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Research article

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Two new species of *Afrithelphusa* Bott, 1969, from Sierra Leone, West Africa (Brachyura: Deckeniidae: Deckeniinae)

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Abstract. This work focuses on two new species of freshwater crabs from Sierra Leone, West Africa: *Afrithelphusa outamba* sp. nov., and *A. mano* sp. nov. These taxa are described based on newly collected material. Diagnoses, illustrations, and a distribution map are provided, and their conservation status is discussed. These new taxa raise the number of species of *Afrithelphusa* from four (*A. afzelii* (Colosi, 1924), *A. gerhildae* Bott, 1969, *A. leonensis* (Cumberlidge, 1987), and *A. monodosa* (Bott, 1959)) to six. An identification key is provided to distinguish between the six species of *Afrithelphusa*, and a tree of phylogenetic relationships based on two mtDNA loci (COI and 16S RNA) is provided, which supports the recognition of the species assigned to this genus.

Keywords. Afrotropical, freshwater crabs, distribution, taxonomy, identification key, molecular phylogeny.

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Introduction

The Afrotropical region hosts three families of freshwater crabs, Potamonautidae Bott, 1970, Potamidae Ortmann, 1896, and Deckeniidae Ortmann, 1897 (Cumberlidge & Daniels 2022). This work focuses on the little-known West African species of the deckeniid subfamily Deckeniinae Ortmann, 1897, that currently comprises five species assigned to *Afrithelphusa* Bott, 1969, and *Globonautes* Bott, 1959. The West African deckenids are found in the Upper Guinea Forests in Liberia, Guinea and Sierra Leone, living sympatrically with potamonautid species belonging to *Liberonautes* Bott, 1955, *Supraguinea* Cumberlidge, Mvogo Ndongo & Fitch, 2025, and *Occidensonautes* Cumberlidge & Daniels, 2022 (Cumberlidge & Daniels 2022; Cumberlidge *et al*. 2025).

This study was prompted by the recent discoveries of populations of three species of the rare West African freshwater crab genus *Afrithelphusa* Bott, 1969 (Cumberlidge & Daniels 2022). One of these species, *A. monodosa* (Bott, 1959), was collected in Guinea in 2006, and the other two poorly-known species, *A. afzelii* (Colosi, 1924) and *A. leonensis* (Cumberlidge, 1987), were collected in Sierra Leone from different locations in 2021 (Mvogo Ndongo *et al*. 2022). These promising discoveries prompted new surveys of the forested areas of the Southern and North Western provinces of Sierra Leone that produced two new species of *Afrithelphusa* which are the focus of the present study. The new species descriptions are based on characters of the carapace, thoracic sternum, mandibles, third maxillipeds, chelipeds, and male gonopods. In addition, new DNA sequence data from these two taxa based on two mitochondrial genes (cytochrome oxidase subunit I (COI) and 16S ribosomal RNA (16S rRNA)) have been combined with DNA sequences available from GenBank and used to construct a new phylogeny for the genus. In addition, new habitat and distributional data presented here can provide the information needed for an assessment of the conservation status of these new West African deckeniids.

Material and methods

Systematic field surveys of freshwater crabs in Sierra Leone undertaken during 2023 focused on two localities in the Upper Guinea forests of West Africa where it was thought likely that species of *Afrithelphusa* might be present (Fig. 1). Crabs were hand-caught near small permanent streams, from under fallen leaves, and from their burrows sited close to water bodies. All measurements (in mm) were taken with digital callipers. The terminology used follows Cumberlidge (1999), and the classification follows Cumberlidge & Daniels (2022). Photos of the whole animals were taken using a Sony 4K, FE 2.8/50 MACRO camera. Characters of the gonopods, carapace, thoracic sternum, chelipeds, third maxillipeds, and mandibles were examined in detail, and photographs were taken using a Leica microscope (model Z16A POA), and Leica Application Suite LAS V4 and Helicon Focus ver. 6.7.1 software. Post processing of the images was undertaken using Adobe Photoshop CC5. Measurements of the terminal article and anterior lobe of the mandibular palp (MPTA and MPAL, respectively) were made along the midline of each structure, and are given as the ratio MPAL/MPTA. Measurements of the subterminal article (SA) of male gonopods 1 and 2 (G1, G2) were made along a straight line beginning at the midpoint of the basal margin and ending at the midpoint of the distal margin, e.g., at the junction between the two articles. Measurements of the G1TA and G2TA were made on the ventral side along the midline beginning at the midpoint of the SA-TA junction and ending at the TA tip. The length of the G1TA and G2TA relative to the length of the SA of each of these structures is presented as the ratio TA/SA. The length of each of the endopod articles (ischium, merus, carpus, propodus and dactylus) of all five pereiopods (P1, cheliped, P2–5, ambulatory legs) was measured along the midline of the article; the lengths of the five articles of each limb were summed to provide the total ambulatory leg length, and then divided by the carapace width (CW) to allow meaningful comparisons of the relative lengths of P2–5 of different sized specimens. The relative lengths of each limb were also summed (ΣP2–5/CW) and used to assign an ambulatory leg length size class (short = 5.0–5.9, medium = 6.0–6.9, long = > 7.0; Table 3) to a species.

Abbreviations

AL = length of anterior lobe of mandibular palp
a.s.l. = altitude above sea level (in metres)
CH = carapace height measured at maximum height of cephalothorax
CL = carapace length measured along median line from anterior to posterior margin
CW = carapace width measured at widest point
FEOW = Freshwater Ecoregions of the World
FW = front width measured along anterior frontal margin between inner angles of orbits
G1 = male first gonopod
G2 = male second gonopod
juv. = juvenile
MPAL = anterior lobe of terminal article of mandibular palp
MPTA = terminal article of mandibular palp
ovig. = ovigerous
P2–5 = pereiopods 2–5 (first to fourth ambulatory legs = respectively)
S = thoracic sternite

