



Research article

[urn:lsid:zoobank.org:pub:661B464B-D514-4110-8531-295432A69767](https://zoobank.org/pub/661B464B-D514-4110-8531-295432A69767)

**Description of three new species of *Potamonautes* MacLeay, 1838
from the Lake Victoria region in southern Uganda, East Africa
(Brachyura: Potamoidea: Potamonautidae)**

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Cumberlidge N. & Clark P.F. 2017. Description of three new species of *Potamonautes* MacLeay, 1838 from the Lake Victoria region in southern Uganda, East Africa (Brachyura: Potamoidea: Potamonautidae). *European Journal of Taxonomy* 371: 1–19. <https://doi.org/10.5852/ejt.2017.371>

Abstract. Three new species of potamonautid freshwater crabs are described from the Lake Victoria region in southern Uganda, East Africa. Two of the new species (*Potamonautes busungwe* sp. nov. and *P. entebbe* sp. nov.) are from the shores of Lake Victoria, while the third (*P. kantsyore* sp. nov.) is from an inland locality on the Kagera River that flows into the lake. In addition, two of the new taxa (*P. busungwe* sp. nov. and *P. kantsyore* sp. nov.) are among the smallest species of freshwater crabs so far known from Africa. Diagnoses, illustrations and distribution maps are provided for these taxa, which are compared to similar species from Uganda and elsewhere in East Africa.

Keywords. *Potamonautes busungwe* sp. nov., *Potamonautes kantsyore* sp. nov., *Potamonautes entebbe* sp. nov., Lake Victoria, Kagera River.

Introduction

This work focuses on a previously unreported collection of freshwater crabs from three different localities in southern Uganda that are all associated with Lake Victoria. The new species were collected during surveys of Uganda's wetland fauna between 1955 and 1967 that were aimed at gaining a better understanding of the role played by freshwater crabs in the transmission of river blindness (onchocerciasis) to humans (Barnley & Prentice 1958; Williams *et al.* 1964; Williams 1968, 1991; Crosskey 1990). Although none of the crabs from this part of Uganda have been linked to river blindness, this material proved to include three new species, which are each described herein based on the adult male's possession of a unique combination of characters concerning the first gonopod, carapace, thoracic sternum and major cheliped.

Recent taxonomic papers have described several new species of freshwater crabs from Uganda and it is becoming clear that the fauna in this country is much more diverse than previously thought (Table 1). The taxonomic history of the freshwater crabs of Uganda from 1837 until the present is discussed in detail and summarized in Tables 1–2. There was a gap of 52 years (1942 until 2001) when no new species of freshwater crabs were described from Uganda. Interest in this fauna resumed in the 21st century when Corace *et al.* (2001) described a new species from the crater lake region of western Uganda, Cumberlidge & Clark (2010a) described two new species from Mount Elgon in southeast Uganda, and Cumberlidge & Clark (2016) described another two new species from the highlands of northern Uganda. In addition, Cumberlidge & Clark (2010b, 2016) confirmed the validity of two other Ugandan species (*Potamonautes loveni* Colosi, 1924 and *P. amalerensis* Rathbun, 1935, respectively) and redescribed each of them based on the types and on previously unidentified museum material. Finally, Cumberlidge (2009) and Cumberlidge & Clark (2010b) expanded the distributional range of *P. niloticus* (H. Milne Edwards, 1837) to include the entire Nile River drainage, and confirmed the presence of *Sudanonautes floweri* (De Man, 1901) in northwest Uganda. The present addition of three new species raises to 14 the number of freshwater crabs now known from Uganda (Bott 1955; Corace *et al.* 2001; Cumberlidge 2009; Cumberlidge & Clark 2010a, 2010b, 2016).

All three of the new species of freshwater crabs described here belong to *Potamonautes* MacLeay, 1838, and the type material of each taxon is deposited in the National History Museum, London, UK (NHMUK). Unfortunately, molecular data for all three new species are not available because the material was originally preserved in formalin at the time of collection, up to 60 years ago. Diagnoses, illustrations and distribution maps are provided for these taxa, which are compared to similar species in the genus from the region.

Material and methods

Measurements were made with digital calipers and are given in millimeters (mm). The terminology is adapted from Cumberlidge (1999) and the higher classification used here follows that of Ng *et al.* (2008). The habitus and gonopod photographs were taken with a digital camera in combination with a Leitz MZ 95 adapter and postprocessing was undertaken using Adobe Photoshop CC5. Adult females have an enlarged pleon that covers the coxae of the chelipeds and walking legs, possess broad feathery pleopods, and may or may not be carrying eggs or hatchlings in the abdominal brood pouch. The adults of freshwater crabs continue to grow after they reach sexual maturity (the moult of puberty) until the species attains its terminal moult. The beginning of the adult size range is indicated by female specimens with a CW equal to or greater than the CW of the smallest known adult female (Cumberlidge 1999; Cumberlidge *et al.* 1999; Marijnissen *et al.* 2004). This value for females was used here to establish the beginning of the adult size range for male specimens. The general lack of specimens for study means that there continues to be a need for more collections, so that the size range and the geographical distributional range of each species can be established with greater accuracy.

Abbreviations

a	=	pleonal (abdominal) somite
a7/a6	=	sutures between pleonal (abdominal) somites
CH	=	carapace height measured at maximum height of cephalothorax
CL	=	carapace length measured along median line from anterior to posterior margin
Congo	=	Republic of the Congo
CW	=	carapace width measured at widest point
DRC	=	Democratic Republic of the Congo
e	=	thoracic episternite
FW	=	front width measured along anterior frontal margin between orbits

Table 1. Updated species list for Uganda recognized in the present work with the updated geographical distribution by country.

Species	Distribution in present work
<i>Potamonautes niloticus</i> (H. Milne Edwards, 1837)	Egypt, Sudan, Ethiopia, Uganda, Rwanda, Kenya
<i>Sudanonautes floweri</i> (De Man, 1901)	Nigeria, Cameroon, Equatorial Guinea (Bioko), Central African Republic, Sudan, DRC, Congo, Gabon, Angola (Cabinda), Uganda
<i>Potamonautes aloysiisabaudiae</i> (Nobili, 1906)	DRC, Uganda
<i>Potamonautes loveni</i> (Colosi, 1924)	Uganda, Kenya
<i>Potamonautes amalerensis</i> (Rathbun, 1935)	Endemic to Uganda
<i>Potamonautes mutandensis</i> (Chace, 1942)	Endemic to Uganda
<i>Potamonautes rukwanzi</i> Corace, Garms & Cumberlidge, 2001	Endemic to Uganda
<i>Potamonautes elgonensis</i> Cumberlidge & Clark, 2010a	Endemic to Uganda
<i>Potamonautes williamsi</i> Cumberlidge & Clark, 2010a	Endemic to Uganda
<i>Potamonautes imatongensis</i> Cumberlidge & Clark, 2016	Endemic to Uganda
<i>Potamonautes morotoensis</i> Cumberlidge & Clark, 2016	Endemic to Uganda
<i>Potamonautes entebbe</i> sp. nov.	Endemic to Uganda
<i>Potamonautes busungwe</i> sp. nov.	Endemic to Uganda
<i>Potamonautes kantsyore</i> sp. nov.	Endemic to Uganda

Table 2. Changes in the taxonomic treatment of Ugandan species of freshwater crabs that affect the status of the six species recognized by Bott (1955) vs their taxonomic status in the present work.

