

*LOUISEA*, A NEW GENUS OF FRESHWATER CRAB  
(BRACHYURA: POTAMOIDEA: POTAMONAUTIDAE)  
FOR *GLOBONAUTES MACROPUS EDEAENSIS*  
BOTT, 1969 FROM CAMEROON

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*Abstract.*—*Globonautes macropus edeaensis* Bott, 1969 and *G. balssi* Bott, 1959 from Cameroon are removed from the Gecarcinucidae Rathbun, 1904 and reassigned to the Potamonautidae Bott, 1970. *Globonautes m. edeaensis* is recognized as a valid species, and is established as the type species of *Louisea*, a monotypic new genus. *Louisea* is defined by a combination of characters of the mandible, third maxilliped, cheliped, and gonopods 1 and 2. *Louisea edeaensis* is compared to, and distinguished from, other freshwater crabs occurring in West Africa. *Globonautes balssi* is close to *Louisea* but is regarded here as *incertae sedis*. A key to the West African genera of the Potamonautidae is provided.

The African family Potamonautidae Bott, 1970 currently includes four genera, *Potamonautes* MacLeay, 1838, *Sudanonautes* Bott, 1955, *Liberonautes* Bott, 1955, and *Potamonemus* Cumberlidge & Clark, 1992. *Potamonautes* is widely distributed throughout sub-Saharan Africa (Bott 1955), *Sudanonautes* is found from Cote d'Ivoire to Central Africa (Bott 1955; Monod 1977, 1980; Cumberlidge 1989, 1993a), and *Liberonautes* is found in West Africa west of Ghana (Cumberlidge & Sachs 1989a, 1989b). The fourth genus, *Potamonemus*, is known only from southwest Cameroon (Cumberlidge & Clark 1992, Cumberlidge 1993b).

The present work reappraises the taxonomy of two poorly known species from Cameroon, *G. macropus edeaensis* Bott, 1969, and *Globonautes balssi* Bott, 1959. Both species are presently included in the Gecarcinucidae Rathbun, 1904 (Bott 1959, 1969, 1970) but there is some doubt as to the validity of these assignments. For example, the form of the mandible of *G. m. edeaensis* indicates that this species belongs in the Potamonautidae, while Cumberlidge

(1987) examined the mandible of *G. balssi* and concluded that this taxon also belongs in the Potamonautidae.

The exact classification of *G. m. edeaensis* and *G. balssi* within the Potamonautidae is more difficult. The two species most closely resemble members of *Potamonemus*, which are also from the same part of Cameroon (Cumberlidge & Clark 1992, Cumberlidge 1993b). *Potamonemus* is characterized by a potamonautid-type mandibular palp (2-segmented, and ending in a single lobe) together with a third maxilliped which completely lacks a flagellum on the exopod. Two male specimens of *G. m. edeaensis* from Cameroon, recently discovered in the Museum für Naturkunde der Humboldt-Universität, Berlin, Germany (ZMB), allow a complete re-assessment of this taxon. *G. m. edeaensis* has a potamonautid-type mandibular palp, together with a third maxilliped which completely lacks a flagellum on the exopod. However, differences in the form of gonopod 2 of *G. m. edeaensis* argue against its inclusion in *Potamonemus*, or in any of the other three potamonautid freshwater crab genera known from Africa. The new

genus *Louisea* is therefore proposed to accommodate *G. m. edeaensis*, which is designated the type species, and a key to the West African genera of the Potamonautidae is provided.

Unfortunately, the position of *G. balssi* cannot be properly assessed because the male type specimen is in poor condition; therefore this taxon is regarded here as incertae sedis.

The following abbreviations are used: CW = carapace width at widest point; CL = carapace length, measured along median line; CH = carapace height, maximum depth of cephalothorax; FW = front width, width of front measured along anterior margin; M = male, F = female, ad = adult, juv = juvenile, ovig = ovigerous; SMF = Natur-Museum und Forschungs-Institut Senckenberg, Frankfurt am Main, Germany; USNM = National Museum of Natural History, Smithsonian Institution, Washington, D.C.; ZIM = Zoological Institute and Museum, Hamburg, Germany; ZSBS = Zoologische Sammlung des Bayerischen Staates, München, Germany.

