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Naucoridae Leach, 1815 (Hemiptera: Heteroptera) of Tanzania

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ABSTRACT

The East African country of Tanzania was surveyed extensively for its fauna of saucer bugs (Heteroptera: Nepomorpha: Naucoridae) in July and August 2010 and August 2013. Previously, two subfamilies, three genera and six species were known from the country. All taxa previously recorded from Tanzania were re-collected, with the exception of two species, *Neomacrocoris karimii* Poisson and *N. usambaricus* (Montandon). We added three genera (*Aneurocoris*, *Ctenipocoris*, and *Laccocoris*) and eight species; thus, the known naucorid fauna of Tanzania now includes six genera and 14 species. Included in the collections were two undescribed species of *Neomacrocoris*. An annotated list and illustrated key to the species are presented.

KEY WORDS: Heteroptera, Nepomorpha, Naucoridae, Afrotropical, aquatic, creeping water bugs, saucer bugs, faunistics, identification key.

INTRODUCTION

Tanzania is a geographically diverse country in East Africa. Although much of the country is an arid plateau, other features punctuate the landscape including several mountain ranges and the East African Rift Valley with its associated great lakes and the streams that flow into them. Few studies that focus on the aquatic insects of Tanzania have been published and none of these has addressed the family of Naucoridae.

Naucorids are predacious aquatic true bugs and the principal arthropod predators of many aquatic insects, including biting fly larvae. Although naucorids are widely understood to be beneficial insects by exerting a level of natural biological control of mosquito (Diptera: Culicidae) and other biting fly larvae (e.g., Simuliidae), several recent papers addressing Buruli ulcer in West Africa have implicated naucorids as possible disease vectors (e.g., Marsollier *et al.* 2002; Merritt *et al.* 2005; Silva *et al.* 2007; Ebong *et al.* 2012). Although transmission to humans has not been demonstrated, the naucorids examined harboured the causative Buruli ulcer mycobacterium in their salivary glands (e.g., Marsollier *et al.* 2002; Merritt *et al.* 2005; Silva *et al.* 2007).

Most papers that treat African naucorids are faunistic inventories of more inclusive taxa (e.g., aquatic Heteroptera) resulting from expeditions to various parks or other well-defined regions in the middle 1900s. Most of these papers were written by Raymond Poisson in which he provided accountings of taxa of national parks and other geopolitical areas from the 1940s through the 1960s (Grasse 1974). Embedded within these papers were brief descriptions of new species. Until recently, the naucorid fauna of Tanzania was poorly known and only from scattered distribution records of six species in three genera (e.g., Signoret 1861; Montandon 1913a; Poisson 1963). In a recent revision of *Neomacrocoris*, two additional species based on fieldwork reported here were described (Sites & Mbogho 2012).

To provide a sound foundation for future biological, ecological, and epidemiological investigations, a faunistic survey to document the taxonomic composition and distribution of the species of Naucoridae of Tanzania was conducted. Presented here is an

annotated list of the species of Naucoridae of Tanzania with information regarding habitats, diagnoses, and distributions. Also included is an illustrated taxonomic key.

MATERIAL AND METHODS

All totaled, 138 sites were sampled for Naucoridae from 24 July – 17 August 2010, and 7–9 August 2013. This sampling was conducted during the dry season to facilitate access to bodies of water and to sample at a time when the insects are present in the adult stage and able to organize to their preferred habitat in the absence of scouring rains and flooding. Six additional sites were sampled during the rainy season in January 2012; however, no specimens were found. Tanzania has been apportioned into six land resource zones (Panagos *et al.* 2011) and our collections were conducted in all six zones (coast, arid lands, semi-arid lands, plateau, highlands, alluvial plains). Habitats sampled included streams, rivers, waterfalls, ponds, lakes, reservoirs, swamps, and cold and hot springs. In lentic habitats, aquatic nets were swept vigorously through submergent vegetation. All recognizably different plant communities were sampled. In Lake Tanganyika, rocks, cobble, and sand also were sampled. Lotic habitats included 1st through 4th order streams and were collected in two ways: the substrate was kick sampled while holding the net downstream, thus allowing the current to carry organic material including insects into the net; and marginal submergent vegetation was swept vigorously, including beneath undercut banks and overhanging vegetation. All specimens were placed into 100% ethanol and brought to the laboratory for identification. Photographs of the collection sites identified as L-numbers are available in a Locality Image Database via a link from the internet site of the Enns Entomology Museum, University of Missouri.

Countries given in square brackets here did not appear on the specimen labels or were not provided in publications, but were inferred from available data; additional information also appears in square brackets. Data on separate labels of old specimens are quoted verbatim and separated with a slash (/).

Specimens from the following collections are referenced in the ‘Material examined’ and ‘Extralimital material examined’ sections in the annotated list of species:

- BMNH – The Natural History Museum (London);
- CMNH – Carnegie Museum of Natural History (Pittsburgh);
- DHJC – Dawid H. Jacobs Collection (Pretoria);
- HNHM – Hungarian Natural History Museum (Budapest);
- MNB – Museum für Naturkunde (Berlin);
- MNHN – Muséum National d’Histoire Naturelle (Paris);
- NHMW – Naturhistorisches Museum (Vienna);
- NMSA – KwaZulu-Natal Museum (Pietermaritzburg);
- NMWC – National Museum of Wales (Cardiff);
- PRC – Patrick Reavell Collection (Cape Town);
- RMCA – Musée Royal de l’Afrique Centrale (Tervuren);
- RMNH – National Museum of Natural History Naturalis (Leiden);
- SANC – South African National Collection of Insects (Pretoria);
- TMSA – Ditsong Museum of Natural History (Pretoria);
- UMC – University of Missouri (Columbia);
- USNM – United States National Museum of Natural History (Washington, DC);
- WSUC – Washington State University (Pullman).

TAXONOMY

Two subfamilies of Naucoridae were collected: Laccocorinae and Naucorinae. Collections of Laccocorinae comprised three genera, *Aneurocoris*, *Ctenipocoris*, and *Laccocoris*, and a total of five species. Collections of Naucorinae comprised three genera, *Macrocoris*, *Naucoris*, and *Neomacrocoris* and a total of seven species. Of the three genera and six species previously recorded from Tanzania, all but two species from the Usambara Mountains were re-collected. As a result of this study, three more genera (*Aneurocoris*, *Ctenipocoris*, and *Naucoris*) and eight more species are added to the naucorid fauna of Tanzania. Thus the known naucorid fauna now includes six genera and 14 species (Table 1). Two of the species added to the fauna were described in the genus *Neomacrocoris*; *Neomacrocoris vuga* Sites was collected in the Usambara Mountains of north-eastern Tanzania, whereas *Neomacrocoris bondelaufa* Sites was collected throughout western Tanzania in the East African Rift Valley and museum specimens from Democratic Republic of Congo and South Africa also were examined.