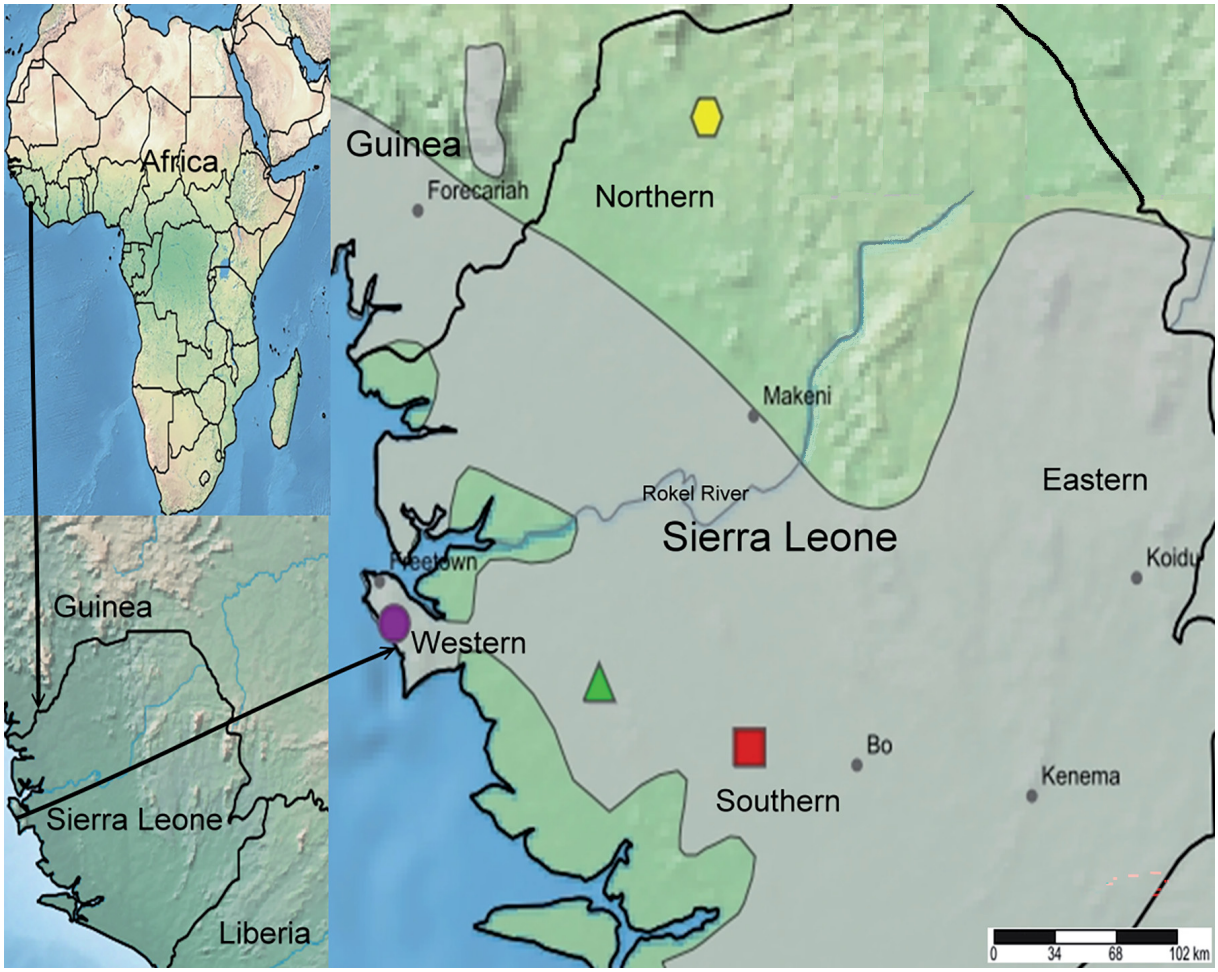

Fig. 1. Map of Sierra Leone showing the localities of the four species of *Afrithelphusa* Bott, 1969 found in that country. *Afrithelphusa afzelii* (Colosi, 1924) (green triangle); *A. leonensis* (Cumberlidge, 1987) (purple oval); *A. mano* sp. nov. (red square); and *A. outamba* sp. nov. (yellow hexagon); grey shaded area = extent of the Upper Guinea Forest biodiversity hotspot. For exact localities see text. Scale bar = 102 km.

Table 1. Species and specimens of *Afrithelphusa* Bott, 1969, and the outgroup taxa included in the molecular analysis. Abbreviations: CARC = Cameroon Association for Research on Crustacean; LZUY = Zoological Collection of the Laboratory of Zoology, University of Yaounde 1, Cameroon; NMU = Northern Michigan University Museum, USA; SMF = Senckenberg Museum, Frankfurt, Germany; ZMB = Museum für Naturkunde, Berlin, Germany.

Species	Locality	Museum number	Reference study	GenBank accession number	
				COI	16S rRNA
Afrithelphusa mano sp. nov. (1)	Dasse Chiefdom, Moyamba District, Southern Sierra Leone	ZMB Crust 33365	Present	PZ362492	PZ362899
Afrithelphusa mano sp. nov. (2)	Dasse Chiefdom, Moyamba District, Southern Sierra Leone	CARC Crust 2026-1x	Present	PZ362493	PZ362900
Afrithelphusa outamba sp. nov. (1)	Karene District, Northern Sierra Leone	ZMB Crust 33366	Present	PZ362494	PZ362901
Afrithelphusa outamba sp. nov. (2)	Karene District, Northern Sierra Leone	CARC Crust 2026-3x	Present	PZ362495	PZ362902
Afrithelphusa afzelii (1)	Moyamba District, Sierra Leone	ZMB Crust. 34607	Cumberlidge *et al*. 2023	OQ644527	OQ646690
Afrithelphusa afzelii (2)	Moyamba District, Sierra Leone	ZMB Crust. 34607	Cumberlidge *et al*. 2023	OQ644528	OQ646691
Afrithelphusa leonensis (1)	Guma Lake, Sierra Leone	ZMB Crust. 34606	Cumberlidge *et al*. 2023	OQ644526	OQ646689
Afrithelphusa leonensis (2)	Guma Lake, Sierra Leone	ZMB Crust. 34s606	Cumberlidge *et al*. 2023	OQ644529	OQ646692
Afrithelphusa gerhildae	Kindia, Guinea	SMF 2619a	Klaus *et al*. 2006	–	AM234633
Afrithelphusa monodosa	Sarabaya, Guinea	NMU 25.IV.2005.C	Daniels *et al.* 2015	KP640469	KP640430
Buea mundemba	Korup National Park, Cameroon	ZMB Crust. 30321	Mvogo Ndongo *et al.* 2021	MN188069	MN217396
Louisea edeaensis	Lake Ossa, Cameroon	LZUY 15–3 (T351-30)	Mvogo Ndongo *et al.* 2017	KY964474	KY964479

S1/2, S2/3, S4/5, S5/6, S6/7 = sternal sulci between adjacent thoracic sternites
S4/E4, S5/E5, S6/ E6, S7/E7 = episternal sulci between adjacent thoracic sternites and episternites
SA = subterminal article of G1 or G2
TA = terminal article of G1, G2 and of mandibular palp

Museum and institution abbreviations

CARC = Unit of Biodiversity Discovery and Conservation, Cameroon Association for Research on Crustaceans and Other Aquatic Resources, Obala, Cameroon
ZMB = Museum für Naturkunde, Berlin, Germany

Molecular analysis

Genomic DNA was extracted from a tissue sample of up to 25 mg cut from the pereiopod muscle of 70% ethanol-preserved specimens using a Qiagen QiaCube following the manufacturer's instructions. Amplicon sequencing on the Oxford Nanopore MinION was performed using the protocol of Srivathsan *et al*. (2021) for polymerase chain reactions (PCRs) with tagged primers and sequencing.

Two mitochondrial gene fragments were amplified by PCR: a ~638 bp region of the 16S ribosomal RNA gene (16S rRNA) using primers 16S-F-Car and 16S-R-Car1 (von Rintelen *et al*. 2007); and a 658 bp region of the protein-coding mitochondrial gene, cytochrome oxidase subunit I gene (COI), using primers LCO1490 and HCO2198 (Folmer *et al*. 1994). PCR was performed in 25 µL volumes containing 1 × Taq buffer, 1.5 mM $MgCl_2$, 200 µM each dNTP, 1 U Taq polymerase, ca 50–100 mg DNA and ddH2O up to volume. After an initial denaturation step of 4 min at 94°C, cycling conditions were 35 cycles at 94°C for 30 s, 45°C for 60 s, and 72°C for 90 s, with a final elongation step of 5 min at 72°C.

Amplicon consensus sequences from the MinION runs were generated using ONTBarcoder ver. 2.0 (Srivathsan *et al*. 2024) and aligned with ClustalW (Thompson *et al*. 1994) as implemented in BioEdit ver. 7.0.5 (Hall 1999). New sequences were submitted to the National Center for Biotechnology Information and are available from GenBank under the accession numbers in Table 1. Results from these genes were concatenated into a single alignment, which was then converted into a Nexus file with FaBox (Villesen 2007). DNA sequences of four of the ingroup taxa, e.g., *A. afzelii*, *A. gerhildae* Bott, 1969, *A. leonensis*, and *A. monodosa*, were obtained from GenBank together with two outgroup taxa, *Louisea edeaensis* (Bott, 1969) and *Buea mundemba* von Rintelen & Cumberlidge in Mvogo Ndongo, von Rintelen, Tomedi-Tabi Eyango & Cumberlidge, 2020. The phylogeny was reconstructed through two methods of phylogenetic inference applied to the data set: maximum likelihood (ML) using the software PAUP*, and Bayesian inference (BI) as implemented in MrBayes (ver. 3.3; Huelsenbeck & Ronquist 2001) (see Mvogo Ndongo *et al*. 2017). The best evolutionary model was determined with jModeltest ver. 2.1.7 (Darriba *et al*. 2012) based on the Akaike information criterion (Posada & Buckley 2004) and resulted in the GTR+I+G (COI) and GTR+G (16S rRNA) models. Reconstruction of phylogenetic trees for ML was undertaken using the software RAxML, under the GTR+(I)+G model of sequence evolution, and trees for BI using the software MrBayes (ver. 3.2.2) (Huelsenbeck & Ronquist 2001). The Markov chain Monte Carlo was run with four independent chains for 10 000 000 generations, samplefreq = 500, and burnin = 10.001. Trees are drawn to scale with branch lengths measured as the number of substitutions.

