

**On the Scorpions of Gabon and Neighboring Countries,
with a Reassessment of the Synonyms Attributed to
Babycurus buettneri Karsch and a Redescription of
Babycurus melanicus Kovařík**

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Results are presented from a study of recently collected scorpions from Gabon. The material is classified into three families and five species: *Babycurus buettneri* Karsch, 1886; *Babycurus melanicus* Kovařík, 2000; *Opisthacanthus africanus* Simon, 1876; *Opisthacanthus lecomtei* (Lucas, 1858); *Pandinus dictator* (Pocock, 1888). The taxonomic validity of synonyms attributed to *B. buettneri* is reassessed by examination of the type material. *Babycurus kirki* (Pocock, 1890) is synonymized with *B. buettneri*. *Babycurus johnstonii* Pocock, 1896 and *Babycurus neglectus* Kraepelin, 1896 are removed from synonymy with *B. buettneri* and *B. kirki*, respectively. The validity of *Babycurus centrurimorphus* Karsch, 1886 and *Babycurus pictus* Pocock, 1896, as distinct from each other and from *B. buettneri*, is upheld. *Babycurus melanicus*, newly recorded from Gabon and previously known only from the holotype, is redescribed on the basis of four new specimens. A key to the identification of the West African species of *Babycurus* is provided, and their distributions mapped. Additional records for *O. africanus*, *O. lecomtei*, *P. dictator*, *Pandinus imperator* (C. L. Koch, 1841) and *Pandinus gambiensis* Pocock, 1899 are provided from a study of previously undetermined museum material, and the distributions of these species are mapped. *Babycurus buettneri* and *O. africanus* are newly recorded from the Central African Republic, *P. dictator* is newly recorded from Gabon, and *O. lecomtei* is newly recorded from Bioko Island (Equatorial Guinea).

RÉSUMÉ

Ce travail présente les résultats d'une étude sur des scorpions récemment récoltés au Gabon. Les spécimens sont rapportés à 5 espèces représentant 3 familles distinctes: *Babycurus buettneri* Karsch, 1886; *Babycurus melanicus* Kovařík, 2000; *Opisthacanthus africanus* Simon, 1876; *Opisthacanthus lecomtei* (Lucas, 1858); *Pandinus dictator* (Pocock, 1888). La validité taxonomique des synonymes attribués à *B. buettneri* est réévaluée par examination des spécimens types. *Babycurus kirki* (Pocock, 1890) est synonyme de *B. buettneri*. *Babycurus johnstonii* Pocock, 1896 et *Babycurus neglectus* Kraepelin, 1896 sont respectivement exclus de la liste de synonymes de *B. buettneri* et *B. kirki*. La validité de *Babycurus centrurimorphus* Karsch, 1886 et *Babycurus pictus* Pocock, 1896, considérées comme étant deux espèces distinctes entre elles et également différentes de *B. buettneri*, est retenue. *Babycurus melanicus*, trouvée pour la première fois au Gabon et seulement connue par l'holotype, est redécrite à partir de 4 nouveaux spécimens. Une

nouvelle clé de détermination des espèces de *Babycurus* pour l'Afrique de l'Ouest est établie ainsi que leur distribution. Des données additionnelles sur les espèces *O. africanus*, *O. lecomtei*, *P. dictator*, *Pandinus imperator* (C. L. Koch, 1841) et *Pandinus gambiensis* Pocock, 1899 ainsi que leur distribution sont présentées à la suite d'une étude de matériels de musées précédemment non-identifiés. *Babycurus buettneri* et *O. africanus* sont rapportées pour la première fois de la République du Centre-Afrique. *P. dictator* et *O. lecomtei* sont rapportées pour la première fois du Gabon et de l'île Bioko (Guinée Equatoriale).

No single work has treated the scorpion fauna of Gabon and neighboring West African countries. However, the species reported from this region have been variously covered in other general works (e.g., Belfield 1956) and most are fairly well known. According to the catalogues of Lamoral and Reynders (1975) and Fet et al. (2000), nine species in three families have been reported from this region. The recent description of a new species of *Babycurus* by Kovařík (2000) raised the total to ten (Table 1).

Although only five of these species had been previously reported from Gabon, additional species reported from neighboring Cameroon, Congo, and Equatorial Guinea were predicted to occur in Gabon. This prediction was confirmed during recent expeditions to Gabon in which 34 specimens were collected and classified into five species, representing three families—Buthidae: *Babycurus buettneri* Karsch, 1886 and *Babycurus melanicus* Kovařík, 2000; Liochelidae: *Opisthacanthus africanus* Simon, 1876 and *Opisthacanthus lecomtei* (Lucas, 1858); Scorpionidae: *Pandinus dictator* (Pocock, 1888). Seven scorpion species are now recorded from Gabon (Table 1).

All localities from Gabon, reported below, represent new records for *B. buettneri*, *B. melanicus*, *O. africanus*, *O. lecomtei* and *P. dictator*. *Babycurus melanicus* and *P. dictator* are newly reported from Gabon. Furthermore, the new records of *B. melanicus* from Gabon represent a considerable range extension for this species, until now known only from the holotype, originating in western DRC (Kovařík 2000). The discovery of four new specimens has prompted a redescription of *B. melanicus*.

Additional records of *O. africanus*, *O. lecomtei*, *P. dictator*, *Pandinus gambiensis* Pocock, 1899 and *Pandinus imperator* (C. L. Koch, 1841), from neighboring countries in West Africa, are provided from a study of previously undetermined museum material. These data provide new records for some of these species and assist in clarifying the distributional ranges suggested by Vachon (1967, 1970) and Lourenço and Cloudsley-Thompson (1996) for the three West African species of *Pandinus*.

The taxonomy and diagnostic characters of the nonbuthids, *O. africanus*, *O. lecomtei*, *P. dictator*, *P. gambiensis* and *P. imperator*, have been thoroughly addressed in the works of Belfield (1956), Vachon (1967, 1974), Lourenço (1982a, 1982b, 1987, 1991) and Lourenço and Cloudsley-Thompson (1996). However, confusion plagues the taxonomy of the buthids, especially *B. buettneri*, to which no fewer than five synonyms have been attributed by various authors (see Fet and Lowe 2000; Kovařík 2000). Much of this confusion can be attributed to the failure of previous authors to examine and compare the type specimens of *B. buettneri* and its putative synonyms, a situation that was unfortunately not resolved in the recent revision of *Babycurus* by Kovařík (2000). According to Kovařík (2000, pers. comm.), the holotype of *B. buettneri* was missing when he requested loan of the specimen from the Zoologisches Museum der Humboldt-Universität, Berlin (ZMB). Apparently, the holotype was officially loaned in 1982 to M. Vachon, who sent the specimen (without notification or approval from the ZMB), to the South African Museum, Cape

SCORPIONS OF GABON

TABLE 1. Scorpion species recorded from Gabon (G) and neighboring West African countries: Cameroon (Ca); Equatorial Guinea, mainland (EG), Bioko Island (BI); Congo (Co); Angola, Cabinda (A); Democratic Republic of Congo (DRC). Species endemic to the region delimited by the outer borders of these countries are indicated with an asterisk. Unconfirmed records and taxonomically dubious species are omitted.

Family	Species	Ca	BI	EG	G	Co	A	DRC
Buthidae	<i>Babycurus buettneri</i> Karsch, 1886	×		×	×	×		
	<i>Babycurus johnstonii</i> Pocock, 1896*	×						
	<i>Babycurus melanicus</i> Kovařík, 2000*				×			×
	<i>Hottentotta hottentotta</i> (Fabricius, 1787)	×						
	<i>Isometrus maculatus</i> (De Geer, 1778)	×			×	×	×	×
	<i>Lychasioides amieti</i> Vachon, 1974*	×						
	<i>Uroplectes occidentalis</i> Simon, 1876	×			×	×	×	×
Liochelidae	<i>Opisthacanthus africanus</i> Simon, 1876*	×		×	×	×	×	×
	<i>Opisthacanthus lecomtei</i> (Lucas, 1858)*	×	×	×	×			
Scorpionidae	<i>Pandinus dictator</i> (Pocock, 1888)*	×	×	×	×	×		

Town (SAMC), where it remained until recently. According to F. Kovařík (pers. comm.), the SAMC did not react to an initial (1997) request that the specimen be returned to the ZMB but only returned the specimen three years later (2000). In the meantime, thinking that the holotype was lost, Kovařík (2000) selected and designated a neotype for *B. buettneri*. But by the time that the present contribution was in preparation, the holotype had been returned to ZMB and was loaned for examination. This investigation thus presents the first comparison of the holotype of *B. buettneri* with type and nontype material of its putative synonyms. As a result of this comparison, *Babycurus kirki* (Pocock, 1890) is synonymized with *B. buettneri*, whereas *Babycurus johnstonii* Pocock, 1896 and *Babycurus neglectus* Kraepelin, 1896 are removed from synonymy with *B. buettneri* and *B. kirki*, respectively. The validity of *Babycurus centrurimorphus* Karsch, 1886 and *Babycurus pictus* Pocock, 1896, as distinct from each other and from *B. buettneri*, is upheld. A key to the identification of the West African species of *Babycurus* is provided.

MATERIALS AND METHODS

Specimens from Gabon were collected mostly from pitfall traps in primary rainforest (B. Fisher and M. Burger, pers. comm.). However, a few were collected at night by searching with torchlight or during the day by turning stones, logs, tree bark, and inspecting other potential diurnal retreats.

Most of the specimens from Gabon are deposited in the collection of the California Academy of Sciences, San Francisco (CAS). Tissue samples of each species, stored in absolute ethanol, have been retained separately for DNA isolation and sequencing in the Ambrose Monell Collection for Molecular and Microbial Research (AMC) at the American Museum of Natural History, New York. Additional material examined is deposited in the following collections: American Museum of Natural History, New York (AMNH); The Natural History Museum, London (BMNH); Museum of Comparative Zoology, Harvard University, Cambridge (MCZ); Musée Royal de l'Afrique Centrale, Tervuren (MRAC); South African Museum, Cape Town (SAMC); Forschungsinstitut und Naturmuseum Senckenberg, Frankfurt-am-Main (SMF); U. S. National Museum of Natural History, Smithsonian Institution, Washington, D. C. (USNM); Zoologisches Museum der Humboldt-Universität, Berlin (ZMB). Abbreviations for collections in which additional

type material, not examined, is deposited are as follows: Muséum National d'Histoire Naturelle, Paris (MNHN); Zoologisches Institut und Museum, Universität Hamburg (ZMH); František Kovařík Private Collection, Prague (FKPC).

Illustrations were produced using a stereomicroscope and camera lucida. Measurements were taken with digital calipers. Color designation follows the numbering system of Smithe (1974, 1975, 1981), trichobothrial notation follows Vachon (1974), and mensuration follows Stahnke (1970) and Lamoral (1979). Morphological terminology follows Couzijn (1976) for the segmentation of legs, Hjelle (1990) and Sissom (1990) for the segmentation of pedipalps, Prendini (2001) for metasomal carinae, and Stahnke (1970), Lamoral (1979), and Sissom (1990) for remaining features. Basal and apical rows of denticles on the fingers of pedipalp chelae are included in counts, following Sissom (1994), Lowe (2000) and Kovařík (2000). This method is considered less confusing than the alternative, variously employed by Kraepelin (1896), Vachon (1940a), Belfield (1956) and Probst (1973).

SYSTEMATIC SECTION

KEY TO THE WEST AFRICAN SPECIES OF *BABYCURUS*

1. Sternite VII with four granular carinae; metasomal segment V with ventromedian and ventrolateral carinae distinct, granular 2
 Sternite VII without granular carinae; metasomal segment V with ventromedian and ventrolateral carinae absent or obsolete 4
2. Fixed and movable fingers of pedipalp chela with six and seven rows of denticles, respectively *B. ugartei* Kovařík, 2000
 Fixed and movable fingers of pedipalp chela with eight and nine rows of denticles, respectively 3
3. Fingers of pedipalp chela each with a pair of external and internal accessory granules at the junction of the fused basal rows of denticles; subaculear tubercle not bifurcate *B. johnstonii* Pocock, 1896
 Fingers of pedipalp chela each with a single external accessory granule at the junction of the fused basal rows of denticles; subaculear tubercle unequally bifurcate *B. melanicus* Kovařík, 2000
4. Metasomal segment V expanded distally in adult male, such that maximum width more than half length; fixed and movable fingers of pedipalp chela with six and seven rows of denticles, respectively *B. ansorgei* Hirst, 1911
 Metasomal segment V not expanded distally in adult male, maximum width less than half length; fixed and movable fingers of pedipalp chela with different numbers of rows of denticles 5
5. Fixed and movable fingers of pedipalp chela with seven and nine rows of denticles, respectively; movable finger of pedipalp chela with a pair of external and internal accessory granules at the junction of the fused basal rows of denticles; telson vesicle width more than half maximum width of metasomal segment V *B. buettneri* Karsch, 1886
 Fixed and movable fingers of pedipalp chela with nine and ten rows of denticles, respectively; movable finger of pedipalp chela with a single external accessory granule at the junction of the fused basal rows of denticles; telson vesicle width less than half maximum width of metasomal segment V *B. neglectus* Kraepelin, 1896

FAMILY BUTHIDAE

Babycurus buettneri Karsch

Babycurus buettneri Karsch, 1886:78, pl. III, fig. 1 (Type loc.: Sibango Farm, Gabon; holotype ♀: ZMB 4367); Kraepelin, 1895:89; Pocock, 1896:428–430; Kraepelin, 1899:62 (part); Pocock, 1899:835; Kraepelin, 1901:268; Kraepelin, 1913:181; Strand, 1916:140; Werner, 1916:86; Lampe, 1917:195; Pavlovsky, 1924:77; Pavlovsky, 1925:199; Werner, 1934:272; Werner, 1936:181; Vachon, 1940a:180, figs. 18, 22; Vachon, 1940b:251, 254, figs. 19, 21, 31, 35; Belfield, 1956:44; Probst, 1972:74.