### Methods

The holotype of *L. edeaensis* was loaned from the ZSBS; two other specimens discovered in the ZMB were subsequently loaned. The male holotype of *L. edeaensis* is in poor condition, and the entire left mandible and the palp of the right mandible are missing. Fortunately the other specimens of *L. edeaensis* are in good condition, and were collected in Cameroon less than 90 km from the type locality. The male holotype of *G. macropus* (Rathbun, 1898) was examined in the USNM.

The male holotype and the second female paratype of *G. balssi* were examined in the SMF where they were on temporary loan. The male holotype of *G. balssi* is a juvenile, and both second gonopods are missing. The female paratype of *G. balssi* was examined in the ZIM.

Four dimensions of the carapace, carapace length, carapace width, carapace height, and front width—were recorded from each specimen using digital calipers (Table 1). The relative proportions of the latter three measurements (adjusted for body size, CL) of both species were calculated (Table 1). The left mandible and the left gonopod 1 and gonopod 2 were illustrated following removal from the specimens in order to describe these structures from different angles and under magnification. Characters of the gonopods, carapace, and third maxillipeds of these specimens correspond closely with those of the holotype. The carapace, mandible and other characters of the largest of these specimens were illustrated. The length of the propodus of the right and left chelipeds of all specimens was measured along the ventral margin (Table 2).

### *Louisea*, new genus

*Globonautes* Bott, 1959:995, pl. 1, figs. 1–6; 1969:359; 1970:23.

*Type species.*—*Globonautes macropus edeaensis* Bott, 1969:360; 1970:24, pl. 1, figs. 3–5, pl. 26, fig. 8.

*Diagnosis.*—Mandibular palp 2-segmented, terminal segment single (Fig. 3d, e). Third maxilliped lacking flagellum on exopod (Fig. 1c). Terminal segment of gonopod 1 directed outward, broad at base, narrowing sharply, final  $\frac{2}{3}$  almost S-shaped, tube-like, end blunt, rounded; completely lacking longitudinal groove; subterminal segment of gonopod 1 very wide at base (Fig. 1g, h). Terminal segment of gonopod 2 flagellum-like, almost as long as subterminal segment (Fig. 1i). Dactylus of right cheliped of adult male slim, propodus with large 3-peaked proximal tooth (Fig. 1e). Propodus very long, as long as carapace width. Anterior dorsal margin of merus of chelipeds with 1 large jagged tooth close to distal end, rows of small pointed teeth along rest of margin (Fig. 1a). Carapace distinctly convex, half carapace length (mean CH/CL

= 0.46), carapace, anterolateral margin, lower margin of orbit, postfrontal crest, smooth (Fig. 1a, b). Exo-orbital, epibranchial teeth small, low, distinct intermediate tooth present, vertical flank suture meeting anterolateral margin at epibranchial tooth (Fig. 1b). Small species, mature at CW = 22.0 mm.

*Distribution.*—Edea (3°48'N, 10°12'E) and Yabassi (4°32'N, 9°58'E) are 90 km apart, in the rain forest zone of the Littoral Province of southwest Cameroon. Edea lies on the Sanaga River, while Yabassi lies on the Wouri River.

*Remarks.*—This new genus of the Potamonautidae is established to accommodate *Louisea edeaensis* previously considered as a subspecies of *Globonautes macropus* in the family Gecarcinucidae.

#### Key to the Genera of the West African Potamonautidae

1. Terminal segment gonopod 2 very short, stump-like,  $\frac{1}{10}$  length of subterminal segment ..... 2
- Terminal segment gonopod 2 very long, flagellum-like, equal in length to subterminal segment ..... 3
2. Third maxilliped with long flagellum on exopod ..... *Sudanonautes*
- Third maxilliped lacking flagellum on exopod ..... *Potamonemus*
3. Third maxilliped with long flagellum on exopod; terminal segment gonopod 1 curved, tapering to pointed tip ..... 4
- Third maxilliped lacking flagellum on exopod; terminal segment gonopod 1 weakly S-shaped, tube-like, with rounded end ..... *Louisea*
4. Terminal segment of gonopod 1 curving inward (toward medial line); intermediate tooth on the anterolateral margin between the exo-orbital tooth and the epibranchial tooth ..... *Liberonautes*
- Terminal segment of gonopod 1

curving outward (away from medial line); no intermediate tooth on the anterolateral margin between the exo-orbital tooth and the epibranchial tooth ..... *Potamonantes*

#### *Louisea edeaensis* (Bott, 1969)

Figs. 1–3, Tables 1, 2

*Globonautes macropus edeaensis* Bott, 1969: 360; Bott, 1970:24, pl. 1, figs. 3–5, pl. 26, fig. 8; Cumberlidge, 1987:table 1.

