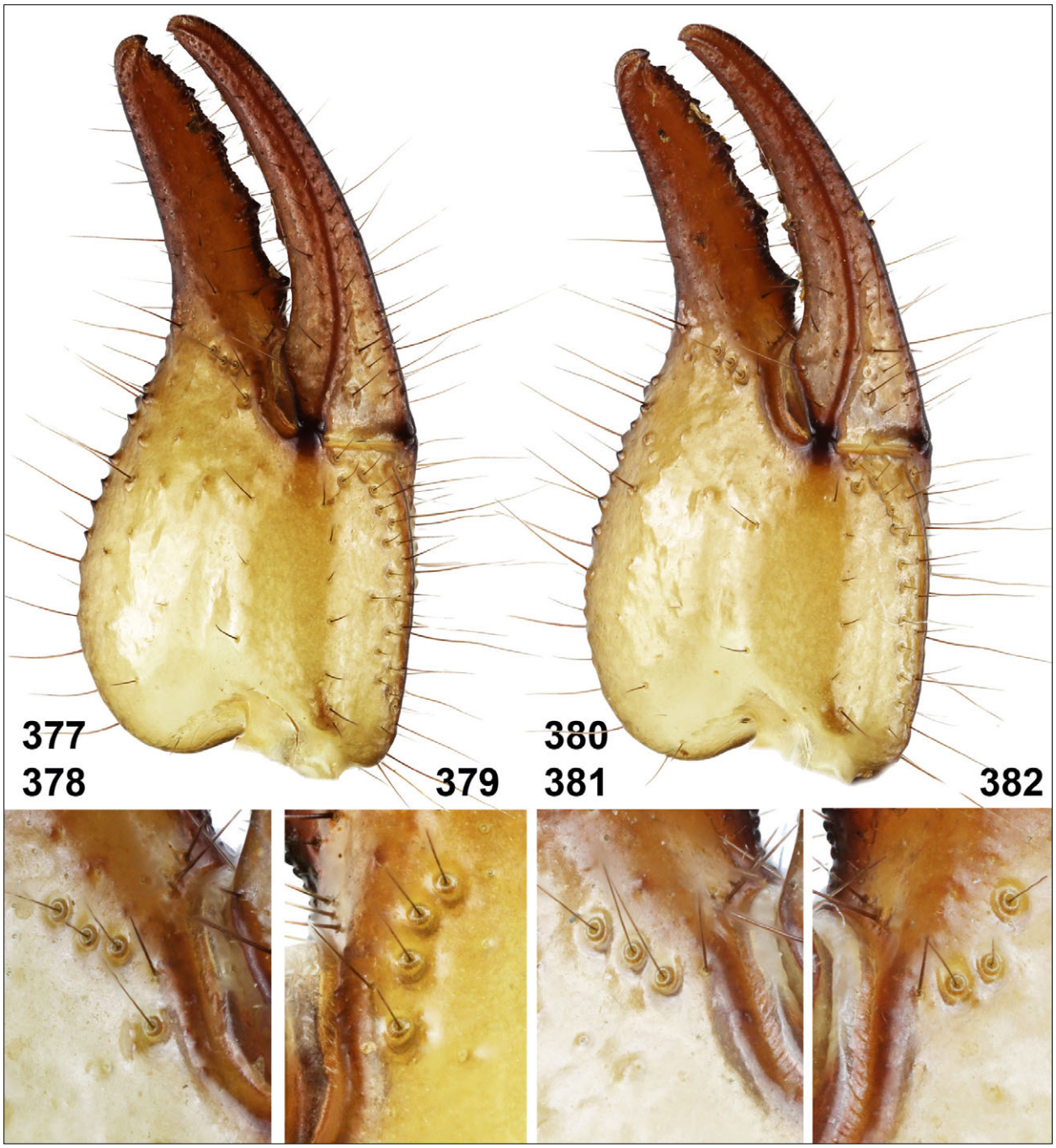
Figures 373–376: *Pandinurus platycheles*, male from locality 14EP, right legs I–IV, ventral aspect. Spiniform setal counts indicated in red.

stant, and relied on this as the sole character to differentiate species and also the genera/subgenera *Pandinoides* and *Pandinus* (*Pandinoirens*). In reality, the number of chelal internal trichobothria exhibits intraspecific variability which we commonly observed within local populations of many other *Pandinurus* species (e. g. *P. citernii*, *P. exitialis*, *P. intermedius*, *P. mazuchi*, and *P. platycheles*) (Figs. 250–255, 377–382). Also, because the shape of the granules on metasomal segments is partly variable, this cannot be used as the sole character for separating species, and it is evident that both *Pandinus* (*Pandinoirens*) *riccardoi* Rossi, 2015 and *Pandinus* (*Pandinoirens*) *bottegoi* Rossi, 2015 are junior synonyms of *Pandinurus platycheles*.

Pandinurus smithi (Pocock, 1897) **comb. n.**
(Figs. 16, 160–161, 201, 390–393, 396)

Scorpio smithii Pocock, 1897: 398–400.
Pandinus smithi: Kraepelin, 1903: 568–569.
Pandinus (*Pandinus*) *smithi*: Birula, 1928: 88; Vachon, 1974: 953; Fet, 2000: 468 (complete reference list until 2000); Kovařík, 2003: 152; Kovařík, 2009: 58, 126, figs. 389–391; Kovařík, 2011: 9–10, 14, figs. 20–22, 41; Kovařík, 2013: 13, fig. 36.
Pandinus smithi: Rossi, 2015a: 12.
Pandinus (*Pandinoirens*) *smithi* Rossi, 2015c: 47.

TYPE LOCALITY AND TYPE REPOSITORY. Somaliland, Hargesa (Hargeysa); BMNH.