Species	Distribution in Bott (1955)	Distribution in present work
<i>Potamonautes niloticus</i> (H. Milne Edwards, 1837)	Egypt, Sudan, Ethiopia, Uganda	Egypt, Sudan, Ethiopia, Uganda, Rwanda, Kenya
<i>Potamonautes aloysiisabaudiae</i> (Nobili, 1906)	DRC, Uganda (with <i>P. antheus</i> (Colosi, 1920) (Ethiopia) and <i>P. congoensis</i> (Rathbun, 1921) (DRC) as junior synonyms)	DRC, Uganda (but with both <i>P. antheus</i> and <i>P. congoensis</i> removed from synonymy and recognized as valid species)
<i>Potamonautes granviki</i> (Colosi, 1924)	Uganda, Kenya	Uganda, Kenya (but as <i>P. loveni</i> with <i>P. granviki</i> treated as a junior synonym)
<i>Potamonautes berardi</i> (Audouin, 1826)	Egypt, Sudan, Ethiopia, Uganda	Egypt, Sudan, Ethiopia (not Uganda when misidentified specimens are removed)
<i>Potamonautes emini</i> (Hilgendorf, 1892)	Tanzania, Uganda (<i>P. mutandensis</i> treated as a junior synonym)	Tanzania (not Uganda, because <i>P. mutandensis</i> is a valid species)
<i>Potamonautes didieri</i> (Rathbun, 1904)	DRC, Uganda (with <i>P. amalerensis</i> (Uganda) as a junior synonym)	Uncertain, possibly DRC, Ethiopia (not Uganda, because <i>P. amalerensis</i> was removed from synonymy and recognized as a valid species)

- G1 = first male gonopod
G2 = second male gonopod
IUCN = International Union for the Conservation of Nature
NHMUK = Natural History Museum, London, UK
p2–p5 = pereopods 2–5
s = thoracic sternite
s3/s4 = sternal sulci between adjacent thoracic sternites
s4/e4 = episternal sulci between adjacent thoracic sternites and episternites

Results

Infraorder Brachyura Latreille, 1802
Superfamily Potamoidea Ortmann, 1896
Family Potamonautidae Bott, 1970
Subfamily Potamonautinae Bott, 1970
Genus *Potamonautes* MacLeay, 1838

Potamonautes entebbe sp. nov.

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Figs 1A–B, 4A, 5A–B, 6A, D, 7; Table 1

Diagnosis

Postfrontal crest faint but complete, lateral ends meeting anterolateral margins at epibranchial teeth; exorbital, epibranchial teeth each reduced to granule; anterolateral margin posterior to epibranchial tooth smooth (Figs 1A, 4A). Third maxilliped ischium lacking vertical sulcus (Figs 1B, 4A); s3/s4 V-shaped, deep at sides, faint in middle; margins of s4 distinctly raised, thickened (Fig. 1B). Propodus, dactylus of major cheliped of adult male slim, elongated, both lined by small teeth, dactylus highly arched, enclosing oval interspace when closed (Figs 1A–B). Cheliped carpus inner margin distal tooth large, pointed, proximal tooth small, broad, pointed (Figs 1B, 5A–B). G1 terminal article short ($0.25 \times$ length of G1), slim, straight, curving gently outward, needle-shaped, evenly tapering, tip straight (Fig. 6A).

Etymology

The new species is named for the city of Entebbe, Uganda, which lies on the northern shore of Lake Victoria where this species was first collected. The specific epithet is used as a noun in apposition. Vernacular name: the Entebbe crab.

Material examined

Holotype (here designated)

UGANDA: adult ♂, CW 35.0, CL 23.2, CH 11.6, FW 9.4 mm, Entebbe, N shore of Lake Victoria, 1.04216° N, 30.67056° E, 11 Aug. 1955, Captain C.R.S. Pittman leg. (NHMUK 1955.11.8.26).

Paratype

UGANDA: subadult ♀, CW 8.5 mm, same collection data as for holotype (NHMUK 1955.11.8.27).

Description

Based on holotype (adult male CW 35 mm). Carapace outline transversely oval, inflated (CH/FW 1.24; Fig. 1A), front broad measuring one-third CW (FW/CW 0.27; Fig. 4A). Postfrontal crest faint but complete, lateral ends meeting epibranchial teeth; epigastric crests distinct, median sulcus between crests short, forked posteriorly; semi-circular, urogastric, cardiac, posterior and cervical carapace grooves all faint. Exorbital tooth very low, blunt, epibranchial tooth reduced to granule; anterolateral

margin between exorbital, epibranchial teeth smooth, lacking intermediate tooth, anterolateral margin posterior to epibranchial tooth smooth (Fig. 1A). Suborbital margin granular (Fig. 4A). Carapace sidewall vertical sulcus faint, incomplete, meeting longitudinal sulcus, dividing sidewall into three parts. Third maxilliped exopod with long flagellum, ischium lacking vertical sulcus (Fig. 4A). Epistomial tooth large, triangular, edges lined by granules (Fig. 4A). Mandibular palp 2-segmented; terminal segment simple; s2/s3 deep, running horizontally across sternum; s3/s4 V-shaped, deep at sides, faint in middle; margins of s4 distinctly raised, thickened (Fig. 1B); s4/e4, s5/e5, s6/e6 and s7/e7 all visible (Fig. 1B). Chelipeds of adult male unequal; fixed finger (propodus) and movable finger (dactylus) of major cheliped slim, elongated, both lined by small teeth, moveable finger highly arched, encompassing oval interspace when closed (Fig. 5A–B). Two pointed teeth on inner margin of cheliped carpus, distal tooth of medium size, proximal tooth small (Fig. 1A). Inferior margins of merus of cheliped with series of small sharp teeth, distal tooth pointed; superior surface of merus with carinae (Fig. 1 A–B). Pleon outline broadly triangular, with straight edges (Fig. 1B). G1 terminal article short ($0.25 \times$ length of G1), curving gently outward, broad at base, tapering evenly to straight tip (Fig. 6 A, D). G2 terminal article long ($0.5 \times$ length of G2), flagellum-like.

SIZE. Medium-sized species, adult at CW 35 mm.

COLOUR. Preserved specimens uniformly light brown.

Distribution

This species is known only from two specimens collected from a single locality at Entebbe, Uganda in the Lake Victoria drainage basin (Fig. 7). Although only sparse details of the habitat were provided by the collector, the inference is that this species was either collected on the Lake Victoria shoreline itself, or in a stream or river close to where it joins the lake.

Ecology

Little is known about the ecology of this species. *Potamonautes entebbe* sp. nov. is not found in a protected area and was collected from a locality that is either in or near Lake Victoria, adjacent to the city of Entebbe. At the time the specimens were collected (1955) this area was relatively undisturbed, but it is now under increasing pressure from anthropogenic pollution and disturbance.

Conservation status

An IUCN extinction risk assessment of *P. entebbe* sp. nov. has not yet been carried out, but given the fact that this species is known for only two specimens from a single locality, it would probably be regarded as Data Deficient.

Remarks

Potamonautes entebbe sp. nov. is superficially similar to several other species in this genus from Uganda that all share the following characters: a medium body size at maturity (CW 30 mm and above); a complete postfrontal crest; reduced or absent exorbital and epibranchial teeth; a smooth anterolateral margin behind the epibranchial tooth; and a male major cheliped with a slim, elongated, highly arched dactylus. Ugandan crabs that share this suite of characters include four species from southeastern Uganda (*P. loveni* (Colosi, 1924), *P. elgonensis* Cumberlidge & Clark, 2010, *P. williamsi* (Cumberlidge & Clark, 2010) and *P. amalerensis* (Rathbun, 1935)), two from northern Uganda (*P. morotoensis* Cumberlidge & Clark, 2016, and *P. imatongensis* Cumberlidge & Clark, 2016), and two from western Uganda (*P. aloysiisabaudiae* (Nobili, 1906) and *P. rukwanzi* Corace, Cumberlidge & Garms, 2001).