*Material examined.*—Holotype of *G. m. edeaensis*, adult male, CW 22.52 mm, from Edea, Cameroon, Jan 1910, ZSBS 1118/1. Two males, CWs 18.1, 13.7 mm, from Yabassi, Cameroon, coll. Riggerbach, ZMB 21575. Holotype of *G. balssi*, juvenile male, CW 12.5 mm, ZIM K-3506; 2 female paratypes, CW 22.0 mm, 13.5 mm, largest female ovigerous, ZIM K-3506. All *G. balssi* from Eosung, Bakossi highlands, Johann-Albrecht-Hohe, 1060 m, Cameroon, coll. Carl Rathke, 10 Sep 1909.

*Type locality.*—Edea, Cameroon.

*Description of holotype.*—Carapace (Fig. 1a, b): Cephalothorax ovoid, widest in anterior third (CW/CL = 1.27), relatively high, with maximum depth in anterior region (CH/CL = 0.51). Anterior margin of front straight, curving under, front relatively narrow, about  $\frac{1}{3}$  carapace width (FW/CW = 0.35). Surface of carapace smooth with no deep sutures. Postfrontal crest smooth, postorbital portions present, mid-groove broad, shallow, epigastric crests poorly defined, ending before meeting anterolateral margins. Exo-orbital tooth small, low, epibranchial tooth present but almost undetectable. Intermediate tooth on anterolateral margin between exo-orbital and epibranchial teeth. Anterolateral margin of carapace smooth. Posterolateral margin curving inward, continuous with anterolateral margin. Posterior margin about  $\frac{2}{3}$  as wide as carapace width.

Each flank with 2 sutures, 1 longitudinal, 1 vertical, dividing flank into 3 parts (Fig.