Results

Taxonomy

Phylum Arthropoda Latreille, 1829
Subphylum Crustacea Brünnich, 1772
Order Decapoda Latreille, 1802
Infraorder Brachyura Latreille, 1802
Superfamily Potamoidea Ortmann, 1896
Family Deckeniidae Ortmann, 1897
Subfamily Deckeniinae Ortmann, 1897
Genus *Afrithelphusa* Bott, 1969

Afrithelphusa mano sp. nov.
urn:lsid:zoobank.org:act:37553DE4-88EB-4932-A372-43C85E9F2CEF
Figs 1, 2A–B, 3A–B, 4A–E, 5A–D, 6; Tables 1–3

Diagnosis

Third maxilliped exopod lacking flagellum, outer margin setose; third maxilliped ischium with deep vertical sulcus; third maxilliped basis covered by dense setae; ventral part of pterygostomial region of carapace sidewall with dense field of setae. Episternal sulcus S4/E4 distinct, S5/E5, S6/E6, S7/E7 all obscure. Cheliped carpus surface smooth with scattered faint granules. Right chela fixed finger (pollex of propodus) proximal cutting edge with two teeth (one small, one medium), followed by large tooth midway, rest lined by small teeth surrounding one medium tooth; right chela movable finger (dactylus) distinctly arched, cutting edge with one large tooth proximally, one large tooth midway, rest lined by small teeth; closed chelae forming elongated interspace that reaches tips of chelae. Ambulatory legs P2–5 medium length, slender (ΣP2–5/CW 6.6).

Etymology

The species name refers to Mano, the town in Moyamba District, Southern Province of Sierra Leone where the holotype was collected. The name is used as a Latin noun in nominative singular.

Type material

Holotype
SIERRA LEONE – **Southern Province, Moyamba District** • adult ♂ (CW 19.0 mm); Dasse Chiefdom, ca 2 km from Mano, Loponga Village, site 1; 8°01′17.5″ N, 12°04′41.4″ W; 65 m a.s.l.; 27 Aug. 2023; H. Sesay leg.; ZMB Crust 33365.

Paratypes
SIERRA LEONE – **Southern Province, Moyamba District** • 2 ♂♂ (CWs 59.5, 39.4 mm), 10 ♀♀ (CWs 62.7, 61.1, 59.2, 56.9, 56.8, 56, 51.6, 48.3, 44.5, 40.3 mm), 3 ♀♀ ovig. (CWs 66.5, 62.8, 54.7 mm); same collection data as for holotype; CARC Crust 2026-xa • 1 adult ♀ (CW 20.5 mm); same collection data as for holotype; CARC Crust 2026-1x • 11 adult ♂♂ (CWs 19.0, 18.0, 18.0, 17.5, 17.0, 17.0, 17.0, 17.0, 17.0, 16.0, 16.0 mm), 5 adult ♀♀ (CWs 18.0, 18.0, 17.0, 17.0, 16.0 m), 5 subadult ♂♂ (CWs 15.5, 15.0, 15.0, 14.0, 14.0 mm), 7 juv. ♂♂ (CWs 10.5, 10.5, 10.0, 10.0, 10.0, 9.0, 9.0 m); Loponga Village, site 1, ~2 km from Mano, Dasse Chiefdom; 8°01′17.5″ N, 12°04′41.4″ W; 73 m a.s.l.; 27 Aug. 2023; H. Sesay leg.; CARC Crust 2026-1 • 10 adult ♂♂ (CWs 20.5, 20.0, 19.5, 19.5, 19.0, 18.0, 17.5, 16.0, 16.0, 16.0 mm), 2 subadult ♂♂ (CWs 15.0, 15.0 mm), 7 adult ♀♀ (CWs 21.0, 20.0, 19.5, 19.0, 19.0, 18.0, 17.5 mm), 1 juv. ♀ (CW 10.0 mm); Loponga Village, site 2, southern outskirts of Mano, Dasse Chiefdom; 8°01′55.4″ N, 12°05′37.6″ W; 77 m a.s.l.; 27 Aug. 2023; H. Sesay leg.; CARC Crust 2026-2.

Description

Based on holotype, adult male. Carapace outline transversely oval, extremely high (CH/FW 1.7); entire carapace surface smooth (Figs 2A–B, 3A); front narrow (CW/FW = 3.5), deflexed (Fig. 3A–B). Epibranchial tooth small, acute, close to small, pointed exorbital tooth, positioned behind postorbital margin (Fig. 3A–B); carapace lateral margin curved evenly outward, anterior part faintly granulated, posterior part smooth, continuous with posterolateral margin (Fig. 3A–B); postfrontal crest distinct, complete, traversing entire carapace, epigastric crests in line with postorbital margin, epigastric crests fused to postorbital crests that meet epibranchial teeth; urogastric sulci faint, cardiac, semicircular sulci deep, cervical sulcus distinct, long, ending before meeting postorbital crest (Figs 2A–B, 3A–B). Suborbital, subhepatic regions of branchiostegite with faint granules, pterygostomial region smooth; vertical sulcus on branchiostegite granular, curving downward from base of epibranchial tooth to meet faint epimeral sulcus (Figs 2A–B, 3A–B). Epistomial tooth triangular, deflexed, edges granular (Fig. 3B). Mandibular palp consisting of basis followed by two articles; terminal article (MPTA) bilobed, with large anterior lobe (MPAL/MPTA = 0.6; Fig. 5D, Table 3). Third maxilliped exopod lacking flagellum, outer margin setose; third maxilliped ischium with deep vertical sulcus; third maxilliped basis covered by dense setae (Fig. 4E); ventral part of pterygostomial region of carapace sidewall with dense field of setae (Figs 3B, 4A). Sternal suture S1/2 short, faint; S2/3 completely traversing sternum; S3/4 U-shaped, faint, almost meeting anterior margin of sternopleonal cavity; S4/5 meeting telson short distance from telson/PL6 suture; S6/7 meeting midpoint of lateral margin of PL5; episternal sulcus S4/E4 distinct, S5/E5, S6/E6, S7/E7 all obscure (Fig. 4A). Right chela largest (major); fixed finger (pollex of propodus) proximal