Rhoptrurus kirki Pocock, 1890:137–138, pl. XIV, fig. 1 (Type loc.: West Africa; holotype ♂: BMNH 1865.60; synonymized by Kraepelin, 1899:62); Pocock, 1896:429.
Rhoptrurus büttneri: Pocock, 1890:138; Kraepelin, 1891:101, pl. II, fig. 23; Lönnberg, 1897:183; Kraepelin, 1898:3.
Babycurus kirki: Kraepelin, 1895:88; Pocock, 1899:835; Kraepelin, 1913:180; Werner, 1936:181–182, fig. 2; Vachon, 1940a:176–178; Belfield, 1956:44; Lourenço, 1986:200–203, figs. 1–4; Kovařík, 1998:104; Kovařík, 2000:248–250 (part), figs. 8, 20, 30, tab. 1–3 (part).
Babycurus buettneri: Werner, 1902:599; Moritz and Fischer, 1980:311; Fet and Lowe, 2000:77 (part); Kovařík, 2000:237–242 (part), figs. 4, 16 (?), tab. 1–3 (part).
Babycurus buttneri: Simon, 1903:123; Borelli, 1911:13; Roewer, 1943:216; Stahnke, 1972:122; Lamoral and Reynders, 1975:496–497 (part); Vachon, 1980:222, fig. 3; Lourenço, 1986:200–203; Dupré, 1990a:9; Warburg and Polis, 1990:229; Kovařík, 1998:104.
Tityus bahiensis: Kovařík, 1992:184 (part).

As noted above, the taxonomic validity of the synonyms attributed to *B. buettneri* [spelling accepted by Fet and Lowe (2000) according to Article 32 (i) (2) of the ICZN (1985)] remain contentious, despite a recent revision by Kovařík (2000). Kraepelin (1891) synonymized *B. centrurimorphus*, the type locality of which is allegedly in northwestern Madagascar, with *B. buettneri*, the type locality of which is in Gabon. Lamoral and Reynders (1975) observed that if *B. centrurimorphus* were truly synonymous with *B. buettneri*, then *B. buettneri* would be one of the most widely distributed scorpions of the Afrotropical region. Kraepelin (1896, 1899) regarded *B. centrurimorphus* as a valid species and did not repeat his previous synonymy with *B. buettneri*, a view adopted by some authors (e.g., Vachon 1940a; Probst 1973; Kovařík 1998, 2000), but not by others (e.g., Lamoral and Reynders 1975; Fet and Lowe 2000).

Similarly, the validity of *B. pictus*, described from Kenya, has remained uncertain. In the original description, Pocock (1896) suggested that this species might prove to be synonymous with *B. centrurimorphus*. Kraepelin (1896) subsequently synonymized it with *B. centrurimorphus*, a view accepted by some authors (e.g., Birula 1914, 1915a, 1915b; Probst 1973; Lamoral and Reynders, 1975; Kovařík 1998; Fet and Lowe 2000), but not by others (e.g., Fage and Simon 1936; Kovařík 2000).

The validity of *B. kirki* also remains ambiguous. Pocock (1896) first suggested that the holotype might be a mature individual of *B. buettneri*. Kraepelin (1896) reiterated this view, and subsequently (1899) synonymized this species with *B. buettneri*. Some authors (e.g., Lamoral and Reynders 1975; Fet and Lowe 2000) accepted this synonymy, but others (e.g., Vachon 1940a; Lourenço 1986; Kovařík 1998, 2000) did not.

Vachon's (1940a) synonymy of *B. neglectus* with *B. kirki* appears to have been forgotten by most authors (e.g., Belfield 1956; Lamoral and Reynders 1975; Lourenço 1986; Fet and Lowe 2000). However, Kovařík (1998, 2000) recently listed it as a junior synonym of *B. kirki*, following Vachon (1940a). Fet and Lowe (2000) considered this synonymy to be unjustified, and followed previous authors (except Vachon 1940a) in retaining *B. neglectus* as a valid species, distinct from *B. buettneri*.

In the most recent development, Kovařík (2000) synonymized *B. johnstonii* with *B. buettneri*, apparently by default, as he was unable to locate the holotype of *B. buettneri* (discussed above). According to Kovařík (2000:240–242):

B. kirki has been synonymized by Kraepelin (1899:62), and *B. centrurimorphus* by Kraepelin (1891:243) and Lamoral and Reynders (1975:497), with this species [*B. buettneri*]. In German museums (SMF, ZMB and ZMH) nearly all specimens labelled as *B. buettneri* agree with the

lectotype of *B. johnstonii*, and several other specimens belong to *B. kirki*. Most specimens of *B. kirki* in German museums were identified as *B. neglectus*. Since *B. centrurimorphus*, *B. johnstonii*, and *B. kirki* (= *B. neglectus*) are different species whose types I have examined, and since I have not found in all the museum materials any specimen labelled as *B. buettneri*, which could not be placed in one of the above three species anyway, I am convinced that one of these species really is a synonym of *B. buettneri*. Existence of the type of *B. buettneri* thus becomes very important. . . . To resolve the mutual position and validity of the above species . . . it is necessary to designate a neotype of *B. buettneri*. Since the holotype of *B. buettneri* was in ZMB, it can be assumed that Kraepelin had examined it. Therefore, I decided to designate as the neotype of *B. buettneri* an adult male which Kraepelin identified as *B. büttneri* and which is from the same locality as the holotype. Specimens that agree with the lectotype of *B. johnstonii* were commonly identified as *B. buettneri* by other German arachnologists, such as Werner and Roewer (unfortunately, there are no specimens identified by Karsch, who described *B. buettneri*), which is evidenced by examined specimens, as well as by published keys. Since I decided to designate a neotype only after seeing all the specimens identified as *B. buettneri*, my identification labels bear the name *B. johnstonii*.

The “rediscovery” of the holotype of *B. buettneri* invalidates Kovařík’s (2000) premature neotype designation. Comparison of the holotype of *B. buettneri* with type and nontype material of its putative synonyms, as well as reassessment of the relevant diagnostic characters has resulted in the following conclusions, several of which differ from those of Kovařík (2000).

(1) The validity of both *B. centrurimorphus* and *B. pictus*, as distinct from *B. buettneri*, is upheld. Notwithstanding their disjunct geographical distributions (*B. centrurimorphus* and *B. pictus* occur in East Africa, whereas *B. buettneri* occurs in West Africa), *B. centrurimorphus* and *B. pictus* can be separated from *B. buettneri* according to the number of rows of denticles on the movable finger of the pedipalp chela (Table 2). Including the apical and fused basal rows, there are seven rows in *B. centrurimorphus* and *B. pictus*, compared with nine rows in *B. buettneri* (Kraepelin 1896, 1899; Vachon 1940a; Kovařík 2000).

(2) The validity of *B. pictus*, as distinct from *B. centrurimorphus*, is provisionally upheld, pending further investigation. The holotype of *B. pictus* displays the diagnostic character combination of *B. centrurimorphus* (Vachon 1940a; Probst 1973; Kovařík 2000): sternite VII and metasomal segments with ventrosubmedian and ventrolateral carinae absent or obsolete; pedipalp movable finger with seven rows of denticles (including the apical and basal rows); 18–19 pectinal teeth. However, the two species appear to be separable by means of differences in sexual dimorphism, notably the longer, narrower pedipalps of adult male *B. centrurimorphus*, as well as the smaller size of adult *B. pictus* (Kovařík 2000). Only the holotype female of *B. pictus* was examined during the present investigation. An independent comparison of additional material (including adult males of both species) should be conducted in order to resolve the issue conclusively.

(3) *Babycurus kirki* is again synonymized with *B. buettneri*. As noted by Pocock (1896) and Kraepelin (1896), the putative diagnostic differences between *B. kirki* and *B. buettneri* (see Vachon 1940a; Belfield 1956) can be ascribed to sexual dimorphism between the male and female holotypes. The ventromedian and ventrolateral carinae on metasomal segment V are obsolete to absent in the male, but weakly developed to obsolete in the female and the pedipalp chela manus of the male is broader than in the female

(Lourenço 1986; Kovařík 2000). Belfield's (1956) statement that carinae are present on sternite VII in *B. buettneri* is erroneous. Furthermore, this species is characterized by nine rows of denticles (including the apical row) on the movable finger of the pedipalp chela, not seven. Specimens with ten rows mentioned by Kovařík (2000) can be ascribed to *B. neglectus* not *B. buettneri*.

Lourenço (1986:200) examined the holotype of *B. kirki* and justified the validity of this species, as distinct from *B. buettneri*, on the basis of differences in habitat (forest vs. savanna): "La mise en synonymie de *B. kirki* avec *B. buettneri* a été admise sur des ressemblances morphologiques; cependant, des différences morphologiques existent entre les deux espèces qui, de toute évidence, ne proviennent pas du même milieu: *B. buettneri* . . . est une espèce vraisemblablement forestière, tandis que les *Babycurus* de Lamto (= *B. kirki*) ont été trouvés exclusivement dans les savanes." This ecological argument is unsupported by the new specimens from Gabon (collected in primary rainforest), which correspond closely with the holotypes of *B. buettneri* and *B. kirki*, as well as with Lourenço's (1986) revised diagnosis and meristics for *B. kirki* (Table 2).

(4) *Babycurus neglectus* is removed from synonymy with *B. kirki*. Although the type specimens of *B. neglectus* were not examined in the present study, three specimens from SMF, previously examined by Kovařík (2000), were found to be morphologically distinct from the holotypes of *B. buettneri* and *B. kirki* and the nontype specimens of *B. buettneri* from Gabon (Table 2). Vachon's (1940a) synonymy, recently adopted by Kovařík (1998, 2000), is thus rejected, based on the following combination of character states provided by Kraepelin (1891, 1896, 1899): metasomal segments with ventrosubmedian and ventrolateral carinae obsolete; pedipalp movable finger with ten rows of denticles (including the apical and fused basal rows); width of metasomal segments increasing distally; telson vesicle width less than half maximum width of metasomal segment V.

(5) *Babycurus johnstonii* is removed from synonymy with *B. buettneri*. Comparison of the lectotype and paralectotype of *B. johnstonii* with the holotypes of *B. buettneri* and *B. kirki* and the nontype specimens of *B. buettneri* from Gabon confirmed that these species are consistently separable on the basis of the following characters of Pocock (1896): sternite VII with four granular carinae in *B. johnstonii*, without carinae in *B. buettneri*; metasomal segment V with ventromedian and ventrolateral carinae distinct, granular in *B. johnstonii*, absent to obsolete in *B. buettneri*; fixed finger of pedipalp chela with eight rows of denticles in *B. johnstonii*, with seven rows in *B. buettneri*.

ECOLOGICAL NOTE. — In common with many buthids, *B. buettneri* appears to be opportunistic, using available shelter on the ground or in the forest canopy. Specimens from Gabon were collected in termite mounds, rotten logs and pitfall traps.

RANGE. — *Babycurus buettneri* may be one of the most widespread scorpions in West Africa (Fig. 1), with records confirmed from Senegal, Guinea, Côte d'Ivoire, Ghana, Togo, Nigeria, Cameroon, Equatorial Guinea, Congo and Gabon (Vachon 1940a; Belfield 1956; Lamoral and Reynders 1975; Lourenço 1986; Fet and Lowe 2000; Kovařík 2000). The species is newly recorded from the Central African Republic in the present study.

The widespread distribution of this species could be associated with its occurrence in a range of vegetation types, including primary lowland rainforest, relict gallery forest and savanna. Specimens for which data are available were collected at an elevation of 110–375 m. It should be noted that many literature records probably still reflect misidentifications of *B. neglectus* and perhaps *B. johnstonii*. A thorough re-examination of the specimens on which these records are based should be undertaken to accurately verify the distributional ranges of these species.

TABLE 2. Meristic data for *Babycurus buettneri* Karsch, 1886, *Babycurus centrurimorphus* Karsch, 1886, *Babycurus johnstonii* Pocock, 1896, *Babycurus melanicus* Kovařík, 2000, *Babycurus neglectus* Kraepelin, 1896 and *Babycurus pictus* Pocock, 1896. Measurements following Stahnke (1970) and Lamoral (1979). ¹ Sum of metasomal segments I–V and telson. ² Measured from base of condyle to tip of fixed finger. ³ Basal and apical rows included.