Key to the Naucoridae of Tanzania

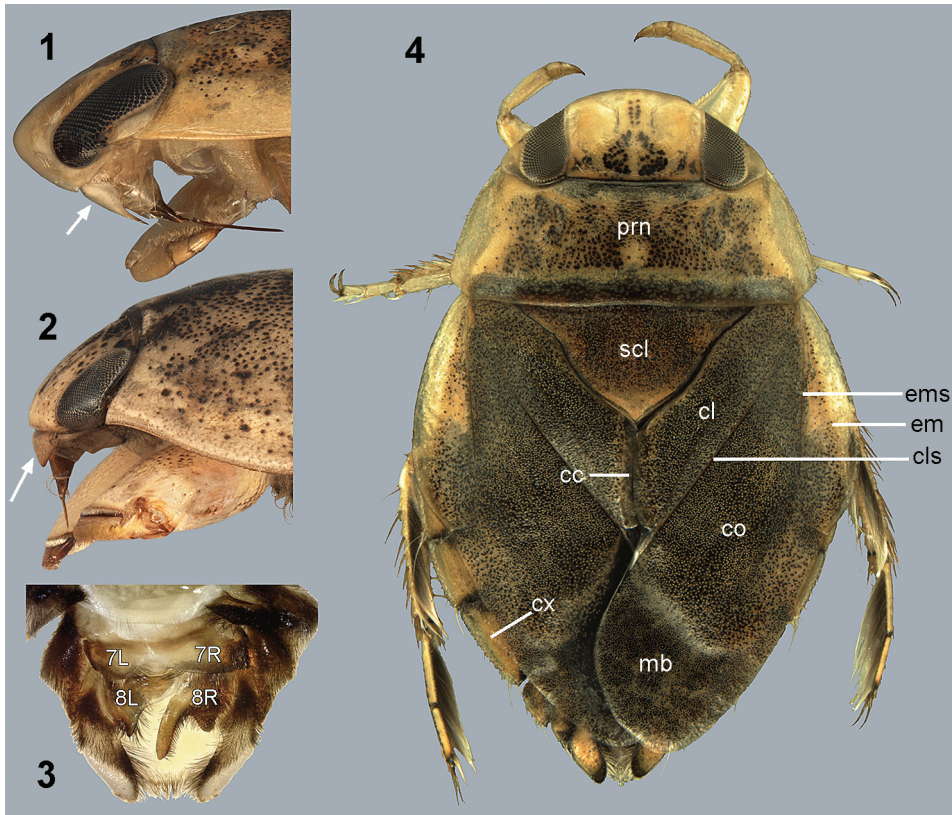
- 1 Front of head folded posteroventrally (Fig. 1). Foreleg pretarsus with two claws. Males with well developed tomentose patch ventrally on pro- and mesotibia (on females weakly developed)..... **Laccocorinae** (2)
- Front of head not folded posteroventrally (Fig. 2). Foreleg pretarsus with a single claw. Without tomentose patch on pro- and mesotibia..... **Naucorinae** (6)
- 2 Length 5.8–7.4 mm. Hemelytra with embolar and claval sutures absent (Fig. 15) (Lake Tanganyika)..... **Aneurocoris insolitus** Montandon
- Length ≥ 7.5 mm. Hemelytra with embolar and claval sutures distinct (Figs 4, 16–19)..... 3
- 3 Pronotum with greatest width approximately twice its length at midline (Fig. 16). Female with two protarsal segments..... **Ctenipocoris africanus** Poisson
- Pronotum with greatest width approximately 3 \times its length at midline (Figs 17–19). Female with one protarsal segment..... **Laccocoris** (4)
- 4 Labrum broad, half as long as wide at base; roundedly pointed; reaching at most to middle of penultimate segment of labium. Body large, length 10–13 mm..... **L. spurcus congoensis** Poisson
- Labrum triangular or acuminate, slightly shorter than wide at base; reaching distal segment of labium. Body shorter, length <10 mm..... 5
- 5 Mesosternal tubercle low, broad, and rounded in profile. Pronotum with posterolateral corners broadly rounded or truncated, not pointed or produced caudad (Fig. 18). Claval commissure subequal in length to scutellum at midline. Hemelytral membrane broad..... **L. limigenus** Stål
- Mesosternal tubercle produced, bluntly acute in profile. Pronotum with posterolateral corners slightly produced caudad or at least bluntly pointed (Fig. 17). Claval commissure approximately twice length of scutellum at midline. Hemelytral membrane narrow..... **L. limicola** (Stål)
- 6 Head including eyes distinctly wider than anterior margin of scutellum (Fig. 22). Body flattened, pyriform. Male with tergites 7 & 8 unmodified. Male parameres

TABLE 1
Checklist of Naucoridae of Tanzania, with previous and new country records.