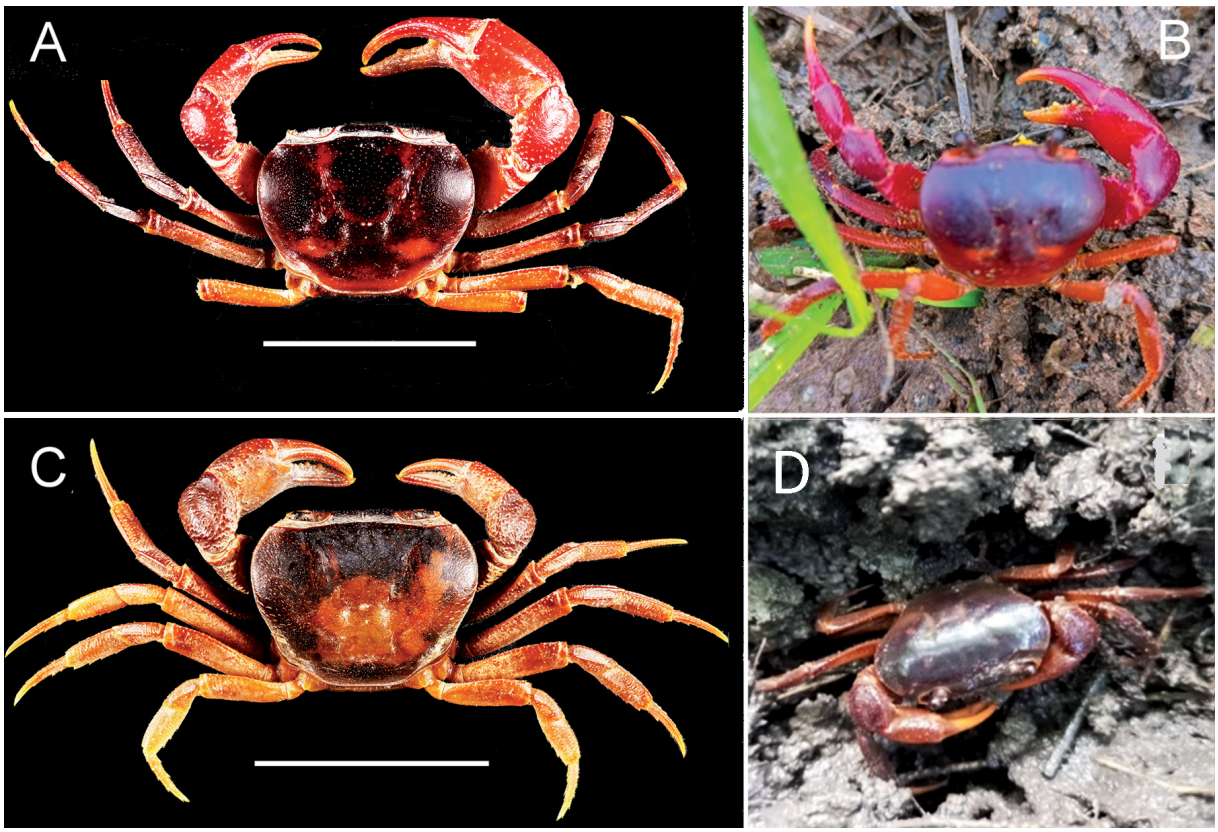

Fig. 2. A–B. Whole animal, dorsal view. *Afrithelphusa mano* sp. nov., holotype, ♂ CW 21.0 mm, Mano, Sierra Leone (ZMB 33365). **C–D**. *Afrithelphusa outamba* sp. nov., holotype, ♂ CW 21.9 mm, Sierra Leone (ZMB 33366). **A**, **C**. Preserved specimen. **B**, **D**. Living specimen. Scale bars: A–B = 21.0 mm; C–D = 21.9 mm.

cutting edge with two teeth (one small, one medium), followed by large tooth midway, rest lined by small teeth surrounding one medium tooth (Fig. 4B); right chela movable finger (dactylus) distinctly arched, cutting edge with one large tooth proximally, one large tooth midway, rest lined by small teeth (Fig. 4B); closed chelae forming elongated interspace that reaches tips of chelae (Fig. 4B–C). Left chela much smaller than right chela, dentition same as right chela (Fig. 4C); lower margin of propodus of both chelae distinctly indented medially (Fig. 4B–C). Female chelae right larger than left, both not greatly enlarged compared to male. Cheliped carpus distal tooth on inner margin large, pointed; proximal tooth significantly smaller, acute, rest of margin smooth; cheliped carpus surface smooth with scattered faint granules (Figs 2A–B, 4D). Cheliped merus inferior margins distinctly toothed, anterior margin with large distal meral tooth; superior surface of cheliped merus roughened by granules; cheliped ischium margins lined by small teeth (Fig. 4A, D). Ambulatory legs P2–5 medium length, slender (ΣP2–5/CW 6.6; Fig. 2A–B). Male pleon plus telson triangular, tapered distally, widest at PL3, narrowest at telson; PL6 relatively broad, with convex lateral margins; telson outline with straight lateral margins, apex rounded (Fig. 4A). Sulcus between G1TA-G1SA distinct on both ventral, dorsal sides; G1TA straight, tapering evenly to broad tip; G1TA angled outward at 45 degrees, medium length (G1TA/G1SA = 0.4); G1SA broad basally, tapering evenly to G1TA-G1SA junction (Fig. 5A–B). G1SA with distinct dorsal

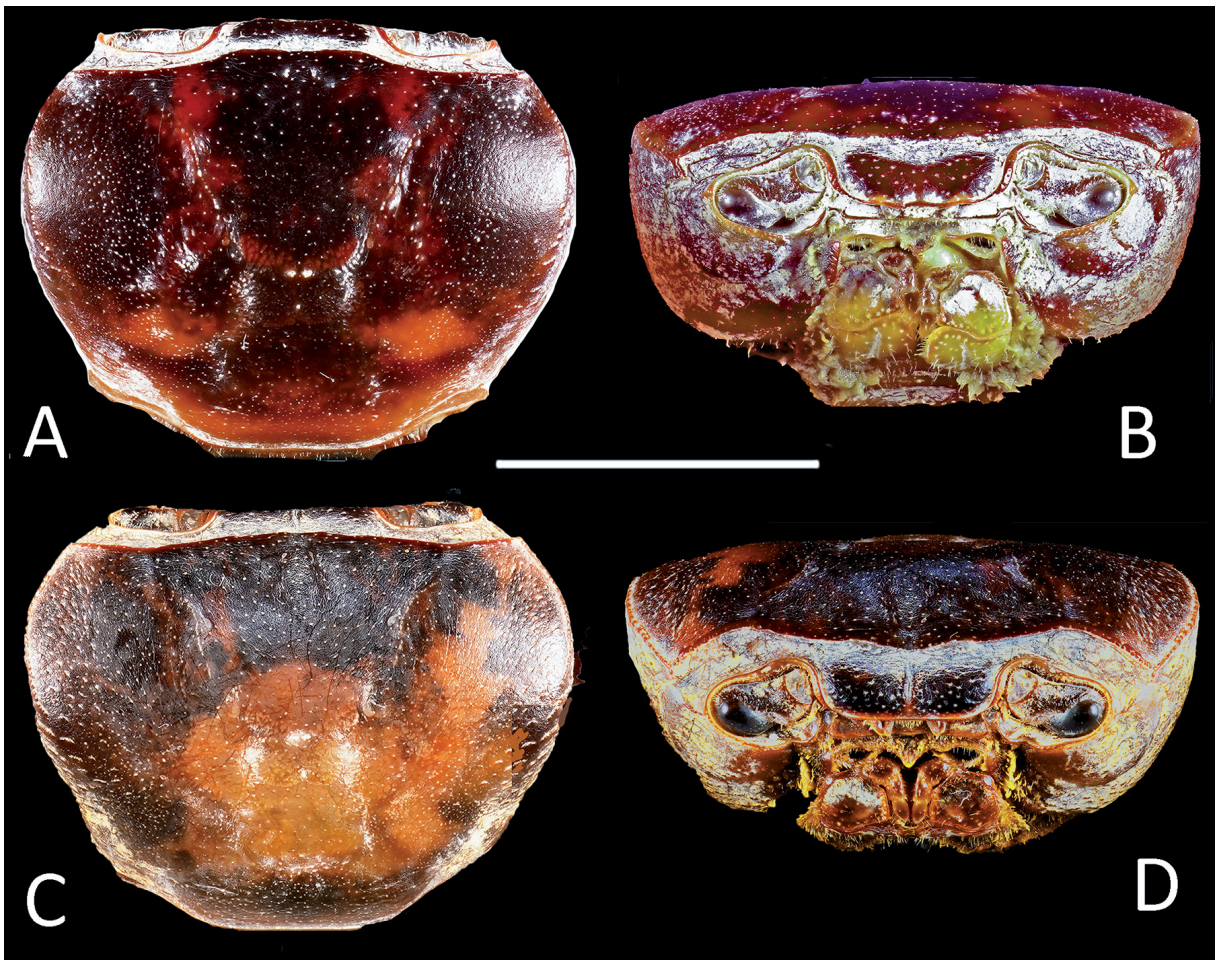

Fig. 3. A–B. Carapace, dorsal view. *Afrithelphusa mano* sp. nov., holotype, ♂ CW 21.0 mm, Mano, Sierra Leone (ZMB 33365). **A**. Dorsal view. **B**. Frontal view. **C–D**. *Afrithelphusa outamba* sp. nov., holotype, ♂ CW 21.9 mm, Sierra Leone (ZMB 33366). **C**. Dorsal view. **D**. Frontal view. Scale bar: A–B = 21.0 mm; C–D = 21.9 mm.

membrane; superior margin of G1 dorsal membrane diagonal, inferior margin J-shaped, lateral margin broad, mesial margin narrow (Fig. 5A). G2TA medium length (G2TA/G2SA = 0.4), flagellum-like, straight (Fig. 5C).

