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**NOTES ON THE DISTRIBUTION OF *PANDINUS (PANDINUS)* THORELL, 1876 AND *PANDINUS (PANDINURUS)* FET, 1997 WITH THE DESCRIPTIONS OF TWO NEW SPECIES FROM CENTRAL AFRICAN REPUBLIC AND DJIBOUTI**

(Scorpiones: Scorpionidae)

**Abstract.** A synopsis about the distribution of *Pandinus (Pandinus)* Thorell, 1876 and *Pandinus (Pandinurus)* Fet, 1997 is proposed. Two new species are described: *Pandinus nistriae* **sp. n.** from Djibouti and *Pandinus ulderigoii* **sp. n.** from Central African Republic. *Pandinus nistriae* **sp. n.** is also the first record of the genus *Pandinus* and the family Scorpionidae from Djibouti. The description of *Pandinus ulderigoii* **sp. n.** confirms the presence of this genus in Central African Republic, although the exact localities remain unknown. In addition, new localities are reported for *Pandinus ugandaensis* Kovařík, 2011 in Uganda and *Pandinus gambiensis* Pocock, 1899 in Mali. An identification key and an updated check-list of all the species of the subgenera *Pandinus* and *Pandinurus* are given.

**Riassunto.** *Note sulla distribuzione di Pandinus (Pandinus) Thorell, 1876 e Pandinus (Pandinurus) Fet, 1997 con le descrizioni di due nuove specie della Repubblica Centrafricana e del Gibuti (Scorpiones, Scorpionidae).* Viene proposta una sinossi sulla distribuzione del sottogenere *Pandinus* Thorell, 1876 e del sottogenere *Pandinurus* Fet, 1997. Vengono descritte due nuove specie: *Pandinus nistriae* **sp. n.** del Gibuti e *Pandinus ulderigoii* **sp. n.** della Repubblica Centrafricana. *Pandinus nistriae* **sp. n.** rappresenta anche la prima segnalazione del genere *Pandinus* e della famiglia Scorpionidae per Gibuti. La descrizione di *Pandinus ulderigoii* **sp. n.** conferma che esemplari di questo genere sono presenti anche nella Repubblica Centrafricana, sebbene le località esatte rimangano sconosciute. In aggiunta, sono riportate nuove località per *Pandinus ugandaensis* Kovařík, 2011 in Uganda e *Pandinus gambiensis* Pocock, 1899 in Mali. Viene fornita una chiave identificativa e una check-list aggiornata di tutte le specie dei sottogeneri *Pandinus* e *Pandinurus*.

**Key words.** *Pandinus*, *Pandinurus*, *P. nistriae* **sp. n.**, *P. ulderigoii* **sp. n.**, distribution, Djibouti, Central African Republic.

**Introduction**

The scorpions of the genus *Pandinus* Thorell 1876 are among the largest scorpions of the world (PRENDINI *et al.*, 2003; KOVAŘÍK, 2009). The three species from West Africa, *Pandinus imperator* (C.L. Koch, 1841), *Pandinus dictator* Pocock, 1888 and *Pandinus gambiensis* Pocock, 1899, all included in the CITES list (LOURENÇO & CLOUDSEY-THOMPSON, 1996), are larger than the several other species occurring in Yemen, East-Africa and in some other countries of central and southern Africa. Despite their large size, only the attention of few authors, especially in the 19<sup>th</sup> century, was focused on them. The most important contributions of the past came from England with Pocock who described the majority of the species (POCOCK 1888, 1890, 1896, 1899, 1900, 1902) and Hirst (HIRST, 1911), from the rich material preserved in the Natural History Museum of London collections. Several German authors (C.L. KOCH, 1841; L. KOCH, 1875; KARSCH, 1879; KRAEPELIN, 1894) contributed to the study of the genus *Pandinus* with isolated descriptions of new species and, subsequently, also Italian (BORELLI, 1901, 1919; DI CAPORIACCO, 1937) and Austrian

ones (WERNER, 1911). In the following years the genus *Pandinus* was ignored by arachnologists with the exception of VACHON (1967, 1974) who divided the known species in five subgenera based upon the number of the internal trichobothria of pedipalp chela (VACHON, 1974). Only recently, KOVAŘÍK (2009) proposed a complete identification key for the genus *Pandinus*, mainly based on two of his previous papers (KOVAŘÍK 2000, 2003) for East-African species. Further descriptions of five new species from Ethiopia, Uganda, Somalia and Democratic Republic of Congo (KOVAŘÍK 2011, 2012) and the elevation to species status of *Pandinus exitialis sudanicus* Hirst, 1911 (KOVAŘÍK, 2012) allowed to better understand the pattern of distribution of *Pandinus* species in Africa, their ecology data and the differences among them. Finally, with the description of *Pandinus trailini*, Kovařík 2013 from Ethiopia (KOVAŘÍK, 2013), the total number of *Pandinus* species reached 28. With the descriptions of *Pandinus nistriae* **sp. n.** from Djibouti and *Pandinus ulderigo* **sp. n.** from Central African Republic, the total number of species of the genus is now elevated to 30. In the present work, new localities in Uganda are reported for *Pandinus ugandaensis* Kovařík, 2011, increasing the known distribution of this species, and a new record of *P. gambiensis* in Mali is herein proposed. An updated identification key is also given for the subgenera *Pandinus* and *Pandinurus*.

### Material and methods

Descriptions and measurements (in mm) mostly follow respectively HJELLE (1990) and SISSOM *et al.* (1990). In the present study, two new species of the genus *Pandinus* are described. *Pandinus (Pandinurus) nistriae* **sp. n.** from Djibouti is compared with the most closely related species: *Pandinus meidensis* and *Pandinus magrettii*; a short diagnosis of these species is also added. *Pandinus (Pandinus) ulderigo* **sp. n.** from Central African Republic is compared with the most closely related species: *Pandinus imperator* from West-Africa and *Pandinus ugandaensis* from Uganda; a brief diagnosis of these species is also added, including new localities for *P. ugandaensis*. In addition, a short diagnosis for *Pandinus gambiensis* is given, including the first record from Mali.