Specimen:	Sex	<i>B. buettneri</i>			
		♀	♀	♂	♂
	Collection	ZMB	CAS	BMNH	CAS
	Number	4367		1860.65	
	Type	holotype		holotype	
	Synonym			<i>B. kirki</i>	
Total length:	prosoma+mesosoma+metasoma	47.20	65.06	69.77	55.21
Carapace:	anterior width	2.88	4.02	4.73	3.54
	posterior width	4.68	6.99	7.22	5.66
	length	4.60	6.64	7.10	5.55
Mesosoma:	total length (tergites)	13.07	20.30	19.58	14.94
Sternite VII:	width	3.85	6.89	6.54	5.06
	length	3.34	4.22	4.84	3.06
Metasoma:	total length ¹	29.53	38.12	43.09	34.72
Metasoma I:	maximum width	2.72	3.68	4.08	2.90
	length	3.87	4.65	5.52	4.01
Metasoma II:	maximum width	2.68	3.48	4.13	2.93
	length	4.48	5.52	6.62	5.07
Metasoma III:	maximum width	2.65	3.43	4.22	2.96
	length	4.81	6.15	6.72	5.75
Metasoma IV:	maximum width	2.60	3.38	4.27	2.97
	length	5.10	6.75	7.58	6.24
Metasoma V:	maximum width	2.46	3.22	4.31	2.99
	length	6.22	8.29	9.13	7.66
Telson:	maximum width	1.61	2.46	3.12	2.15
	maximum height	1.60	2.21	2.65	1.99
	aculeus length	2.43	2.76	3.39	2.29
	total length	5.05	6.76	7.52	5.99
Pedipalp:	total length (including trochanter)	22.28	27.79	31.20	24.56
Chela:	maximum width	1.77	2.15	3.81	2.38
	maximum height	1.57	1.99	3.77	2.29
	length ²	9.42	12.51	13.93	11.16
	length of ventroexternal carina	3.47	3.96	5.94	3.92
	length of movable finger	6.38	8.12	8.32	6.59
	rows of denticles fixed (left/right)	7/-	7/7	7/7	7/7
	rows of denticles movable ³ (left/right)	9/9	9/9	9/9	9/9
Patella:	maximum width	2.09	2.47	2.76	2.23
	length	5.97	7.38	7.62	5.98
Femur:	maximum width	1.53	1.84	1.99	1.69
	length	4.85	6.37	6.60	5.34
Pectines:	total length	4.24	4.57	6.36	4.83
	length along dentate margin	4.10	4.55	6.35	4.71
	tooth count (left/right)	19/19	18/17	19/19	18/18

SCORPIONS OF GABON

TABLE 2. Meristic data (continued).

<i>B. centrurimorphus</i>		<i>B. johnstonii</i>	<i>B. melanicus</i>	<i>B. neglectus</i>	<i>B. pictus</i>
♀	♂	♀	♀	♀	♀
ZMB	ZMB	BMNH	CAS	SMF	BMNH
4307b	4307a	1890.3.18.1-2		RII/8873	1893.11.9.3
lectotype	paralectotype	lectotype			holotype
64.96	47.04	64.95	81.34	54.79	52.59
4.44	2.84	4.48	5.17	3.66	3.29
6.98	4.98	7.28	8.87	6.18	5.59
6.90	4.82	6.74	8.42	6.20	5.50
18.74	13.91	19.19	24.2	16.22	16.98
6.70	4.18	6.95	7.67	6.41	5.55
4.48	2.97	5.02	5.51	4.23	3.83
39.32	28.31	39.02	48.72	32.37	30.11
3.51	2.53	3.88	4.58	3.48	2.67
4.90	3.97	5.05	6.26	4.07	4.14
5.58	2.69	3.58	4.39	3.56	2.68
5.49	4.21	6.03	7.37	4.43	4.29
3.59	2.77	3.52	4.38	3.63	2.71
5.96	4.29	6.42	7.95	5.10	4.65
3.52	2.74	3.42	4.02	3.70	2.81
6.86	4.91	6.61	8.42	5.37	5.20
3.29	2.40	3.26	3.69	3.71	2.53
9.04	6.07	8.14	9.98	7.69	6.35
2.55	1.62	2.51	3.34	1.77	1.97
2.35	1.53	2.43	2.90	1.69	1.77
3.27	2.13	2.47	3.22	2.41	2.23
7.07	4.86	6.77	8.74	5.71	5.48
29.59	23.66	29.78	34.54	25.38	22.4
2.45	1.98	2.21	2.70	1.77	2.06
2.61	2.03	2.00	2.61	1.80	2.10
12.97	10.24	12.68	14.26	10.93	9.34
4.92	4.16	3.85	4.40	3.61	4.02
7.61	5.75	8.03	9.41	7.41	5.10
6/6	6/6	8/8	8/8	9/9	6/6
7/7	7/7	9/9	9/9	10/10	7/7
2.45	1.58	2.46	2.88	2.28	2.07
7.43	5.99	7.59	8.96	6.34	5.55
1.77	1.26	1.77	2.37	1.61	1.62
6.33	5.50	6.72	8.06	4.93	5.24
4.70	4.28	5.05	5.94	4.23	3.86
4.55	4.27	4.73	5.47	4.04	3.83
19/19	20/20	18/19	18/19	18/18	19/19

Babycurus centrurimorphus Karsch

Babycurus centrurimorphus Karsch, 1886:78–79, pl. III, fig. 2 (Type loc.: NW Madagascar [dubious]; lectotype ♀ [desig. Kovařík, 2000]: ZMB 4307b; ♂, 3 ♀ paralectotypes [desig. Kovařík, 2000]: ZMB 4307a); Kraepelin, 1895:89; Kraepelin, 1896:124 (part); Kraepelin, 1899:63 (part); Kraepelin, 1913:180, 182–183; Birula, 1914:119–120 (part); Birula, 1915a:16–17 (part); Birula, 1915b:51 (part); Fage, 1929:72; Fage and Simon, 1936:303; Werner, 1936:181; Vachon, 1940a:179, figs. 20, 24; Roewer, 1952:28; Geeraerts, 1953:1066; Probst, 1973:325 (part); Vachon, 1980:222; Moritz and Fischer, 1980:312; Warburg and Polis, 1990:234; Kovařík, 1998:104 (part); Kovařík, 2000:242–244 (part), figs. 17, 33–34, tab. 1–3.

Buthus (Rhoptrurus) centrurimorphus: Pocock, 1890:122.

Rhoptrurus büttneri: Kraepelin, 1891:101, 243.

Babycurus (Rhoptrurus) centrurimorphus: Kraepelin, 1901:268.

Babycurus buttneri: Lamoral and Reynders, 1975:496–497 (part).

Babycurus buettneri: Fet and Lowe, 2000:77 (part).

As discussed under *B. buettneri*, *B. centrurimorphus* is a distinct species. The diagnostic characters of this species were reviewed by Vachon (1940a), Probst (1973) and Kovařík (2000). A lectotype and paralectotypes were designated by Kovařík (2000).

RANGE. — The type locality of *B. centrurimorphus* is ambiguous. Although Karsch (1886) indicated that the type specimens originated in northwestern Madagascar, all remaining species of *Babycurus* have been described from specimens originating on the African mainland or the Arabian Peninsula (Lamoral and Reynders 1975; Sissom 1994; Fet and Lowe 2000; Lowe 2000; Kovařík 2000). No other specimens of *Babycurus* have been reported subsequently from Madagascar and Lourenço (1996) omitted *Babycurus* from his monograph on the Malagasy scorpion fauna. Probst (1973) speculated that the occurrence of *B. centrurimorphus* in Madagascar might be attributed to artificial importation. However, it is more parsimonious to conclude that the type specimens of *B. centrurimorphus* originated in East Africa and were erroneously labelled.

All confirmed records of *B. centrurimorphus* occur in East Africa, principally Kenya, Tanzania, Mozambique, and Rwanda (Probst 1973; Kovařík 2000). Kovařík (2000) suggested that the species may also occur in the DRC, following Roewer (1952), but this requires confirmation. Kovařík (2000) followed Probst (1973) in rejecting Kraepelin's (1913) record of *B. centrurimorphus* from Angola and suggested that Kraepelin may have misidentified *B. ansorgei*. Although Kovařík's (2000) suggestion is possibly correct, the same misidentification may be attributed to several specimens listed by him from "San Paolo de Loanda" (the old name for Luanda, which occurs in Angola not Tanzania). The latter specimens (ZMH 8180, 10182, 10186) may be conspecific with *B. ansorgei* or may represent an undescribed species (see also under *B. pictus*).

Babycurus johnstonii Pocock

Babycurus johnstonii Pocock, 1896:429–430 (Type loc.: Rio del Rey, near Old Calabar River, Cameroon-Nigeria border [Cameroon]; lectotype ♀, paralectotype ♀ [desig. Kovařík, 2000]: BMNH 1890.3.18.1–2); Pocock, 1899:835; Lamoral and Reynders, 1975:498; El-Hennawy, 1992:97, 111; Kovařík, 1998:104; Fet and Lowe, 2000:78.

Babycurus johnstoni: Kraepelin, 1899:63; Kraepelin, 1913:181; Borelli, 1925:323; Vachon, 1940a:180, figs. 19, 23; Belfield, 1956:44; Strinati, 1960:536.

Babycurus (Rhoptrurus) johnstoni: Kraepelin, 1901:268.

Babycurus buettneri: Kovařík, 2000: 237–242 (part), figs. 4, 16 (?), tab. 1–3 (part).

This species was, in part, redescribed as *B. buettneri* by Kovařík (2000), who also designated a lectotype and paralectotype. Diagnostic characters for *B. johnstonii* were provided in the keys of Vachon (1940a) and Belfield (1956) and the species can be separated from the remaining West African *Babycurus* by means of the key provided above. The subspecies, *Babycurus johnstonii ochraceus* Masi, 1912, described from Mogadiscio (Somalia), was tentatively synonymized with *Babycurus wituensis taramassoi* Borelli, 1919 by Kovařík (2000).

RANGE. — The type locality of *B. johnstonii* occurs on the Cameroon side of the border between Nigeria and Cameroon in an area of primary lowland rainforest (Fig. 1). Vachon (1940a) stated that *B. johnstonii* occurs from Cameroon to Togo, perhaps based on specimens in the MNHN. Strinati (1960) reported this species from former French Equatorial Africa (now Congo and Gabon). These reports require confirmation.

Babycurus melanicus Kovařík (Figs. 1–10)

Babycurus melanicus Kovařík, 2000:250, figs. 28, 37, tab. 1–3 (Type loc.: CDR (Zaire) [Democratic Republic of Congo], west; holotype ♀ [not examined]: FKPC).