Figures 377–382: *Pandinurus platycheles*, variability in numbers and position pedipalp chelal internal trichobothria between two juvenile siblings from locality 16EJ showing on their third exuviae. **Figures 377**–**379**. Both chelae of exuvia of one of these siblings from 2.VII.2016, left (377–378) and right (379). **Figures 380**–**382**. Both chelae of exuvia of the second of these siblings from 9.VII.2016, left (380–381) and right (382).

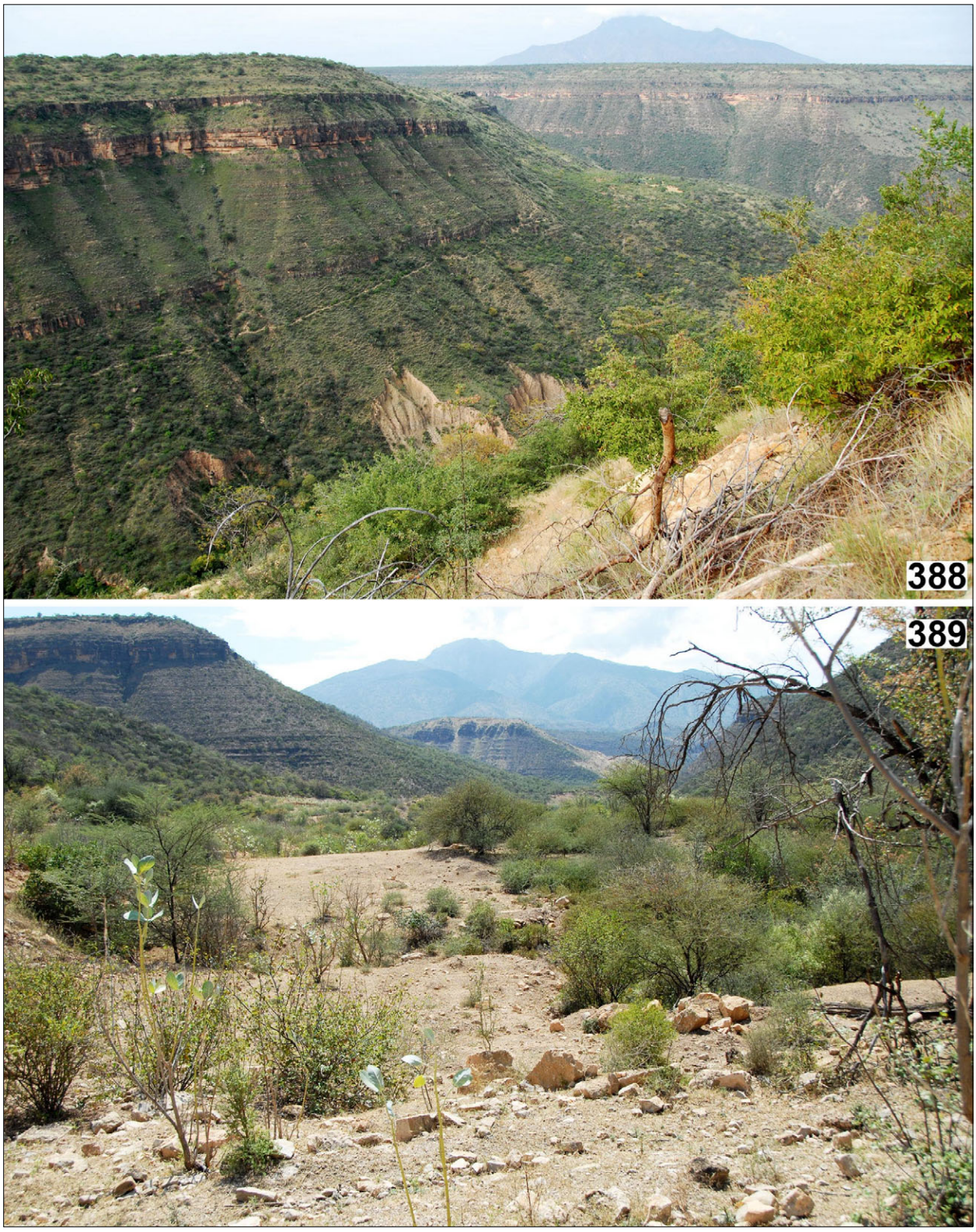
TYPE MATERIAL EXAMINED. **Somaliland**, Hargesa (Hargeysa), 1♀ (lectotype, Figs. 392–393), BMNH No. 1897.11.10.1-3.

ADDITIONAL MATERIAL EXAMINED. **Ethiopia**, 55 km S of Degehbur, 07°49'27.2"N 43°41'56.3"E, 1053 m a.s.l. (Locality No. **11EV**, figs. 20 and 22 in Kovařík, 2011: 9), 17.VII.2011, 1♂(Figs. 16, 160–161, 201, 390–391, and figs. 389–391 in Kovařík, 2009: 58, 126, and figs. 21, 41 in Kovařík, 2011: 9 and 14), leg. F. Kovařík, FKCP.