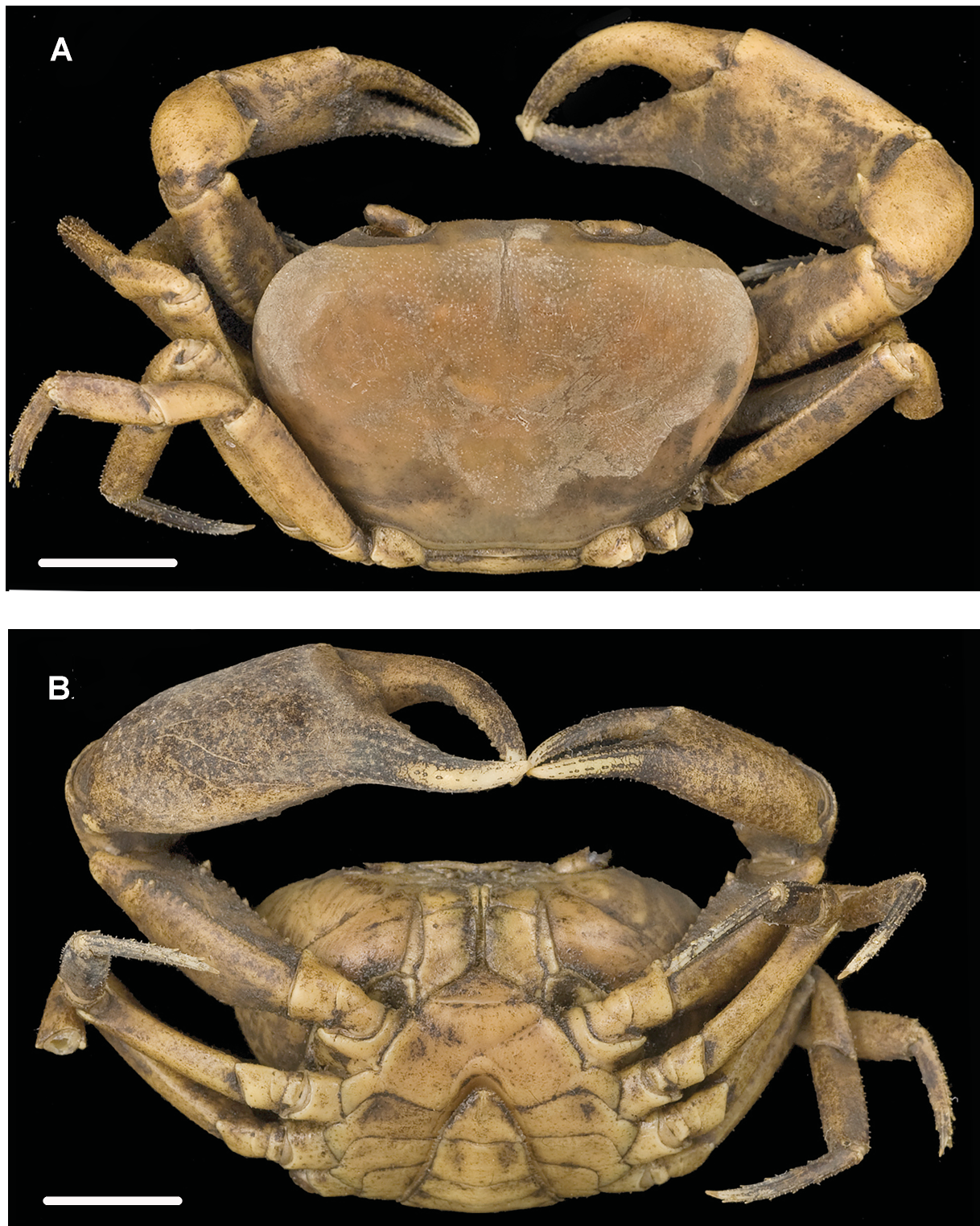


Fig. 1. *Potamonautes entebbe* sp. nov., holotype, adult ♂, CW 35 mm, from Entebbe, southern Uganda (NHMUK 1955.11.8.26). **A.** Whole animal, dorsal view. **B.** Whole animal, ventral view. Scale bars: 6.3 mm. Photographs by Phillip Crabb, NHMUK.

Potamonautes entebbe sp. nov. differs from *P. loveni* and *P. williamsi* in that the proximal tooth on the inner margin of the cheliped carpus of *P. entebbe* sp. nov. is pointed and subequal to the distal tooth (Fig. 1A) (vs both teeth weak, low and blunt in *P. loveni* and *P. williamsi*). *Potamonautes entebbe* sp. nov. differs from *P. aloysiisabaudiae*, *P. busungwe* sp. nov., *P. elgonensis* and *P. kantsyore* sp. nov. in that the G1 terminal article of *P. entebbe* sp. nov. has a straight tip (Fig. 6A, D) (vs a G1 terminal article that has either a slightly or distinctly upcurved tip in these other species) (Chace 1942; Bott 1955; Cumberlidge & Clark 2010a). *Potamonautes entebbe* sp. nov. differs from *P. williamsi* as follows: the distal tooth on the inner margin of the carpus of the cheliped is strong and pointed (Fig. 1A) (vs small and low in *P. williamsi*) and s3/s4 is deep at the edges and faint medially (Fig. 1B) (vs not visible except for two short notches on the external margins of the sternite in *P. williamsi*) (Cumberlidge & Clark 2010a). *Potamonautes entebbe* sp. nov. differs from *P. rukwanzi* by the third maxilliped ischium, which has a faint, barely visible sulcus (Fig. 1B) (vs a distinct and complete sulcus in *P. rukwanzi*) (Corace *et al.* 2001).

***Potamonautes busungwe* sp. nov.**

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Figs 2A–B, 4B, 5C–D, 6B, E, 7; Tables 1, 3

Diagnosis

Based on holotype (adult male CW 15.9 mm). Carapace outline transversely oval, medium height (CH/FW 1.0); exorbital tooth low, blunt, epibranchial tooth reduced to granule, postfrontal crest complete but faint, lateral ends meeting epibranchial teeth; anterolateral margin posterior to epibranchial tooth smooth (Fig. 2A); carapace sidewall vertical sulcus meeting anterolateral margin. Third maxilliped ischium smooth, lacking vertical sulcus; s3/s4 deep at edges, faint in middle; margins of s4 distinctly raised, thickened (Fig. 2B). Chelipeds of adult male unequal; movable finger (dactylus) and fixed finger (propodus) of major cheliped of adult male both slim, elongated, both with series of small, even-sized teeth, dactylus highly arched, encompassing wide oval interspace when closed. Inferior margins of merus of cheliped lined by series of small pointed teeth, distal tooth large, pointed; superior surface of merus granulated (Fig. 2B). Distal, proximal teeth on inner margin of cheliped carpus small, low, equal-sized (Fig. 2B). G1 terminal article short ($0.25 \times$ length of G1), straight, in line with longitudinal axis of subterminal segment, distal third curving outward, tapering to slightly upcurved tip (Fig. 6B, E).

Etymology

The new species is named for the small island of Busungwe in the northwestern part of Lake Victoria near the border with Tanzania, where this species was first collected, and is used as a noun in apposition (Fig. 7). Vernacular name: the Busungwe crab.