### Abbreviations

L = length; W = width; H = height;

ACSA = Aracnofilia - Centro Studi sugli Aracnidi, Massa, Italy;

AMNH = American Museum of Natural History, New York, USA;

ARPC = Andrea Rossi Private Collection, Massa, Italy;

BMNH = Natural History Museum, London, United Kingdom;

FKCP = František Kovařík Private Collection, Prague, Czech Republic;

MHNG = Muséum d'Histoire Naturelle de Genève, Switzerland;

MSNB = Museo Civico di Scienze Naturali di Bergamo "E. Caffi", Italy;

MSNM = Museo Civico di Storia Naturale di Milano, Italy;

MZUF = Museo di Storia naturale dell'Università degli Studi di Firenze, Sezione di Zoologia "La Specola", Italy;

ZMBH = Museum für Naturkunde der Humboldt-Universität Berlin, Germany.

### Taxonomy

#### Subgenus *Pandinurus* Fet, 1997

#### *Pandinus (Pandinurus) magrettii* Borelli, 1901

*Pandinus magrettii* BORELLI, 1901: 1. BIRULA, 1928: 85 (in part). *Pandinus (Pandinurus) magrettii*: VACHON, 1974: 953; LAMORAL & REYNDEERS, 1975: 566 (in part); KOVAŘÍK, 1998: 140; FET, 2000: 471 (in part); KOVAŘÍK & WHITMAN, 2005: 114; KOVAŘÍK, 2009: 54, Figs 300, 339-346, 418-419 (in part); KOVAŘÍK, 2012: 1-3, 6, 9, 17, 19-20.

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

= *Scorpio africanus* *subt*

*ypicus* Kraepelin, 1894: 69 (syn. by KOVAŘÍK, 2003: 151).

**Type locality and type repository:** Eritrea, Keren; MSNM.

**Diagnosis:** Total length 90-120 mm. Chela of pedipalp with 2 internal and 10-11 ventral trichobothria. Colour of adults uniformly reddish brown to reddish black, legs yellowish (Fig. 1). Pectinal teeth number 18-22. Dorsal surface of manus tuberculate. Dorsal carinae on fourth metasomal segment without marked denticles. Chela internal with two longitudinal carinae covered by several granules. No sexual dimorphism evident. Male could have bigger telson than female. Tarsomere II with 3 spines on inclined anteroventral surface. Spination formula of tarsomere II = 6/4-5: 6-7/4-5: 6-7/4-5: 6-7/4-5. Tarsomere I of all legs with spina distal prosuperior.

**Distribution:** Eritrea, Ethiopia (Tab. 2 and Fig. A).

**Material examined:** *Pandinus (Pandinurus) magrettii*: 4 ♀♀, Eritrea, Adi Ugri, 16-30.VI.1901, leg. A. Andreini (MZUF: 1110).

**Comments:** the two syntypes deposited at MSNM could not be located. According to the catalogue of the types deposited at MSNM (LEONARDI *et al.*, 1995) they were still present after the big fire which destroyed part of the collections in the year 1943, during the Second World War. A precise study of the type material could be useful for better understand intraspecific variation in telson size.

*Scorpio africanus subtypicus* Kraepelin, 1894 was synonymized with *P. magrettii* (KOVAŘÍK, 2003). However, it is possible that *Scorpio africanus subtypicus* is rather a synonym of *P. exitialis* Pocock, 1888, or *Pandinus sudanicus* Hirst, 1911, taking into account the distribution. Since the type of *Scorpio africanus subtypicus* from Sudan is not designated (FET, 2000), it is however impossible to establish with absolute certainty which one is.

### ***Pandinus (Pandinurus) meidensis* Karsch, 1879**

*Pandinus meidensis* KARSCH, 1879: 127.

*Pandinus (Pandinurus) meidensis*: VACHON, 1974: 953; LAMORAL & REYNDERS, 1975: 566; KOVAŘÍK, 1998: 140; FET, 2000: 472; KOVAŘÍK, 2003: 152; KOVAŘÍK & WHITMAN, 2005: 114; KOVAŘÍK, 2009: 52, 55-56, 59, 123; KOVAŘÍK, 2012: 17-20.

**Type locality and type repository:** Meid, Somalia; ZMHB.

**Diagnosis:** Total length 90-140 mm. Chela of pedipalp with 2 internal and 12-14 ventral trichobothria. Base colour uniformly reddish-brown, legs yellow to orange (Fig. 2). Pectinal teeth number 18-23. Dorsal surface of manus with smooth tubercles (Fig. 4). Dorsal carinae on third and fourth metasomal segments without marked denticles (Fig. 5B). Ventral side of manus with 2 longitudinal carinae covered by several granules. Sexual dimorphism evident, with male having a more pronounced tooth on the movable finger of pedipalp (Fig. 10). Tarsomere II with 3 spines on inclined antero-ventral surface. Spination formula of tarsomere II = 7-8/5-6: 7-8/5-6: 7-8-9/6-7: 7-8-9/6-7.

**Distribution:** Somalia (Tab. 2 and Fig. A).

**Material examined:** *Pandinus (Pandinurus) meidensis*: 3 ♂♂, 9 ♀♀, 8 imm., Somalia, Oasi di Galgala, X.1973, S.B.S. (MZUF 1026).

**Comments:** Usually scorpions of the genus *Pandinus* have a quite fixed spination formula of tarsomere II. Since I had the opportunity to study a large number of *P. meidensis*, I noted that in this species the spination formula of tarsomere II is very different among specimens from the same locality. Taking into account the complete values that I have

examined, the spination formula of tarsomere II is = 7-8/5-6: 7-8/5-6: 7-8-9/6-7: 7-8-9/6-7. However, a so complex formula was never reported in any *Pandinus* species. I suggest that the typical formula could be = 7-8/5-6: 8/6: 8/6: 8-9/6-7. In reference to the spination formula of tarsomere II of *Pandinus nistriae* **sp. n.**, it is important to note that the value of leg II (7/5) was never noted among the twenty *Pandinus meidensis* examined. In fact, in 40 legs scored, only in 5 cases the value was 7/6 and only in two cases the value was 8/5. Besides, also a value of 6/5 (recorded in *P. nistriae* **sp. n.**) in leg I was not present in any *P. meidensis* specimens.

### ***Pandinus (Pandinurus) nistriae* sp. n.**

**Type locality and type repository:** W Obock, Djibouti province, Djibouti (Fig. C); MZUF.

**Type material:** ♂ holotype, Djibouti, Medeho, Obock district, 11° 58' 15" N, 43° 01' 30" E, 25.II.2013, leg. P. Agnelli, A. Nistri & A. Ugolini, (MZUF: 4133).