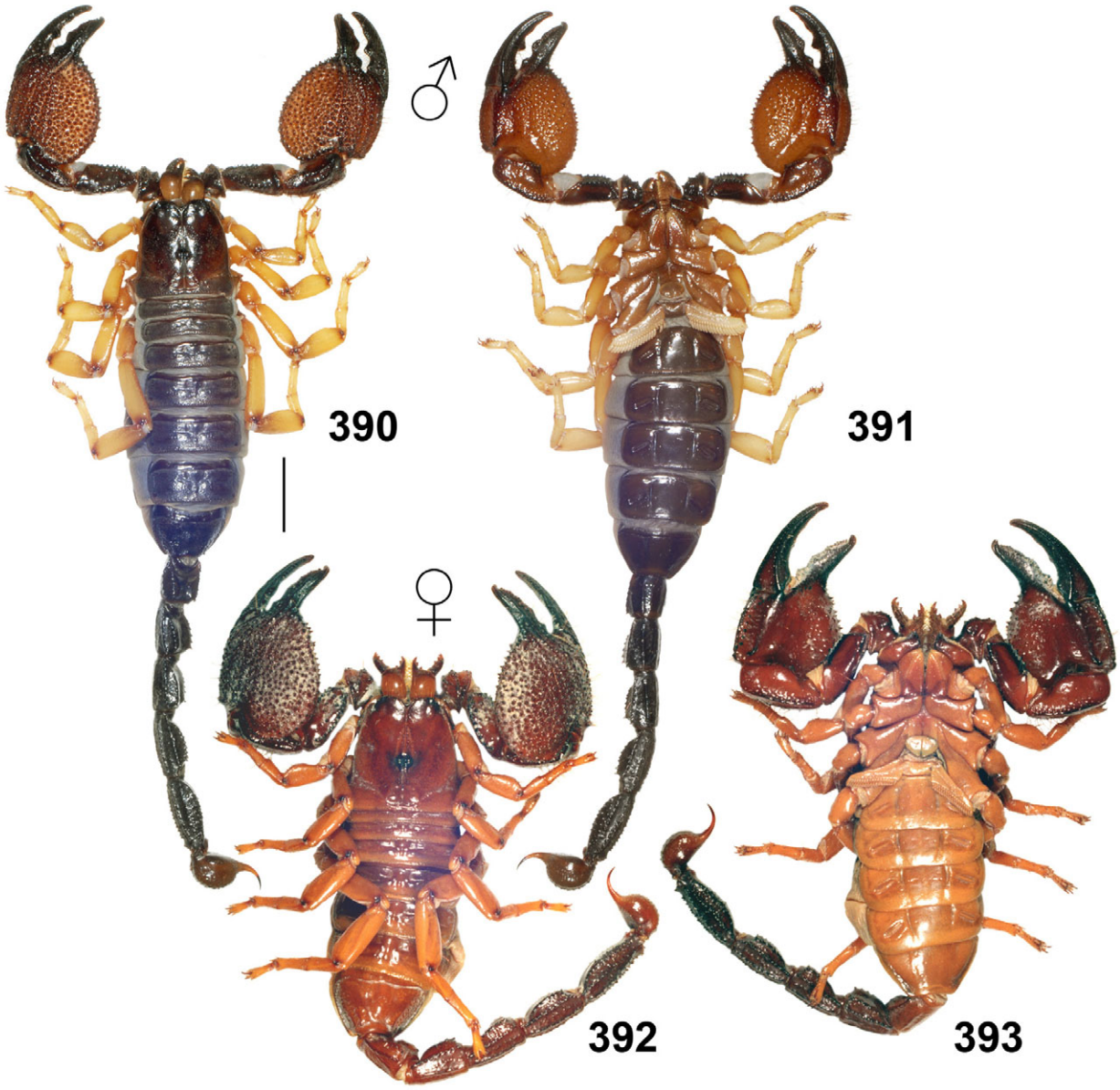
EMENDED DIAGNOSIS. Total length 100–110 mm. Color uniformly reddish brown; legs bright yellow; chela

Figures 383–384: *Pandinurus platycheles*. **Figure 383**. Female in vivo habitus in locality 14EQ. **Figure 384**. Male from locality 14EP.

Figures 385–387: *Pandinurus platycheles*. **Figures 385**–**386**. Juvenile from locality 14EQ before (385) and shortly after (386) ecdysis. **Figure 387**. Another juvenile from locality 14EQ shortly after ecdysis.



Figures 388–389: *Pandinurus platycheles*, locality 14EQ. Down inside the valley visible in Fig. 388 there is locality 14EP.



Figures 390–393: *Pandinurus smithi*. **Figures 390**–**391**. Male from locality 11EV in dorsal (390) and ventral (391) aspects. **Figures 392**–**393**. Female lectotype in dorsal (392) and ventral (393) aspects. Scale bar: 10 mm.

orange to reddish brown. Chelicerae yellowish brown, reticulate, with black fingers and anterior margin. Carapace lacking carinae and sparsely granulate. Ex-ternal trichobothria on patella number 17 (5 *eb*, 4 *esb*, 2 *em*, 3 *est*, 3 *et*); ventral trichobothria on patella number 32–34; internal trichobothria on chela number 3, accessory external trichobothrium *ea* on chela absent, ventral trichobothria on chela number 12–15. Pedipalp very densely hirsute, mainly on chela. Granules on manus of pedipalp conical and pointed. Lobe of chela granulated with the same intensity as whole dorsal surface of chela. External surface of chela granulate and without carinae. Chela of male length/ width ratio is 1.56. Pectinal teeth number 18–21 in both sexes. Dorsal carinae on first through fourth metasomal segments granulate and terminate in a larger tooth most conspicuous on fourth segment. Spiniform formula of tarsomere II = 7/4: 7-8/4: 8-9/5-6: 8-9/6-7. Tarsomere II with 3 spiniform setae on inclined anteroventral surface. Length to width ratio of male 5th metasomal segment = 2.29.

NOTE. For habitus of male in vivo and locality photos see figs. 20–22 in Kovařík, 2011: 9.

Pandinurus trailini (Kovařík, 2013) **comb**. **n**.
(Figs. 5–9, 17, 162–163, 203, 260–263, 394, 396)

Pandinus (*Pandinus*) *trailini* Kovařík, 2013: 1–14, figs. 1–6, 9–36.
Pandinus trailini: Rossi, 2015a: 12.
Pandinus (*Pandinoirens*) *trailini*: Rossi, 2015c: 46–48.

TYPE LOCALITY AND TYPE REPOSITORY. Ethiopia, Oromia State, Arsi Province, 06°56'06"N 40°41'23"E, 1693 m a.s.l.; FKCP.