Material examined

Holotype (here designated)

UGANDA: adult ♂, CW 15.9, CL 10.6, CH 5.4, FW 5.3 mm, Central Region, Kakuuto, Busungwe Island, -0.953781° S, 31.783557° E, exposed rocky shore, 21 Apr. 1955, P. Corbett leg., East African Fisheries Research Organization (NHMUK 2017.37).

Paratype (here designated)

UGANDA: adult ovigerous ♀, CW 15.4, CL 10.5, CH 5.3, FW 5.3 mm, Central Region, Kakuuto, Busungwe Island, -0.950000° S, 31.7833° E, exposed rocky shore, same date and collector as for holotype (NHMUK 2015.3056).

Description

Carapace of medium height (CH/FW 1.0; Fig. 2A), front broad, measuring one-third CW (FW/CW 0.33; Fig. 2B). Semi-circular, urogastric, cardiac, posterior and cervical carapace grooves all distinct.

Postfrontal crest complete, faint, lateral ends meeting epibranchial teeth; epigastric crests faint, median sulcus between crests short, forked posteriorly; exorbital tooth low, blunt; epibranchial tooth reduced to granule; anterolateral margin between exorbital, epibranchial teeth smooth, curving slightly outward, lacking intermediate tooth; anterolateral margin posterior to epibranchial tooth smooth (Fig. 2A);

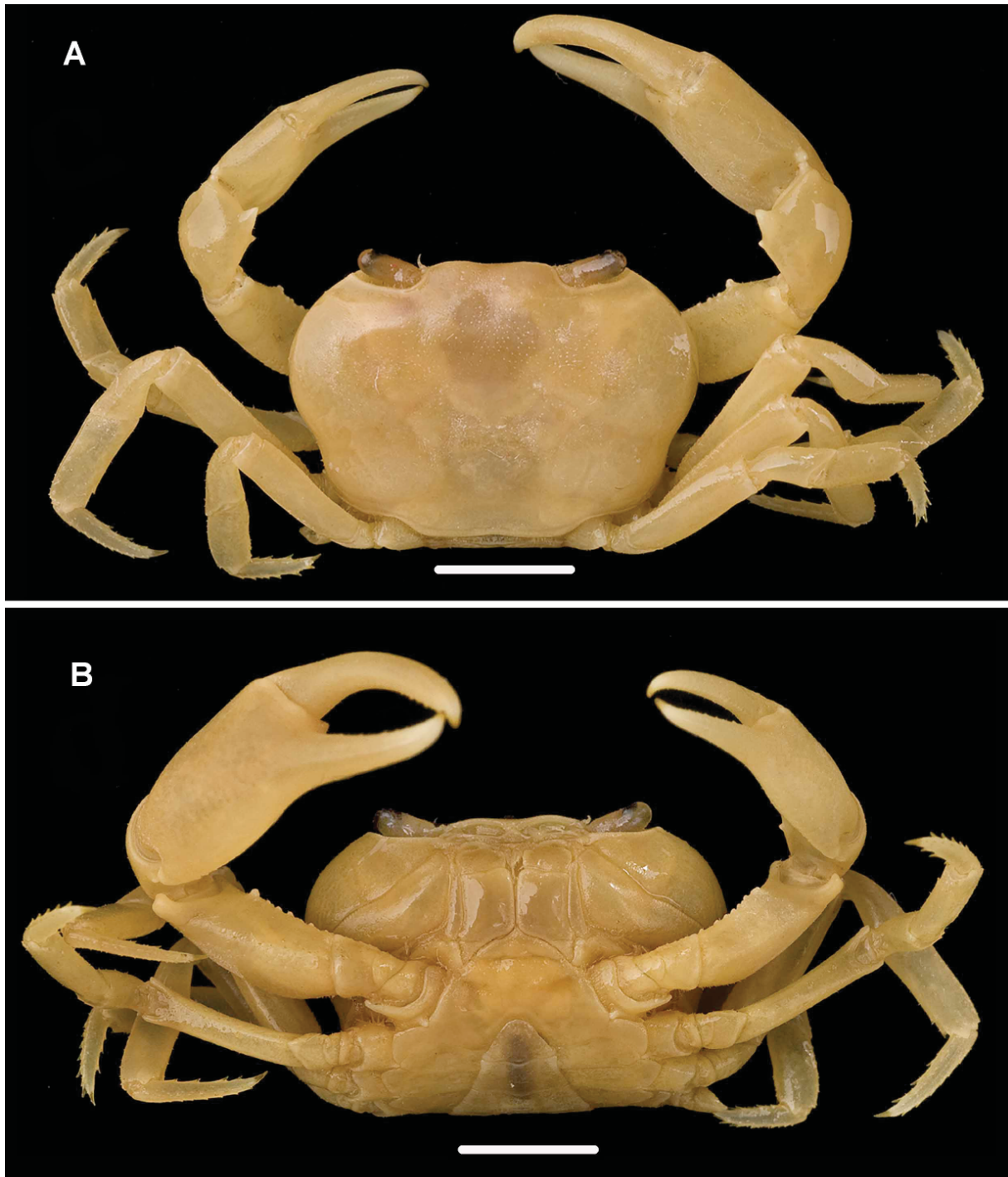


Fig. 2. *Potamonautes busungwe* sp. nov, holotype, adult ♂, CW 15.9 mm, from Busungwe Island, Lake Victoria, southern Uganda (NHMUK 2017.37). **A.** Whole animal, dorsal view. **B.** Whole animal, ventral view. Scale bars: 6.3 mm. Photographs by Phillip Crabb, NHMUK.

carapace sidewall vertical sulcus faint, meeting longitudinal sulcus, dividing sidewall into three parts (Figs 2B, 4B). Suborbital margin granulated (Figs 2B, 4B). Third maxilliped exopod with long flagellum, ischium smooth, lacking vertical sulcus (Figs 2B, 4B). Epistomial tooth large, triangular, edges lined by large round granules. Mandibular palp 2-segmented; terminal segment simple; s2/s3 deep, completely crossing sternum; s3/s4 deep at edges, faint in middle; s4/e4, s5/e5, s6/e6 and s7/e7 all visible (Fig. 2B). Chelipeds of adult male unequal; movable finger (dactylus) and fixed finger (propodus) of major cheliped of adult male slim, elongated, with series of small, even-sized teeth, dactylus highly arched, encompassing wide oval interspace when closed (Fig. 5C–D). Inferior margins of merus of cheliped lined by series of small pointed teeth, distal tooth large, pointed; superior surface of merus granulated (Fig. 2B). Cheliped carpus inner margin teeth both small, low, equal-sized. Pleon outline broadly triangular, with straight edges (Fig. 2B). G1 terminal article short ($0.25 \times$ length of G1), straight, in line with longitudinal axis of subterminal segment, distal third curving outward, tapering to slightly upcurved tip (Fig. 6B, E). G2 terminal article long ($0.5 \times$ length of G2), flagellum-like.

SIZE. Small species, adult at CW 15 mm.

COLOUR. Preserved specimens uniformly light brown.

Distribution

Busungwe Island in the northern part of Lake Victoria (Fig. 7). The nearest town on the mainland to Busungwe is Kakuuto, in the Rakai District of the Central Region of southwestern Uganda.

Ecology

Little is known about the ecology of this species. These specimens were collected in 1955 by P. Corbett of the East African Fisheries Research Organization based at Jinja, who sampled offshore islands including Busungwe as part of a study of the fisheries of Lake Victoria. This small island is still relatively undisturbed, with only a few buildings on the northern part of the island.

Conservation status

An IUCN extinction risk assessment of *P. busungwe* sp. nov. has not yet been carried out, but given the fact that this species is known for only two specimens from a single locality, it would probably be regarded as Data Deficient.