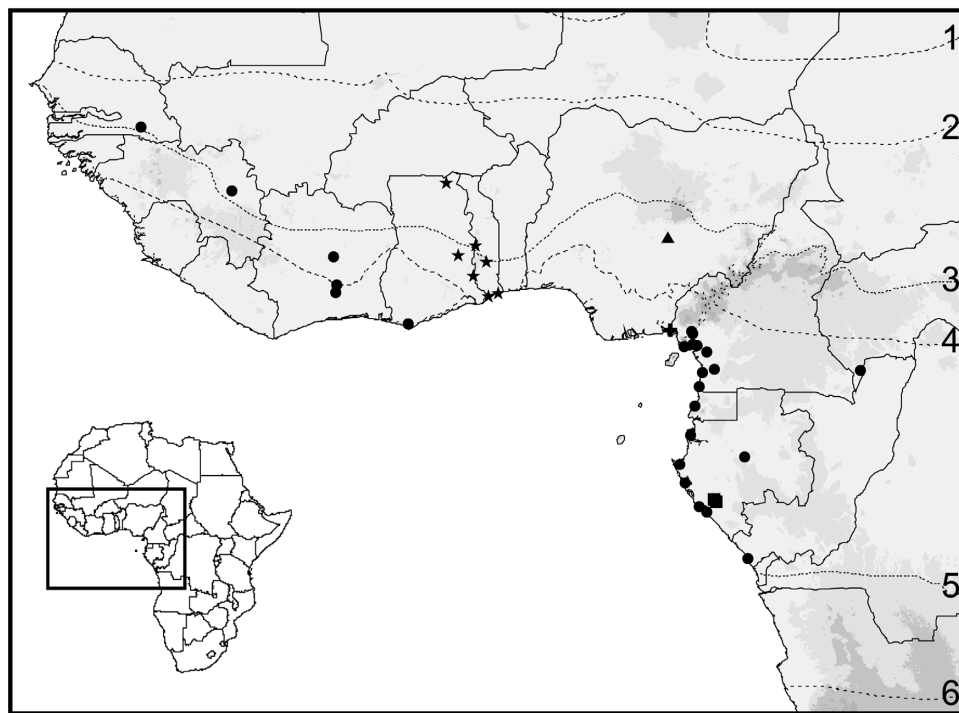
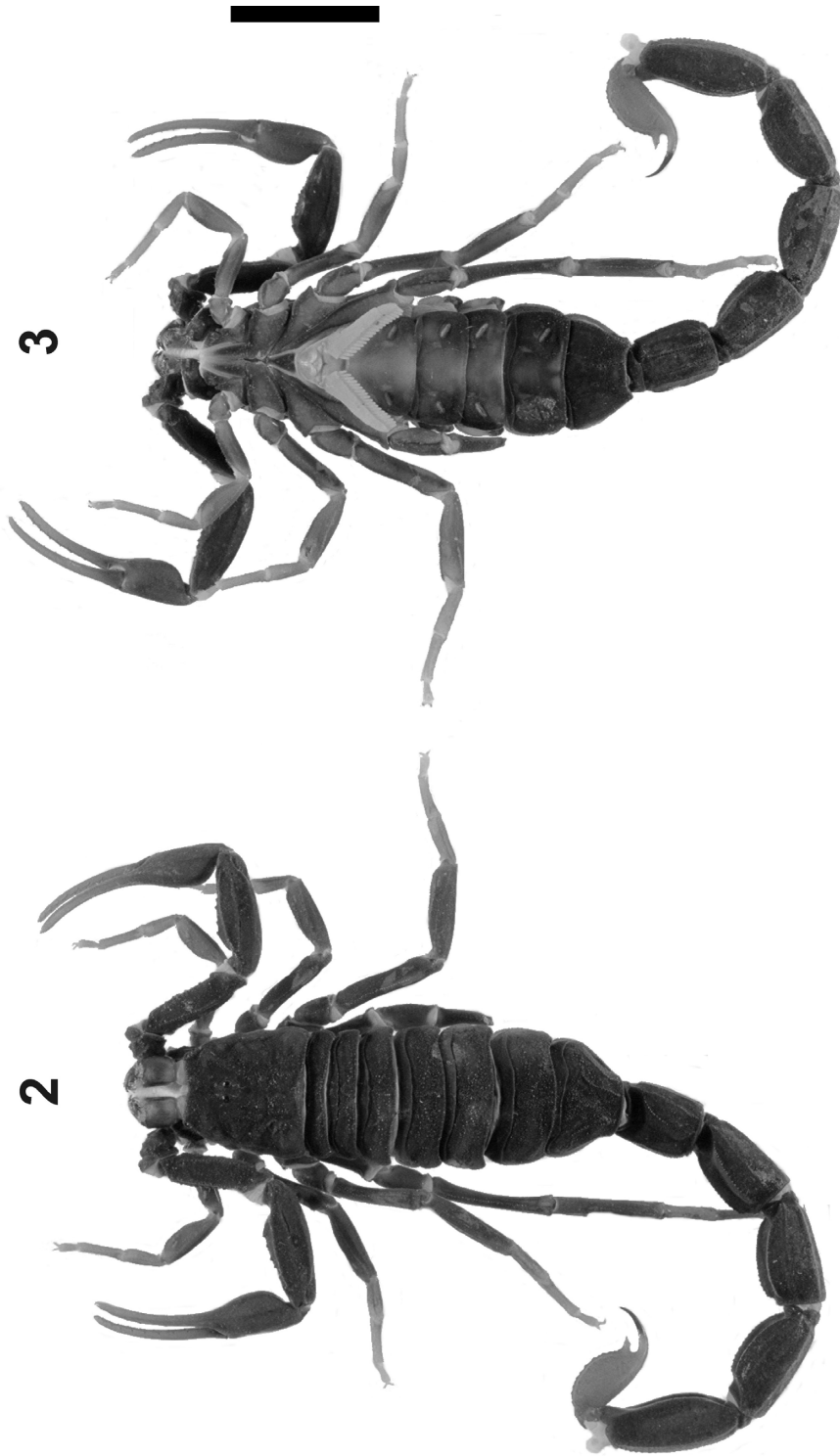
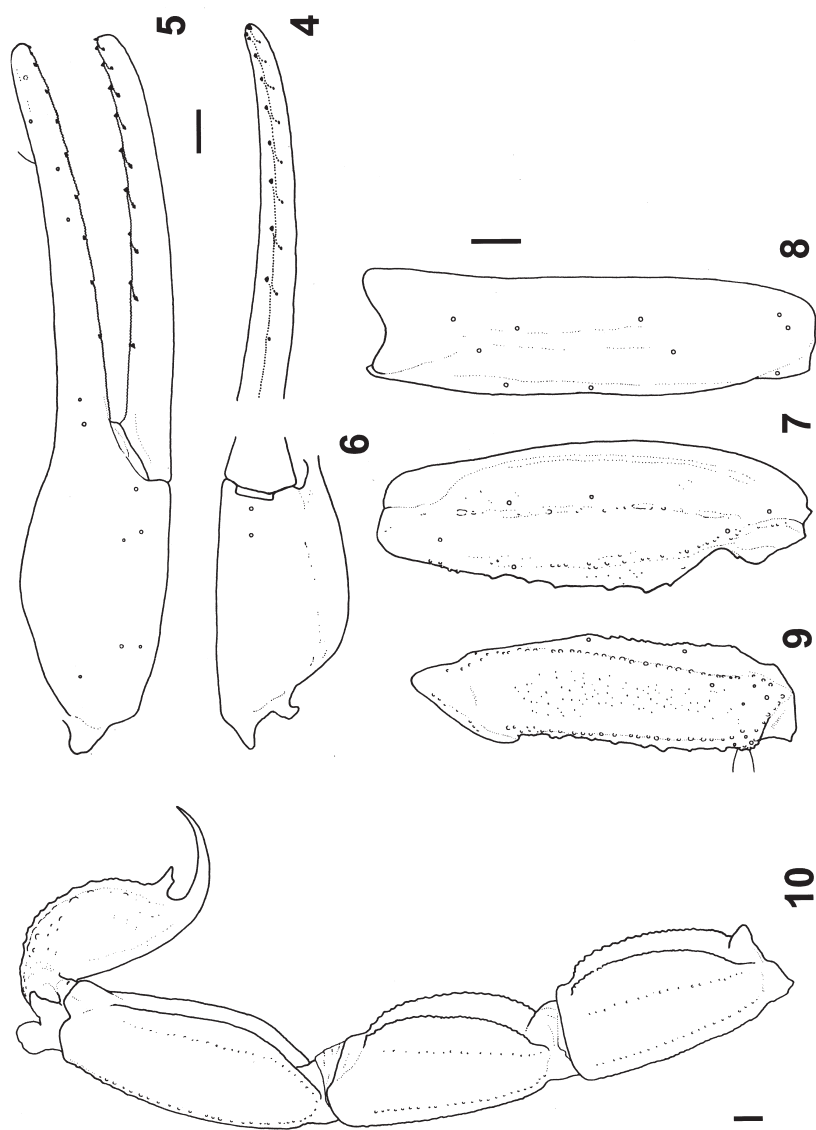


FIGURE 1. Map of West Africa illustrating the known distributional ranges of *Babycurus buettneri* Karsch, 1886 (circles), *Babycurus johnstonii* Pocock, 1896 (cross), *Babycurus melanicus* Kovařík, 2000 (squares), *Babycurus neglectus* Kraepelin, 1896 (stars) and *Babycurus ugartei* Kovařík, 2000 (triangle), based on data from Lamoral and Reynders (1975), Lourenço (1986), Kovařík (2000) and the present contribution. Numbered, dashed lines indicate the boundaries of major vegetation zones according to White (1983), such that: <1 = desert; 1-2 = semidesert; 2-3, >6 = arid to semiarid savanna; 3-4, 5-6 = moist savanna, with montane vegetation at high elevation; 4-5 = rainforest.



FIGURES 2–3. *Babycyrtus melanicus* Kovarik, 2000. (♀, CAS), habitus. 2. Dorsal aspect. 3. Ventral aspect. Scale bar = 10 mm.



FIGURES 4–10. *Babycurus melanicus* Kovářik, 2000. (♀, CAS), diagnostic characters. 4. Cutting margin of dextral pedipalp chela movable finger, indicating dentition. 5–9. Distribution of trichobothria on the dextral pedipalp segments. 5. Dorsal aspect of chela. 6. Ventral aspect of chela. 7. Dorsal aspect of patella. 8. External aspect of patella. 9. Dorsal aspect of femur. 10. Lateral aspect of metasomal segments III–V and telson. Scale bar = 1 mm.

DIAGNOSIS. — *Babycurus melanicus* appears to be most closely related to *B. johnstonii*, with which it shares the following character states: sternite VII with four granular carinae; metasomal segment V with ventromedian and ventrolateral carinae distinct, granular; fixed finger of pedipalp chela with eight rows of denticles. Kovařík (2000) evidently drew the same conclusion when suggesting that *B. melanicus* was most closely related to *B. buettneri*, although that conclusion was predicated on the mistaken impression that *B. buettneri* and *B. johnstonii* were synonymous (discussed above).

Babycurus melanicus can be separated from *B. johnstonii* by means of the following character states: fingers of pedipalp chela each with a single external accessory granule at the junction of the fused basal rows of denticles; subaculear tubercle bifurcate. In *B. johnstonii*, the corresponding character states are as follows: fingers of pedipalp chela each with a pair of external and internal accessory granules at the junction of the fused basal rows of denticles; subaculear tubercle not bifurcate. The rufous coloration of the telson vesicle, contrasting with the black coloration of the carapace, mesosoma, metasoma, pedipalps and legs, is also diagnostic for *B. melanicus*. *Babycurus johnstonii* is characterized by uniform dark brown coloration of the metasomal segments and telson. Further color differences were provided by Kovařík (2000).

DESCRIPTION. — The following redescription is based on the largest female from Gabon (Figs. 2, 3). Differences between this specimen and the other three are provided in the section on variation.

Color: Carapace, tergites, metasomal segments I–V, pedipalps (excluding chelae) and dorsal surfaces of legs: Jet Black No. 89. Pedipalp chelae: Chestnut No. 32. Telson: Cinnamon-Rufous No. 40. Chelicerae, sternites, and ventral surfaces of legs: Clay Color No. 26. Pectines and genital operculum: Cream Color No. 54. Rufous telson contrasting markedly with black carapace, mesosoma, metasoma, pedipalps and legs.

Carapace: Carapace subrectangular, becoming wider posteriorly; anterior margin distinctly procurved, posterior margin straight. Entire carapace surface evenly, coarsely, and sparsely granular, except for ocular tubercle and posteromedian furrow, which are smooth. Three pairs of lateral ocelli. Median ocelli considerably larger than lateral ocelli, situated anteromedially. Ocular tubercle distinctly elevated above carapace surface, with pair of weakly granular superciliary carinae. All other carinae obsolete. Anteromedian furrow shallow, subovate; posteromedian furrow narrow, shallow anteriorly, becoming deeper posteriorly; posterolateral furrows shallow, wide, curved; posteromarginal furrow narrow, deep.

Chelicerae: Movable finger with distal external and distal internal teeth equal, opposable. Fixed finger with two ventral teeth. Ventral aspect of fingers and manus with long, dense macrosetae.

Sternum: Subtriangular. Median longitudinal furrow T-shaped, shallow anteriorly, deep and narrow posteriorly.

Pedipalps: Femur pentacarinata; carinae distinct, costate granular to granular, with spiniform granules on internomedian carina; dorsal and ventral intercarinal surfaces finely and evenly granular, lateral intercarinal surfaces smooth. Patella with seven distinct carinae; dorsointernal and dorsomedian carinae comprising several large spiniform granules, remaining carinae costate; intercarinal surfaces smooth, except for dorsointernal surface which is finely granular medially; basal tubercle weakly developed. Chela entirely smooth; dorsomedian, digital and ventroexternal carinae weakly developed but distinct, costate; other carinae obsolete. Chela long and slender, length along ventroexternal carina 39% greater than width and 41% greater than height; length of movable finger 53% greater

than length along ventroexternal carina. Dentate margins of fixed fingers each with eight oblique rows of denticles, rows 7–8 being fused into a single continuous row; dentate margins of movable fingers each with nine oblique rows of denticles, rows 8–9 being fused (Fig. 4); each row flanked proximally by internal and external accessory granules, except for the junctions of the fused basal rows of denticles, flanked only by an external accessory granule; two granules, proximal to the enlarged terminal denticle, flank the first row of each finger; supernumerary granules absent.

Trichobothria: Orthobothriotaxic, type A, β configuration (Figs. 5–9), with the following segment totals: femur, 11 (5 dorsal, 4 internal, 2 external), patella, 13 (5 dorsal, 1 internal, 7 external) and chela, 15 (8 manus, 7 fixed finger). Total number of trichobothria per pedipalp, 39.

Mesosoma: Pretergites entirely smooth, except on distal margins, which are finely granular. Post-tergites sparsely and coarsely granular, becoming more so on distal segments; II–VII each with a strongly developed, granular median carina; VII additionally with distinct pairs of granular dorsosubmedian and dorsolateral carinae. Sternites III–VI smooth; VII sparsely granular, with weakly developed pairs of granular ventrosobmedian and ventrolateral carinae.

Pectines: First proximal median lamella of each pecten with proximal corner acute. Pectinal teeth: 18/19.

Genital operculum: Completely divided longitudinally.

Legs: Tibia I–III without spurs. Basitarsi each with paired rows of long macrosetae and numerous microsetae on prolateral on retrolateral surfaces. Telotarsi each with a pair of ventrosobmedian rows of macrosetae and sparse setation on prolateral and retrolateral surfaces. Prolateral tarsal spurs with a basal bifurcation bearing a stout seta; retrolateral tarsal spurs simple. Telotarsal laterodistal lobes truncated; median dorsal lobes extending to ungues. Telotarsal ungues short, distinctly curved, and equal in length.

Metasoma and telson: Metasomal segments I–V progressively increasing in length, and decreasing in width, with segment V 19% narrower than segment I; width percentage of length 73% for I, 60% for II, 55% for III, 48% for IV, and 37% for V. Telson oval, with flattened dorsal surface and rounded ventral surface; vesicle moderately globose, slightly narrower than metasomal segment V, width 91% of metasomal segment V. Metasomal segments sparsely setose; ventral intercarinal surfaces smooth, but lateral and dorsal surfaces sparsely and finely granular; carinae costate granular to granular, becoming more weakly developed on distal segments; dorsal intercarinal surfaces each with a shallow median furrow. Segment I with ten carinae, II–IV with eight carinae, and V with five carinae. Median lateral carinae fully developed on segment I but absent in segments II–V. Segments I–IV with paired ventrosobmedian carinae whereas segment V with single ventromedian carina. Segment V with paired ventrolateral and dorsolateral carinae, dorsolateral carinae becoming obsolete distally; ventrolateral carinae converging distally. Telson sparsely and coarsely granular, with two parallel linear furrows extending from proximal edge to base of aculeus, and a well developed, spinoid subaculear tubercle, unevenly bifurcated distally (Fig. 10). Aculeus long, 37% of vesicle length, and sharply curved.

Variation: The remaining specimens are similar in most respects, besides having a higher pectinal tooth count (19/20).

Measurements: As in Table 2.

ECOLOGICAL NOTE. — Available data suggest that this species is opportunistic, using available shelter on the ground. One specimen was collected from a rotten log, whereas the others were collected in pitfall traps.