TYPE MATERIAL EXAMINED. **Ethiopia**, Oromia State, Arsi Province, 06°56'06"N 40°41'23"E, 1693 m a.s.l. (Locality No. **13EA**, fig. 25–26 in Kovařík, 2013: 8), 5.VII.2012, 1♂ (holotype) and its exuvia from 20.I. 2013, leg. V. Trailin, 24.VI.2013, 1♀2juvs (paratypes), leg. F. Kovařík, J. Plíšková, P. Novák, 8 "juvs.", from which 3♂4♀ (paratypes, DNA No. 1137) are adults bred by F. Kovařík, FKCP; Oromia State, Arsi Province, 06° 54'19"N 40°50'08"E, 1708 m a.s.l. (Locality No. **13EB**, fig. 30–31 in Kovařík, 2013: 11), 24.VI.2013, 4♀1im. 12juvs. (paratypes), leg. F. Kovařík, J. Plíšková, P. Novák, V. Socha; Oromia State, Arsi Province, Sof Omar, 06°54'19"N 40°51'04"E, 1200 m a.s.l. (Locality No. **13EC**, fig. 34–35 in Kovařík, 2013: 12), 24.-25. VI.2013, 3♀1im.1juv. (paratypes) (UV detection), leg. F. Kovařík, J. Plíšková, P. Novák, FKCP.

ADDITIONAL MATERIAL EXAMINED. **Ethiopia**, Oromia State, Arsi Province, Sof Omar, 06°54'19"N 40°51'04"E, 1200 m a.s.l. (Locality No. **14EN** = 13EC), 23.-24. XI.2014, 4♂ (Figs. 5–9, 17, 162–163, 203, 261–263, 394, DNA No. 724) 4♀ (Fig., 260, topotypes), leg. F. Kovařík; (Locality No. **16EI** = 13EC), 20.-21.IV.2016, 1♂ (Fig. 394, DNA No. 947) (topotype), leg. F. Kovařík, FKCP.

EMENDED DIAGNOSIS. Total length 98–120 mm. Color uniformly brown to reddish black including legs, only chela reddish brown. Chelicerae brown, reticulate, with black fingers and anterior margin. Carapace lacking carinae and with very fine sparse granules. External trichobothria on patella number 18–19 (5–6 *eb*, 4–5 *esb*, 2 *em*, 3 *est*, 3 *et*); ventral trichobothria on patella number 32–40; internal trichobothria on chela number 3, accessory external trichobothrium *ea* on chela absent, ventral trichobothria on chela number 13–18. Pedipalp densely hirsute, mainly on chela. Granules on dorsal surface of chela conical, conspicuous but not pointed. Lobe of chela granulated with the same intensity as whole dorsal surface of chela. External surface of chela with conical granules in distal part and without carinae. Chela of male length/width ratio is 1.67–1.81. Pectinal teeth number 16–20 in both sexes. Dorsal carinae on first through fourth metasomal segments granulate and terminate in a larger tooth most conspicuous on fourth segment. Spiniform formula of tarsomere II = 6/4: 6-7/4: 7-8/4-5: 7-8/4-5. Tarsomere II with 2 spiniform setae on inclined anteroventral surface but there could be additional spiniform seta on external margin indicated by another not well developed macroseta. Length to width ratio of 5th metasomal segment = 2.60–2.75.

NOTE. For habitus of both sexes and other photos of *Pandinurus trailini* specimens and localities see figs. 1–6, 9–36 in Kovařík, 2013: 1–14. Here we have added Figs. 5–9 which show the complete spiniform setal formula of tarsomeres of legs.

KEY TO SPECIES OF *PANDINURUS*

1. Accessory external trichobothrium *ea* on chela present (Fig. 207). 2
–Accessory external trichobothrium *ea* on chela absent (Fig. 340). 6

2. Legs bright yellow (Fig. 352) also in juveniles (Figs. 385–387). 3
– Legs not bright yellow (Fig. 351), yellowish brown to black (Figs. 307–309). 4

3. Total length 85–110 mm. Chela of male length/ width ratio 1.68. Occurs in Ethiopia. .... ***P***. ***platycheles*** (Werner, 1916)
– Total length 100–128 mm. Chela of male length/ width ratio is 1.84. Occurs in Somaliland. .... ***P***. ***phillipsii*** (Pocock, 1896)

4. Total length 87–135 mm. Chela with 13–17 ventral trichobothria. Granules on dorsal surface of chela of pedipalp conical (Fig. 150). Lobe of chela granulated with the same intensity as whole dorsal surface of chela. Pectinal teeth number 16–21 .... ***P***. ***intermedius*** (Borelli, 1919)
– Total length 70–93 mm. Chela with 10–12 ventral trichobothria. Granules on dorsal surface of chela of pedipalp not conical, their apices sometimes confluent (Fig. 152). Lobe of chela without granules, only rugose. Pectinal teeth number 14–17..... 5

5. Dorsal carinae on first through fourth metasomal segments sparsely granulate and terminate in a larger tooth most conspicuous on fourth segment (Fig. 222) .... ***P***. ***mazuchi*** Kovařík, 2011
– Dorsal carinae metasomal segments I–IV are not granulated by large poined tooth (Fig. 223). ..... ***P***. ***afar*** **sp**. **n**.