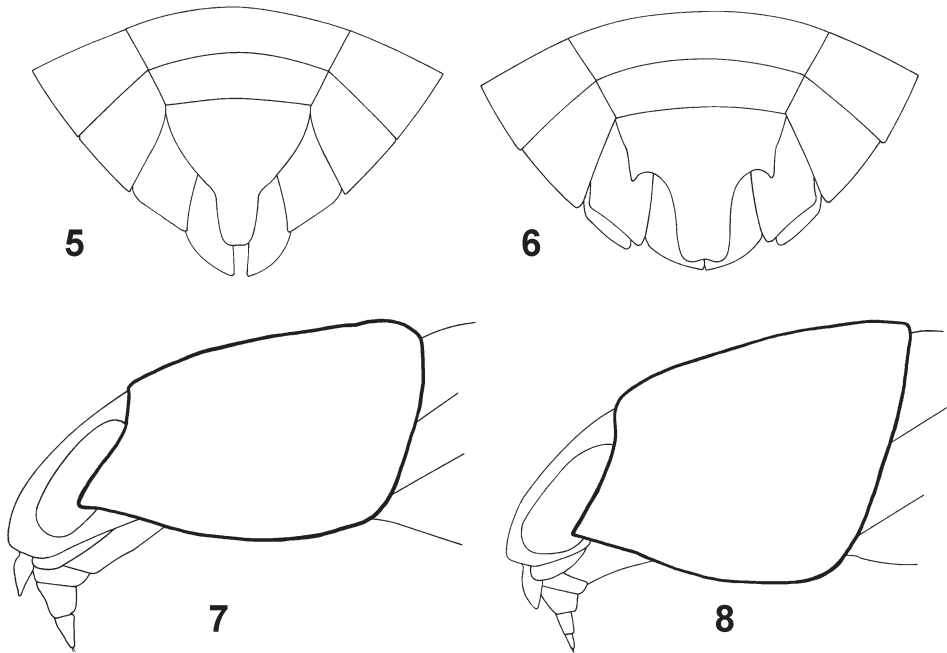
Taxon	Previous	New
<i>Aneurocoris insolitus</i> Montandon		X
<i>Ctenipocoris africanus</i> Poisson		X
<i>Laccocoris limicola</i> (Stål)		X
<i>Laccocoris limigenus</i> Stål	X	
<i>Laccocoris spurcus congoensis</i> Poisson		X
<i>Macrocoris flavicollis</i> Signoret	X	
<i>Macrocoris laticollis</i> Montandon		X
<i>Naucoris obscuratus</i> Montandon		X
<i>Neomacrocoris bondelaufa</i> Sites		X
<i>Neomacrocoris handlirschi</i> (Montandon)	X	
<i>Neomacrocoris karimii</i> Poisson	X	
<i>Neomacrocoris parviceps parviceps</i> (Montandon)	X	
<i>Neomacrocoris parviceps ocellatus</i> Poisson	X	
<i>Neomacrocoris usambaricus</i> Montandon	X	
<i>Neomacrocoris vuga</i> Sites		X

- elongate and crossing (Fig. 10); aedeagus unmodified distally **Naucoris obscuratus** Montandon
- Head as wide as or narrower than anterior margin of scutellum (Figs 20, 21, 23–29). Body dorsoventrally robust, ovate. Male with abdominal terga 7 and/or 8 modified with asymmetrical medial lobes (Fig. 3). Male parameres present (Fig. 9) or absent (Figs 11–14); aedeagus modified distally with complex vesica (Figs 9, 11–14) 7
- 7 Greatest head width across the eyes is less than half the greatest pronotum width (Figs 23–29). Male parameres absent (Figs 11–14)..... **Neomacrocoris** (8)
- Greatest head width across the eyes is more than half the greatest pronotum width (Figs 20, 21). Male parameres well developed (Fig. 9) **Macrocoris** (15)
- 8 Body large, usually ovate; length ≥ 10.0 mm; width/length ratio usually ≥ 0.675 ... 9
- Body smaller and more elongate; length < 10.0 mm; width/length ratio < 0.675 ... 12
- 9 Females (female of *N. karimii* unknown)..... 10
- Males (male of *N. usambaricus* unknown) 11
- 10 Subgenital plate with lateral margins smoothly sinuate to distal spatulate process (Fig. 5)..... **N. usambaricus** Montandon
- Subgenital plate with strong mid-lateral projections and distal spatulate process (Fig. 6)..... **N. vuga** Sites
- 11 Phallosoma with acute apical hook projecting to left (Fig. 14) **N. vuga** Sites
- Phallosoma with left side of apex flattened (Fig. 11)..... **N. karimii** Poisson
- 12 Thick setae scattered sparsely on scutellum and hemelytra, including on clavus, embolium, corium, and membrane (Fig. 28). Pronotum slightly flattened (Fig. 7)..... **N. handlirschi** (Montandon)
- Thick setae restricted to embolium and adjacent areas of corium, although thin hair-like setae can be present throughout. Pronotum dorsoventrally robust (Fig. 8).... 13

- 13 Lateral margin of embolium slightly less arcuate in anterior $\frac{1}{3}$ to $\frac{1}{2}$ (Fig. 26). Phallosoma with rounded gibbosity on right (Fig. 12).....**N. bondelaufa** Sites
 – Lateral margin of embolium evenly arcuate throughout (Figs 23, 24). Phallosoma with elongate flange on right (Fig. 13)..... 14
- 14 Pronotum with black spots on lateral $\frac{1}{3}$ larger than spots on central $\frac{2}{3}$ (Fig. 24).....
**N. parviceps ocellatus** Poisson
 – Pronotum with black spots on lateral $\frac{1}{3}$ subequal to spots on central $\frac{2}{3}$ (Fig. 23)....
**N. parviceps parviceps** (Montandon)
- 15 Pronotum mostly yellow (green in live specimens) with sparse large black spots (Fig. 20), some specimens with dark punctation in addition to larger dark spots. Connexiva continuously greenish yellow **M. flavicollis** Signoret
 – Pronotum with profuse small black spots (Fig. 21). Connexiva with posterolateral corners dark brown, yellow anteriorly **M. laticollis** Montandon



Figs 1–4. (1, 2) Lateral aspect of head of (1) *Laccocoris limigenus* (Laccocorinae) and (2) *Neomacrocoris parviceps* (Naucorinae) showing position of labrum (white arrow) with respect to the front of the head; (3) terminal abdominal terga of male *Macrocoris flavicollis* with asymmetrical medial lobes of segments 7 and 8; (4) *Laccocoris limigenus*. Abbreviations: cc – claval commissure, cl – clavus, cls – claval suture, co – corium, cx – connexivum, em – embolium, ems – embolar suture, mb – membrane, prn – pronotum, scl – scutellum.