Size

Small-sized species, largest known specimen CW 21.0 mm, pubertal moult between CWs 15.0–16.0 mm; adult size range between CWs 16.0–21.0 mm.

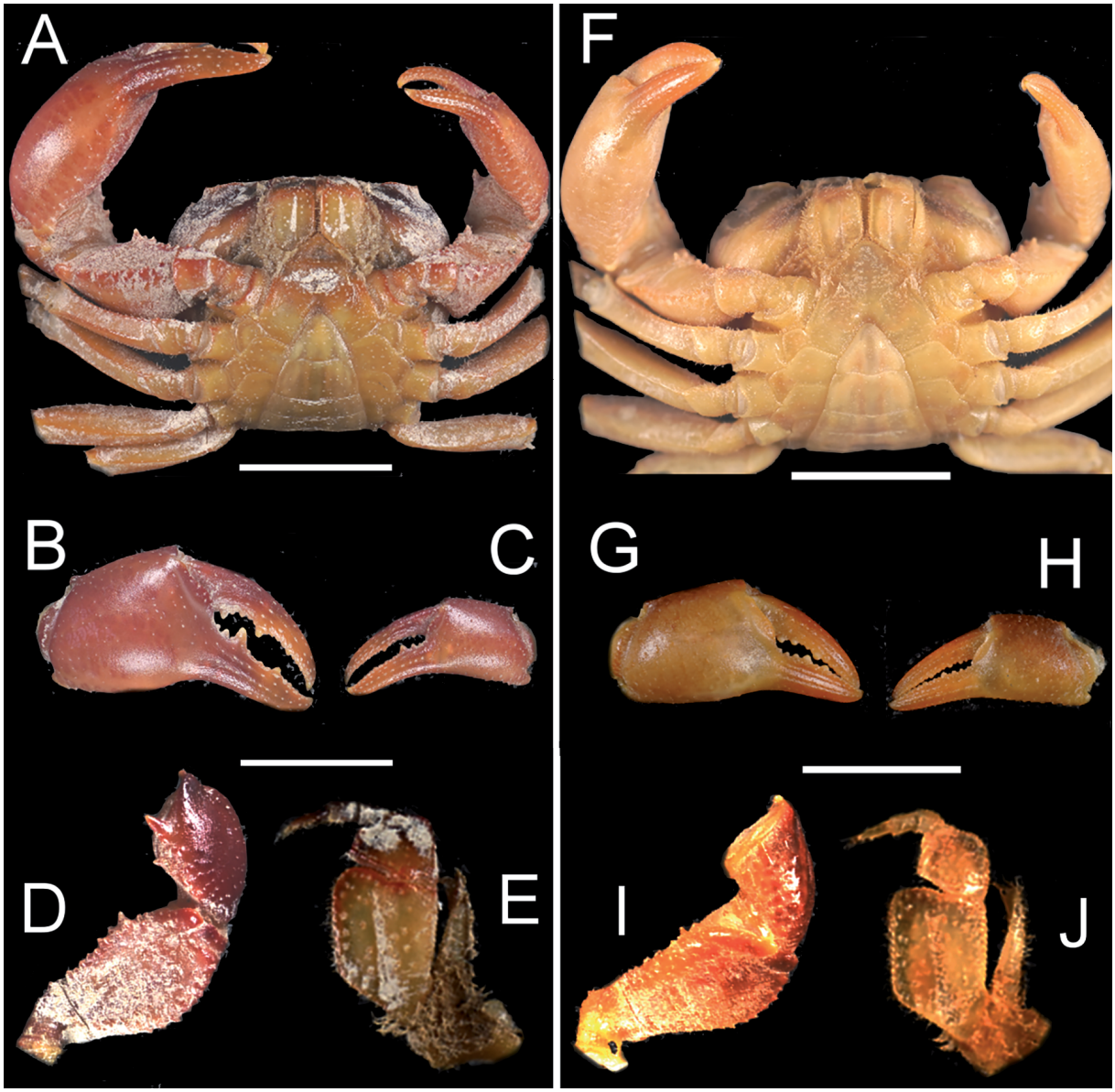

Fig. 4. A–E. *Afrithelphusa mano* sp. nov., holotype, ♂ CW 21.0 mm, Mano, Sierra Leone (ZMB 33365). **A**. Carapace, ventral view. **B**. Major chela frontal view. **C**. Minor chela frontal view. **D**. Right cheliped merus and carpus superior view. **E**. Right third maxilliped frontal view. **F–J**. *Afrithelphusa outamba* sp. nov., holotype, ♂ CW 21.90 mm, Sierra Leone (ZMB 33366). **F**. Carapace, ventral view. **G**. Major chela frontal view. **H**. Minor chela frontal view. **I**. Right cheliped merus and carpus superior view. **J**. Right third maxilliped frontal view. Scale bars: A = 21.0 mm; B–D, G–I = 5 mm; E, J = 2 mm; F = 21.9 mm.

Colour

Chelipeds and walking legs deep red-orange; dorsal carapace and chelipeds rose red; sternum cream (Fig. 2B). Preserved specimens are uniformly pale brown (Fig. 2A).

Distribution

Endemic to the Upper Guinea rainforest zone in Sierra Leone, West Africa (Fig. 1).

Vernacular name

The Mano freshwater crab.

Habitat

Afrithelphusa mano sp. nov. is known from two nearby localities in the Moyamba District, Southern Province, Sierra Leone in an area of lowland rainforest located in the Northern Upper Guinea Ecoregion (FEOW 511). The crabs were collected from burrows in a forested area that was previously cleared for rice fields and is now characterized by secondary growth. Human activities like forestry and farming have destroyed much of the natural vegetation in the area. The crab burrows serve as the main habitat for *A. mano* and have the following characteristics: they contain water at the bottom which is expected to decrease or evaporate during the dry season, and they are sheltered from direct sunlight which helps reduce evaporation and keeps the water temperature from rising excessively.

Conservation

Afrithelphusa mano sp. nov. would likely be Data Deficient under the IUCN Red List guidelines because there is little or no information available on its population size and trends, habitat, distributional range, or threat levels (Mvogo Ndongo *et al*. 2022). If deforestation and habitat disturbance in Sierra Leone continue in the region where this species is found, then the increased threat levels would be of concern, and this taxon would probably be assessed as a threatened species in danger of extinction.

Afrithelphusa outamba sp. nov.
urn:lsid:zoobank.org:act:A91557D4-B0F6-4FD2-A047-4B8DE781B837
Figs 1, 2C–D, 3C–D, 4F–J, 5E–H, 6; Tables 1–3

Diagnosis

Third maxilliped exopod lacking flagellum, outer margin setose; third maxilliped ischium with deep vertical sulcus; third maxilliped basis covered by dense setae; ventral part of pterygostomial region of carapace sidewall smooth, lacking setae. Episternal sulci S4/E4, S5/E5, S6/E6, S7/E7 all obscure. Cheliped carpus surface distinctly roughened by fields of carinae, raised granules. Right chela fixed finger (pollex of propodus) proximal cutting edge with three teeth, small proximally, large distally, largest tooth midway, rest lined by small teeth surrounding one large tooth; right chela movable finger (dactylus) distinctly arched, proximal cutting edge with one large tooth proximally, one large tooth midway, otherwise lined by small teeth; closed chelae forming narrow interspace that ends before reaching tips of chelae.