6. Granules on dorsal surface of chela of pedipalp conical and pointed (Fig. 162)..... 7
– Granules on dorsal surface of chela of pedipalp are not pointed and usually not conical, their apices may be confluent (Fig. 146). 8

7. Color uniformly brown to reddish black including legs, only chela reddish brown. .....……..... …….. ***P. trailini*** Kovařík, 2013
– Color uniformly reddish brown; legs bright yellow; chela orange to reddish brown. ……..……..... …….. ***P. smithi*** (Pocock, 1897)

8. Chela of male length/ width ratio is 1.59–1.62. …….. ……..... ***P. exitialis*** (Pocock, 1888)
– Chela of male length/ width ratio is 1.62–1.80. 9

9. Color uniformly brown to reddish black; legs and chela reddish brown (Fig. 351). .....……..... 10
– Color of adults uniformly reddish black, legs yellow in adults; chela usually orange to reddish brown (Fig. 352). .....……..... 12

10. Internal trichobothria on pedipalp chela number 3–4, ventral trichobothria on chela number 14–19. ……..... 11
– Internal trichobothria on pedipalp chela number 2, ventral trichobothria on chela number 10–14. …….. .....…..... ***P. gregoryi*** (Pocock, 1896)

11. Margin of lobe of chela rugose with the same intensity as whole lobe of chela. ……... ***P. oromo*** **sp. n.**
– Margin of lobe of chela almost smooth. ...….....…… ***P. citernii*** (Borelli, 1919)

12. Internal trichobothria on pedipalp chela number 2–3, ventral trichobothria on chela number 9–12. Occurs in Sudan and Chad. Pedipalp chela sparsely hirsute. ……... ……..…. ***P. sudanicus*** (Hirst, 1911)
– Internal trichobothria on pedipalp chela number 1–2, ventral trichobothria on chela number 10–16. Pedipalp chela densely hirsute. Occurs in Somalia. …….. ……..... ***P. pallidus*** (Kraepelin, 1894)

COMMENTS ON KEYS TO SPECIES. The taxonomic positions of most *Pandinurus* and *Pandiborellius* species are supported by DNA and karyotype analysis. However, these species keys are created strictly according to morphological characters which we verified from specimens examined in this study. The keys could be used for quick orientation in connection with distribution (see Fig. 396). There is a possibility that other specimens can show intraspecific variability in some characters used in these keys for separation at species level.

Several species are well characterized by bright yellow color of legs and chela which is present also in juveniles. This character easily distinguishes these species from other species. However, this color changes quickly in specimens deposited in alcohol (Figs. 25–26 versus Figs, 27–28).

HEMISPERMATOPHORES OF *PANDINUS* SENSU LATO. Previously, little information was published about hemispermatophores of *Pandinus* sensu lato. Vachon (1952b) provided rough line drawings of the capsule region and distal lamina of *Pandinus* (*Pandinus*) *imperator*, with recognizable structures such as hook (='li'), internobasal reflection of the sperm duct (='lb') and proximal lobe (='le'). Lourenço (2014) utilized the shape of the distal lamina as a key character to reinstate *Pandinus roeseli* (Simon, 1872), removing it from synonymy with *P.* (*P.*) *imperator*, and to define a new species, *P.* (*P.*) *camerounensis* Lourenço, 2014. However, Prendini (2016) synonymized both species under *P.* (*P.*) *imperator*, noting that they were weakly supported, being based on small sample sizes with no analysis of variation. In describing *Pandinurus* (*Pandinurus*) *cianferonii* (= *P. pallidus*), Rossi (2015d) included a crude hemispermatophore image that lacked detail, and did not mention it in the description (see also Rossi, 2015a). The distal lamina appeared curled and tapered, but the hemispermatophore was not cleaned and looked to be in poor condition. Rossi (2015c) showed an image of the hemispermatophore of *Pandinus ugandaensis* Kovařík, 2011 that also lacked detail, although the profile of the distal lamina was clearly visible (see also Rossi, 2015a).

We examined hemispermatophores freshly extracted from males of many of the species described or revised in this study. For some species, several males were available for dissection, providing enough samples to assess variation and stability of potential taxonomic characters. Both right and left hemispermatophores were always extracted to check for bilateral asymmetry, which has been reported in the diplocentrine subfamily of Scorpionidae (Santibáñez López & Francke, 2013). We found no signficant left-right differences that were greater than variation between different conspecific individuals. Figs. 394–395 show 25 hemispermatophores from a variety of *Pandinus* sensu lato species representing the genera *Pandinurus*, *Pandiborellius*, *Pandinops*, *Pandinoides* and *Pandinus* (*Pandinus*). Their basic structure is similar to what has been reported for other scorpionine genera: *Scorpio* (Levy & Amitai, 1980; Lourenço, 2009; Vachon, 1950, 1952a), *Heterometrus* (Couzijn, 1981; Kovařík et. al., 2016b; Stockwell, 1989), and *Opistophthalmus* (Alexander, 1956, 1957, Lamoral, 1979). A relatively short, compact trunk connects via a truncal flexure to a much longer distal lamina with a single prominent hook near the base of its internal margin. The basal section of the distal lamina below the hook is broad with a trough on its dorsal surface, and a variably developed, convex 'median lobe' on its ventrointernal side. The distal section of the lamina above the hook is much narrower, basally constricted, and more or less uniformly wide for much of its length. On the ventral side of the hemispermatophore, structures involved in sperm storage and delivery straddle the truncal flexure and basal distal lamina. The internally directed sperm duct encloses a conspicuous