RANGE. — Presently known only from the type locality (indefinitely located in western DRC) and the two, newly reported localities in Gabon (Fig. 1). This species appears to be endemic to primary lowland rainforest. The specimens from Gabon were collected at an elevation of 110–375 m.

Babycurus neglectus Kraepelin

Rhoptrurus dentatus (nec Karsch, 1879): Kraepelin, 1891:99, 241.

Babycurus neglectus Kraepelin, 1896:125 (Type loc.: Klein-Popo [Togo]; lectotype ♀, paralectotype ♂ [desig. Kovařík, 2000; not examined]: ZMH); Kraepelin, 1899:63–64; Werner, 1902:599; Kraepelin, 1913:180; Werner, 1916:86; Lampe, 1917:195; Werner, 1934:272, fig. 339; Roewer, 1943:216; Belfield, 1956:44; Lamoral and Reynders, 1975:498; Dupré, 1990a:9; Kovařík, 1992:182; Fet and Lowe, 2000:79.

Babycurus kirki: Vachon, 1940a:176–178 (part); Kovařík, 1998:104 (part); Kovařík, 2000:248–250 (part), figs. 7, 19, 29, tab. 1–3 (part).

This species was, in part, redescribed as *B. kirki* by Kovařík (2000), who also designated a lectotype and paralectotype. As discussed under *B. buettneri*, *B. neglectus* is a distinct species, which can be separated from the former, and from the remaining West African species of *Babycurus*, by means of the key provided above. Belfield's (1956) key provides additional diagnostic differences.

RANGE. — Kraepelin (1891, 1899) gives the distributional range of *B. neglectus* as “Gold Coast to Gaboon River” (Ghana to Gabon). However, the only confirmed locality records available for this species occur in the Dahomey gap, a region of savanna in Ghana, Togo, and Benin (Fig. 1). It is not known whether the distributional range of *B. neglectus* extends into the lowland rainforests of the Congo basin, or whether the records from Gabon are merely misidentifications of *B. buettneri*.

Babycurus pictus Pocock

Babycurus pictus Pocock, 1896:426–430, pl. XVIII, fig. 1 (Type loc.: Athi Plains, Kenya; holotype ♀: BMNH 1893.11.9.3); Pocock, 1898:430; Fage and Simon, 1936:303; Kovařík, 2000:242–244, figs. 17, 33–34, tab. 1–3.

Babycurus centrurimorphus: Kraepelin, 1896:124 (part); Kraepelin, 1899:63 (part); Birula, 1914:119–120 (part); Birula, 1915a:16–17 (part); Probst, 1973:325 (part); Kovařík, 1998:104 (part).

Babycurus buttneri: Lamoral and Reynders, 1975:496–497 (part).

Babycurus buettneri: Fet and Lowe, 2000:77 (part).

As discussed under *B. buettneri*, the validity of *B. pictus*, as distinct from *B. centrurimorphus*, is provisionally upheld on the basis of differential sexual dimorphism in the adult male presented by Kovařík (2000), but the matter requires further investigation.

RANGE. — All except one confirmed record occur in Kenya and Tanzania (Probst 1973; Kovařík 2000). Kovařík (2000) reported a single male specimen from Angola, differing from typical specimens by its larger size and the presence of costate carinae on the pedipalp chela. This specimen is doubtfully referable to *B. pictus* and may represent an undescribed species [perhaps conspecific with the abovementioned Angolan specimens identified as *B. centrurimorphus* by Kovařík (2000)], rather than a subspecies of the former, as suggested by Kovařík (2000).

FAMILY LIOCHELIDAE

Opisthacanthus africanus Simon

?*Scorpio 7-dentatus* Beauvois, 1805:191, pl. V, fig. 5 (Type loc.: unknown; holotype: lost; synonymized by Kraepelin, 1894:123).

Opisthacanthus africanus Simon, 1876:221–222 (Type loc.: Landana, Congo [now Cabinda, Angola]; holotype ♂ [not examined]: MNHN RS 289); Kraepelin, 1894:123–125; Kraepelin, 1898:4; Kraepelin, 1899:149; Pocock, 1899:837; Kraepelin, 1901:272; Werner, 1902:603; Simon, 1904:444; Borelli, 1911:13; Kraepelin, 1911:76; Hewitt, 1912:307; Borelli, 1913:220; Giltay, 1929:17; Kraepelin, 1929:89; Bacelar, 1950:5; Belfield, 1956:45; Newlands, 1973:92; Lamoral and Reynders, 1975:544–545; Lourenço, 1979:30; Lourenço, 1982b:147–153, figs. 1–14; Lourenço, 1987:904–905, pl. IV, figs. 9–11; Lourenço, 1991:31; Kovařík, 1998:134; Fet, 2000a:403–404.

Opisthacanthus septemdentatus: Karsch, 1879:372–373; Lourenço, 1979:29.

Opisthocentrus africanus: Pocock, 1893:317–318.

Opisthacanthus africanus was redescribed by Lourenço (1982b), who rediscovered the holotype in the collection of the MNHN. Lourenço (1987) provided additional diagnostic differences and mapped the known distributional range. The most closely related species of *Opisthacanthus* (subgenus *Nepabellus*) occur in southern and eastern Africa (Lourenço 1987, 1991).

ECOLOGICAL NOTE. — The morphology of the telotarsi (notably the strongly curved unguis and, to a lesser extent, the dactyl) is indicative of an arboreal habit. This species is known to inhabit holes in tree trunks and the spaces behind peeling bark, but has also been collected at ground level (Newlands 1973). The two recently collected specimens from Gabon were obtained in a rotten log and a pitfall trap, respectively.

RANGE. — Specimens of *O. africanus* are well represented in collections, with locality records confirmed from Angola, Cameroon, Congo, the DRC, Equatorial Guinea, and Gabon (Fig. 11). The species is newly recorded from the Central African Republic in the present study (CAS).

Records from Mozambique (Bacelar 1950) and South Africa (Kraepelin 1894, 1899; Hewitt 1912) are referable to *Opisthacanthus asper* (Peters, 1961) or *Opisthacanthus validus* Thorell, 1876. Reports from Guinea (Pocock 1893, 1899) and Sierra Leone (Kraepelin 1899, 1929), if confirmed, would support Belfield's (1956) suggestion that *O. africanus* occurs all along the West African coast. However, as no other records have been reported west of Cameroon, this is extremely doubtful. *Opisthacanthus africanus* appears to be endemic to primary lowland rainforest in the Congo basin. Specimens for which data are available were collected at an elevation of 110 m.

Opisthacanthus lecomtei (Lucas)

Scorpio (Ischnurus) lecomtei Lucas, 1858:428 (Type loc.: indefinite locality in West Africa [Gabon?]; holotype: MNHN [lost]; neotype ♂ [desig. Lourenço, 1982a; not examined]: MNHN RS 4627, Yaoundé, Ototomo forest reserve, Cameroon).

Opisthacanthus duodecimdentatus Karsch, 1886:79 (Type loc.: Sibango Farm, Gabon; holotype ♂: ZMB 4369 [not examined]; synonymized by Kraepelin, 1894:122); Lourenço, 1979:30; Moritz and Fischer, 1980:314.

Opisthocentrus lecomtei: Pocock, 1893:318; Pavlovsky, 1925:200.

Opisthacanthus lecomtei: Kraepelin, 1894:122–123, pl. II, fig. 50; Kraepelin, 1899:149; Pocock, 1899:836; Kraepelin, 1901:272; Simon, 1903:123; Kraepelin, 1911:73; Strand, 1916:140;

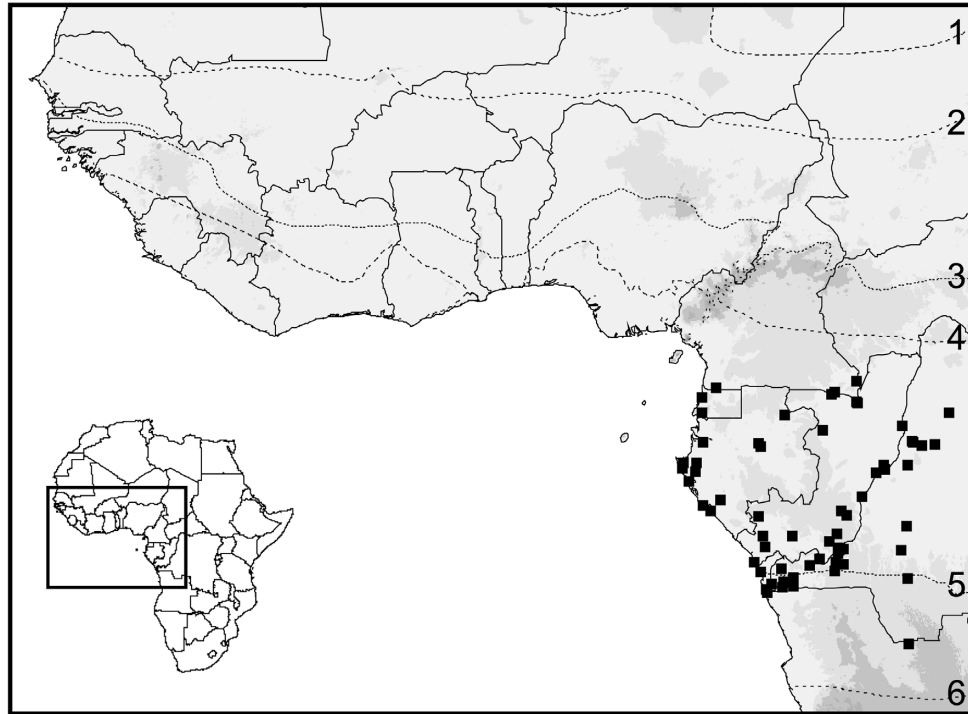


FIGURE 11. Map of West Africa illustrating the known distributional range of *Opisthacanthus africanus* Simon, 1876 (squares), based on data from Lamoral and Reynders (1975), Lourenço (1987) and the present contribution. Numbered, dashed lines indicate the boundaries of major vegetation zones according to White (1983), such that: <1 = desert; 1-2 = semidesert; 2-3, >6 = arid to semiarid savanna; 3-4, 5-6 = moist savanna, with montane vegetation at high elevation; 4-5 = rainforest.

Werner, 1916:91; Lampe, 1917:200; Werner, 1934:279; Roewer, 1943:234; Belfield, 1956:45; Newlands, 1973:92; Lamoral and Reynders, 1975:547; Lourenço, 1979:29; Lourenço, 1982a:1163–1168, figs. 1–13; Lourenço, 1987:900–901, pl. III, figs. 5–9; Lourenço, 1991:31; Nenilin and Fet, 1992:21; Lourenço, 1995:79; Kovářík, 1998:134; Fet, 2000a:401–402.

Opisthacanthus lecomtei was redescribed by Lourenço (1982a), who designated a neotype from the Ototomo forest reserve, Cameroon. Lourenço (1987) provided additional diagnostic differences and mapped the known distributional range.

The most closely related species of *Opisthacanthus* (subgenus *Opisthacanthus*) occur in northern South America (Lourenço 1987, 1991, 1995), which has elicited some debate on the zoogeography of the genus. The recognition of five Neotropical species of *Opisthacanthus* (Lourenço 1987, 1991, 1995) suggests that West African elements of the genus had reached the neotropics prior to the African disjunction in the late Cretaceous, where they subsequently evolved in isolation (Lamoral 1980). This invalidates both Newlands' (1973, 1978) trans-Atlantic rafting hypothesis and Francke's (1974) generic relimitation.

ECOLOGICAL NOTE. — The morphology of the telotarsi (notably the strongly curved ungues and enlarged dactyl) is indicative of an arboreal habit. In Gabon, specimens were observed at night sitting on tree trunks several metres above the ground (M. Burger, pers. comm.). This species presumably inhabits holes in tree trunks and the spaces behind peel-

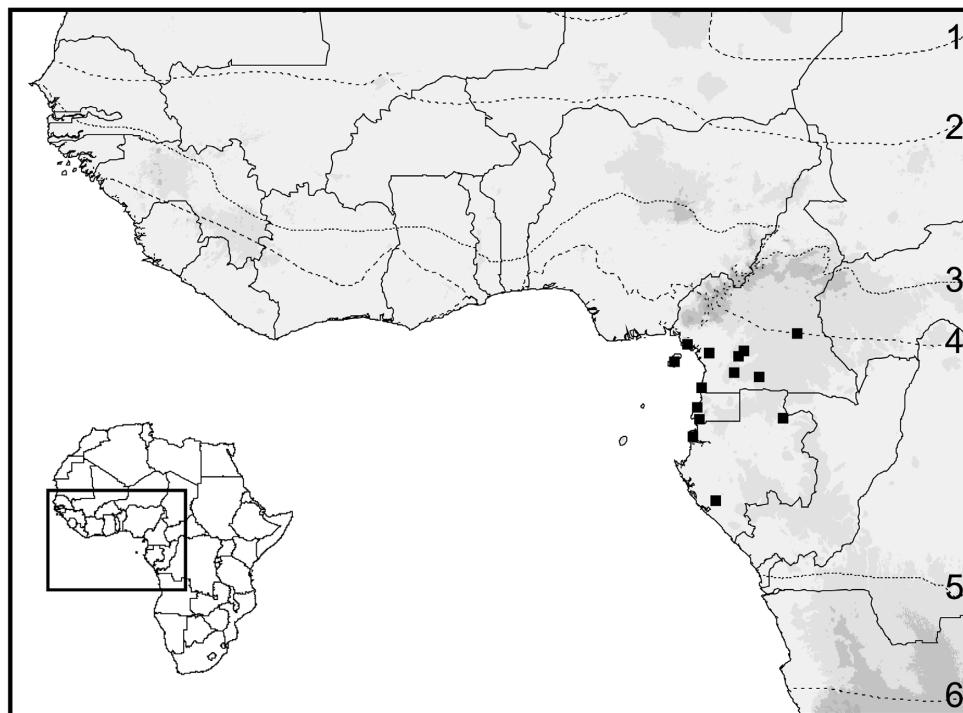


FIGURE 12. Map of West Africa illustrating the known distributional range of *Opisthacanthus lecomtei* (Lucas, 1858) (squares), based on data from Lamoral and Reynders (1975), Lourenço (1987) and the present contribution. Contour interval = 500 m. Numbered, dashed lines indicate the boundaries of major vegetation zones according to White (1983), such that: <1 = desert; 1-2 = semidesert; 2-3, >6 = arid to semiarid savanna; 3-4, 5-6 = moist savanna, with montane vegetation at high elevation; 4-5 = rainforest.

ing bark (Newlands 1973, 1978). The only other specimen for which ecological data are available was sifted from leaf litter.