Etymology

The species name refers to Outamba, near the Outamba-Kilimi National Park in Northwest Province of Sierra Leone. The name is used as a Latin noun in nominative singular.

Table 2. Mean carapace proportions of the six species of *Afrithelphusa* Bott, 1969 and of *Globonautes macropus* (Rathbun, 1898) (NMU VII 1988). Abbreviations: CH = carapace height; CL = carapace length; CW = carapace width; FW = front width.

Species	CW/FW (size class)	CL/FW (size class)	CH/FW (size class)
A. mano sp. nov. (n = 35)	3.5 (medium)	2.7 (medium)	1.7 (high)
A. outamba sp. nov. (n = 38)	3.3 (medium)	2.5 (medium)	1.8 (high)
A. gerhildae (n = 3)	3.5 (medium)	2.7 (medium)	1.5 (high)
A. afzelii (n = 1)	3.7 (medium)	2.9 (medium)	1.4 (high)
A. monodosa (n = 1)	3.6 (medium)	2.8 (medium)	1.8 (high)
A. leonensis (n = 3)	3.5 (medium)	2.7 (medium)	l.6 (high)
G. macropus (n = 33)	3.9 (medium)	3.0 (medium)	1.7 (high)

Type material

Holotype

SIERRA LEONE – **Northwest Province, Karene District** • adult ♂ (CW 22.0 mm); Sanda Loko Chiefdom, Kola Forest site 1, Outamba, near Kilimi National Park; 9°39′19.9″ N, 12°11′02.0″ W, 114 m a.s.l.; 24 Sep. 2023; H. Sesay leg.; ZMB Crust 33366.

Paratypes

SIERRA LEONE – **Northwest Province, Karene District** • 1 adult ♀ (CW 21.5 mm); same collection data as for holotype; CARC Crust 2026-3 • 3 adult ♂♂ (CWs 21.5, 19.5, 19 mm), 7 adult ♀♀ (CWs 21.5, 21.0, 20.5, 20.0, 19.5, 19.0, 18.5, 17.5 mm); Sanda Loko Chiefdom, Kola Forest site 1; 9°39′19.9″ N, 12°11′02.0″ W; 114 m a.s.l.; 24 Sep. 2023; H. Sesay leg.; CARC Crust 2026-3 • 6 adult ♂♂ (CWs 21.5, 20.5, 19.5, 19.0, 19.0, 18.5 mm), 7 adult ♀♀ (CWs 21.5, 20.5, 19.5, 19.0, 19.0, 18.5 mm); Sanda Loko Chiefdom, Kola Forest site 2; 9°39′19.3″ N, 12°11′00.2″ W; 120 m a.s.l.; 24 Sep. 2023; H. Sesay leg.; CARC Crust 2026-4 • 9 adult ♂♂ (CWs 21.0, 20.5, 19.5, 19.0, 18.0, 17.5, 17.0, 17.0, 17.0 mm), 4 adult ♀♀ (CWs 20.5, 20.0, 19.0, 19.0 mm); Sanda Loko Chiefdom, Thakuray Forest; 9°39′35.3″ N, 12°11′20.0″ W; 155 m a.s.l.; Nov. 2023; H. Sesay leg.; CARC Crust 2026-5 • 2 adult ♂♂ (CWs 18.0, 16.5 mm), 3 subadult ♂♂ (CWs 15.5, 14.0, 13.5 mm), 1 adult ♀ (CW 18.0 mm); Sanda Loko Chiefdom, Symbaya Forest; 9°37′57.8″ N, 12°11′19.3″ W; 129 m a.s.l.; 24 Sep. 2023; H. Sesay leg.; CARC Crust 2026-6.

Description

Based on holotype, adult male. Carapace outline transversely oval, extremely high (CH/FW 1.8); front narrow (CW/FW = 3.3), deflexed; entire carapace surface smooth (Figs 2C–D, 3C–D). Epibranchial tooth small, acute, close to small, pointed exorbital tooth, positioned behind postorbital margin; carapace lateral margin curved evenly outward, anterior part faintly granulated, posterior part smooth, continuous with posterolateral margin; postfrontal crest distinct, complete, traversing entire carapace, epigastric crests in line with postorbital margin, epigastric crests fused to postorbital crests that meet epibranchial tooth; urogastric sulci faint, cardiac, semicircular sulci deep, cervical sulcus distinct, long, ending before meeting postorbital crest (Figs 2C–D, 3C–D). Suborbital, subhepatic regions of branchiostegite with faint granules, pterygostomial region granulated; vertical sulcus on branchiostegite granular, curving downward from base of epibranchial tooth to meet faint epimeral sulcus (Figs 3D, 4F). Epistomial tooth triangular, deflexed, edges granular (Fig. 3D). Mandibular palp consisting of basis followed by two articles; terminal article (MPTA) bilobed, with large anterior lobe (MPAL/MPTA = 0.6; Fig. 5H, Table 3). Third maxilliped exopod lacking flagellum, tip reaching lower half of merus, outer margin setose; third

maxilliped ischium with deep vertical sulcus, short setae covering basis of third maxilliped exopod (Fig. 4J); ventral part of pterygostomial region of carapace sidewall smooth, lacking setae (Figs 3D, 4F). Sternal suture S1/2 short, faint; S2/3 completely traversing sternum; S3/4 U-shaped, faint, almost

Fig. 5. A–D. *Afrithelphusa mano* sp. nov., holotype, ♂ CW 21.0 mm, Mano, Sierra Leone (ZMB 33365). **A–B**. Right first gonopod. **A**. Dorsal view. **B**. Ventral view. **C**. Right second gonopod, ventral view. **D**. Left mandibular palp, frontal view. **E–H**. *Afrithelphusa outamba* sp. nov., holotype, ♂ CW 21.9 mm, Sierra Leone (ZMB 33366). **E–F**. Right first gonopod. **E**. Ventral view. **F**. Dorsal view. **G**. Right second gonopod, ventral view. **H**. Left mandibular palp, frontal view. Scale bars: A–C, E–G = 2 mm; D, H = 1 mm.

meeting anterior margin of sternopleonal cavity; S4/5 meeting telson short distance from telson/PL6 suture; S6/7 meeting midpoint of lateral margin of PL5; episternal sulcus S4/E4, S5/E5, S6/E6, S7/E7 all obscure (Fig. 4F).

Right chela fixed finger (pollex of propodus) proximal cutting edge with three teeth, small proximally, large distally, largest tooth midway, rest lined by small teeth surrounding one large tooth; right chela movable finger (dactylus) distinctly arched, proximal cutting edge with one large tooth proximally, one large tooth midway, otherwise lined by small teeth (Fig. 4G); closed chelae forming narrow interspace that ends before reaching tips of chelae (Fig. 4G–H). Left chela much smaller than right, dentition same (Fig. 4H); lower margin of propodus of both chelae distinctly indented medially (Fig. 4G–H). Female chelae right larger than left, both not greatly enlarged compared to male. Cheliped carpus distal tooth on inner margin large, pointed; proximal tooth significantly smaller, acute, rest of margin smooth; cheliped carpus surface distinctly roughened by fields of carinae, raised granules (Figs 2C–D, 4I). Cheliped merus inferior margins distinctly toothed, anterior margin with large distal meral tooth; superior surface of cheliped merus roughened by granules; cheliped ischium margins lined by small teeth (Fig. 3F, I). Ambulatory legs P2–5 short, stout (ΣP2–5/CW 5.2; Fig. 2C–D). Male pleon plus telson triangular, tapered distally, widest at PL3, narrowest at telson; PL6 relatively broad, with convex lateral margins; telson outline with straight lateral margins, apex rounded (Fig. 4F). Sulcus between G1TA-G1SA distinct on both ventral, dorsal sides; G1TA straight, tapering evenly to broad tip; G1TA angled outward at 45 degrees, medium length (G1TA/G1SA = 0.4); G1SA broad basally, tapering evenly to G1TA-G1SA junction (Fig. 5E–F). G1SA with distinct dorsal membrane; superior margin of G1 dorsal membrane diagonal, inferior margin J-shaped, lateral margin broad, mesial margin narrow (Fig. 5F). G2TA medium length (G2TA/G2SA = 0.4), flagellum-like, straight (Fig. 5G).