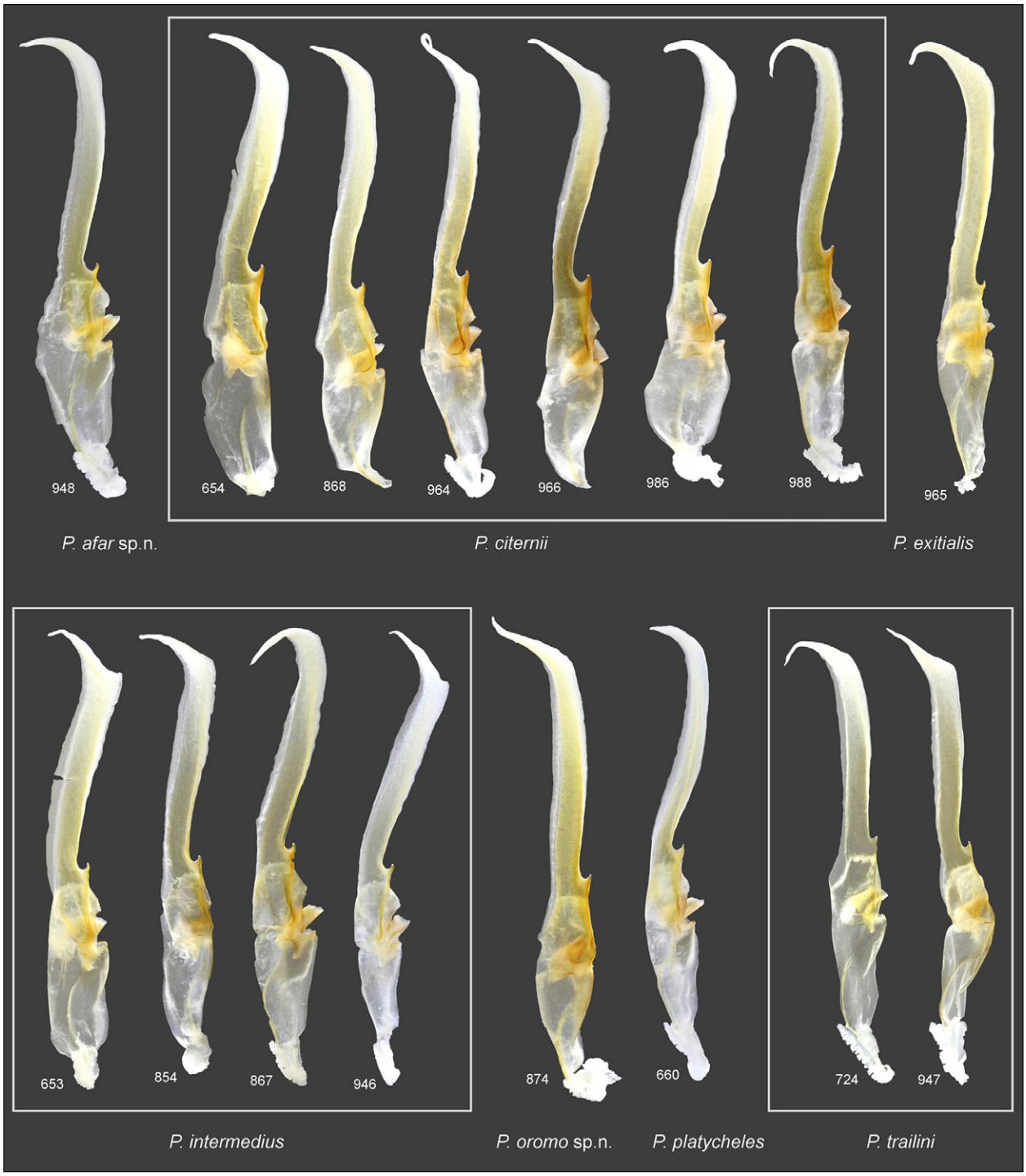


Figure 394: Morphology of hemispermatophores of 7 species of *Pandinurus* in dorsal view, showing intra- and interspecific variation. Species represented are: *P. afar* sp. n. (1 sample), *P. citernii* (6 samples), *P. exitialis* (1 sample), *P. intermedius* (4 samples), *P. oromo* sp. n. (1 sample), *P. platycheles* (1 sample) and *P. trailini* (2 samples). For visual comparison, images are rescaled to similar dimensions and show either right hemispermatophores, or left hemispermatophores in mirror image. Numerical labels are the DNA sample numbers associated with each specimen.

tube-like process, the eversible 'internobasal reflection' (Stockwell, 1989) or 'valve' (Alexander, 1956, 1957), whose distal end comprises the 'inner lobe', and whose base bears a wide flange, the 'proximal lobe'. A smaller sclerotized 'basal lobe' is developed where the proximal edge of the sperm duct joins the trunk.

The examined hemispermatophores of *Pandinus* sensu lato exhibited consistent differences from those of