**Diagnosis:** Total length 108 mm (Tab. 1). Chela of pedipalp with 2 internal and 11-12 ventral trichobothria (Fig. 8). Base colour uniformly dark brown, legs orange (Fig. 6). Pectinal teeth number 20-21 in male (Fig. 7). Dorsal surface of manus with many tubercles but not conical or pointed (Fig. 3). Dorsal carinae on third and fourth metasomal segments without marked denticles (Fig. 5A). Ventral side of manus with 2 longitudinal carinae covered by several granules. Sexual dimorphism should be in the size of the tooth on movable finger of pedipalp, which is larger in male; however the female of this species remains, for the moment, unknown. Tarsomere II with 3 spines on inclined antero-ventral surface. Spination formula of tarsomere II = 6-7/5: 7/5: 7/6: 8/6.

**Etymology:** Named in honour of Dr Annamaria Nistri, curator of the herpetological collection of the MZUF and one of the collectors of this new species.

**Description:** Coloration: carapace dark brown; tergites uniformly dark brown; only tergite VII laterally is reddish-brown; sternites brown; metasomal segments and pedipalps are dark brown, only chela reddish brown; telson reddish brown; pectines and genital operculum dark yellow; legs dark orange (Fig. 6).

Prosoma: carapace without carinae; two deep furrows in its posterior side; the surface is intensely and finely granulated. Its posterior width is more than its length. The anterior margin shows a deep concavity. Median eyes reddish brown and separated by two ocular diametres; three pairs of small lateral eyes black. Median eyes are located just before the half of carapace length.

Mesosoma: tergites I to VI with a vestigial and reduced median carina. Tergite VII with three vestigial carinae; its surface, especially on lateral side, is densely granulated. Sternites smooth, except for sternite VII which bears 4 vestigial carinae. Spiracles strongly elongated.

Metasoma (Fig. 5A): very elongated with all segments longer than wide; length/width ratio of I metasomal segment is 1.14 and that of V metasomal segment is 2.86; segment I with 10 complete carinae; segments II and III with 8 carinae and 2 incomplete lateral carinae; segment IV with 8 carinae; segment I to IV have all carinae almost smooth; segment V shows 7 carinae, all with spinoid tubercles. Ventrally segment V is strongly granulated. Only few granules are ventrally present in segment IV.

Telson: vesicle, strongly globular, granulated with many hairs; aculeus curved and strongly shorter than vesicle; subaculear tubercle not noticeable.

Chelicerae: ventral aspect of both fingers and manus covered with long yellow dense setae. Movable finger with distal external and distal internal teeth not opposable to moderately opposable.

Pedipalps: all segments are densely hirsute. Femur with four marked tuberculated carinae; many granules are present on anterior and dorsal side of femur; the exteroventral carina is less marked and distally smooth. The patella shows five complete carinae with granules;

the external surface of patella is less granulated while the anterior surface is full of irregular granules. The chela is lobate and has two smooth ventral carinae. The entire dorsal surface of the chela is densely granulated: the granules are not pointed; their summits are sometimes confluent (Fig. 3). The movable finger has a big distal tooth and a very low proximal tooth (Fig. 9). The fixed finger has a distal lobe and a low proximal tooth. Both movable and fixed fingers have 5 or 6 subrows on the dentate margin. The internal surface of the chela has many granules and two marked carinae. Chela of pedipalp with 2 internal and 12-11 ventral trichobothria (Fig. 8).

Legs: densely hirsute. Tarsomere II of legs bears three spines on the inclined anteroventral surface. The spination formula of tarsomere II = 6-7/5: 7/5: 7/5-6: 8/6. Tarsomere I of legs I-IV bears a distal prosuperior spina.

Pectines, genital operculum and sternum: pectinal teeth count is 20-21 in male holotype; female unknown. Genital operculum wide and lobate, splitted into two parts. Sternum pentagonal, about as long as wide.

**Distribution:** Djibouti (Tab. 2 and Fig. A).

**Relationships and comments:** Scorpions of the genus *Pandinus* were never reported from Djibouti. This represents the first record of the genus *Pandinus* and the family Scorpionidae for this country. For biogeographical and morphological reasons *Pandinus nistriae* **sp. n.** could be a possible link between *P. magrettii*, common in Eritrea, and reported also in northern Ethiopia, and *P. meidensis* from Somalia, with the latter morphologically more similar.

*Pandinus nistriae* **sp. n.** can be distinguished from *P. magrettii* by I) a different spination formula of tarsomere II = 6-7/5: 7/5: 7/5-6: 8/6, while in *P. magrettii* the formula is = 6/4-5: 6-7/4-5: 6-7/4-5: 6-7/4-5; II) a slightly different value of number of ventral trichobothria of chela, 11-12, versus 10-11; III) the male of *Pandinus nistriae* **sp. n.** has a very pronounced tooth at the middle of movable finger of pedipalp chela (Fig. 9) while sexual dimorphism is not present in the male of *P. magrettii*.

*Pandinus nistriae* **sp. n.** can be distinguished from *P. meidensis*, the most similar species and the only one that shares the same (high) spination formula of tarsomere II in IV legs, by I) different number of chela ventral trichobothria, 11-12, versus 12-14 in *P. meidensis*; II) a different spination formula of tarsomere II = 6-7/5: 7/5: 7/5-6: 8/6, while in *P. meidensis* it is usually 7-8/5-6: 8/6: 8/6: 8-9/6-7 \*; III) different morphometric ratios (Tab. 1), as L/H ratio of IV metasomal segment which is 2.37 in *Pandinus nistriae* **sp. n.** and 2.63 in *P. meidensis* (Tab. 1); IV) a very low proximal teeth in the movable finger of pedipalp in the male of *Pandinus nistriae* **sp. n.** (Fig. 9) while in the male of *P. meidensis* it is clearly higher (Fig. 10); V) dorsal surface of chela densely granulated (Fig. 3) while in *P. meidensis* it is prevalently smooth (Fig. 4); VI) in addition, the telson of *Pandinus nistriae* **sp. n.** is less swollen (Fig. 5A) than that of *P. meidensis* (Fig. 5B), although this character could be not fixed since in other examined males of *P. meidensis* the telson is similar to that of *Pandinus nistriae* **sp. n.**

\* see comments under *P. meidensis*.