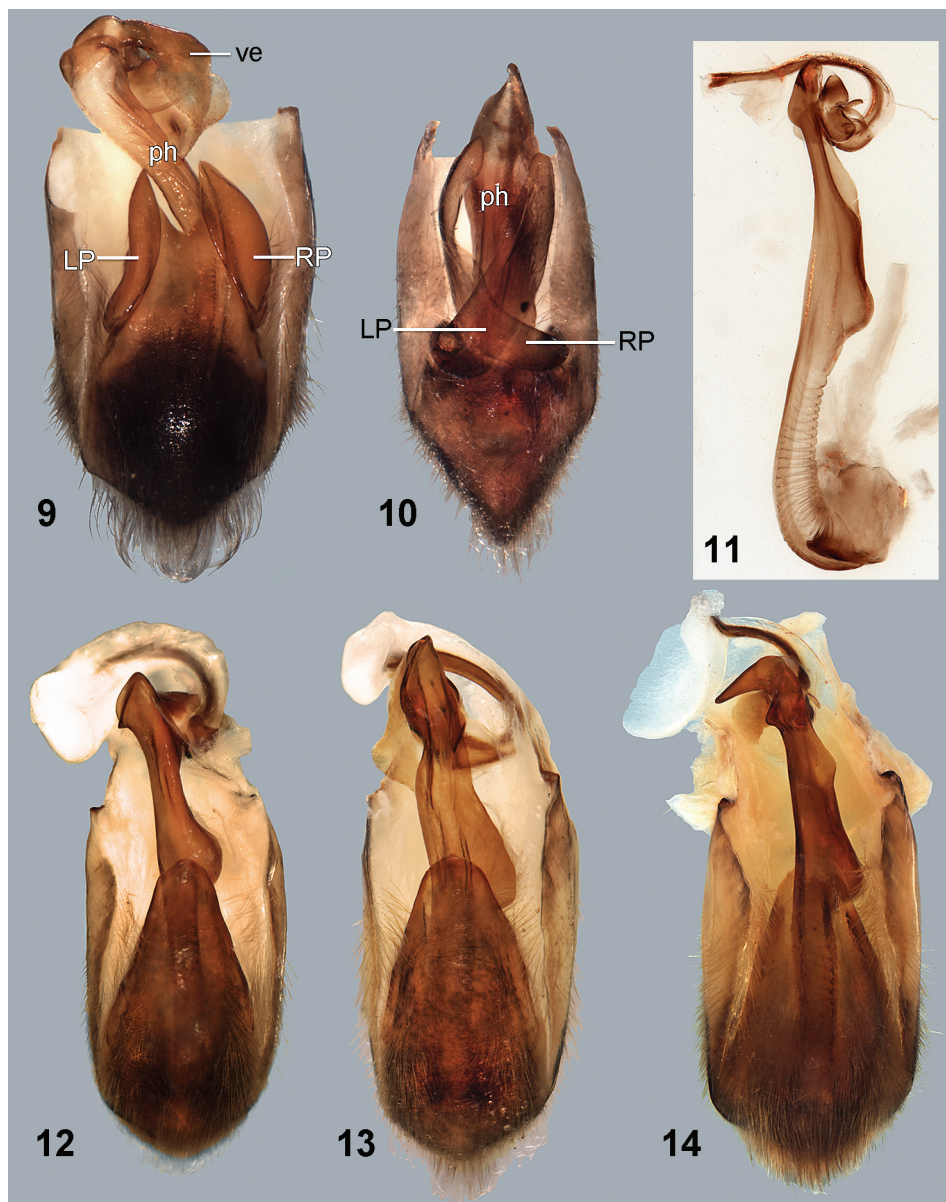
Figs 5–8. (5, 6) Terminal abdominal sterna of female including subgenital plates of (5) *Neomacrocoris usambaricus* and (6) *Neomacrocoris vuga*; (7, 8) lateral view of pronotum of (7) *Neomacrocoris handlirschi* and (8) *Neomacrocoris parviceps*. (Reproduced from Sites & Mbogho (2012), with permission by Magnolia Press.)

Annotated list of Naucoridae of Tanzania

Two subfamilies of Naucoridae occur in Africa, Laccocorinae and Naucorinae, and can be distinguished from each other easily using several simple morphological characteristics. In Laccocorinae, the front of the head is folded posteroventrally such that the labrum is set back from the anterior margin of the head giving an opisthognathous appearance (Fig. 1). In Naucorinae, the labrum is positioned on the ventral surface at the anterior margin of the head (Fig. 2). Second, the prothoracic legs bear two articulated pretarsal claws in African Laccocorinae, whereas a single immovable claw is fused to the protibia in Naucorinae. Other features including genitalia can be used, but these are not necessary with the obvious head and leg features.

Subfamily Laccocorinae Stål, 1876

The front of the head is folded posteroventrally such that the labrum is set back from the anterior margin of the head. The prothoracic legs bear two articulated pretarsal claws (except the Indochinese genus *Namtokocoris* Sites, which has one claw). In males, a well developed tomentose patch occurs on the distal half of the pro- and mesotibia; in females this patch is weakly developed on the mesotibia and imperceptible to weakly developed on the protibia. Three genera occur in Tanzania: *Aneurocoris* is endemic to Lake Tanganyika, *Ctenipocoris* is uncommon and occurs in lentic habitats, and *Laccocoris* is commonly collected in the vegetated margins or shallow areas of streams.



Figs 9–14. Male genitalia: (9) *Macrocoris flavicollis*, (10) *Naucoris obscuratus*, (11) *Neomacrocoris karimii*, (12) *Neomacrocoris bondelaufa*, (13) *Neomacrocoris parviceps*, (14) *Neomacrocoris vuga*. Abbreviations: LP – left paramere, RP – right paramere, ph – phallosoma, ve – vesica. (Figs 11–14 are reproduced from Sites & Mbogho (2012), with permission by Magnolia Press.)

A unique, unreported feature present in certain mainland African and Middle Eastern Laccocorinae is a transverse fracture of the hemelytra extending from near the distal end of the embolium through the apex of the claval commissure (Figs 15, 17, 19). This fracture is present in both sexes of *Aneurocoris* and mostly only females of *Heleocoris*

and *Laccocoris*. Exceptions among Tanzanian taxa are that we have one male of *L. limicola* in which the fracture is present and one female of *L. spurcus congoensis* in which the fracture is absent. That the fracture is present only in laccocorine taxa from mainland Africa and the Middle East provides support for the concept that these species of *Heleocoris* and *Laccocoris* represent a clade distinct from congeners in Asia (see discussion of *Laccocoris* below). The laccocorine taxa of Madagascar appear to differ from those of the mainland in that they lack the transverse fracture; we have examined many specimens of *Temnocoris* and *Heleocoris*, including *Heleocoris humeralis* (Signoret), none of which exhibits this attribute. Further, the fracture is lacking in both sexes of *Ctenipocoris africanus* which is known only from mainland Africa, although the genus is found in both the New and Old World.

Genus *Aneurocoris* Montandon, 1897

The genus *Aneurocoris* includes only two known species, both of which are endemic to Lake Tanganyika: *Aneurocoris insolitus* Montandon and *Aneurocoris marlieri* Poisson. Poisson (1960c) provided a comparison of *A. insolitus* with *A. marlieri* from the north-western shoreline in the Democratic Republic of the Congo. Coulter (1991) and Irvine & Donohue (1999) indicated that these species live on the underside of stones in shallow water and possibly remain submerged throughout their life cycle. Polhemus and Polhemus (2008a) were in error in reporting that two endemic genera of Naucoridae are known from Lake Tanganyika. The second naucorid genus known from the lake is *Naucoris* (Montandon 1913b; Poisson 1967), which is not an endemic but occurs widely throughout Africa, Europe, Asia, and Australia. *Aneurocoris* is the only endemic genus of Naucoridae known from Lake Tanganyika.