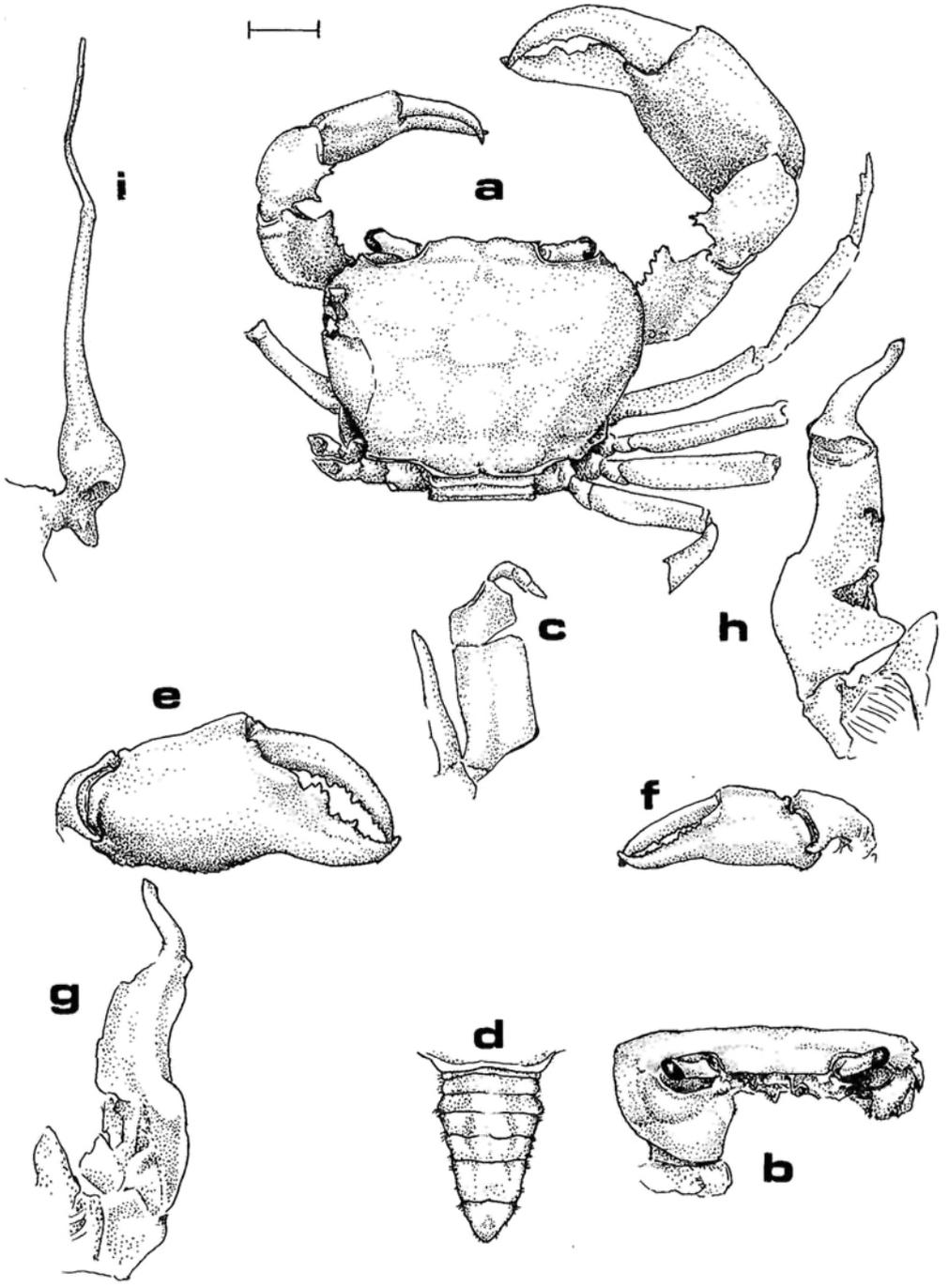


Fig. 1. *Louisea edeaensis*, holotype, adult male from Edea, Cameroon (CW 22.5 mm), ZSBS 1118/1. (a), whole animal, dorsal aspect; (b), carapace, frontal aspect; (c), left third maxilliped; (d), abdomen; (e), right cheliped, frontal view; (f), left cheliped, frontal view; (g), left gonopod 1, caudal view; (h), left gonopod 1, cephalic view, (i), left gonopod 2, caudal view. Scale bar equals 10 mm (a, b, d-f), 5 mm (c), and 2 mm (g-i).

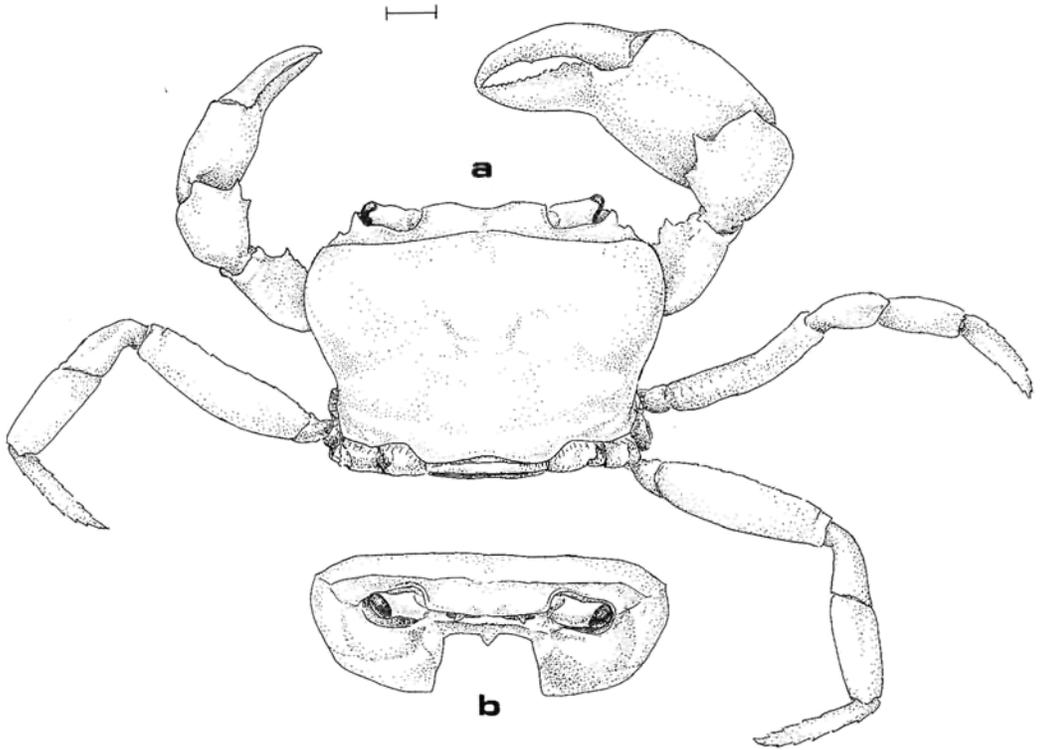


Fig. 2. *Louisea edeaensis*, from Yabassi, Cameroon male (CW 18.1 mm), ZMB 21575, (a), carapace, dorsal aspect; (b), carapace, frontal aspect. Scale bar equals 5 mm.