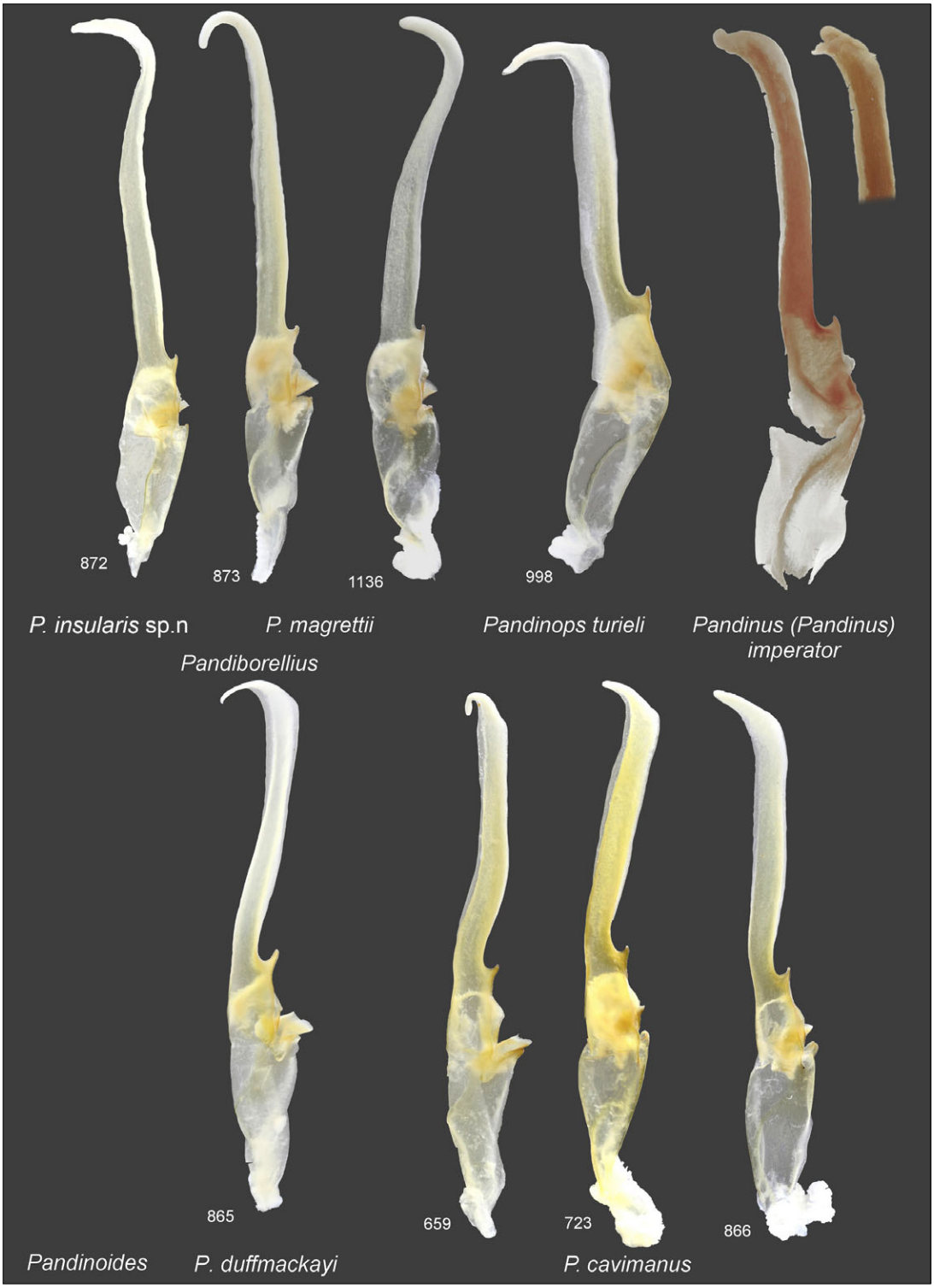


Figure 395: Morphology of hemispermatophores of 6 species of *Pandinus* sensu lato in dorsal view, showing intra- and interspecific, and intergeneric variation. Represented are 4 genera/ subgenera and 6 species: *Pandiborellius*: *P. insularis* sp. n. (1 sample), *P. magrettiii* (2 samples); *Pandinops*: *P. turieli* (1 sample); *Pandinoides*: *P. cavimanus* (3 samples), *P. duffmackayi* (1 sample); and *Pandinus* (*Pandinus*): *P.* (*P.*) *imperator* (1 sample). For visual comparison, images are rescaled to similar dimensions and show either right hemispermatophores, or left hemispermatophores in mirror image. Numerical labels are the DNA sample numbers associated with each specimen. For *P.* (*P.*) *imperator* both right hemispermatophore and apical half of the distal lamina of left hemispermatophore (inset) are shown to the variable shape of the terminus.