Subgenus	<i>Pandinurus</i>	<i>Pandinurus</i>	<i>Pandinurus</i>	<i>Pandinus</i>	<i>Pandinus</i>	<i>Pandinus</i>
Species	<i>P. magrettii</i> ♀	<i>P. meidensis</i> ♂	<i>P. nistriae</i> <b>sp. n.</b> ♂	<i>P. imperator</i> ♀	<i>P. ugandaensis</i> ♀	<i>P. ulderigoi</i> <b>sp. n.</b> ♀
Depository	MZUF	MZUF	MZUF	ARPC	MSNB	ARPC
Carapace L/ posterior W	16.86/ 18.38	17.31/ 18.32	16.48/ 17.42	16.25/ 14.76	14.31/ 14.75	18.51/ 18.65
Mesosoma L	41.56	30.12	28.72	39.60	33.00	47.70
Metasomal segment I L/W/H	7.56/6.96/ 5.37	8.66/6.77/ 4.97	7.71/6.78/ 4.87	6.68/6.82/ 5.39	5.76/6.44/ 4.83	8.46/8.14/ 6.61
Metasomal segment II L/W/H	8.12/6.51/ 5.31	9.91/6.08/ 5.10	8.84/6.01/ 4.89	8.02/6.24/ 5.12	5.90/5.68/ 4.67	9.47/7.33/ 6.44
Metasomal segment III L/W/H	8.80/5.86/ 5.18	10.57/5.47/ 5.03	9.54/5.51/ 4.85	8.70/5.89/ 4.94	6.32/5.45/ 4.69	10.08/6.90/ 6.27
Metasomal segment IV L/W/H	10.03/4.98/ 4.99	11.93/5.02/ 4.53	10.71/4.95/ 4.51	10.14/5.37/ 4.84	7.10/4.99/ 4.41	11.60/6.26/ 5.99
Metasomal segment V L/W/H	13.04/5.06/ 4.78	14.64/5.31/ 4.69	13.69/4.78/ 4.63	12.61/5.11/ 4.73	8.92/4.58/ 4.23	14.58/5.61/ 5.93
Telson L/H/W	11.28/5.19/ 5.35	13.34/6.30/ 5.44	12.13/5.59/ 5.06	11.76/5.11/ 4.39	9.15/4.77/ 4.00	13.47/6.95/ 6.00
Aculeus L	4.00	4.22	3.90	5.58	3.72	4.97
Femur L/W	11.32/6.08	13.32/5.93	11.96/5.66	9.86/5.26	8.48/5.24	11.60/6.58
Patella L/W	12.09/6.98	13.05/7.18	12.34/6.93	10.71/6.31	7.68/4.56	13.16/7.70
Chela L/W	25.95/ 16.06	27.19/ 14.65	25.17/ 13.84	24.49/ 15.24	18.62/ 12.20	26.82/ 16.77
<b>Total L</b>	<b>117.25</b>	<b>116.48</b>	<b>107.82</b>	<b>113.76</b>	<b>90.46</b>	<b>133.87</b>

Tab. 1. Measurements of the examined *Pandinus* (*Pandinurus*) spp. and *Pandinus* (*Pandinus*) spp.

	DRC	DJI	ERI	ETH	KEN	MAL	MOZ	SOM	SUD	TAN	YEM	ZAM	ZIM
<i>P. arabicus</i>											X		
<i>P. awashensis</i>				X									
<i>P. nistriae</i> <b>sp. n.</b>		X											
<i>P. exitialis</i>				X				X					
<i>P. gregoryi</i>					X								
<i>P. lowei</i>	X												
<i>P. magrettii</i>			X	X									
<i>P. meidensis</i>								X					
<i>P. pallidus</i>								X					
<i>P. percivali</i>										X			
<i>P. somalilandus</i>								X					
<i>P. sudanicus</i>									X				
<i>P. viatoris</i>	X				?	X	X			X		X	X

Tab. 2. Check-list of the subgenus *Pandinurus* Fet, 1997. Legends: DRC = Democratic Republic of Congo; DJI = Djibouti; ERI = Eritrea; ETH = Ethiopia; KEN = Kenya; MAL = Malawi; MOZ = Mozambique; SOM = Somalia; SUD = Sudan; TAN = Tanzania; YEM = Yemen; ZAM = Zambia; ZIM = Zimbabwe.

	BE	BF	CAR	ET	GA	GH	GU	GB	IC	LI	MA	NI	SE	SL	SO	TO	UG
<i>P. gambiensis</i>					X		X	X			X		X				
<i>P. imperator</i>	X	X				X	X		X	X	X	X		X		X	
<i>P. mazuki</i>				X													
<i>P. phillipsi</i>															X		
<i>P. smithi</i>				X											X		
<i>P. trailini</i>				X													
<i>P. ugandaensis</i>																	X
<i>P. ulderigoi</i> <b>sp. n.</b>			X														

Tab. 3. Check-list of the subgenus *Pandinus* Thorell, 1876. Legends: BE = Benin; BF = Burkina Faso; CAR = Central African Republic; ET = Ethiopia; GA = Gambia; GH = Ghana; GU = Guinea; GB = Guinea-Bissau; IC = Ivory Coast; LI = Liberia; MA = Mali; NI = Nigeria; SE = Senegal; SL = Sierra Leone; SO = Somalia; TO = Togo; UG = Uganda.

**Subgenus *Pandinus*** Thorell, 1876

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

*Pandinus imperator gambiensis* POCOCK, 1899: 836.

*Pandinus gambiensis*: VACHON, 1967: 1534-1537, Figs 1, 3-5, 9-11; VACHON *et al.*, 1970: 412-432, Figs 1-14; PRENDINI, 2004: 254.

*Pandinus (Pandinus) gambiensis*: VACHON, 1974: 953; KOVAŘÍK, 1998: 140; FET, 2000: 466; KOVAŘÍK & WHITMAN, 2005: 114; KOVAŘÍK, 2009: 56, 126, Figs 386-388; PENNEY, 2009: 74; KOVAŘÍK, 2011: 1, 10, 15-17; KOVAŘÍK, 2013: 10, 15.

**Type locality and type repository:** Gambia; BMNH.

**Diagnosis:** Total length 130-200 mm. Base colour uniformly dark brown to black. Legs approximately coloured as the body (Fig. 11). Chela with 3 internal and 10 ventral trichobothria. Pectinal teeth number 15-19. Movable fingers of pedipalp and telson without noticeable sexual dimorphism. Spiniform formula of tarsomere II = 5/4: 6/4: 6/4: 6/4. Tarsomere II with 3 spines on inclined anteroventral surface.