1b). Longitudinal suture dividing suborbital and subhepatic regions from pterygostomial region, beginning at respiratory opening and curving backward across flank. Short vertical suture dividing suborbital region from subhepatic region (Fig. 1b); suture beginning at epibranchial tooth, curving forward under intermediate tooth, then curving sharply down meeting longitudinal suture, continuing round to medial corner of lower orbital margin, marked by row of granules. Groove between sternal segments 2 and 3 complete; groove between sternal segments 3 and 4 consisting of 2 small notches at sides of sternum. Third maxillipeds filling entire oral field, except for transversely oval efferent respiratory openings in superior lateral corners. Exopod of third maxilliped lacking flagellum (Fig. 1c). Ischium of third maxilliped smooth, with faint vertical groove. Mandibular palp 2-segmented, terminal

segment single, undivided, rudimentary curved flange at junction between segments, supporting fringe of long, soft hairs (Fig. 3d). Abdomen triangular, sides not indented, terminal segment rounded at distal margin (Fig. 1d).

Chelipeds (Fig. 1a, e, f) greatly unequal, right longer (22.6 mm), higher (10.2 mm) than left (14.9 mm, 5.5 mm respectively). Dactylus of right cheliped narrow, teeth small, enclosing long narrow space when closed; propodus with large 3-peaked proximal tooth, smaller teeth distally, palm swollen. Propodus very long, as long as carapace width. Anterior dorsal margin of merus of right and left chelipeds with 1 large jagged tooth close to distal end, rows of small round teeth along rest of margin, outer margin with 1 row of fainter granules. Carpus of cheliped with 2 large pointed teeth, first smaller than second. Left cheliped showing

less enlargement, dactylus also narrow, enclosing narrow space, teeth smaller than those of right cheliped. Walking legs (pereopods 2–5) slender, P4 longest, P5 shortest. Dactyli P2–5 tapering to point, each bearing rows of downward-pointing sharp bristles, dactylus of P5 shortest of the 4 legs.

Terminal segment of gonopod 1 (Fig. 1g–i) directed outward, broad at base, final  $\frac{1}{3}$  narrow, weakly S-shaped, tube-like, end blunt, rounded; completely lacking longitudinal groove and bristles; subterminal segment gonopod 1 very wide at base. Caudal face of subterminal segment forming raised triangular flap extending halfway across segment, flap tapering diagonally to point at junction with terminal segment, forming roof of chamber for gonopod 2; cephalic face of subterminal segment narrow, forming lower floor of chamber for gonopod 2, extending outward forming wide platform. Terminal segment of gonopod 2 (Fig. 1i) flagellum-like, extremely long. Subterminal segment gonopod 2 wide at base, otherwise a long, thin, slightly tapering, upright process supporting long terminal segment.

*Variation.*—Male from Yabassi (Fig. 2a, b) with large tooth close to distal end of anterior dorsal margin of merus of chelipeds, but this tooth not as large as in holotype. First of two large pointed teeth on carpus of cheliped larger than second in male from Yabassi. Postfrontal crest well defined, meeting anterolateral margins in Yabassi specimens, in contrast to that of holotype.

*Distribution.*—Between the Wouri and Sanaga rivers in the rain forest zone of southwest Cameroon.

*Size.*—Measurements given in Table 1.

*Etymology.*—The genus *Louisea* is named for my wife, Dr. Louise M. Bourgault, a Professor of Mass Communications at Northern Michigan University, Marquette, Michigan, U.S.A., in recognition of her dedicated support of African freshwater crab biology, an effort which she has maintained for more than twelve years.

*Remarks.*—*Globonautes macropus edea-*

*ensis* was briefly described by Bott (1969), without illustrations, and assigned to the Gecarcinucidae. A more detailed description, including photographs of the carapace and gonopod 1, appeared in a later work (Bott 1970). There have been no further reports of Bott's taxon since that time, other than brief comparison with species of *Globonautes* by Cumberlidge (1987). Bott's taxon is here elevated to specific rank, and placed in the new genus *Louisea*.