Remarks

Potamonautes busungwe sp. nov. is superficially similar to several other species in this genus from Uganda that share the following characters: reduced exorbital and epibranchial teeth; a smooth anterolateral margin immediately behind the epibranchial tooth; an incomplete s3/s4 which is deep at the sides but absent in the middle; a male major cheliped with a slim, highly arched dactylus. Ugandan crabs that share this suite of characters include *P. rukwanzi*, *P. williamsi*, *P. mutandensis* (Chace, 1942), *P. morotoensis* and *P. imatongensis*.

Potamonautes busungwe sp. nov. can be distinguished from *P. rukwanzi* by its postfrontal crest, which is faint but complete (Fig. 2A) (vs distinct and complete in *P. rukwanzi*), by its third maxilliped ischium, which lacks a sulcus (Fig. 2B) (vs a deep sulcus in *P. rukwanzi*) by a sharp and pointed distal tooth on the cheliped merus (Fig. 2A–B) (vs a small, blunt and low distal tooth in *P. rukwanzi*), and by the G1 terminal article that ends in a slightly upturned tip (Fig. 6B, E) (vs an article that turns sharply upward at the tip in *P. rukwanzi*). *Potamonautes busungwe* sp. nov. differs from *P. williamsi*, *P. mutandensis*, *P. morotoensis* and *P. imatongensis* in that the distal tooth on the inner margin of the cheliped carpus of *P. busungwe* sp. nov. is strong and pointed (vs a weak, low and blunt distal carpal tooth in these four

Table 3. Size range of the seven smallest known species of Afrotropical freshwater crabs. The range of the pubertal moult was estimated to be the size range between the carapace width (CW) of the largest subadult female and the CW of the smallest adult female. Based on Cumberlidge *et al.* (1999: table 2) and Marijnissen *et al.* (2004: table 2). See text for a discussion of how to establish the size range of a species of freshwater crab and for the taxonomic authorities of the species in this table.

Species	Pubertal moult (CW mm)	Largest known specimen (CW mm)	Distribution	Habitat
<i>Platythephusa maculata</i>	11.0	17.9	Lake Tanganyika (Zambia)	Inside empty mollusc shells, 1–60 m deep
<i>Platythephusa conculcata</i>	11.3	30.3	Lake Tanganyika (DR Congo, Burundi, Zambia)	Under rocks, 2–5 m deep
<i>Platythephusa polita</i>	11.4	18.0	Lake Tanganyika (DR Congo, Burundi, Tanzania)	Inside empty mollusc shells, 5–60 m deep
<i>Platythephusa echinata</i>	12.6	39.0	Lake Tanganyika (Burundi, Tanzania)	Inside empty mollusc shells, 10–30 m deep
<i>Potamonautes busungwe</i> sp. nov.	15.4	15.9	Lake Victoria, Uganda	Rocky shores of Busungwe Island
<i>Potamonautes kantsyore</i> sp. nov.	15.6	16.1	Kagera River, Uganda	Kantsyore, an island in the river
<i>Platythephusa immaculata</i>	16.9	31.0	Lake Tanganyika (Zambia)	40–80 m deep

species). *Potamonautes busungwe* sp. nov. differs from *P. morotoensis* and *P. imatongensis* by the G1 terminal article whose tip is slightly upcurved in *P. busungwe* sp. nov. (Fig. 6B, E) (vs a G1 terminal article with a tip that turns sharply upward in *P. morotoensis* and *P. imatongensis*). *Potamonautes busungwe* sp. nov. can be distinguished from *P. entebbe* sp. nov. by an examination of s3/s4, which is reduced to two short notches at the edges and faint in the middle (Fig. 2B) (vs V-shaped and deepest at the edges and faintest in the middle in *P. entebbe* sp. nov.; Fig. 1B).

***Potamonautes kantsyore* sp. nov.**

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Figs 3A–B, 4C, 5E–F, 6C, F, 7; Tables 1, 3

Diagnosis

Carapace of medium height (CH/FW 1.2; Fig. 3B); exorbital tooth low, blunt, epibranchial tooth reduced to granule, postfrontal crest complete, faint medially, lateral ends well defined, meeting epibranchial teeth; anterolateral margin posterior to epibranchial tooth finely serrate, almost smooth (Fig. 3A); carapace sidewall vertical sulcus meeting anterolateral margin (Fig. 3B). Third maxilliped ischium with vertical sulcus (Fig. 3B); s3/s4 not visible except for two short deep notches at edges (Fig. 3B). Inferior margins of merus of cheliped with series of small granules, distal tooth pointed; cheliped carpus distal tooth large, pointed, proximal tooth small, one-third as large as distal tooth (Fig. 3B). Fixed finger (propodus) of major cheliped of adult male with large teeth along cutting edges, largest molars proximal, movable finger (dactylus) cutting edge with only small even granules, dactylus not arched, encompassing long narrow interspace when closed (Fig. 5F). G1 terminal article straight, directed outward at 45° angle to longitudinal axis of subterminal segment, curving outward throughout, tip slightly upturned (Fig. 6C, F).

Etymology

The new species is named for Kantsyore Island, which is located in the Kagera River (where it is about 130 m wide) at a locality that is about 120 km west of the point where the river enters Lake Victoria. The name is used as a noun in apposition. Vernacular name: the Kantsyore Island crab.

Material examined

Holotype (here designated)

UGANDA: adult ♂, CW 16.8, CL 11.6, CH 5.5, FW 4.6 mm, Ankole, Mbarara District, Kantsyore (Toni Nuti's) Island, in the Kagera River, 12.9 km E of Kikagati, -1.04216°S, 30.67056°E, 1280 m a.s.l., 19–20 Aug. 1967, J.S. Williams leg. (NHMUK 2017.29).

Paratypes

UGANDA: 1 adult ♂, CW 15.6, CL 11.6, CH 5.5, FW 4.6 mm, same collection data as for holotype (NHMUK 2017.30); 4 adult ♀♀ (CWs 16.1, 15.7, 15.5, 15.3), 1 subadult ♀ (CW 14.2), 1 subadult ♂ (CW 13.2 mm), same collection data as for holotype (NHMUK 2017.31–36).

Description

Carapace of medium height (CH/FW 1.2; Fig. 3B); front broad, measuring one-third CW (FW/CW 0.3; Fig. 3A). Semi-circular, urogastric, cardiac, posterior and cervical carapace grooves all faint. Postfrontal crest complete, faint, lateral ends well defined, meeting epibranchial teeth; exorbital tooth low, blunt. Epigastric crests faint, median sulcus between crests short, forked posteriorly. Epibranchial tooth reduced to granule; anterolateral margin between exorbital, epibranchial teeth smooth, curving slightly outward, lacking intermediate tooth; anterolateral margin posterior to epibranchial tooth finely serrate, almost smooth (Fig. 3A); carapace sidewall vertical sulcus faint, incomplete, beginning at longitudinal sulcus, not meeting anterolateral margin, dividing sidewall into three parts (Fig. 4C). Suborbital margin granulated (Fig. 4C). Third maxilliped exopod with long flagellum, ischium with faint vertical sulcus (Fig. 4C). Epistomial tooth large, triangular, edges lined by large, round granules (Fig. 4C). Mandibular palp 2-segmented; terminal segment simple, s2/s3 deep, completely crossing sternum; s3/s4 not visible except for 2 short, deep notches at edges; margins of s4 flat, not raised; s4/e4, s5/e5, s6/e6 and s7/e7 all faint. Inferior margins of merus of cheliped with series of small granules, distal tooth pointed; two teeth on inner margin of cheliped carpus, both small, pointed; superior surface of merus granulated (Fig. 3B). Fixed finger (propodus) of major cheliped of adult male with large teeth along cutting edges, largest molars proximal, movable finger (dactylus) cutting edge with only small, even granules, dactylus not arched, encompassing long narrow interspace when closed (Fig. 5E–F). Pleon outline broadly triangular, with straight edges (Fig. 3B). G1 terminal article straight, directed outward at 45° angle to longitudinal axis of subterminal segment, with slightly upturned tip (Fig. 6C, F). G2 terminal article long (0.5 × length of G2), flagellum-like.