**Distribution:** Gambia, Guinea, Guinea-Bissau, Mali (new record), Senegal (Tab. 3 and Fig. B).

**Material examined:** 1 ♀, Senegal: Saint Louis, 18??, (MZUF: 1016).

**Comments:** I was able to see several photos of *P. gambiensis* collected at Loulo, 13° 4' N, 11° 22' W, in Mali. This locality is only 3 km far from Senegal border, where *P. gambiensis* is widely diffused. Since there were incomplete or erroneous data about distribution of *P. gambiensis* (FET, 2000; KOVAŘÍK, 2009) it is important to note that this species is not present more south than northern Guinea (PRENDINI, 2004). In the map about distribution of *Pandinus* in West Africa PRENDINI (2004) included several localities in Southern Mali and Burkina Faso for *P. imperator*, referred by VACHON (1970) but requiring confirmation by his admission. However, Mali represents a new record for *P. gambiensis*.

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

*Buthus imperator* C.L. KOCH, 1841: 1, Fig. 695.

*Pandinus imperator*: VACHON, 1967: 1534-1537, Figs 2, 6-8; PRENDINI, 2004: 255.

*Pandinus (Pandinus) imperator*: VACHON, 1974: 953;

KOVAŘÍK, 1998: 86, 140, Fig. on page 95; FET, 2000: 466;

KOVAŘÍK, 2002: 19; KOVAŘÍK, 2009: 57, 127, Figs 392-397, 132, Figs 414-415; KOVAŘÍK,

2011: 1, 3, 10, 14-17; KOVAŘÍK, 2013: 1, 10, 13;

= *Heterometrus roeseli* Simon, 1872: 54 (syn. by THORELL, 1876: 203).

= *Scorpio simoni* Becker, 1880: 137 (syn. by THORELL, 1893: 377).

**Type locality and type repository:** unknown.

**Diagnosis:** Total length is 115-230 mm. Base colour uniformly dark brown or dark green to reddish black. Legs coloured as body (Fig. 12). Chela with 3 internal and 9-14 ventral trichobothria. Pectinal teeth number 15-19. Movable finger of pedipalp and telson without noticeable sexual dimorphism. Spiniform formula of tarsomere II = 4/3: 4-5/3: 4-5/2-3: 4-5/2-3. Tarsomere II with 2 spines on inclined anteroventral surface. Length to height ratio of 4th metasomal segment higher than 2.



**Distribution:** Benin, Burkina Faso, Ghana, Guinea, Ivory Coast, Liberia, Mali, Nigeria, Sierra Leone, Togo (Tab. 3 and Fig. B).

**Material examined:** *Pandinus (Pandinus) imperator*: 1 ♀, Togo/Ghana, X.2003, (ARPC: 0023); 2 ♂♂ and 2 ♀♀, Liberia, (MHNG); ♂, without data, (MSNB).

***Pandinus (Pandinus) ugandaensis* Kovařík, 2011**

*Pandinus (Pandinus) ugandaensis* KOVAŘÍK, 2011: 10-17, (Figs 23-34, 38, 42); *Pandinus (Pandinus) ugandaensis* KOVAŘÍK, 2013: 2, 10, 13.

**Type locality and type repository:** Uganda, Kaabong environment; FKCP.

**Diagnosis:** Total length is 90-110 mm. Colour uniformly brown to reddish brown (Fig. 13). Chela of pedipalp with 3 internal and 8-10 ventral trichobothria. Carapace lacks carinae and it is smooth without granules, with very fine and shallow punctuations. Pectinal teeth number 13-15 in males and 10-13 in females. Dorsal carinae on metasomal segments composed of three to seven round teeth of similar size. Spiniform formula of tarsomere II = 3-4/3: 3-4/3: 4/3: 4/3. Tarsomere II with 2 spines on inclined anteroventral surface. Pedipalps sparsely hirsute, mainly on fingers. Granules on dorsal surface of chela not conical and pointed, their summits sometimes confluent. External surface of chela smooth, with several conical granules in anterior part and without carinae. Length to height ratio of 4th metasomal segment = 1.6-1.7.

**Distribution:** Uganda (Tab. 3 and Fig. B).

**Material examined:** 7 ♂♂ and 6 ♀♀, Uganda, Pakwach, 2.VI.1976, leg. A. Valle, (MSNB: 11394, 11384, 11393, 11401, 11381, 11402, 11379, 11385, 11378, 11386, 11392, 11396, one without number); 3 ♂♂ and 3 ♀♀, Uganda, XI.2011, (ARPC).

**Comments:** *P. ugandaensis* was only known from Kaabong, the type locality, in the region of northern Uganda, near to the borders with Kenya and South Sudan. The new material examined from Pakwach in MSNB in the region of northern Uganda, increases its range westwards. Moreover I was also able to see several photos of this species, from Soroti, in the region of Eastern Uganda.

***Pandinus (Pandinus) ulderigoii* sp. n.**

*Pandinus* sp. (?): PRENDINI *et al.*, 2003: 231, 234.

**Type locality and type repository:** Central African Republic; ARPC, formally in ACSA.

**Type material:** ♀ holotype, Central African Republic, X.1992, leg. local collector (ARPC: 0025).

**Etymology:** named in honor of Dr Ulderigo Rossi, Massa, Italy, for his kind help.

**Diagnosis:** Total length 134 mm (Tab. 1). Colour of adults uniformly reddish brown: legs coloured like body (Fig. 14). Pectinal teeth number 13-13. Chela hirsute, with 3 internal and 10-11 ventral trichobothria (Fig. 16). Dorsal surface of chela manus with many granules, sometimes pointed. Spiniform formula of tarsomere II = 5/3: 5/3: 5-6/3: 6/3. Tarsomere II with 2 spines on inclined anteroventral surface. Length to height ratio of 4th metasomal segment is 1.93.

**Description:** Coloration: carapace dark brown; tergites uniformly dark brown; sternites brown; metasomal segments and pedipalps are uniformly dark brown; only the chela is dark reddish-brown; telson yellowish-brown; pectines and genital operculum yellowish-brown; legs of the same colour of the body. Chelicerae yellowish-brown (Fig. 14).

Prosoma: carapace without carinae and with two deep furrows in its lateral sides, and a very deep triangular concavity in the middle of the posterior side; the surface is very finely granulated, especially on lateral sides. Its posterior width is almost like its length. The anterior margin shows a deep irregular concavity, more pronounced in the left half. Median eyes yellowish brown, separated by half an ocular diameter; three pairs of small lateral eyes brown. Median eyes are located just before the half of carapace length.

Mesosoma: tergites I to VII totally smooth and shiny. Sternites smooth except for sternite VII which bears four vestigial carinae. Spiracles strongly elongated (Fig 15).