It is interesting to speculate on why *L. edeaensis* and *G. balssi* were originally assigned to the Gecarcinucidae by earlier workers. One possibility could be that the small hard flange at the junction between segments of the mandibular palp of these taxa (which is partly obscured by a fringe of long hairs) was counted as a second lobe. For example, Bott (1955, 1965) considered this feature to warrant subfamilial recognition for Madagascan crabs of the genus *Hydrothelphusa* A. Milne-Edwards, 1872, and erected the Hydrothelphusinae Bott, 1955, a subfamily of the Gecarcinucidae, to accommodate this genus. However, similar small flanges between the segments of the mandibular palp are also found in *Sudanautes orthostylis* (Bott 1955) and *S. floweri* (De Man 1901) and this feature has not been judged to warrant familial recognition for these species which are all in the Potamonautidae (Rathbun 1921, Cumberlidge 1993a). It should be noted that the Gecarcinucidae and Pseudothelphusidae possess a mandibular palp with a large, distinct second lobe which is a separate, hardened process resting on the anterior face of the mandible.

#### Generic Comparisons

Differences in the length of the terminal segment of gonopod 2, the form of the terminal segment of gonopod 1, and the form of the third maxilliped are diagnostic in distinguishing between *Sudanautes*, *Libronautes*, *Potamonautes*, and *Potamonemus*