RANGE. — Specimens of *O. lecomtei* are fairly well represented in collections. Almost all locality records occur in southwestern Cameroon and Gabon (Fig. 12), where the species is evidently endemic to montane rainforest. The two specimens for which data are available were collected at an elevation of 580–630 m. MRAC 134.274 represents the first record of this species from Bioko Island (Equatorial Guinea).

FAMILY SCORPIONIDAE

Pandinus dictator (Pocock)

Scorpio dictator Pocock, 1888:251–253 [Type loc.: Fernando Po (Bioko Island, Equatorial Guinea); holotype ♀: BMNH 1854.34]; Kraepelin, 1894:70–73, pl. I, figs. 16–17.

Pandinus dictator: Kraepelin, 1899:123, fig. 35; Kraepelin, 1901:270; Pocock, 1899:836; Werner, 1916:90; Lampe, 1917:199; Birula, 1927:87–88; Kraepelin, 1929:89; Werner, 1936:185; Kästner, 1941:234; Roewer, 1943:229; Belfield, 1956:45; Bücherl, 1964:59; Lourenço and Cloudsley-Thompson, 1996:133–136, figs. 2, 16–17; Kovařík, 1998:140.

Pandinus (Pandinopsis) dictator: Vachon, 1974:953, figs. 100, 113–115; Lamoral and Reynders, 1975:565; Kovařík, 1992:186; Kovařík, 1997:183; Fet, 2000b:470.

Although *P. dictator* has not been redescribed since its original description, the diagnostic characters of this species have been thoroughly elaborated in three papers. Belfield's (1956) key reviewed traditional diagnostic differences in the pectinal tooth count and the surface ornamentation of the carapace, terga and pedipalp chela manus between *P. dictator* and the closely related *P. imperator* and *P. gambiensis* (as *P. imperator gambiensis*). Vachon (1974) presented a new key, wherein diagnostic differences in the numbers and relative positions of pedipalp trichobothria were demonstrated among the three species, transferred *P. dictator* to a new subgenus, *Pandinopsis*, and retained the other two species, which are evidently more closely related, in the subgenus *Pandinus*. Lourenço and Cloudsley-Thompson (1996) summarized the differences presented by Vachon (1974) and discussed the known distributional range of the three species. All three species are protected by CITES due to overexploitation for the international trade in exotic pets (IUCN 1994).

ECOLOGICAL NOTE.—The thickened metasoma, short, robust legs with stout, spiniform macrosetae distributed laterally and distally on the basitarsi, and curved telotarsal unguis of *P. dictator* are indicative of a fossorial habit. As with the closely related *P. imperator* and *P. gambiensis*, *P. dictator* constructs burrows in termite mounds and under stones or logs (Newlands 1987). It is not known whether these burrows are occupied by more than one individual, as is the case with *P. imperator* (Toye 1970; Polis and Lourenço 1986; Mahsberg 1990).

RANGE.—Specimens of *P. dictator* are reasonably common in collections and, as is the case with *O. lecomtei*, this species appears to have a fairly restricted distributional range. All confirmed locality records occur in Cameroon, Congo, Equatorial Guinea (including Bioko Island, the type locality), and Gabon (Fig. 13), from which *P. dictator* is newly recorded in the present study (MRAC 132.725, CAS). Lourenço and Cloudsley-Thompson (1996) suggested that this species might also occur in southeastern Nigeria, but this seems unlikely as the Massif de l'Adamaoua, between Cameroon and Nigeria, appears to be an agent of vicariance, separating the distributional ranges of *P. dictator* and *P. imperator* (see below). *P. dictator* is endemic to lowland and montane rainforest, having been recorded at an elevation of 110–640 m.

Pandinus gambiensis Pocock

Pandinus imperator gambiensis Pocock, 1899:836 (Type loc.: Gambia; holotype ♂: BMNH 1895.7); Birula, 1910:143; Belfield, 1956:45.

Pandinus gambiensis: Vachon, 1967:1534–1537, figs. 1, 3–5, 9–11; Lourenço and Cloudsley-Thompson, 1996:133–136, figs. 3, 18–19; Kovařík, 1998:140.

Pandinus (Pandinus) gambiensis: Vachon, 1974:953; Lamoral and Reynders, 1975:566; Prost, 1982:7; Fet 2000b:466.

Vachon (1967) first realized the distinction between *Pandinus gambiensis* and its sister species, *P. imperator*, which can be separated by differences in granulation, the number of telotarsal spiniform setae, and the relative positions of pedipalp trichobothria (Belfield 1956; Vachon 1967, 1974; Lourenço and Cloudsley-Thompson 1996).

ECOLOGICAL NOTE.—Ecological data are absent for *P. gambiensis*, but are expected to be similar to *P. imperator*. The thickened metasoma, short, robust legs with stout, spiniform macrosetae distributed laterally and distally on the basitarsi, and curved telotarsal unguis are indicative of a fossorial habit. The species presumably constructs bur-

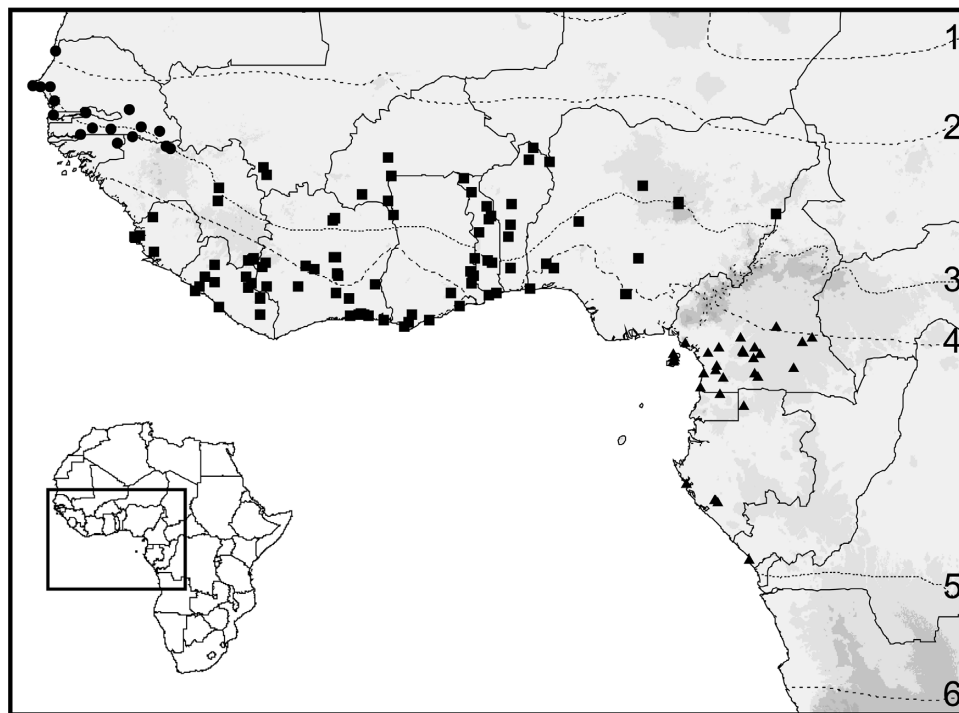


FIGURE 13. Map of West Africa illustrating the known distributional ranges of *Pandinus dictator* (Pocock, 1888) (triangles), *Pandinus gambiensis* Pocock, 1899 (circles), and *Pandinus imperator* (C. L. Koch, 1841) (squares), based on data from Vachon (1970), Lamoral and Reynders (1975) and the present contribution. Contour interval = 500 m. Numbered, dashed lines indicate the boundaries of major vegetation zones according to White (1983), such that: <1 = desert; 1-2 = semidesert; 2-3, >6 = arid to semiarid savanna; 3-4, 5-6 = moist savanna, with montane vegetation at high elevation; 4-5 = rainforest.

rows under stones or logs, which may be occupied by more than one individual, as in the latter species (Toye 1970; Polis and Lourenço 1986; Mahsberg 1990).

RANGE. — *Pandinus gambiensis* is endemic to savanna in Gambia, Senegal, Guinea-Bissau, and northern Guinea (Fig. 13). Vachon (1967, 1970) referred specimens from Boromo Somo (Burkina Faso) to *P. gambiensis*, but this is questionable. Prost (1982) and Lourenço and Cloudsley-Thompson (1996) referred records from Burkina Faso to *P. imperator*.

The distributional range of *P. gambiensis* is allopatric with that of its sister species, *P. imperator* (Vachon 1970; Lourenço and Cloudsley-Thompson 1996). Reports from Côte d'Ivoire (Fet 2000b) are referable to the latter. The conservation status of *P. gambiensis* is presently unknown, but the restricted range of this species is cause for concern.

Pandinus imperator (C. L. Koch)

Buthus afer (nec *Scorpio afer* Linnaeus, 1758): C. L. Koch, 1836:17, pl. LXXIX, fig. 175 (part); ?Guérin Méneville, 1843:9.

Buthus imperator C. L. Koch, 1841:1–2, pl. CCLXXXIX, fig. 695 (Type loc.: unknown; types: lost); C. L. Koch, 1850:87.

Heterometrus roeseli Simon, 1872:53–54, pl. VI, fig. 4 (Type loc: Guinea; type(s): MNHN [not examined]; synonymized by Thorell, 1893:377).

Heterometrus imperator: Simon, 1872:55–56.

Pandinus africanus Thorell, 1876:128, 202–203 (Type loc.: unknown; types not designated; synonymized by Fet 2000b:466).

Pandinus imperator: Thorell, 1876:130; Kraepelin, 1899:122–123; Pocock, 1899:836; Kraepelin, 1901:270; Werner, 1902:602; Birula, 1913:419; Borelli, 1913:220; Lampe, 1917:199; Pavlovsky, 1924:78; Birula, 1927:87–88; Werner, 1934:278, fig. 349; Werner, 1936:185; Vachon, 1940a:180; Kästner, 1941:234; Roewer, 1943:229; Frade, 1947:269; Bacelar, 1950:4; Roewer, 1952:32; Takashima, 1952:33; Vachon, 1952:13–15, figs. 7–12; Belfield, 1956:45; Bücherl, 1964:59; Vachon, 1967:1534–1537, figs. 1–2, 6–8; Garnier, 1973:1813–1816; Vachon, 1974, fig. 96; Prost, 1982:7; Lourenço, 1986:200; Kovařík, 1992:186; Lourenço and Cloudsley-Thompson, 1996:133–136, figs. 1, 10–14; Kovařík, 1998:140.

Scorpio simoni Becker, 1880:137–140, pl. II, fig. 1 [Type loc.: unknown; types possibly in Musée Royal d'Histoire Naturelle de Belgique, Bruxelles, Belgium (Fet 2000b:466); synonymized by Thorell, 1893:377].

Scorpio roeseli: Becker, 1880:137–140, pl. II, fig. 2; Pocock, 1888:253–254.

Scorpio imperator: Becker, 1880:137–140, pl. II, fig. 3; Pocock, 1888:254.

Pandinus africanus: Thorell, 1893:377–379; Karsch, 1884:68; Pavesi, 1895:39; Pavesi, 1897:157.

Scorpio africanus: Kraepelin, 1894:62–65 (part), pl. I, figs. 23, 25; Kraepelin, 1898:4–5.

Scorpio africanus typicus: Kraepelin, 1894:69.

Pandinus imperator typicus: Kraepelin, 1899:123.

Pandinus (Pandinus) imperator: Vachon, 1974:953; Lamoral and Reynders, 1975:566–567; Dupré, 1990a:9; El-Hennawy, 1992:100, 138; Kovařík, 1997:184; Fet, 2000b:466–467.

Pandinus imperator is the best known of the three West African species of the genus. Diagnostic differences between *P. imperator* and the related species, *P. gambiensis* and *P. dictator*, are summarized by Belfield (1956), Vachon (1967, 1974) and Lourenço and Cloudsley-Thompson (1996). The taxonomic validity of the subspecies *Pandinus imperator subtypicus* (Kraepelin, 1894), described from Habab, Abyssinia (now Eritrea) is uncertain. This may represent a distinct species, or a synonym of one of the 20 species of *Pandinus* described from northeastern Africa.

The ecology, behavior, and physiology of *P. imperator* have been extensively studied (e.g., Toye 1970; Garnier and Stockmann 1973; Casper 1985; Mahsberg 1990). This species is readily obtained from pet stores in Europe, the U. S. A., and Japan and there is an extensive literature on captive husbandry and breeding (e.g., Larrouy et al. 1973; Garnier 1974; Krapf 1988; Copeland 1990; Dupré 1990b; Montambaux 1996; Schiejok 1997; Mahsberg et al. 1999). The remaining wild populations are threatened not only by the exotic pet trade, but also by continuing destruction of their habitat through deforestation. However, the decline in this species may be partially alleviated by its recent CITES status (IUCN 1994; Lourenço and Cloudsley-Thompson 1996) and the increasing preference for captive-bred specimens in the pet trade (R. D. Gaban, pers. comm.).