Metasoma: elongated with all segments longer than wide; length/width ratio of I metasomal segment 1.04 and of V metasomal segment about 1.85; segment I with 10 complete carinae; segments II-IV with 8 carinae; segment I to IV have all carinae smooth except for dorsal carinae that show pointed tubercles, especially in segment IV; segment V shows 7 carinae, all with dentate tubercles. Ventrally segment V is strongly tuberculated. Length to height ratio of 4th metasomal segment is 1.93.

Telson: vesicle strongly globular and very swollen, granulated and hirsute; aculeus curved and short, strongly shorter than vesicle; subaculear tubercle not noticeable.

Chelicerae: ventral aspect of both fingers and manus covered with long yellow dense setae. Movable finger with distal external and distal internal teeth not opposable to moderately opposable.

Pedipalps: all segments are densely hirsute. Femur with four marked carinae, except for exteroventral part which is almost all smooth. The patella shows four complete carinae with granules; the entire surface is smooth except for the anterior and dorsal surfaces that show irregular granules. The chela is rounded and has two smooth ventral carinae. The entire dorsal surface of the chela is densely granulated: the granules are sometimes pointed. The movable finger has a triangular distal tooth (lobe) not much strong. The dentate margins of the movable and fixed fingers have two parallel rows of denticles with five or six subrows on the movable finger and the fixed finger. The internal surface of the chela has many granules and two vestigial carinae. Chela of pedipalp with 3 internal and 10-11 ventral trichobothria (Fig. 16).

Legs: densely hirsute. Tarsomere II of legs bears two spines on the inclined anteroventral surface. The spination formula of tarsomere II = 5/3: 5/3: 5-6/3: 6/3. Tarsomere I of legs I-IV bears spina distal prosuperior.

Pectines, genital operculum and sternum: pectinal teeth count is 13-13 in female holotype; male unknown. Genital operculum wide and lobate, splitted into two irregular and different parts. Sternum pentagonal, about as long as wide.

**Distribution:** Central African Republic (Tab. 3 and Fig. B).

**Relationships and comments:** Historically, scorpions of the genus *Pandinus* were never reported from Central African Republic until PRENDINI *et al.* (2003) cited a single specimen from Central African Republic, now deposited at AMNH, unfortunately without a precise locality. It is even possible that the specimen in AMNH could belong to *Pandinus ulderigoi* **sp. n.** In ARPC there is a second specimen from Central African Republic, obtained in a different period, but regrettably again without a precise locality. Since the two specimens in ARPC probably came from distinct localities, the second specimen (ARPC: 0026) is not included in the type material and its identity is still under investigation. Thus, unfortunately, the exact type locality remains, for the moment, unknown. For biogeographical and morphological reasons, *Pandinus ulderigoi* **sp. n.** seems to be a link between species from Western Africa and Eastern Africa belonging to the subgenus *Pandinus*. In fact, it shows elements in common both with *Pandinus imperator* and *Pandinus ugandaensis*: as for size, it resembles *P. imperator*, but for number of pectinal teeth it is closer to *P. ugandaensis*. Moreover, the L/H ratio of IV metasomal segment, used to distinguish *P. imperator* and *P. ugandaensis*, in *P. ulderigoi* **sp. n.** has an intermediate value between the two species: 1.93 (Tab. 1). Another character with a value between the

two species is the number of ventral trichobothria of pedipalp chela: *P. imperator* has 9-14 ventral trichobothria, *P. ugandaensis* has only 8 of them according to KOVAŘÍK (2011), 8-9 according to KOVAŘÍK (2013) but 8-10 according with the new data hereby presented. Thus, *P. ulderigoi* **sp. n.** with 10-11 ventral trichobothria (Fig. 16) has a value, exactly between (and overlapping) the ranges of the two mentioned species. Concerning the number of pectinal teeth, the female holotype of *Pandinus ulderigoi* **sp. n.** counts 13/13. KOVAŘÍK (2011), in the original description of *P. ugandaensis*, reported a total of 10-11 pectinal teeth for females of this species, but new material examined from Western Uganda increases the range up to 13 teeth, which is the most common value in the examined females.

*Pandinus ulderigoi* **sp. n.** can be distinguished by *P. imperator* for I) a different formula of tarsomere II = 5/3: 5/3: 5-6/3: 6/3, while in *P. imperator* is 4/3: 4-5/3: 4-5/2-3: 4-5/2-3; II) a lower number of pectinal teeth, 13-13, in contrast to 15-19 in *P. imperator*; III) a lower L/H ratio of IV metasomal segments, of about 1.93, while this value is always higher than 2 in *P. imperator* (Tab. 1); IV) V metasomal segment is higher than wide, while in *P. imperator* and usually also in other *Pandinus* it is wider than high (Tab. 1). In addition, the female holotype has a very swollen vesicle, in contrast to the typical females of *P. imperator*. However, since a precise study about intraspecific variation in the size of vesicles in *Pandinus* is not yet done, I would prefer to examine additional material before considering it in a diagnostic key.

*Pandinus ulderigoi* **sp. n.** can be distinguished by *P. ugandaensis* for I) a bigger size, more than 130 mm in total length (Fig. 14), in contrast with 90-110 mm for *P. ugandaensis*; II) a very different formula of tarsomere II = 5/3: 5/3: 5-6/3: 6/3, against 3-4/3 : 3-4/3: 4/3: 4/3; III) an higher L/H ratio of IV metasomal segments, of about 1.93, while this value is between 1.6-1.7 in *P. ugandaensis* (Tab. 1); IV) besides, V metasomal segment is higher than wide (Tab. 1), while in *P. ugandaensis* and usually also in other *Pandinus* it is wider than high.