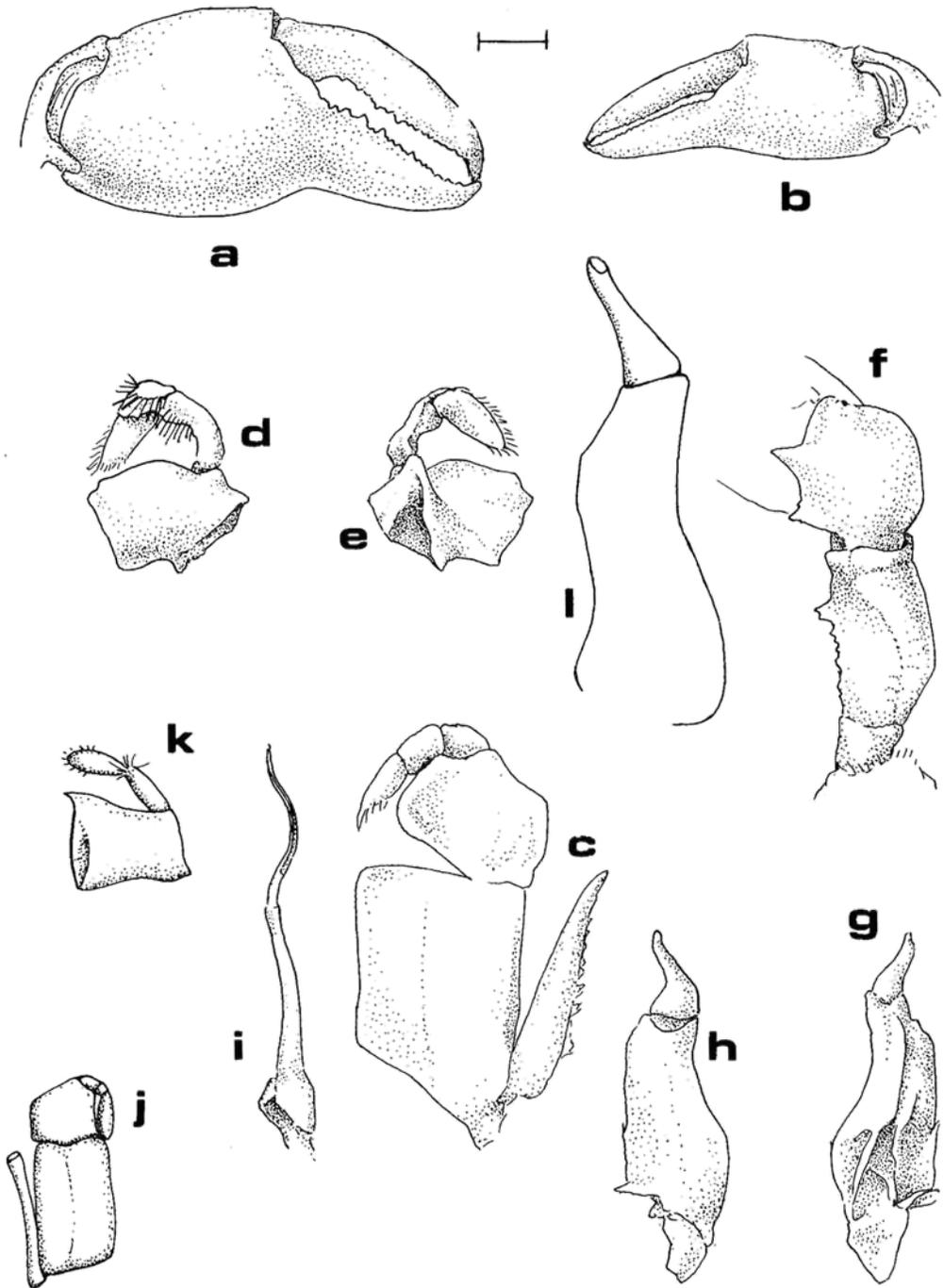


Fig. 3. *Louisea edeensis*, from Yabassi, Cameroon male (CW 18.1 mm), ZMB 21575, (a), right cheliped, frontal view; (b), left cheliped, frontal view; (c), left third maxilliped; (d), left mandible anterior view; (e), left mandible posterior view; (f), merus and carpus of right cheliped superior view; (g), left gonopod 1, caudal view; (h), left gonopod 1, cephalic view; (i), left gonopod 2, caudal view. *Globonautes balsi* from Johann-Albrecht-Hohn, Cameroon, paratype, adult female (CW 22.0 mm), ZIM K-3506; (j), right third maxilliped; (k), left mandible anterior view. *Globonautes balsi* from Johann-Albrecht-Hohn, Cameroon, male holotype (CW 12.5

Table 1.—Carapace measurements (mm) and proportions relative to body size (CL) for all known specimens of *Louisea edeaensis* and *Globonautes balssi* from Cameroon, West Africa.

Sex	CW	CL	CH	FW	CW/CL	CH/CL	FW/CL
<i>Louisea edeaensis</i>							
Holotype, ZSBS 1118/1							
1. M	22.5	17.8	9.1	7.93	1.27	0.51	0.45
ZMB, 21575							
2. M	18.1	13.1	7.4	6.3	1.38	0.41	0.48
3. M	13.7	10.1	4.8	4.8	1.36	0.48	0.48
<i>Globonautes balssi</i>							
Holotype, ZIM K3506							
1. M (juv)	13.5	10.5	5.5	5.0	1.29	0.52	0.48
Paratypes, ZIM K3506							
2. F (ad, ovig)	22.0	15.5	10.0	7.0	1.42	0.65	0.45
3. F (juv)	12.5	9.5	5.0	4.5	1.32	0.53	0.47

(Bott 1955, Cumberlidge & Clark 1992). Of these four genera, *Louisea* most closely resembles *Potamonautes* and *Liberonautes*, since gonopod 2 in species of these genera has a long, flagellate, terminal segment, and the mandibular palp has a single-lobed terminal segment. However, characters of the third maxilliped and gonopod 1 clearly distinguish *Louisea* from these two genera. In both *Potamonautes* and *Liberonautes* the exopod of the third maxilliped possesses a flagellum, and the terminal segment of gonopod 1 curves evenly and tapers to a pointed tip (Bott 1955, Cumberlidge & Sachs 1989a, 1989b). In *Louisea* the exopod of the third maxilliped lacks a flagellum, and the terminal segment of gonopod 1 is S-shaped, tube-like, and has a blunt, rounded end. *Liberonautes* can further be eliminated on biogeographic grounds since members of this genus are not found east of Ghana (Cumberlidge & Sachs 1989a, 1989b).

The other two potamonautid genera occurring in Cameroon (*Sudanonautes* and *Potamonemus*) possess a second gonopod with a short terminal segment, and are

therefore not closely related to *Louisea*. Members of *Sudanonautes* can be distinguished from *Louisea* using the same characters of the third maxilliped and gonopod 1 outlined above for *Potamonautes* and *Liberonautes*. While *Potamonemus* and *Louisea* both lack a flagellum on the exopod of the third maxilliped, they can be clearly distinguished by the length of the terminal segment of gonopod 2: it is extremely short in

Table 2.—Measurements (mm) of right and left cheliped length (RCL and LCL), and height (RCH and LCH) for all known specimens of *Louisea edeaensis* and *Globonautes balssi* from Cameroon, West Africa.