SIZE. Small species, adult size range between CW 15.3 and 16.8 mm.

COLOUR. Preserved specimens uniformly light brown.

Distribution

This species is known from only a single locality on Kantsyore Island in the Kagera River, 12.9 km east of Kikagati, where the river forms the border between Uganda and Tanzania (Fig. 7).

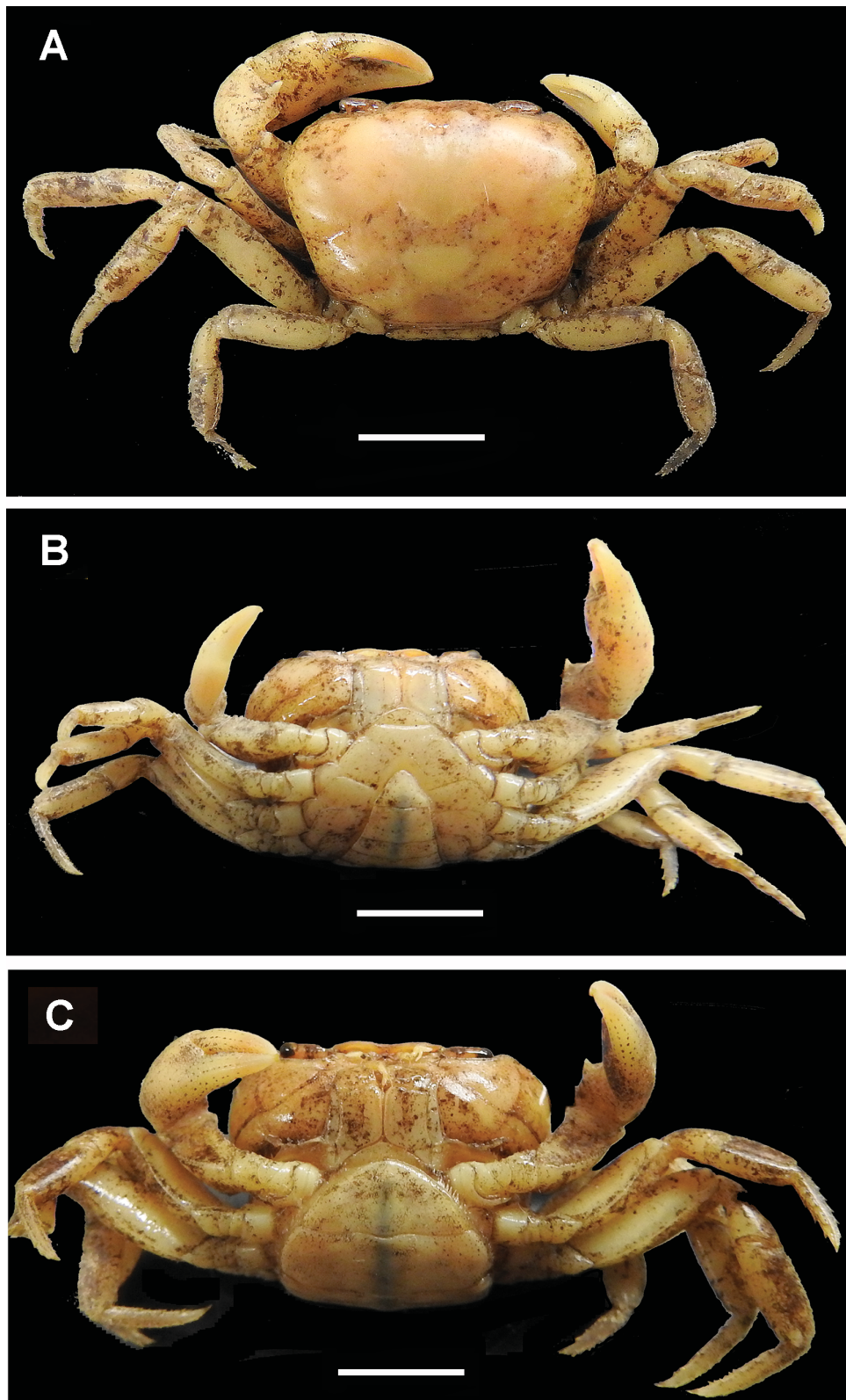


Fig. 3. *Potamonautes kantsyore* sp. nov. from Kantsyore Island in the Kagera River, southern Uganda. **A–B.** Holotype, adult ♂, CW 16.8 mm, (NHMUK 2017.29). **A.** Whole animal, dorsal view. **B.** Whole animal, ventral view. **C.** Paratype, adult ♀, CW 16.1 mm, (NHMUK 2017.33), whole animal, ventral view. Scale bars: A–B = 6.1 mm; C = 6.4 mm.

Ecology

This river-living species was captured on Kantsyore Island in the Kagera River (water temperature 20–24°C) from between tree roots using meat as bait. The new species was collected in the same stretch of river as *P. niloticus*, a large-bodied, widely distributed species found throughout the Nile River basin (Cumberlidge 2009; Cumberlidge & Clark 2010b).

Conservation status

An IUCN extinction risk assessment of *Potamonautes kantsyore* sp. nov. has not yet been carried out, but given the fact that this species is known for only a few specimens from a single locality, it would probably be regarded as Data Deficient.

Remarks

Potamonautes kantsyore sp. nov. is superficially similar to several other species in this genus that share the following characters: reduced or absent exorbital and epibranchial teeth; a smooth anterolateral margin immediately behind the epibranchial tooth; and a thoracic sternum with a s3/s4 which is incomplete and deep at the sides but faint or absent in the middle. Ugandan crabs that share this suite of characters include *P. rukwanzi*, *P. williamsi*, *P. mutandensis*, *P. morotoensis* and *P. imatongensis*. *Potamonautes emini* (Hilgendorf, 1892), from a geographically close locality in northwestern Tanzania, was also compared.

Potamonautes kantsyore sp. nov. can be distinguished from *P. rukwanzi* by the distal tooth on the cheliped merus, which is large, sharp and pointed in *P. kantsyore* sp. nov. (Fig. 3B) (vs small, blunt and low in *P. rukwanzi*). *Potamonautes kantsyore* sp. nov. differs from *P. williamsi*, *P. mutandensis*, *P. morotoensis* and *P. imatongensis* in that the proximal tooth on the inner margin of the cheliped carpus of *P. kantsyore* sp. nov. is pointed and almost as large as the distal tooth (Fig. 3A) (vs a weak, low and blunt proximal tooth in the other species) and the ischium of the third maxilliped is smooth in *P. kantsyore* sp. nov. (Fig. 3B) (vs with a distinct vertical sulcus in the other species). *Potamonautes kantsyore* sp. nov. is superficially similar to *P. emini* from northwest Tanzania (Reed & Cumberlidge 2006) in that both are small species and both have smooth carapace margins. The most important differences between these two species are that the postfrontal crest is weak in *P. kantsyore* sp. nov. (vs distinct in *P. emini*) and the ischium of the third maxilliped has a faint vertical sulcus in *P. kantsyore* sp. nov. (vs smooth in *P. emini*) (Bott 1955: pl. XIV, figs 1a–d; Reed & Cumberlidge 2006; Meyer & Cumberlidge 2011). *Potamonautes kantsyore* sp. nov. can be distinguished from *P. entebbe* sp. nov. by examination of s3/s4, which is almost completely absent except for two short notches on the external margins of the sternite (Fig. 3B) (vs deep at the edges and faint in the middle in *P. entebbe* sp. nov., Fig. 1B). Finally, *P. kantsyore* sp. nov. can be distinguished from *P. busungwe* sp. nov. by examination of the ischium of the third maxilliped, which has a faint vertical sulcus (Fig. 3B) (vs smooth in *P. busungwe* sp. nov.; Fig. 2B).