### Identification key for species of *Pandinus* (*Pandinus*) and *Pandinus* (*Pandinurus*)

1. Chela with 2 internal trichobothria (*Pandinurus*) ..... 2
  - Chela with 3 internal trichobothria (*Pandinus*) ..... 14
2. Tarsomere II with 3 spines on inclined anteroventral surface ..... 3
  - Tarsomere II with 2 spines on inclined anteroventral surface ..... 8
3. Spination formula of tarsomere II of 4<sup>th</sup> leg = 8-9/6. Chela of pedipalp bears 11-14 ventral trichobothria ..... 4
  - Spination formula of tarsomere II of 4<sup>th</sup> leg = 6-8/4-5; chela of pedipalp bears 9-12 ventral trichobothria ..... 5
4. 12-14 ventral trichobothria; typical spination formula of tarsomere II = 7-8/5-6: 8/6: 8/6: 8-9/6-7 (but see comments); in male L/H ratio of IV metasomal segment 2.63; dorsal surface of chela almost smooth ..... *P. meidensis* Karsch, 1879
  - 11-12 ventral trichobothria; spination formula of tarsomere II = 6-7/5: 7/5: 7/5-6: 8/6; in male L/H ratio of IV metasomal segment 2.37; dorsal surface of chela densely granulated ..... *P. nistriae* **sp. n.**
5. Dorsal surface of manus with evenly sized conspicuous granules. Chela densely hirsute. Chela of pedipalp length to width ratio in both adult sexes between 2 and 2.2 ..... 6
  - Dorsal surface of manus of adults more or less tuberculate, without evenly sized granules. Chela with only a few hairs, more lobate and wider. Chela of pedipalp length to width ratio in both adult sexes between 1.6 and 1.9 ..... 7

6. Legs of adults yellow (Fig. 29). Tarsomere I of legs I- IV with distal prosuperior spina. Females with 20-23 pectinal teeth ..... *P. somalilandus* Kovařík, 2012  
 - Legs of adults reddish brown (Fig. 23). Tarsomere I of legs I-III with spina, but on leg IV with distal prosuperior seta. Female with 18 pectinal teeth .... *P. awashensis* Kovařík, 2012
7. Pectinal teeth number 22-24. Distribution: Asia (Yemen) .....  
 ..... *P. arabicus* (Kraepelin, 1894)  
 - Pectinal teeth number 18-22. Distribution: Africa (Eritrea and Ethiopia) .....  
 ..... *P. magrettii* Borelli, 1901
8. Chela of pedipalp bears 10-14 ventral trichobothria. Male has more pronounced tooth on movable finger of pedipalp ..... 9  
 - Chela of pedipalp bears 6-11 ventral trichobothria. Movable finger of pedipalp without noticeable sexual dimorphism ..... 11
9. Dorsal surface of manus with evenly sized conspicuous granules. Chela densely hirsute.  
 ..... *P. exitialis* (Pocock, 1888)  
 - Dorsal surface of manus more or less tuberculate, often with longitudinal carinae but without conical, evenly sized granules. Chela hirsute, but not densely ..... 10
10. Legs reddish brown. Distribution: Kenya ..... *P. gregoryi* (Pocock, 1896)  
 - Legs yellow to yellowish, always lighter-coloured than body. Distribution: Sudan .....  
 ..... *P. sudanicus* Hirst, 1911
11. Legs yellow to yellowish, always lighter-coloured than body.....  
 ..... *P. pallidus* (Kraepelin, 1894)  
 - Legs brownish and coloured as body ..... 12
12. Males with chela, femur and patella of pedipalp narrower and longer than in females. Distribution: Africa..... 13  
 - Length of segments of pedipalp without noticeable sexual dimorphism. Distribution: Asia (Yemen) ..... *P. percivali* Pocock, 1902
13. Dorsal surface of chela reddish black and entirely granulated. Spination formula of tarsomere II of 4th leg = 4/3. First metasomal segment is wider than long in males. Chela of pedipalp length to width ratio in males less than 2.2 ..... *P. lowei* Kovařík, 2012  
 - Dorsal surface of chela red and smooth, with granules in anterior part only. Spination formula of tarsomere II of 4th leg = 5/3. First metasomal segment longer than wide in males. Chela of pedipalp length to width ratio in males greater than 2.5 .....  
 ..... *P. viatoris* (Pocock, 1890)
14. Spination formula of tarsomere II of 4th leg = 4-6/2-4 ..... 18  
 - Spination formula of tarsomere II of 4th leg = 7-9/4-5 ..... 15
15. Legs yellow ..... 16  
 - Legs not yellow, coloured approximately as body ..... 17
16. Granules on dorsal surface of chela of pedipalp conical and pointed. Tarsomere II with 3 spines on inclined anteroventral surface ..... *P. smithi* (Pocock, 1899)  
 - Granules on dorsal surface of chela of pedipalp not conical and pointed, their tips may be confluent. Tarsomere II with 2 spines on inclined anteroventral surface .....  
 ..... *P. phillipsii* (Pocock, 1896)
17. Granules on dorsal surface of chela of pedipalp not conical, their tips sometimes confluent. Chela with 10 ventral trichobothria ..... *P. mazuchi* Kovařík, 2011  
 - Granules on dorsal surface of chela of pedipalp conical. Chela with 16-18 ventral trichobothria ..... *P. trailini* Kovařík, 2013

18. Tarsomere II with 3 spines on inclined anteroventral surface .....  
 ..... *P. gambiensis* Pocock, 1899  
 - Tarsomere II with 2 spines on inclined anteroventral surface ..... 19
19. Chela with 9-14 ventral trichobothria; length to height ratio of 4th metasomal segment greater than 1.9; total length 115-230 mm ..... 20  
 - Chela with 8-10 ventral trichobothria (Fig. 29). Length to height ratio of 4th metasomal segment = 1.6-1.7; total length 90-110 mm ..... *P. ugandaensis* Kovařík, 2011
20. Spination formula of tarsomere II = 4/3: 4-5/3: 4-5/2-3: 4-5/2-3; pectinal teeth count 15-19; V metasomal segment wider than high ..... *P. imperator* (C.L. Koch, 1841)  
 - Spination formula of tarsomere II = 5/3: 5/3: 5-6/3: 6/3; pectinal teeth count 13-13; V metasomal segment higher than wide ..... *P. ulderigoi* **sp. n.**