Aneurocoris insolitus Montandon, 1897

Figs 15, 30

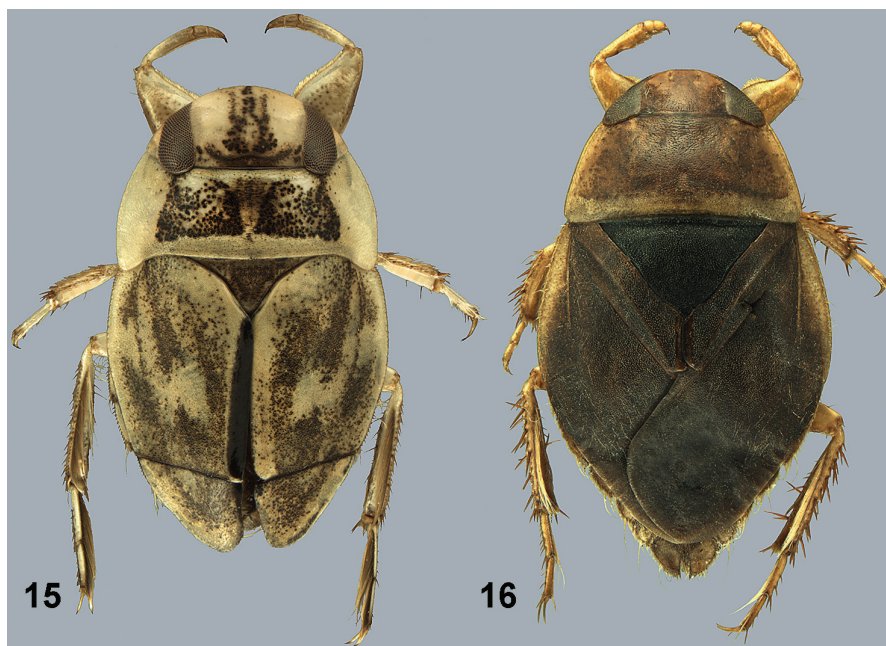
Aneurocoris insolitus: Montandon 1897a: 437.

Diagnosis: *Aneurocoris insolitus* can be distinguished from other species of Naucoridae in Tanzania by the entirely coriaceous hemelytra which are devoid of claval and embolar sutures and membrane (Fig. 15). It is relatively small for the family, measuring 5.8–7.4 mm in length. All specimens examined for hindwing condition lacked hindwings.

Material examined: TANZANIA: *Kigoma Region*: Lake Tanganyika, Kigoma, 4°54.719'S 29°37.989'E, 772 m, 28.vii.2010, R.W. Sites & A. Mbogho, rootmats of matete on waveswept sandy shoreline, L-1166 (UMC; 26♂, 13♀, 74 nymphs); same locality, 4°55.319'S 29°40.256'E, 773 m, 28.vii.2010, R.W. Sites & A. Mbogho, dense rootmats of matete in heavy wave action, L-1167 (UMC; 18♂, 15♀, 18 nymphs). *Rukwa Region*: Lake Tanganyika, Karema, 6°49.694'S 30°26.646'E, 780 m, 31.vii.2010, R.W. Sites & A. Mbogho, heavily wave swept roots of reed grass, L-1189 (UMC; 3♀, 2 nymphs); Lake Tanganyika, Kasanga, 8°26.746'S 31°08.642'E, 773 m, 2.viii.2010, R.W. Sites & A. Mbogho, waveswept reed grass clumps, L-1203 (DHJC, NHMW, NMSA, SANC, TMSA, UMC, WSUC; 98♂, 96♀, 203 nymphs); Tanganyika Terr., Kirando [Kiranda?], 14.x.1926, Dr C. Christy Exp., B.M. 1927-203 / under stones on water line / 427 (BMNH; 1♀).

Extralimital material examined: [DEMOCRATIC REPUBLIC OF CONGO]: "Museum Paris, Tanganyika (Mpala), Oberthür 99-96 / Type / *Aneurocoris insolitus* Montand type 1897" (MNHN; ♀).

Distribution: *Aneurocoris insolitus* is limited to Lake Tanganyika. In Tanzania, we collected it from Kigoma to the southernmost point of the lake. Streams and rivers which flow into the lake were not found to harbour this species. Its distribution in the lake is not continuous, but apparently restricted to the isolated patches of reed grass, *Phrag-*



Figs 15, 16. (15) *Aneurocoris insolitus* male from L-1203, (16) *Ctenipocoris africanus* male from Namanve Swamp, Uganda.

mites mauritianus, where the insects live among the rhizomes and root mats. The type specimen in the Paris Museum is labelled “Tanganyika (Mpala)”. In 1897, Tanganyika could have referred to the lake or the country. Villages named Mpala occur in both Democratic Republic of the Congo (DRC) and Tanzania. Mpala in Tanzania is not near Lake Tanganyika, but is in Iringa Region 415 km southeast of Lake Tanganyika and 70 km northeast of Lake Malawi, whereas Mpala in DRC is on the western shoreline of Lake Tanganyika, almost directly west of Karema in Tanzania. Thus, we interpret Mpala, DRC to be the type locality of this species. Although the species has been recorded from Lake Tanganyika and because the type locality is in DRC, reported here is the first record of its occurrence in Tanzania.

Discussion: In addition to Coulter (1991) and Irvine & Donohue (1999) suggesting association with a stony substrate, label data of older museum specimens indicated that *A. insolitus* was collected from rocks in Lake Tanganyika. However, during our collections it was not found among rocks despite collecting intensively in rocky substrates at several locations near Kigoma. Rather than living under or among rocks, this species was associated consistently with root mats of reed grass (*matete* in Swahili), *Phragmites mauritianus* Kunth, in the four sites where it was collected. At all other sites with sand and rock substrates that also were sampled, *A. insolitus* was not found.

Genus *Ctenipocoris* Montandon, 1897

The genus *Ctenipocoris* is known from eight described species on four continents, with an additional undescribed species in India. Specifically, *C. asiaticus* Montandon

and *C. sinicus* Zettel occur in Asia, and *C. brasiliensis* (De Carlo), *C. oscari* Herrera, *C. peruvianus* (La Rivers), *C. schadei* (De Carlo), and *C. spinipes* (Montandon) occur in the New World. Only one species is known from Africa.