Sex	CW	RCL	LCL	RCH	LCH
<i>Louisea edeaensis</i>					
Holotype, ZSBS 1118/1					
1. M	22.5	22.6	14.9	10.2	5.5
ZMB, 21575					
2. M	18.1	15.4	7.3	7.5	3.9
3. M	13.7	9.9	8.7	4.7	2.7
<i>Globonautes balssi</i>					
Paratype, ZIM K3506					
1. F (ad, ovig)	22.0	14.0	14.0	5.5	5.0

←

mm), ZIM K-3506; (l), right gonopod 1, caudal view, based on Bott (1959, Fig. 7). Scale bar equals 5 mm (d-f, k), 2 mm (a-c, g-i), and 2 mm (j).

*Potamonemus* and extremely long in *Louisea*. For the above reasons, *L. edeaensis* has been removed from its former designation as a subspecies of *Globonautes macropus* in the family Gecarcinucidae, and placed in the new monotypic genus *Louisea* in the family Potamonautidae.

The single-lobed terminal segment of the mandibular palp of *G. balssi* led Cumberlidge (1987) to doubt its assignment to the Gecarcinucidae, and therefore, to *Globonautes*. Indeed, the form of the mandibular palp, and the lack of a flagellum on the exopodite of the third maxilliped of *G. balssi*, position this taxon close to either *Louisea* or to *Potamonemus*. The best way to distinguish between these two genera is by an examination of gonopod 2: a short terminal segment would place *G. balssi* in *Potamonemus*, while a long, flagellate terminal segment would place *G. balssi* in *Louisea*. However, gonopod 2 of *G. balssi* is missing on both sides in the holotype, the only male specimen. For this reason *G. balssi* is regarded as incertae sedis until more material is available.

Despite these differences the following important characters are shared by both *G. balssi* and *L. edeaensis*: (1) the mandibular palp is 2-segmented and the terminal segment is a single lobe (Fig. 3d, e, k); (2) the exopod of the third maxilliped lacks a flagellum (Figs. 1c, 3j); (3) the terminal segment of gonopod 1 is weakly S-shaped, tubular, and is not grooved (Figs. 1g, h, 3l); (4) there is a distinct intermediate tooth on the anterolateral margin between the exo-orbital and epibranchial teeth (Figs. 1a, b, 2a, b); (5) the vertical flank suture on the flank begins at the epibranchial tooth, curves forward under the intermediate tooth, and finally curves sharply down to meet the longitudinal suture on the flank (Figs. 1b, 2b); (6) the postfrontal crest is smooth, poorly defined, and ends before meeting the anterolateral margins (Fig. 1a, b); (7) the groove between sternal segments 2 and 3 is complete, while the groove between sternal seg-

ments 3 and 4 consists of 2 small notches at the sides of the sternum; (8) the exo-orbital tooth is small and low, the epibranchial tooth is present but is almost undetectable (Figs. 1a, b, 2a, b); (9) the carapace is relatively high (CH/CL = 0.51 *L. edeaensis*, 0.65 *G. balssi*); and (10) both species are small, reaching maturity at CW 22.0 mm.

The following are reasons why *G. balssi* is not included here in *Potamonemus*: (1) the terminal segment of gonopod 1 of *Potamonemus* is evenly curved, with a clear longitudinal groove (Cumberlidge & Clark 1992, Cumberlidge 1993b), whereas that of *L. edeaensis* and *G. balssi* is S-shaped, tubular, and lacks a groove (Figs. 1g, h, 3l); (2) the anterolateral margin of *Potamonemus* lacks an intermediate tooth on the anterolateral margin, whereas both *L. edeaensis* and *G. balssi* possess a small but distinct intermediate tooth (Figs. 1a, b, 2a, b); (3) the carapace of *Potamonemus* is relatively flatter (CH/CL = 0.47–0.49, Cumberlidge 1993b) than that of both *L. edeaensis* and *G. balssi* (CH/CL = 0.51 and 0.65 respectively).

Finally, the most recent specimens of *L. edeaensis* were collected in 1910, and the species has not been encountered since. This is undoubtedly due in part to difficulties in the identification of freshwater crabs from Cameroon, but it may also indicate that *Louisea* is a rare, and possibly endangered, rain forest species.

#### Acknowledgments

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