Size

Small-sized species, largest known specimen CW 22.0 mm, pubertal moult between CWs 15.0–16.0 mm; adult size range between CWs 17.0–22.0 mm.

Colour

When alive, ambulatory legs light brown/orange, carapace dark brown, sternum and underside cream (Fig. 2D). Preserved specimens uniformly pale brown (Fig. 2C).

Distribution

Afrithelphusa outamba sp. nov. is restricted to the Upper Guinea forests of West Africa in the forest zone in the Northwest Province of Sierra Leone (Fig. 1). No specimens of *A. outamba* were found in earlier surveys in lowland forests of the Southern or Eastern provinces, or in the Western Area of Sierra Leone, but large parts of this country have yet to be surveyed for freshwater crabs. The rest of the forest zone in Sierra Leone, which originally occupied about ⅔ of the land area of this country between its borders with Guinea and Liberia, offers similar conditions to those of the Northwest Province, so there is no obvious reason for the apparent absence of *A. outamba* or similar species from this region.

Vernacular name

The Outamba freshwater crab.

Habitat

This species was collected from four nearby localities in rainforest near farmland in Northwest Province, Sierra Leone, which lies in the Northern Upper Guinea Ecoregion (FEOW 511) (Abell *et al*. 2008).

Table 3. Relative size of the mandibular palp anterior lobe (MPAL), the ambulatory legs, and the terminal articles of G1 and G2 of the six species of *Afrithelphusa* and of *Globonautes macropus* (Rathbun, 1898) (NMU VII 1988). Abbreviations: CW = carapace width; G1, G2, gonopods 1–2; G1SA = subterminal article of gonopod 1; G1TA = terminal article of gonopod 1; G2TA = terminal article of gonopod; G2SA = subterminal article of gonopod 2; MPAL = mandibular palp anterior lobe; MPTA = mandibular palp terminal article; NMU = Northern Michigan University, USA; P2–5 = ambulatory legs 2–5; SA = subterminal article of G1 or G2; TA = terminal article of G1 or G2.

Species	Mandibular palp anterior lobe size (MPAL/MPTA)	Ambulatory leg length (ΣP2–5/CW)	G1TA/G1SA	G2TA/G2SA
	(size class)	(size class)	(size class)	(size class)
A. mano sp. nov.	0.6 (large)	6.6 (medium)	0.4 (medium)	0.4 (medium)
A. outamba sp. nov.	0.6 (large)	5.2 (short)	0.4 (medium)	0.4 (medium)
A. gerhildae	0.7 (large)	(short/medium)	0.4 (medium)	0.5 (medium)
A. afzelii	0.6 (large)	6.4 (medium)	0.4 (medium)	0.4 (medium)
A. leonensis	0.6 (large)	6.5 (medium)	0.4 (medium)	0.4 (medium)
A. monodosa	0.5 (large)	6.2 (medium)	0.4 (medium)	0.4 (medium)
G. macropus	0.7 (large)	6.7 (medium)	0.4 (medium)	0.1 (short)

Conservation

A conservation assessment of the extinction risk of *A. outamba* sp. nov. has not yet been undertaken, but the new material from Sierra Leone together with data on its ecology, habitat preferences, and threats presented here are sufficient to allow an assessment of this species using the International Union for Conservation of Nature (IUCN) Red List protocols.

Amended key to the species of West African Deckeniinae

The addition of two species of *Afrithelphusa* means that an amended key to the genus is now necessary. The following key also distinguishes members of *Afrithelphusa* from *Globonautes*.

1. G2TA short stub (G2TA/G2SA = 0.1; Cumberlidge 1999; fig. 53z; Table 3); G1TA-G1SA junction not marked by visible sulcus on ventral side (Cumberlidge 1999, fig. 53z) ..... ***Globonautes macropus*** (Rathbun, 1898)
– G2TA medium length, flagellum-like (G1TA/G1SA = 0.4; Table 3); G1TA-G1SA junction with visible sulcus on ventral, dorsal sides (Fig. 5A–B, E–F; Cumberlidge *et al*. 2023: fig. 6a, c–d, f–g, i–j, l) 2

2. Ambulatory legs P2–5 short (ΣP2–5/CW 5.2; Table 3)..... 3
– Ambulatory legs P2–5 long (ΣP2–5/CW 6.6; Table 3) 4

3. Pterygostomial region of carapace branchiostegite smooth, lacking dense setae ..... ***Afrithelphusa outamba*** sp. nov.
– Pterygostomial region of carapace branchiostegite with patches of dense setae ..... ***Afrithelphusa gerhildae*** Bott, 1969

4. G2TA ending in barbed tip (Cumberlidge *et al*. 2023: fig. 6k) ..... ***A. monodosa*** (Bott, 1959)

– G2TA ending in rounded tip (Fig. 5C, G; Cumberlidge *et al*. 2023: fig. 6b, h) 5

5. Cheliped carpus smooth-textured (Figs 2C, 3D; Cumberlidge *et al*. 2023: fig. 5i) 6
– Cheliped carpus texture roughened by granules, carinae (Cumberlidge *et al*. 2023: fig. 5k) ....***A. leonensis*** (Cumberlidge, 1987)

6. Cutting edge of dactylus major chela with one small tooth proximally, one small tooth at midpoint (Cumberlidge *et al*. 2023: fig. 5a) .....***A. afzelii*** (Colosi, 1924)
– Cutting edge of dactylus major chela with one large tooth proximally, one large tooth at midpoint (Fig. 4B).....***A. mano*** sp. nov.

Discussion

Comparisons

The present preliminary account of the biology of this species is based on the examination of 50 specimens of *A. mano* sp. nov and 44 specimens of *A. outamba* sp. nov. collected in 2023 from localities in the lowland rainforest of the Southern and Northwest Provinces of Sierra Leone. The key diagnostic characters of these specimens, e.g., of the carapace, chelipeds, mandibles, pleon, G1, G2, and ambulatory legs, when considered together with the molecular evidence, indicate that these specimens should be included in *Afrithelphusa* and treated as two new species.

All six species of *Afrithelphusa* can be distinguished from *G. macropus* (Rathbun, 1898), the closest relative of this genus, as follows. The postfrontal crest of all six species of *Afrithelphusa* is sharp-edged and runs uninterrupted across the carapace (Figs 2A–D, 3A–D; Cumberlidge 1999: fig. 46a–d), vs a postfrontal crest that is poorly-defined and periodically interrupted in *G. macropus* (Cumberlidge 1999: fig. 46e), the G2TA of all six species of *Afrithelphusa* is a medium-length flagellum (G2TA/G2SA = 0.4) (Table 3), vs a G2TA that is extremely short and stub-like (G2TA/G2SA = 0.1) in *G. macropus* (Table 3; Cumberlidge 1999: fig. 53z); and all six species of *Afrithelphusa* have a G1TA with a visible sulcus on the ventral and dorsal sides of the G1TA-G1SA junction (Fig. 5A–B, E–F; Cumberlidge *et al*. 2023: fig. 6a, c–d, f–g, i–j, l), vs an obscured sulcus on the ventral side of the G1TA-G1SA junction in *Globonautes* (Cumberlidge 1999: fig. 52a).