Discussion

History of the freshwater crabs of Uganda

Between 1837 and 1942, five species of freshwater crabs were described from Uganda (Table 1). The major taxonomic revision of Bott (1955) radically altered our understanding of Uganda's freshwater crab fauna (Table 2). Although Bott (1955) recognized six species from Uganda, only three of these (*P. niloticus*, *P. aloysiisabaudiae* and *P. granviki* (Colosi, 1924)) were included in that work (Table 2). The other two Ugandan species (*P. mutandensis* and *P. amalerensis*) were considered by Bott (1955) to be subspecies of other taxa (*P. emini* and *P. didieri* (Rathbun, 1904), respectively). One consequence of these synonymies was that the distributional ranges of the parent species were expanded to include Uganda (Table 2). Bott (1955) listed a third species, *P. berardi* (Audouin, 1826), as occurring in Uganda, but this was based on misidentified specimens from Mount Elgon (Table 2).

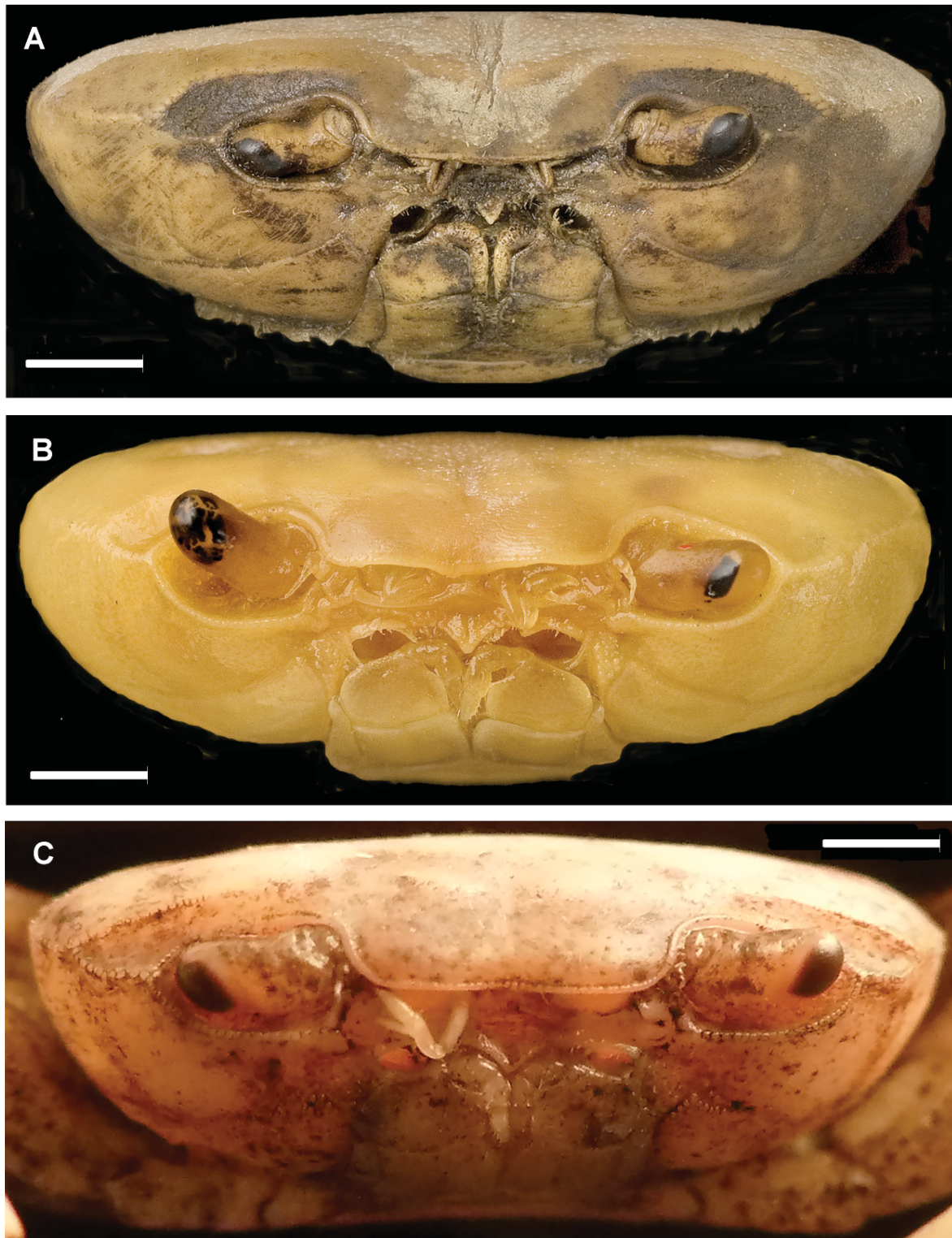


Fig. 4. Frontal view of carapace. **A.** *Potamonautes entebbe* sp. nov., holotype, adult ♂, CW 35 mm, from Entebbe, Lake Victoria, southern Uganda (NHMUK 1955.11.8.26). – **B.** *P. busungwe* sp. nov., holotype, adult ♂, CW 21.5 mm, from Busungwe Island, Lake Victoria,, southern Uganda (NHMUK 2017.37). – **C.** *P. kantsyore* sp. nov., holotype, adult ♂, CW 16.8 mm, from Kantsyore Island in the Kagera River, southern Uganda (NHMUK 2017.29). Scale bars: A = 2.34 mm; B = 3.1 mm; C = 3.3 mm. Photographs A–B by Phillip Crabb, NHMUK.

The modern understanding of African freshwater crab taxonomy, which developed after the monograph of Bott (1955), has radically altered the classification of this group and has revised the species lists for each country including Uganda (Table 1). For example, taxonomic revisionary work based on new material, and in some cases phylogenetic data, has affected the status of taxa from Uganda with the result that the scheme of Bott (1955) (Table 2) is no longer accepted. Three species (*P. berardi*, *P. emini* and *P. didieri*) are removed here from the species list for Uganda established by Bott (1955), and *P. granviki* from Mount Elgon is now treated as a junior synonym of *P. loveni* from Mount Elgon and western Kenya (Williams 1991; Cumberlidge & Clark 2010b, table 1). In addition, *P. mutandensis* and *P. amalerensis* are both recognized as valid species endemic to Uganda (Cumberlidge & Meyer 2011; Cumberlidge & Clark 2016), and the range of *Sudanonautes floweri* (De Man, 1901) has been expanded to include northwest Uganda (Cumberlidge 2009). Furthermore, eight new species of Ugandan freshwater crabs have been described since 2001 (Corace *et al.* 2001; Cumberlidge & Clark 2010a, 2010b, 2016, present work: Table 1).