Ctenipocoris africanus Poisson, 1948

Figs 16, 30

Ctenipocoris africana: Poisson 1948b: 219–221.

Diagnosis: Among Tanzanian laccocorines, *Ctenipocoris* can be distinguished from *Aneurocoris* because the hemelytra have distinct embolar and claval sutures, and from *Laccocoris* because the pronotum's greatest width is approximately twice its length at the midline (Fig. 16). This genus can be distinguished from most other naucorids by the meso- and metatibial spines that are especially stout and divergent at a greater angle from the axis of the leg segment.

Material examined: TANZANIA: *Rukwa Region*: 110 km N of Mpanda, 5°37.745'S 30°36.039'E, 1295 m, 30.vii.2010, R.W. Sites & A. Mbogho, shallow creek with muddy bottom and marginal grasses, L-1185 (UMC; 1♀).

Extralimital material examined: CAMEROON: Oboerssanga, Carnot 20–26 II [19]14 TessmannS (MNB; 1♂). UGANDA: Namanve Swamp, Kampala, 18 I 1933, G.L.R. Hancock, B.M. 1933-585 / Pres. By Imp. Inst. Ent. B.M. 1933-585 (BMNH; 1♂); Namanve, 11 VII 1932, G.L.R. Hancock, NO 29 / Pres. By Imp. Inst. Ent. B.M. 1933-585 (BMNH; 1♂); Kampala, 30 III 1932, G.L.R. Hancock, NA 12 / Pres. By Imp. Inst. Ent. B.M. 1933-585 (BMNH; 1♀); Kampala, 27 IV 1932, G.L.R. Hancock, NA 7 / Pres. By Imp. Inst. Ent. B.M. 1933-585 (BMNH; 1♀).

Distribution: Because so few specimens are known, it is not possible to discuss distribution in any detail. Thus far, this species is known from only a few localities in four countries: Cameroon, Democratic Republic of Congo, Uganda, and Tanzania.

Discussion: This species was described from Ituri in northeastern Democratic Republic of Congo (Poisson 1948b). La Rivers (1960) subsequently redescribed it as *Heleocoris faradjensis* from Belgian Congo (=DRC), which later was synonymized with *C. africanus* (Polhemus & Polhemus 2008b). It is not common in collections, although we have studied a series from Uganda in the British Museum. Presented here are the first records of *C. africanus* from Tanzania and Cameroon. We collected a single female specimen in a shallow, nearly stagnant, muddy creek with soft bottom and marginal grasses (L-1185).

Genus *Laccocoris* Stål, 1858

Among Tanzanian laccocorines, *Laccocoris* can be distinguished from *Aneurocoris* because the hemelytra have distinct embolar and claval sutures, and from *Ctenipocoris* because the pronotum's greatest width is approximately three times its length at the midline (Figs 17–19). This genus is currently known from Africa through India to the Greater Sunda Islands and the Philippines. However, an unpublished study suggests that the genus should be restricted to species from Africa and the Middle East, a concept supported by our discovery of the transverse hemelytral fracture, which is absent in Southeast Asian taxa (see discussion of Laccocorinae). The African species of *Laccocoris* were revised by Linnavuori (1987) with a key to species and subspecies, illustrations, distributions, and other annotations. Eleven species are known from Africa; of these only one (*L. limigenus*) was recorded from Tanzania previously. We add two species here.

Laccocoris limicola (Stål, 1855)

Figs 17, 30

Naucoris limicola Stål, 1855: 46.*Laccocoris limicola*: Stål 1865: 178.

Diagnosis: *Laccocoris limicola* can be distinguished from its two known congeners in Tanzania by the triangular or acuminate labrum nearly as long as wide and the produced, bluntly acute mesosternal tubercle. This species also has a body length of 8.5–9.3 mm and sharp posterolateral corners of the pronotum (Fig. 17). It is known in Tanzania only from specimens with micropterous hindwings; however, if a different wing morph is discovered the posterolateral corners of the pronotum probably will be of a different shape.

Material examined: TANZANIA: *Kagera Region*: Kagera/Kigoma regional border, Muvozi River, 3°11.331'S 31°02.129'E, 27.vii.2010, 1156 m, R.W. Sites & A. Mbogho, rocky stream with dense filamentous vegetation, L-1158 (UMC; 5♂, 2♀). *Kigoma Region*: 40 km N of Kigoma, 4°53.201'S 29°52.190'E, 952 m, 27.vii.2010, R.W. Sites & A. Mbogho, rapid stream with slab rocks, gravel, marginal vegetation, L-1165 (UMC; 1♂, 1♀).

Distribution: *Laccocoris limicola* was originally described from Gariep (Northern Cape Province) and Limpopo, South Africa (Stål 1855). During our collections, the species was found in Kagera and Kigoma regions of western Tanzania. In each of the collections, it was taken syntopically with *L. limigenus* Stål in association with rocks and submerged vegetation in moderate current.

Discussion: The African species of *Laccocoris* were apportioned into two groups by Poisson (1949): the *spurcus* group and the *limigenus* group. *Laccocoris limicola* is in the *spurcus* group, which is characterized as having slightly shortened membranes of the hemelytra and brachypterous or micropterous hindwings, and the posterolateral angles of the pronotum are more or less acute and recurved caudad (Poisson 1949; Linnavuori 1987). Linnavuori (1987) added that the membranes of the hemelytra are acuminate apically.



Figs 17–19. (17) *Laccocoris limicola* female from L-1158, (16) *Laccocoris limigenus* male from L-1225, (19) *Laccocoris spurcus congoensis* female from L-1207. Sizes are proportionate among figures.

Laccocoris limigenus Stål, 1865

Figs 18, 30

Laccocoris limigenus: Stål 1865: 178; Linnavuori 1987: 479–480 (*L. aurivillii* synonymy).*Laccocoris aurivillii* Montandon, 1897b: 50–52.

Diagnosis: *Laccocoris limigenus* can be distinguished from its two known congeners in Tanzania by the triangular or acuminate labrum nearly as long as wide and the low, broad, and rounded mesosternal tubercle. Body length is variable across the range of this species and was reported as 7.0–9.5 mm (Linnavuori 1987). Our specimens measured 7.8–9.0 mm in length. This species has broadly rounded or truncated posterolateral corners of the pronotum (Fig. 18). All of our specimens have macropterous hindwings; however, if a different wing morph is discovered, the posterolateral corners of the pronotum probably will be of a different shape.