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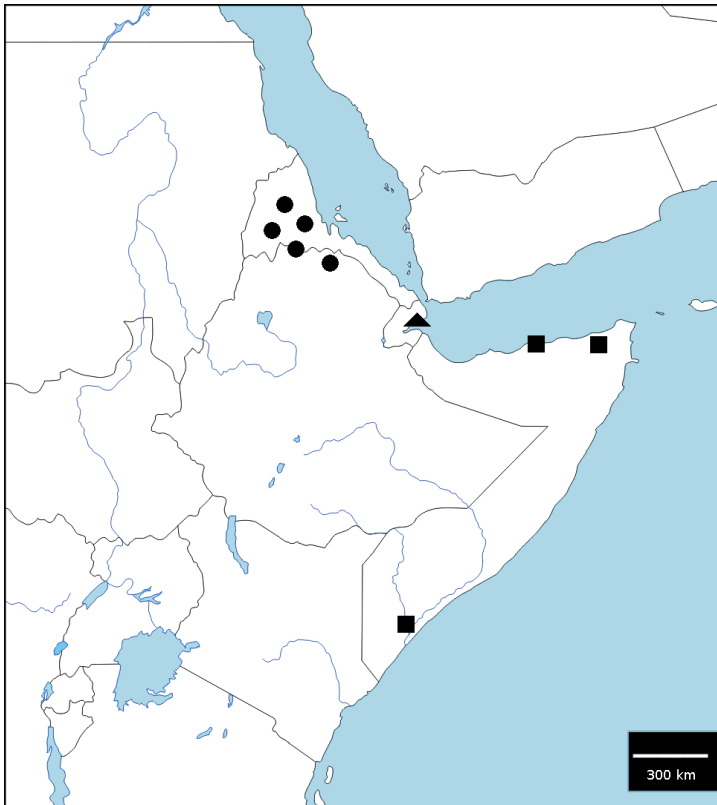


Fig. A. Map of the East-Africa with the known localities for the *Pandinurus* Fet, 1997 species cited in the present work: circle = *P. magrettii* Borelli, 1901; square = *P. meidensis* Karsch, 1879, triangle = *P. nistriae* **sp. n.**



Fig. B. Map of Africa with the known localities for the *Pandinus* Thorell, 1876 species cited in the present work: square = *P. gambiensis* Pocock, 1899; circle = *P. imperator* (C.L. Koch, 1841); triangle = *P. ugandaensis* Kovařík, 2011; question mark = *P. ulderigo* **sp. n.** (the exact locality in Central African Republic is unknown).





Fig. C. Type locality of *Pandinus nistriae* **sp.n.**: Medeho, Obock district, Djibouti province (Djibouti) (Foto A. Nistri).



Fig. 1. Female of *Pandinus magrettii* Borelli, 1901 from Eritrea, 117 mm (MZUF).



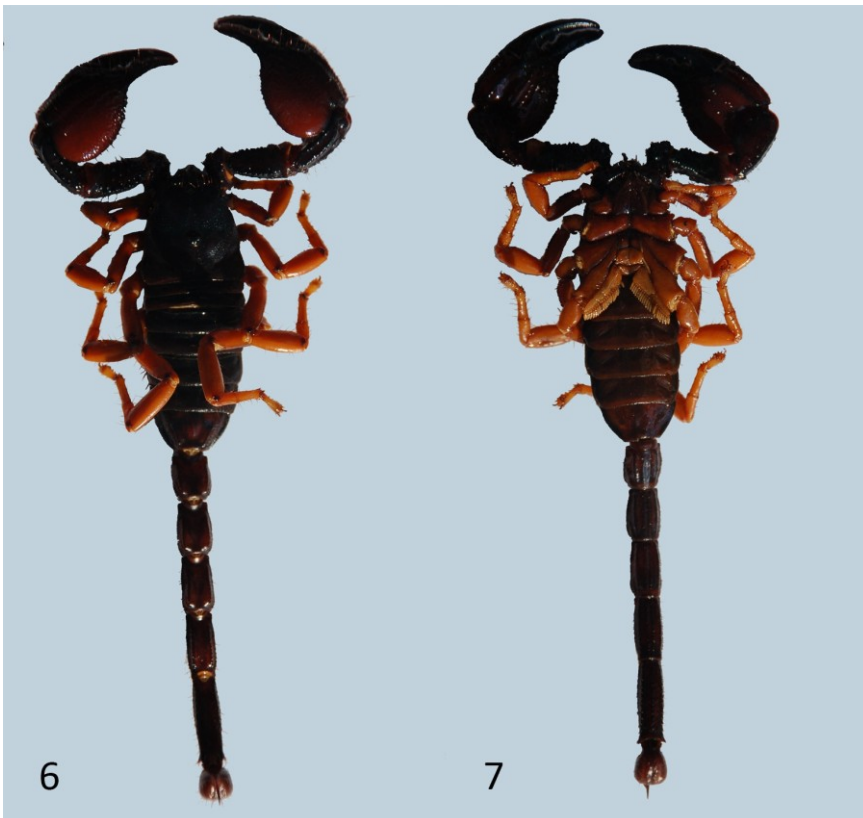
Fig. 2. Male of *Pandinus meidensis* Karsch, 1879 from Somalia, 116 mm (MZUF).



Figs 3-4. Dorsal view of chela of *Pandinus nistriae* **sp. n.** (3) male holotype from Djibouti, 108 mm (MZUF), and *P. meidensis* Karsch, 1879 (4) male from Somalia, 116 mm (MZUF).



Figs 5A-5B. Metasomal segments I-V and telson of *Pandinus nistriae* **sp.n.** (5A) male holotype from Djibouti, 108 mm (MZUF), and metasomal segments II-V and telson of *P. meidensis* Karsch, 1879 (5B) male from Somalia, 116 mm (MZUF).



Figs 6-7. *Pandinus nistriae* **sp.n.** male holotype from Djibouti, 108 mm. 6. Dorsal view. 7. Ventral view.



Fig. 8. Ventral and internal trichobothria of chela of *Pandinus nistriae* **sp.n.** male holotype from Djibouti, 108 mm (MZUF).



Figs 9-10. Lateral view of chela of *Pandinus nistriae* **sp.n.** (9) male holotype from Djibouti, 108 mm (MZUF) and *Pandinus meidensis* Karsch, 1879 (10) male from Somalia, 116 mm (MZUF).



Fig. 11. Female of *Pandinus gambiensis* Pocock, 1899 from Senegal, about 165 mm (MZUF).



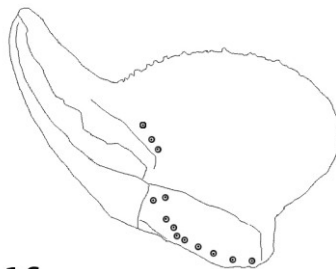
Fig. 12. Male of *Pandinus imperator* (C. L. Kock, 1841) from Liberia, about 180 mm (MHNG).



Fig. 13. Female of *Pandinus ugandaensis* Kovařík, 2011 from Uganda, 90 mm (ARPC).



Figs 14-15. *Pandinus ulderigoi* **sp.n.** female holotype from Central African Republic, 134 mm (ARPC). 14. Dorsal view. 15. Ventral view.



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Fig. 16. Ventral and internal trichobothria of chela of *Pandinus ulderigoi* **sp.n.** female holotype from Central African Republic, 134 mm (ARPC).