There are several characters of the carapace, thoracic sternum, chelae and ambulatory legs that distinguish *A. mano* sp. nov. from *A. outamba* sp. nov. The ventral part of the pterygostomial region of the carapace sidewall has a dense field of setae in *A. mano* (Figs 3B, 4A), vs a pterygostomial region of the carapace sidewall that is smooth and lacks setae in *A. outamba* (Figs 3D, 4F); the episternal sulcus S4/E4 on the thoracic sternum is distinct in *A. mano* (Fig. 4A), vs an obscure episternal sulcus S4/E4 on the thoracic sternum in *A. outamba* (Fig. 4F); the cheliped carpus surface is smooth with scattered faint granules in *A. mano* (Figs 2A–B, 4D), vs a cheliped carpus surface that is distinctly roughened by carinae and granules in *A. outamba* (Figs 2C–D, 4I); the proximal cutting edge of the right chela fixed finger (pollex of propodus) has two teeth (one small, one medium) in *A. mano* (Fig. 4G), vs a proximal cutting edge of the right chela fixed finger (pollex of propodus) that has three small teeth in *A. outamba* (Fig. 4B), the right chela movable finger (dactylus) is distinctly arched in *A. mano* (Fig. 4B) vs a right chela movable finger (dactylus) is only slightly arched in *A. outamba* (Fig. 4G); the closed chelae form an elongated interspace that reaches the tips of the chelae in *A. mano* (Fig. 4B–C) vs the closed chelae form a short narrow interspace that does not reach the tips of the chelae in *A. outamba* (Fig. 4G–H), and finally, the ambulatory legs P2–5 are of medium length and slender (ΣP2–5/CW 6.6) in *A mano* (Fig. 2A–B), vs short and stout (ΣP2–5/CW 5.6) ambulatory legs P2–5 in *A. outamba* (Fig. 2C–D)

In addition, the six species of *Afrithelphusa* can be distinguished from each other as follows. *Afrithelphusa monodosa* has a G2TA that ends in a barbed tip which is a character that distinguishes this species from

the other five species in this genus (whose G2TA ends in a rounded tip). The dense field of setae on the ventral part of the pterygostomial region of the carapace sidewall is found in both *A. gerhildae* and *A. mano* sp. nov. and is a character that distinguishes these two species from *A. outamba* sp. nov., *A. monodosa*, *A. afzelii*, and *A. leonensis* (that all have a smooth carapace sidewall pterygostomial region that lacks setae). In additiony, the short ambulatory legs P2–5 (ΣP2–5/CW 5.6) found in *A. outamba*, and *A. gerhildae* distinguish these two species from *A. mano*, *A. monodosa*, *A. afzelii*, and *A. leonensis* (because these species all have longer ambulatory legs P2–5 (ΣP2–5/CW 6.6)).

The phylogenetic tree of *Afrithelphusa*, based on the mitochondrial genes COI and 16S RNA (Fig. 6) showed the following relationships. *Afrithelphusa gerhildae* is positioned at the base of the tree, forming a sister group to the other five species of *Afrithelphusa*. Strong support for the relationships within the remaining five species was found, with *A. outamba* sp. nov. as sister to the rest of the group. The final group of four species is divided first by *A. monodosa*, which is sister to a clade of the three remaining species composed of a sister pairing of *A. afzelii* and *A. leonensis*, which together are a sister group to *A. mano* sp. nov.

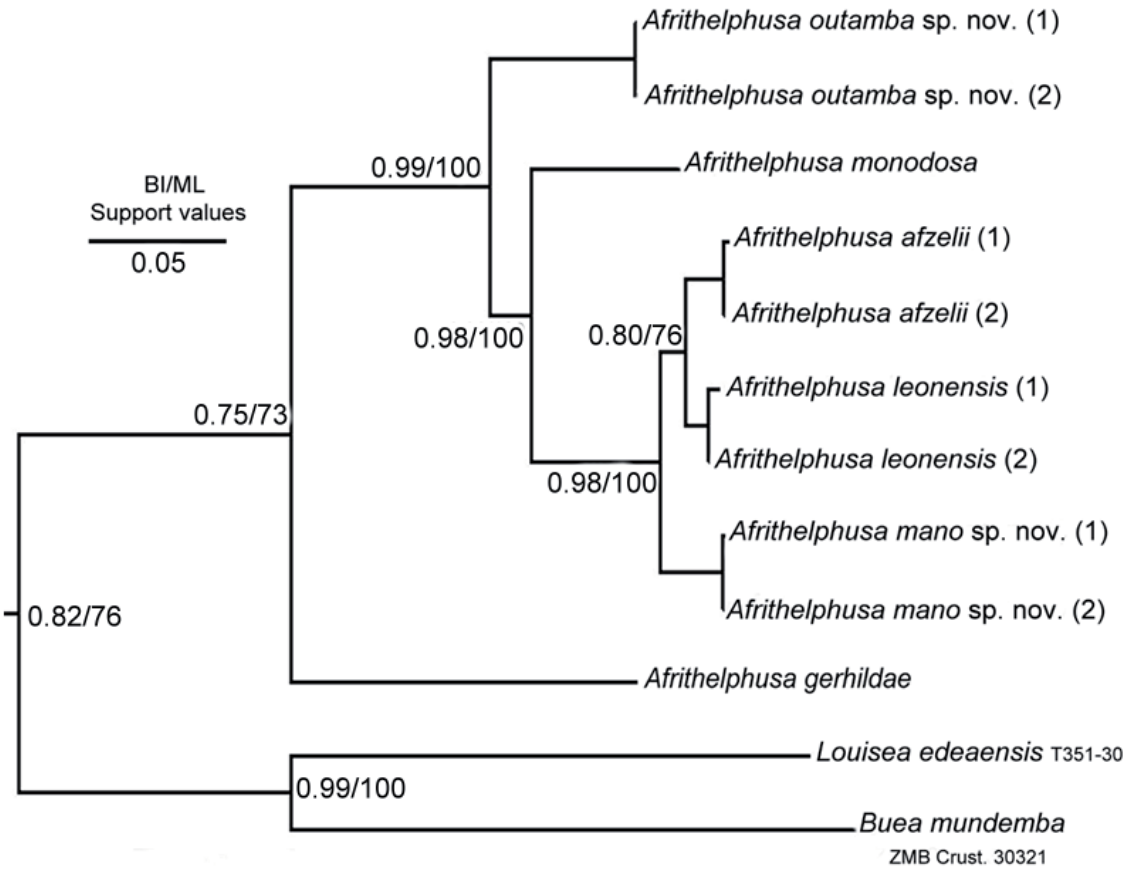

Fig. 6. Maximum Likelihood tree topology for the freshwater crab genus *Afrithelphusa* Bott, 1969 from West Africa included in this study derived from mtDNA sequences from partial 16S rRNA and CO1 genes. Two outgroup taxa selected from the Potamonautidae Bott, 1970, Liberonautinae Cumberlidge 2022 (*Louisea edeaensis* Bott, 1969 and *Buea mundemba* Mvogo Ndongo, von Rintelen & Cumberlidge, 2020) are also shown. Bayesian posterior probabilities and Maximum Likelihood bootstrap values on the nodes indicate posterior probabilities and bootstrap support, respectively. The scale bar indicates the substitution rate.

The freshwater crab fauna of the Upper Guinea forests of West Africa has a relatively high number of species in both the Potamonautidae and the Deckeniidae, which are all endemic to West Africa (Cumberlidge 2009; Starnes *et al*. 2021). This is likely to be an underestimate of the actual diversity of the region because most parts of the forested region in Guinea, Sierra Leone, and Liberia have not been surveyed for freshwater crabs (Cumberlidge 1999; Mvogo Ndongo *et al*. 2022). There is an urgent need for further sampling in West Africa to increase knowledge of these rare and restricted species.

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