ECOLOGICAL NOTE. — *Pandinus imperator* inhabits primary rainforest, relict gallery forest, and savanna (Toye 1970; Vachon 1970; Lourenço 1986; Mahsberg 1990; Lourenço and Cloudsley-Thompson 1999). Vachon (1952) reported specimens collected from primary rainforest in Guinea at an elevation of 500–1250 m. Two ecotypes, corresponding to forest and savanna populations, have been reported from the Côte d'Ivoire (Garnier and Stockmann 1972; Garnier 1973; Lourenço and Cloudsley-Thompson 1996, 1999).

As with other species of the genus, *P. imperator* constructs burrows using the short, robust legs with stout, spiniform macrosetae distributed laterally and distally on the basitarsi, and the thickened metasoma (Newlands 1987). Burrows are preferentially constructed in termite mounds and under stones or logs, and may contain up to 20 individuals, with the largest individual nearest the entrance (Toye 1970; Polis and Lourenço 1986; Mahsberg

1990). Mixed age groups of related and unrelated individuals cohabit with minimal aggression or cannibalism in laboratory terraria, and group living has been demonstrated to contribute significantly to postembryonic growth rate and survival probability, especially among kin (Mahsberg 1990; Kriesch 1994).

Pandinus imperator is known for its unusual activity rhythms. Diurnal activity has frequently been observed in this species, which may appear on the surface in large numbers, especially after rains (Toye 1970; Newlands 1987).

RANGE. — As indicated by Vachon (1967, 1970) and Lourenço and Cloudsley-Thompson (1996), the distributional range of *P. imperator* extends from Guinea and Sierra Leone, through Liberia, Côte d'Ivoire, Ghana, Togo and Benin, into eastern Nigeria (Fig. 13). Records from Mali (Vachon 1970) and Burkina Faso (Vachon 1970; Prost 1982) are unconfirmed.

Reports of *P. imperator* from Guinea-Bissau (Frade 1947; Bacelar 1950) and Senegal (Werner 1936) are referable to *P. gambiensis*, whereas reports from Congo, Equatorial Guinea and Gabon (Pocock 1899; Lamoral and Reynders 1975; Fet 2000b) are referable to *P. dictator*. Reports from East Africa (Kraepelin 1894, 1898; Pavese 1895, 1897; Roewer 1952; Fet 2000b) are referable to other species of *Pandinus*.

Pandinus imperator is allopatric with *P. gambiensis* and *P. dictator* (Vachon 1967; Lourenço and Cloudsley-Thompson 1996). The Massif de l'Adamaoua, between Cameroon and Nigeria, appears to be the agent of vicariance, separating the distributional ranges of *P. imperator* and *P. dictator*, which evidently display similar habitat predilections. The agent of vicariance separating the distributional ranges of *P. gambiensis* and *P. imperator* is unclear, but may be associated with climatic variables, e.g., northwardly decreasing rainfall.

DISCUSSION

The region encompassed by Cameroon, Equatorial Guinea, and Gabon contains the highest species richness and endemism of scorpions in tropical West Africa. Nine species are recorded from Cameroon alone (ca. 475,000 km²), whereas only four species are recorded from the region encompassed by Côte d'Ivoire and Ghana (ca. 560,999 km²), yet both regions are similar in area and habitat—rainforest in the coastal lowlands, with savanna in the interior (White 1983) — and comparably well sampled.

Gabon is 43% smaller (ca. 267,667 km²), and its scorpion fauna more poorly sampled, than neighboring Cameroon. However, Gabon includes six of the species recorded from Cameroon, and four of the six species endemic to the region (Table 1). This is unexpected, since Gabon incorporates less habitat diversity than Cameroon, comprising mostly lowland rainforest (White 1983). Future collecting efforts in the savannas of southern Gabon may increase the count.

The high species richness and endemism of Cameroon, Equatorial Guinea, and Gabon can be attributed to the greater number of silvicolous palaeoendemics (e.g., *O. lecomtei* and *Lychasioides amieti* Vachon, 1974), in turn resulting from prolonged climatic stability in the region. The Massif de l'Adamaoua, separating Cameroon from Nigeria, appears to represent a natural biogeographic boundary between the richer scorpion fauna inhabiting the rainforests of the Congo basin to the southeast, and the more depauperate scorpion fauna inhabiting the coastal rainforest-savanna mosaic to the west.

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APPENDIX A
Specimens Examined

Babycurus buettneri. — West Africa, Dr Kirk: BMNH 1865.60 (holotype ♂ of *Rhoptrurus kirki*). CENTRAL AFRICAN REPUBLIC: Prefecture Sangha-Mbaéré, Parque National de Dzanga-Ndoki, Mabea Bay, 21.4 km 53° NE of Bayanga, at Camp 1, 03°02'01"N, 016°24'34"E, M. Burger, 5.v.2001: CAS (♀). GABON: Sibango Farm bei Gaboon, Büttner, 15.ix–20.x.1884: ZMB 4367 (holotype ♀); Prov. Ogooué-Maritime, Aire d'Exploit, Rationnelle de Faune des Monts Doudou, 24.3 km 307° NW Doussala, 02°13'21"S, 010°24'21"E, 375 m, B. L. Fisher, 6–12.iii.2000, rainforest, bucket pitfall trap: CAS (2♂); Prov. Ogooué-Maritime, Reserve de Faune de la Moukalaba-Dougoua, 12.2 km 305° NW Doussala, 02°17'S, 010°29'49"E, 110 m, B. L. Fisher, 10.ii.2000, rainforest, ex rotten log: CAS (♀); Prov. Ogooué-Maritime, Reserve Monts Doudou, 25.2 km 304° NW Doussala, 02°13'36"S, 010°23'12"E, 375 m, M. Burger, 14–19.iii.2000, rainforest, between termite mound and tree trunk: AMC (♂); Prov. Ogooué-Maritime, SE of Gamba, on road to Vera, near pitfall trapline #3, 02°45'13"S, 010°06'41"E, M. Burger, vii.2001, in forest habitat: USNM (♀).

Babycurus centrurimorphus. — NW Madagascar [dubious], J.M. Hildebrandt: ZMB 4307b (♀ lectotype), ZMB 4307a (♂, 3 ♀ paralectotypes).

Babycurus johnstonii. — CAMEROON: Rio del Rey [04°44'N, 008°39'E], near Old Calabar River, Cameroon-Nigeria border, H. H. Johnston: BMNH 1890.3.18.1–2 (lectotype ♀ and paralectotype ♀).

Babycurus melanicus. — GABON: Prov. Ogooué-Maritime, Reserve de Faune de la Moukalaba-Dougoua, 12.2 km 305° NW Doussala, 02°17'S, 010°29'49"E, 110 m, M. Burger, 3.iii.2000, rainforest, ex rotten log: ♀ (CAS); same data, except 'B. L. Fisher,

24.ii–3.iii.2000, rainforest, on ground': CAS (♀); Prov. Ogooué-Maritime, Aire d'Exploit, Rationnelle de Faune des Monts Doudou, 24.3 km 307° NW Doussala, 02°13'21"S, 010°24'21"E, 375 m, B. L. Fisher, 6–12.iii.2000, rainforest, bucket pitfall trap: AMC (♀), CAS (subadult ♀); Prov. Ogooué-Maritime, Loango National Park, O. S. G. Pauwels, xi.2002: MRAC 213087 (2♀).

Babycurus neglectus. — GHANA: Kete Kratschi [Kete Krachi, 07°48'N, 000°01'W]: SMF RII/8873 (2♀ [not ♂, ♀]). TOGO: Atakpamé [07°38'N, 000°59'E]: SMF RII/6696 (♀).

Babycurus pictus. — KENYA: Athi Plains, G. W. Gregory: BMNH 1893.11.9.3 (holotype ♀).

Opisthacanthus africanus. — CENTRAL AFRICAN REPUBLIC: Prefecture Sangha-Mbaéré, Parque National de Dzanga-Ndoki, 38.6 km 173° S of Lidjombo, at Camp 3; 02°31'26"N, 016°03'12"E, M. Burger, 25.v.2001: CAS (♀). DEMOCRATIC REPUBLIC OF CONGO: Congo [06°04'S, 012°24'E], don. Gilson: MRAC 4552–4554 (♂, 2♀); Bas. Congo, Cattien, Delafaille, 1956: MRAC 88.080 (♀); Bas. Congo, Kimwenza [04°27'S, 015°17'E], R. P. Van Eyden, 1956: MRAC 85.570 (♀); Moyen Congo, Kimuenza, 04°28'S, 015°17'E, A. Bouillon, 1965: MRAC 128.436 (♂); Bas. Congo, rég. Weka, 05°43'S, 012°36'E, A. Marée, i.1949: MRAC 66.981 (♂); Equateur, Bas. Congo, riv. Bangu Bangu, km 53 route N Boma, 00°04'S, 019°12'E, J. Meulenbergh, 1964: MRAC 127.111 (♀); Kongo dia Venga, 05°26'S, 013°27'E, M. Bequaert, 19.vi.1951: MRAC 69.743 (subad. ♀); Bamanian, 00°01'N, 018°19'E, R. P. Hulstaert, 20.iii.1956: MRAC 85.445 (♂); same data, except '21.viii.1957': MRAC 113.442 (♀); Bamba Kilenda [04°55'S, 015°29'E], Mme. Lepersonne, vii.1948: MRAC 61.382 (♂); Banana, 06°00'S, 012°24'E, Mesmaeckers, i.1952: MRAC 72.488 (♂); Basankusu, 01°14'N, 019°48'E, N. D. Bunderen, x.1951: MRAC 69.346 (subad. ♂); Bokuma, 00°06'S, 018°41'E, R. P. Lootens, 1.ii.1952: MRAC 72.528 (♂); same data, except 'vii.1952': MRAC 73.614 (♀); same data, except '1954': MRAC 80.864–80.865 (♂, ♀); Boma, 05°51'S, 013°03'E, L. Mesmaeckers, xii.1950: MRAC 68.924 (juv.); Bolobo, 02°10'S, 016°14'E, J. D. Vickers, 1956: MRAC 87.665 (♀); Coquilhatville [Mbandaka, 00°04'N, 018°16'E], Lang-Chapin Congo Exp., 19.v.1915: AMNH (♀); Kamangu [05°30'S, 018°06'E], H. Schouteden, 1941: MRAC 57.771 (♂); Kinshasa [04°20'S, 015°19'E], Lang-Chapin Congo Exp., 27.v.1915: AMNH (2♀); S. E. Kinshasa, 80 km de Moloundou, R. Brisson, vi.1970: MRAC 138.722 (2♂); Léopoldville [Kinshasa], 04°19'S, 015°19'E, Mme. Lepersonne, 1942: MRAC 57.667 (♀); Léopoldville, Stanley Pool [Pool Malebo, 04°17'S, 015°30'E], J. H. Camp, 30.ix.1893: USNM 27389 (5♂, 4♀, 2 juv.); Lukalela [01°03'S, 017°12'E], Breulheid, xi.1941: MRAC 57.728–57.730 (♂, 2♀); Lukolela [01°03'S, 017°12'E], Lang-Chapin Congo Exp., 21.v.1915: AMNH (♀); Lukengi, Kasoi [03°23'S, 018°03'E], Fontainas: MRAC 4677 (♀); Luki, 05°38'S, 013°04'E, A. van Olstein, 28.iv.1952: MRAC 72.704 (♀); Luki, Boma, 05°38'S, 013°04'E, Wagemans, 1957: MRAC 97.204–97.205 (♂, ♀); Camp de la Luki, 05°38'S, 013°04'E, Leprez: MRAC 130.815 (♀); Luozi, 04°57'S, 014°08'E, Bequaert and Schotte, 1951: MRAC 69.527 (juv. ♂); Mabali, 00°53'S, 018°07'E, G. Marlier, 1955: MRAC 85.441 (subad. ♀); Mayidi, 05°11'S, 015°09'E, R. P. van Eyden, 1952: MRAC 74.727–74.729 (♂, 2♀); Malela [04°20'S, 017°51'E], Lang-Chapin Congo Exp., 9.vii.1915: AMNH (3♂, 5♀, 2 subad. ♂, 3 subad. ♀, 15 juv.); Matadi, 05°49'S, 013°28'E, Courtois: MRAC 57.773 (♀); same data, except 'S. A. Coplac, 1920': MRAC 171.949 (♀); Mavuma,

05°05'S, 012°59'E, M. Bequaert, xi.1950: MRAC 68.934 (♀); Moanda, 05°56'S, 012°21'E, E. Darteville, 1947: MRAC 65.907 (♀); Wolter (C.F.M.L.) [04°49'S, 015°11'E], R. Close, 1954: MRAC 77.183 (♀). GABON: Prov. Ogooué-Maritime, Reserve de Faune de la Moukalaba-Dougoua, 12.2 km 305° NW Doussala, 02°17'S, 010°29'49"E, 110 m, B. L. Fisher, 25.ii–4.iii.2000, rainforest, bucket pitfall trap: AMC (♀); same data, except 'M. Burger, 3.iii.2000, rainforest, ex rotten log': CAS (♀); Prov. Ogooué-Maritime, E of Gamba, on road to Vera, trapline #5, 02°44'25"S, 010°06'41"E, M. Burger, 24.vii.2001, in forest habitat with stream nearby: USNM (♂).