Material examined: TANZANIA: *Dodoma Region*: Lukali hot spring, 5°43.936'S 35°30.082'E, 991 m, 8.viii.2010, R.W. Sites & A. Mbogho, warm spring with algae and *Typha angustifolia*, L-1223 (UMC; 2♂, 2♀). *Iringa Region*: Silunga River at Chikuyu, 5°52.223'S 35°04.568'E, 842 m, 8.viii.2010, R.W. Sites & A. Mbogho, dead twigs in muddy river, L-1224 (UMC; 1♀); Mwiriwa River at Kimamba, 7°39.657'S 36°05.275'E, 1312 m, 6.viii.2010, R.W. Sites & A. Mbogho, pooled stream with algae and overhanging grasses, L-1215 (UMC; 3♀, 9 nymphs). *Kagera Region*: Kagera/Kigoma border, Muvozi River, 3°11.331'S 31°02.129'E, 1156 m, 27.vii.2010, R.W. Sites & A. Mbogho, rocky stream with dense filamentous vegetation, L-1158 (UMC; 1♀). *Kigoma Region*: 40 km N of Kigoma, 4°53.201'S 29°52.190'E, 952 m, 27.vii.2010, R.W. Sites & A. Mbogho, rapid stream with slab rock, gravel, marginal vegetation, L-1165 (UMC; 6♂, 3♀, 2 nymphs); Kibaoni stream, 5°03.974'S 30°20.666'E, 1026 m, 30.vii.2010, R.W. Sites & A. Mbogho, pooled areas of slow stream, L-1183 (UMC; 1♂, 1 nymph). *Manyara Region*: Yayeda River at Bagheti, 4°00.158'S 35°20.470'E, 1974 m, 9.viii.2010, R.W. Sites & A. Mbogho, marginal overhanging grasses, L-1232 (UMC; 1♂, 1♀); Tiawi, Kwaanseri Lake, 3°54.600'S 35°27.739'E, 1940 m, 9.viii.2010, R.W. Sites & A. Mbogho, wetland with heavy vegetation, L-1234 (UMC; 1♀, 15 nymphs). *Morogoro Region*: Ruaha River at Mbuyuni, 7°27.922'S 36°30.973'E, 527 m, 6.viii.2010, R.W. Sites & A. Mbogho, large river with sparse marginal vegetation, L-1216 (UMC; 3♂, 3♀, 1 nymph); Magole River at Dumila, 6°23.221'S 37°21.629'E, 436 m, 7.viii.2010, R.W. Sites & A. Mbogho, marginal veg in shallow sandy river, L-1222 (UMC; 8♂, 7♀, 73 nymphs); Mzombe River at Mzombe, 7°29.428'S 37°02.000'E, 367 m, 7.viii.2013, R.W. Sites, A. Mbogho & G. Rwegasira, shallow sandy stream, L-1622, (UMC; 1♂, 4♀); Kiberege River at Kiberege, 7°56.871'S 36°51.378'E, 299 m, 8.viii.2013, R.W. Sites, A. Mbogho & G. Rwegasira, vegetated margins of sandy stream, L-1628 (UMC; 1♂, 1♀); Ndawiachi River at Itete, 8°39.065'S 36°25.927'E, 324 m, 9.viii.2013, R.W. Sites & G. Rwegasira, muddy pasture stream, L-1634 (UMC; 2♀, 1 nymph). *Mwanza Region*: Kisesa, ca 20 km NE Mwanza, 2°33.266'S 33°03.767'E, 1222 m, 24.vii.2010, R.W. Sites & A. Mbogho, vegetation in pooled cattle stream, L-1145 (UMC; 1♂, 6♀). *Rukwa Region*: 57 km N of Mpanda, Masito/Ogala, 5°56.742'S 30°57.812'E, 1144 m, 30.vii.2010, R.W. Sites & A. Mbogho, slow stream, coarse roots at margin, L-1187 (UMC; 1♀); 1 km E of Karema, 6°48.473'S 30°26.315'E, 782 m, 31.vii.2010, R.W. Sites & A. Mbogho, algal mat at margin, L-1190 (UMC; 2♂, 1♀, 17 nymphs); Mpanda, Kasimba River, 6°21.602'S 31°04.382'E, 1064 m, 1.viii.2010, R.W. Sites & A. Mbogho, grasses hanging into river, L-1195 (UMC; 1♀); Kamawe River at Puwi, 8°21.029'S 31°50.054'E, 1598 m, 3.viii.2010, R.W. Sites & A. Mbogho, clear stream, marginal vegetation, some rocks, L-1205 (UMC; 2♂, 1♀, 17 nymphs). *Singida Region*: Kipumbuiko River, 5°05.667'S 34°45.940'E, 1516 m, 8.viii.2010, R.W. Sites & A. Mbogho, shallow silty stream with algae & *Typha angustifolia*, L-1225 (NMSA, UMC; 66♂, 71♀, 114 nymphs); Kindai Reservoir at Singida, 4°50.065'S 34°44.173'E, 1484 m, 8.viii.2010, R.W. Sites & A. Mbogho, tall grasses, L-1226 (UMC; 1♂, 2♀, 4 nymphs); Singidan Reservoir at Singida, 4°47.568'S 34°44.570'E, 1483 m, 8.viii.2010, R.W. Sites & A. Mbogho, *Typha angustifolia* roots & submergent vegetation, L-1227 (UMC; 10♂, 4♀, 1 nymph); Mtinko stream at Mtinko, 4°33.525'S 34°50.649'E, 1552 m, 9.viii.2010, R.W. Sites & A. Mbogho, pooled temp stream with algae, L-1229 (UMC; 5♂, 4♀, 12 nymphs). *Tanga Region*: Mazinde stream at Mazinde, 4°48.209'S 38°12.615'E, 433 m, 13.viii.2010, R.W. Sites & A. Mbogho, narrow stream with tall emergent macrophytes, L-1252 (UMC; 1♀); Kwamaluli River at Mbagai, 4°58.561'S 38°23.154'E, 465 m, 14.viii.2010, R.W. Sites & A. Mbogho, shaded narrow stream with overhanging vegetation and undercuts, L-1256 (UMC; 1♂).