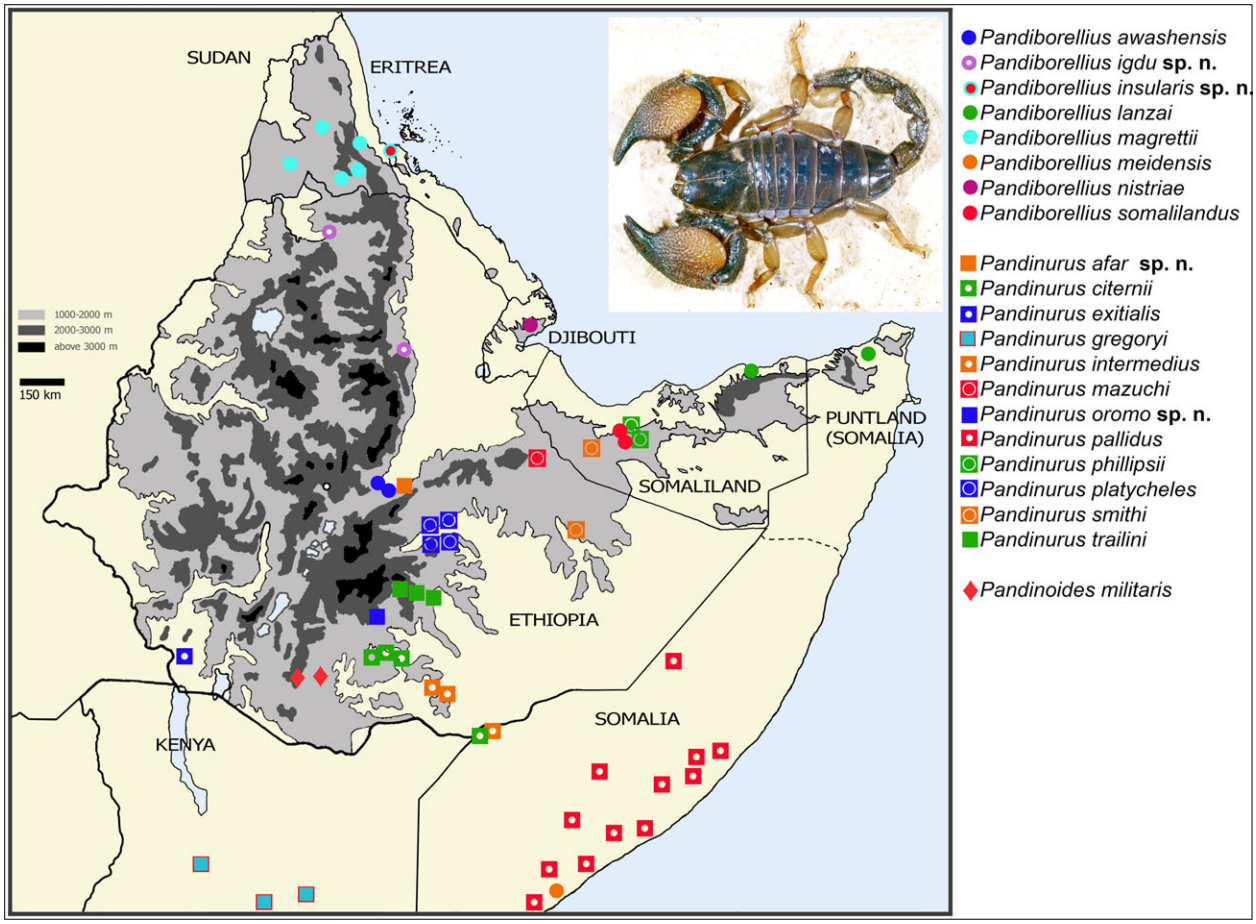


Figure 396: Map showing confirmed Horn of Africa distribution of *Pandiborellius* and *Pandinurus*. There are only two recently verified localities of *Pandinoides militaris* in Ethiopia, Oromia State, Sidamo Province marked (Yabello, 4°50.574'N 38°15.484'E, 1610 m a.s.l., 14.IV.2010; and 60km SSW Negele Borena, Goba village, 04°51'48"N 39°18'35"E, 750m a.s.l., 24.V.2015) which represented the northern limit of distribution of genus *Pandinoides*. For complete distributions of genus *Pandinoides* see fig. 2 in Prendini (2016: 9) and for distributions of genus *Pandinops* see fig. 69 in Kovařík (2016: 18). Scorpion in photos inside map is a female of *Pandinurus pallidus* from Somalia, Jubbada Hoose Province, Bilis Quoqaani env.

other scorpionines. The most striking difference visible in Figs. 394–395 is the shape of the apical portion of the distal lamina. In nearly all cases, this was tapered and either curved or abruptly bent in an external direction. This contrasted with the truncate, spatulate, blunt or rounded terminus in genera *Scorpio*, *Heterometrus* and *Opistophthalmus* (c. f. above references). The apical deflection was strongest in *Pandinurus*, in which there was usually a sharp bend of up to 70° and after the bend there was rapid tapering to an acuminate tip, shaped like a sickle blade. Comparison of 6 samples of *P. citerniii* and 4 samples of *P. intermedius* showed this to be generally consistent and reliable, although the precise shape and curvature of the bent apex could be variable (Fig. 394). A similar morphology was seen in single samples of other *Pandinurus* spp., and we may expect a similar level of intraspecific variation for those species. A sharply bent, strongly tapered apex was also observed in representatives of two other genera: *Pandinops turieli*, *Pandinoides cavimanus* and *Pandinoides duffmackayi*. However, the genus *Pandiborellius* differed in having a much longer, narrower distal lamina that was more gradually tapered, with a gentle sinuous apical bend that was also directed in an external direction. These differences support our hypothesized scheme of generic subdivison of *Pandinus* sensu lato.

In Fig. 395 we also show for comparison a hemispermatophore from *Pandinus* sensu stricto, i.e. *Pandinus* (*Pandinus*) *imperator*. Note that the apical portion of the distal lamina is neither tapered nor sharply bent. Rather, it is broadly rounded and gently curved in an external direction, and it bears a rounded, knob-like terminal elaboration. The other hemispermatophore dissected from the same animal had a similar untapered lamina but bore a different shaped terminal structure (c.f. inset, Fig. 395). Lourenço (2014) illustrated a hemispermatophore purportedly from *P.* (*P.*) *imperator* with a tapered distal lamina, not apically curved but with a

knob-like structure, and used this to differentiate it from *P*. (*P*.) *camerounensis*. It is apparent that the shape of the distal lamina of *Pandinus* (*Pandinus*) can be variable, and its potential value as a diagnostic character requires further investigation. An untapered, distally truncate lamina is shown in most of the published illustrations of hemispermatophores of *Pandinus* (*Pandinus*), i.e. *P*. (*P*.) *roeseli* and *P*. (*P*.) *camerounensis* (both now synonyms of *P*. (*P*.) *imperator*) (c.f. Lourenço, 2014: 144, figs. 10, 12), *P*. (*P*.) *imperator* (c.f. Vachon, 1952b: 14, fig. 12), and *P*. (*P*.) *ugandaensis* (c.f. Rossi, 2015a: 49, fig. 7; 2015c: 50, fig. 22). We propose that the untapered form of the distal lamina (perhaps with weakly curved apex) of *Pandinus* (*Pandinus*) is a plesiomorphic condition because it resembles that seen in other scorpionine genera. The bent, tapered apex is thus a potential synapomorphy uniting several genera within *Pandinus* sensu lato. The distal lamina with curved, tapered apex in the diplocentrine subfamily (e.g. Levy & Amitai, 1980; Santibáñez López & Francke, 2013; Santibáñez López et. al., 2013b; Sissom, 1994a,b; Sissom & Wheeler, 1995; Stockwell, 1985, 1988, 1989) is probably not homologous, but evolved independently.

Another noticeable difference was in the form of the basal lobe. In *Pandinus* sensu lato it was typically symmetric, subtriangular or lobate in form with a blunt, rounded end. This differs from the basal lobe of *Opistophthalmus* and *Scorpio*, which is often asymmetric with an internally pointed apex. In the few *Heterometrus* that we have examined, the basal lobe appears more similar to that of *Pandinus* sensu lato. This is consistent with the hypothesized close relationship between *Pandinus* sensu lato and *Heterometrus* (Prendini et al, 2003).

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