Opisthacanthus lecomtei. — CAMEROON: Kamerun, West Africa, E. A. Ford: AMNH (♂, juv. ♂); British Cameroons, Sassé, near Buea [04°09'N, 009°14'E], ca. 3500 ft on slope of Mt. Cameroons, S. Tita, xii.1950: CAS (♂, ♀); same data, except 'iii.1951': CAS (♀); same data, except 'iv–v.1951': CAS (♀); Olounou, 02°49'N, 012°08'E, F. Puylaert, 11–19.ix.1971: MRAC 140.746 (subad. ♂); 10 mi W Bertoua [04°35'N, 013°41'E], 640 m, E. S. Ross and K. Lorenzen, 5.x.1966: CAS (♂, subad. ♂). EQUATORIAL GUINEA: Fernando Po [Bioko Island, 03°27'N, 008°41'E], Banapa, Ramon Persamon, vii.1968: MRAC 134.274 (♀). GABON: Prov. Ogooué-Maritime, Aire d'Exploit, Rationnelle de Faune des Monts Doudou, 24.5 km 303° WNW Doussala, 02°13'58"S, 010°23'53"E, 630 m, B. L. Fisher, 18.iii.2000, rainforest, sifted litter: AMC (♂).

Pandinus dictator. — West Africa, purchased Stevens: BMNH 1865.33 (paratype ♀). En face d'Irebu, rive Française ou fleuve Congo [Irebu, 00°37'S, 017°45'E, dubious], Nassent: MRAC 23.924 (♂). CAMEROON: 30 km E of Kribi [02°57'N, 009°55'E], on road to Yaoundé [03°52'N, 011°31'E], Vanderbilt Afr. Exped., 26.xi.1924: MCZ (2♂, 2♀, subad. ♂, 22 juv.); Kamerun, West Africa, E. A. Ford: AMNH 3427 (2♀); Kamerun, Finley McGrissett: AMNH 25505 (subad. ♀); Akandinga [Akanolinga, 03°46'N, 012°15'E], D. Thys v.d. Audenaerde, 28.x.1964: MRAC 127.802 (♀); Bipindi [03°05'N, 010°25'E], French Cameroon, S. E. Johnson: MCZ (6♀, juv. ♀); Efulén [02°46'N, 010°43'E], French Cameroon, Finley McGrissett, 1931–1932: AMNH (4♀, juv.); Ekoumdoum, Biba, 03°49'N, 011°32'E, D. Thys v.d. Audenaerde, 9.x.1964: MRAC 127.801 (2♂); Métet [02°58'N, 012°01'E], George Schwab: AMNH ex MCZ (♀), MCZ (3 ♀, subad. ♀); Mevo-Nkoulou, 03°47'N, 011°34'E, Thys v.d. Audenaerde, 22–28.iv.1973: MRAC 148.448 (♀); Lom et Kadié [Kadey], Miéri, Batouri, 04°15'N, 13°58'E, F. Puylaert, 26.i.1976: MRAC 148.189 (♀); Nkolmébang, 04°24'N, 011°25'E, D. Thys v.d. Audenaerde, 20.x.1964: MRAC 127.800 (5♂); Olounou, 02°49'N, 012°08'E, F. Puylaert, 11–19.ix.1971: MRAC 140.741 (♀); Sakbayémé [04°02'N, 010°34'E] par Edéa [03°48'N, 010°08'E], George Schwab: MCZ (♀). EQUATORIAL GUINEA: Micomeseng, 02°08'N, 010°37'E, M. Alderweireldt, vii.1989: MRAC 173.131 (♂); Fernando Po [Bioko Island, 03°27'N, 008°41'E], Capt. Birch: BMNH 1854.34 (holotype ♀); Fernando Po, St. Isabel, 03°45'N, 008°42'E, Ramon Persamon, vii.1968: MRAC 134.273 (♂). GABON: Omboué (Fernan Vaz) [01°34'S, 009°15'E], C. R. Aschemeier, Collins-Garner Congo Exp., 14.v.1917: USNM (♀); same data, except '30.vi.1917': USNM (♀); same data, except '7.vii.1917': USNM (♀); Oyem, 01°37'N, 011°35'E, J. Collot, 1966: MRAC 132.725 (♀); Prov. Ogooué-Maritime, Aire d'Exploit, Rationnelle de Faune des Monts Doudou, 24.3 km 307° NW Doussala, 02°13'21"S, 010°24'21"E, 375 m, B. L. Fisher, 6–12.iii.2000, rainforest, bucket pitfall trap: AMC (♀); Prov. Ogooué-Maritime, Aire d'Exploit, Rationnelle

de Faune des Monts Doudou, 24.5 km 303° WNW Doussala, 02°13'58"S, 010°23'53"E, 630 m, B. L. Fisher, 18.iii.2000, rainforest, sifted litter: AMC (2♂); Prov. Ogooué-Maritime, Reserve de Faune de la Moukalaba-Dougoua, 12.2 km 305° NW Doussala, 02°17'S, 010°29'49"E, 110 m, B. L. Fisher, 10.ii.2000, rainforest, on ground: CAS (♀); same data, except '24.ii–3.iii.2000, rainforest': CAS (4♂, 2♀, juv. ♀); same data, except '25.ii–4.iii.2000, rainforest, bucket pitfall trap': CAS (2♂, 2♀); same data, except 'M. Burger, 3.iii.2000, rainforest, ex rotten log': CAS (4 juv. ♂, juv. ♀); Prov. Ogooué-Maritime, Reserve Monts Doudou, 24.5 km 303° WNW Doussala, 02°14'S, 010°23'54"E, 630 m, B. L. Fisher, 18.iii.2000, rainforest, sifted litter: CAS (♂, subad. ♀, juv. ♀). No data: AMNH (juv.).

Pandinus gambiensis. — GAMBIA: Gambia, Captain Maloney: BMNH 1895.7 (holotype ♂). SENEGAL: USNM (2♂); Tonia Taba Gambia [Toniataba, 13°19'N, 013°35'W], D. E. Harvey, 14.vi.1966: USNM (2♂). No data: MCZ (2♀).

Pandinus imperator. — West Coast Africa, Dr G. A. Perkins: MCZ (♀). BENIN: 11°40'N, 002°50'E, near Djona on Alibory River, J. A. MacKallor, v.1964: USNM (juv. ♂); Ferme Founfoun à 1 km de Savacon [Savakon, 07°15'N, 002°04'E], D. Meirte, 30.iii.1997, sous bois mort: MRAC 208.379. CÔTE D'IVOIRE: Adiopo Doumé [05°20'N, 004°07'W], 17.viii.1966: MRAC 130.708 (♀); Appouessou, Forêt Classée Bossematie, Eco. Forest, 06°35'N, 003°28'W, pitfall, Station 2°, R. Jocqué and N. Séabé, 18.iii.1994: MRAC 205.479 (juv. ♀); same data, except 'Station 2B, 3.v.1994': MRAC 205.480 (juv. ♀); same data, except 'Station 2C, R. Jocqué and Tanoh, 9.iv.1995': MRAC 205.309 (juv. ♀); same data, except 'Station 2B': MRAC 205.310 (juv. ♀); Ivory Coast, Banco Forest [05°22'N, 004°03'W], J. Visser, ii.1989: SAMC C4509–4510 (2♀), SAMC C4508 (subad. ♂); Bingerville, 05°21'N, 003°54'W, J. Decelle, 1962: MRAC 123.726 (2♂); same data, except 'xii.1963': MRAC 126.978 (♂); Bouaké, 07°41'N, 005°02'W, P. M. Elsen, vi.1977: MRAC 160.472 (juv. ♀); same data, except 'v.1977': MRAC 160.474 (juv. ♂); Chaussée de Badika[ha], riv. Bandama blanc, 09°12'N, 005°10'W, G. Teugels, 22.viii.1985: MRAC 168.783 (juv. ♂); Danangoro, 07°11'N, 005°56'W, P. M. Elsen, iii.1977: MRAC 160.473 (juv. ♂); Flampleu, 07°17'N, 008°03'W, Verheyen and Thys v.d. Audenaerde, 20–24.vii.1966: MRAC 131.048–131.049 (2 juv. ♂); Kossou, 06°57'N, 004°58'W, R. Jocqué, 13.iv.1975: MRAC 160.528 (subad. ♂); same data, except '13.v.1975': MRAC 160.529 (2 juv. ♂); same data, except 'v.1975': MRAC 161.991 (2 juv. ♂, juv. ♀); Toyébli [06°37'N, 008°29'W], Verheyen and Thys v.d. Audenaerde, 2–3.viii.1966: MRAC 130.717 (7♂, 13♀); same data, except '29–30.viii.1966': MRAC 130.718 (11♂, 9♀); Village km 7 route Toulépleu Liberia, 06°28'N, 008°38'W, Verheyen and Thys v.d. Audenaerde, 2.viii.1966: MRAC 130.719 (16♂, 6♀), MRAC 130.720 (20♂, 9♀). GHANA: Cape Coast [05°06'N, 001°14'W], Univ. Cape Coast Collection, Dr Jerry Boggs: AMNH (♂, ♀, 5 juv.); Cape Coast, 15.vi.1969: USNM (subad. ♂); Tafo [06°13'N, 000°22'W], residential area, in garden of bungalow, at base of dead plantain, excavated chambers in soil terrarium, R. G. Donald, iii–iv.1946: AMNH (2♂, juv.); Wegbe [07°07'N, 000°27'E], Togoland, W. Innes, 1899: SAMC 6353 (♀). LIBERIA: Colonization Society, J. O. Wilson: USNM 30467 (♂); Bell[e] Yella [07°23'N, 010°00'W], W. M. Mann, Smithsonian Institution-Firestone Expedition, iii.1940: USNM (♂); Dobli Island [06°53'N, 010°23'W], Bequaert: MCZ (♂); Ganta [05°38'N, 009°48'W], 1932: AMNH 32332 (2♀); Gibanga, Harvard Exped.: MCZ (3♂, 2♀, subad. ♂, juv. ♂); Gibi [06°40'N, 010°00'W], W. M. Mann, Smithsonian Institu-

tion-Firestone Expedition, 1940: USNM (♂, subad. ♂); Monrovia [06°18'N, 010°48'W]: MCZ (♂); Monrovia, 06°19'N, 010°48'W, W. G. Johnson, 1975: MRAC 147.335 (8♂, 5♀); Monrovia, R. N. Nilson, 29.vii.1963: CAS (2♂); Mt. Coffee [06°30'N, 010°36'W], O. F. Cook, 1896: USNM (5♂, ♀); Mt. Coffee, Rev. George P. Goll, 1899–1900: USNM (♀); Nimba County, Oldtown Gobonwea, 225 mi from Monrovia, 40 miles E Mt. Nimba [07°33'N, 008°37'W], Charles D. Miller III, at night, with aid of light, they frequent rocky outcrops in the bush, frequently come out during the day after heavy rains: AMNH (2♂, 2♀), USNM (4♂, 3♀); Yekepa Nimba, 07°35'N, 008°28'W, M. Louette and P. Rigaux, 15.iii.1980: MRAC 155.160 (♂); Zwedru (Tchien) [06°04'N, 008°08'W], Eastern Prov., J. J. Baldwin, Jr.: USNM 177246 (♂); Zwedru [06°01'N, 008°09'W], Jensen, 6.vi.1947: USNM (juv. ♀). NIGERIA: Ibadan, 07°14'N, 003°50'E, S. Afolabi Toyé, ix.1968: MRAC 134.308 (♂, ♀); Jos, 09°55'N, 008°54'E, E. Bot Gwong, x–xii.1965: MRAC 130.639 (juv. ♂, 2 juv. ♀); Kaduna [10°36'N, 007°27'E], N Nigeria, W. McDonald, ii.1958: AMNH (♀); Kwara State, Iyale, 60 miles S Idah [07°39'N, 007°17'E], L. Dick, i.1970: AMNH (juv. ♀); Oloke Meji [07°25'N, 003°32'E], Ibadan: USNM (2♀); Plateau Province, Jos, 09°55'N, 008°54'E, Meussen and Bouguiaux, 7–26.iv.1963: MRAC 123.774 (juv. ♀). SIERRA LEONE: Freetown, Pepel Town, 08°30'N, 013°15'W, D. Olu-Pitt, iv.1977: MRAC 159.087 (juv. ♀); Pepel Town, 08°35'N, 013°03'W, D. Olu-Pitt, ix.1976: MRAC 148.502 (juv. ♂). TOGO: AMNH (♂, 3♀, juv.); Atakpamé, Kolekepe [Kolokopé], 07°28'N, 001°19'E, F. Puylaert, 26–31.viii.1969: MRAC 136.004 (♂); Badou, 07°37'N, 000°37'E, Dr W. Verheyen and coll., 17.vii.1968: MRAC 134.644 (♂); Bafilo, Aledje [Alédjo], 09°15'N, 001°12'E, F. Puylaert, 19.vii.1969: MRAC 136.007 (subad. ♀); Fazao [08°42'N, 000°46'E], F. Puylaert, 20–24.viii.1969: MRAC 200.957 ex 135.994 (♂, 2♀); Niamtougou, 09°46'N, 001°06'E, F. Puylaert, 21–24.vii.1969: MRAC 136.005 (2♂, ♀); Nanergou, 10°55'N, 000°09'E, Dr W. Verheyen and coll., 17.viii.1968: MRAC 134.642 (7♂, 11♀); Togoville, 06°14'N, 001°29'E, F. Puylaert, 11–17.ix.1969: MRAC 136.006 (♂), MRAC 200.958 ex 135.995 (♀), MRAC 136.008 (2 juv. ♂, 2 juv. ♀). No data: AMNH (2♂).

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