Fig. 5. Frontal view of left and right chelipeds. **A–B.** *Potamonautes entebbe* sp. nov., holotype, adult ♂, CW 35 mm, from Entebbe in southern Uganda (NHMUK 1955.11.8.26). – **C–D.** *Potamonautes busungwe* sp. nov., holotype, adult ♂, CW 21.5 mm, from Entebbe in southern Uganda (NHMUK 2017.37). – **E–F.** *Potamonautes kantsyore* sp. nov., holotype, adult ♂, CW 16.8 mm, from Kantsyore Island in the Kagera River in southern Uganda (NHMUK 2017.29). Scale bar: A–B = 2.3 mm; C–D = 3.1 mm; E–F = 3.3 mm. Photographs A–D by Phillip Crabb, NHMUK.



Fig. 6. G1, ventral view (A–C) and dorsal view (D–F). **A, D.** *Potamonautes entebbe* sp. nov., holotype, adult ♂, CW 35 mm, from Entebbe, southern Uganda (NHMUK 1955.11.8.26). – **B, E.** *P. busungwe* sp. nov., holotype, adult ♂, CW 21.5 mm, from Busungwe Island, Lake Victoria (NHMUK 2017.37). – **C, F.** *P. kantsyore* sp. nov., holotype, adult ♂, CW 16.8 mm, from Kantsyore Island in the Kagera River, southern Uganda (NHMUK 2017.29). Scale bars: A, D = 2.3 mm; B, E = 3.1 mm; C, F = 3.3 mm.

Concluding remarks

Two of the new species described here (*P. busungwe* sp. nov. and *P. kantsyore* sp. nov.) are the smallest species of freshwater crabs assigned to *Potamonautes* known from Africa. Four miniature species of shell-dwelling crabs of the endemic genus *Platythelphusa* A. Milne-Edwards, 1887, from Lake Tanganyika are the smallest known species of African freshwater crabs (Cumberlidge *et al.* 1999; Marijnissen *et al.* 2004), and are even smaller than the Ugandan species (Table 3). The small Lake Tanganyika species are *Platythelphusa polita* Capart, 1952, *P. conculcata* (Cunnington, 1907), *P. maculata* (Cunnington, 1899) and *P. echinata* Capart, 1952 (with adult size ranges beginning at CWs 11.0, 11.3, 11.4 and 12.6 mm respectively; Capart 1952; Cumberlidge *et al.* 1999; Table 3).

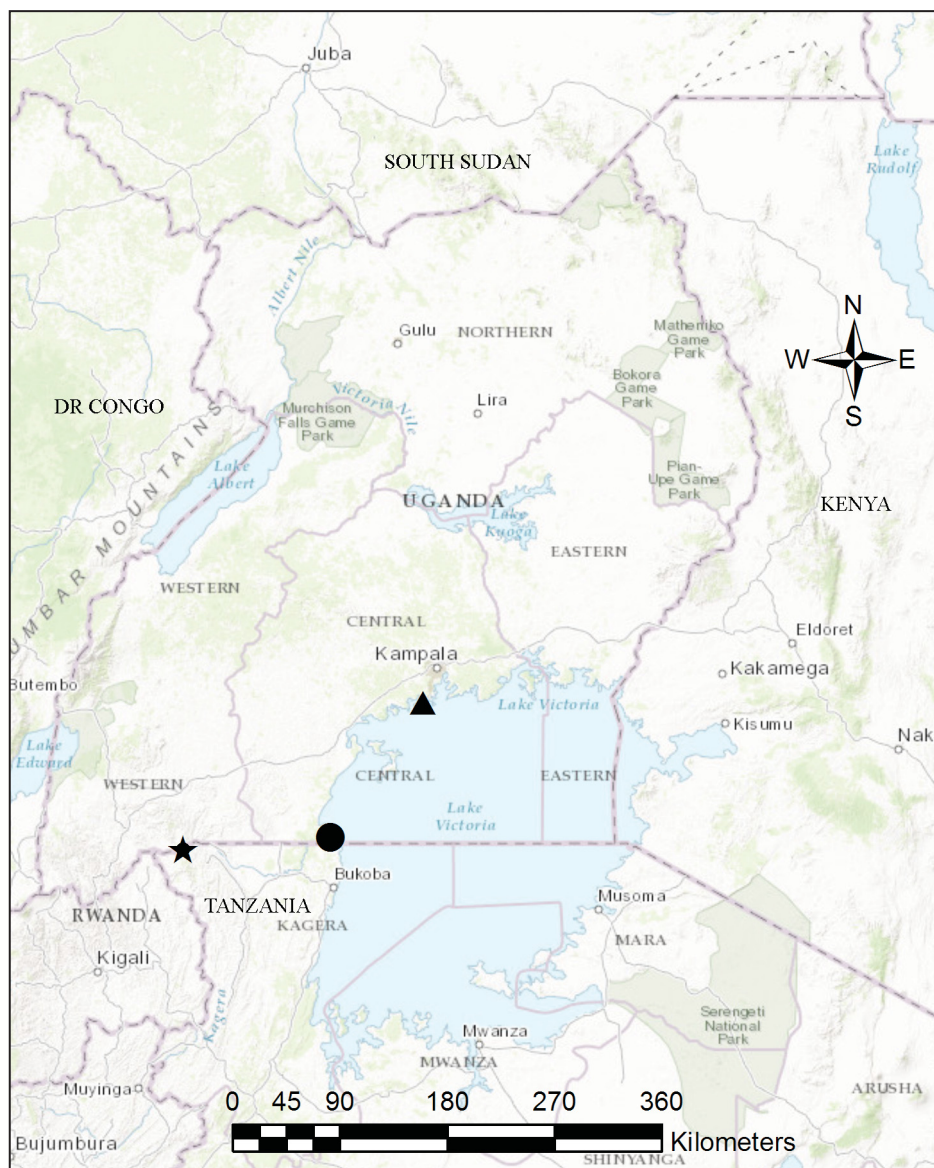


Fig. 7. Distribution map showing the known localities of *Potamonautes entebbe* sp. nov. (black triangle), *P. busungwe* sp. nov. (black circle) and *P. kantsyore* sp. nov. (black star) in Uganda, East Africa. For exact localities, see text.

Until the present study, it was thought that *P. niloticus* was the only species of freshwater crab found in Lake Victoria. *Potamonautes niloticus* is a large commercially exploited species that is widespread throughout the Nile River drainage basin (from Egypt to Rwanda) and is not endemic to Lake Victoria (Cumberlidge 2009; Cumberlidge & Clark 2010a). The present study raises the possibility that there are three species of freshwater crabs living in Lake Victoria – *P. niloticus*, *P. entebbe* sp. nov. and *P. busungwe* sp. nov. – rather than one non-endemic species (*P. niloticus*), and that the two new species described here are the first endemic species known from this lake.

The other small species discovered in the present study is *P. kantsyore* sp. nov. (adult at CW 15.3 mm), which is endemic to Kantsyore Island in a widened stretch of the Kagera River, about 120 km west of the point where the river enters Lake Victoria. The Kagera River arises in Burundi and is thought to be one of the sources of the Nile River. In Burundi the Kagera River flows north along the Rwanda-Burundi and Rwanda-Tanzania borders, and then turns east where it follows the Tanzania-Uganda border before eventually emptying into Lake Victoria in Uganda.

Acknowledgements

We would like to acknowledge support from Northern Michigan University (NMU) Faculty Grant Award #554901 and the useful contributions of NMU biology students Harrison Moynihan and Wesley S. Bos, who assisted the authors in part of this work.

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Manuscript received: 23 February 2017

Manuscript accepted: 10 April 2017

Published on: 28 November 2017

Topic editor: Rudy Jocqué

Desk editor: Chloe Chester

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