Distribution: This species occurs throughout Africa and is known specifically from Algeria, Ethiopia (Linnavuori 1971), Sudan (Linnavuori 1987), Chad, Nigeria (Linnavuori 1981) and Niger (Poisson 1950), west to Benin (Poisson 1951a; Linnavuori 1981) and Togo (Poisson 1951a), south through Central African Republic (Linnavuori 1981),

Kenya (Poisson 1963), Democratic Republic of the Congo (Poisson 1949, 1951*a*, 1954; Linnavuori 1987), Tanzania (Poisson 1960*b*, 1963), Zambia (Poisson 1963; Linnavuori 1987), Mozambique (Poisson 1934), and South Africa (Poisson 1963; Linnavuori 1987). In Tanzania, it has been recorded from Arusha Region (as Maji ya Chai), Tanga Region, and Usambara North (Poisson 1963). We found this species to be widespread and collected it from 24 localities in 10 regions: Dodoma, Iringa, Kagera, Kigoma, Manyara, Morogoro, Mwanza, Rukwa, Singida, and Tanga.

Discussion: *Laccocoris limigenus* is arguably the most widespread and common species of *Laccocoris* in Africa. *L. aurivillii* Montandon was considered by Poisson (1949) to be a race of *L. limigenus*, differing from the latter by having a larger body size and more slender phallosoma. Because of high variability in both characters, Linnavuori (1987) formally synonymized *L. aurivillii* with *L. limigenus*. Naturally, this species is in the *limigenus* group (Poisson 1949), which is characterized as being macropterous with alary dimorphism rare, and with the posterolateral angles of the pronotum rounded. Linnavuori (1987) added that the membranes of the hemelytra are roundedly truncate. The species is common in oligotrophic rivers with a sandy bottom (Linnavuori 1981) and has been recorded in shallow pools in river sandbanks with dead leaves and detritus (Weir 1966). We collected this species most frequently in shallow streams with sandy or silty bottoms and in association with vegetation. It occurred syntopically with *L. limicola* at L-1158 and L-1165.

Laccocoris spurcus congoensis Poisson, 1949

Figs 19, 30

Laccocoris spurcus congoensis: Poisson 1949: 67–69.

Diagnosis: *Laccocoris spurcus congoensis* can be distinguished from its two known congeners in Tanzania by the longer body length of >10 mm and the labrum half as long as wide and not reaching the distal labial segment. This subspecies has sharp posterolateral corners of the pronotum (Fig. 19) and all of our specimens have brachypterous hindwings. However, if a different wing morph is discovered as is known to occur in the Democratic Republic of the Congo, the posterolateral corners of the pronotum probably will be of a different shape.

Material examined: TANZANIA: Mbeya Region: Maboo stream at Mbeya Peak village, 8°50.432'S 33°25.060'E, 2433 m, 4.viii.2010, R.W. Sites & A. Mbogho, vegetated pool of small high elevation stream, L-1207 (NMSA, UMC; 12♂, 10♀, 19 nymphs).

Distribution: *Laccocoris spurcus congoensis* was known from the Democratic Republic of Congo (Poisson 1949, 1951*b*), whereas the nominate subspecies is known only from Cape Province in South Africa. In Tanzania, *L. s. congoensis* was found in only one locality at high elevation at Mbeya Peak in Mbeya Region.

Discussion: *Laccocoris spurcus* is one of the largest species of *Laccocoris* in Africa. The nominotypical subspecies is known from South Africa (Stål 1865). Poisson (1949) described a subspecies from Democratic Republic of the Congo which is known to have wing polymorphism with which are associated differences in pronotum shape. Poisson (1949) reported that approximately 90% of the individuals from Democratic Republic of the Congo were brachypterous and 10% macropterous. We collected only hindwing brachypterous individuals of this species from a single location in Tanzania.

Subfamily Naucorinae Leach, 1815

In Naucorinae, the labrum is positioned on the ventral surface at the anterior margin of the head. The prothoracic leg bears a single, small, immovable claw fused to the protibia. The pro- and mesotibiae do not have tomentose areas in either sex.

Genus *Macrocoris* Signoret, 1861

The most recent comprehensive treatment of this genus (Poisson 1959) did not provide a rigorous assessment of interspecific distinctions. Although Poisson described species and subspecies of both *Macrocoris* and *Neomacrocoris*, his work has been found to be somewhat unreliable (Sites & Mbogho 2012). Thus, generic revision of *Macrocoris* is necessary. This genus is endemic to the African continent and is represented by nine described species, three of which are endemic specifically to Madagascar (*M. distinctus* Bergroth, *M. rhantoides* Bergroth, and *M. sikorae* Bergroth). Original descriptions of species of *Macrocoris* generally are brief and inadequately illustrated, if illustrated at all, and little reliable information exists in the literature regarding their identification, despite the key by Poisson (1959). As such, comparison with authoritatively identified museum specimens and collection at the type localities are helpful strategies to aid in determinations.

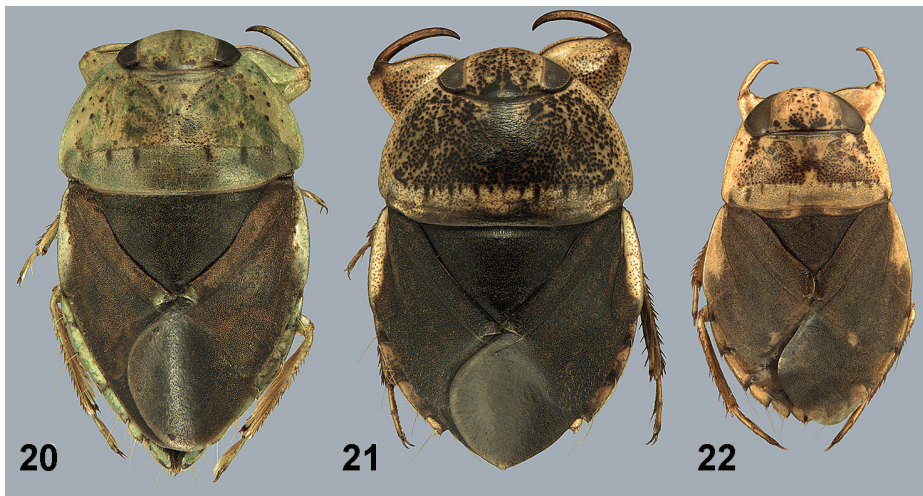
Macrocoris flavicollis Signoret, 1861

Figs 9, 20, 30

Macrocoris flavicollis: Signoret 1861: 970.

Diagnosis: This species is variable in appearance, but fresh specimens have a distinctly green pronotum and legs (Fig. 20), which fade to yellow in alcohol or exposure to light. This species also is characterized by a concolorous connexivum.

Material examined: TANZANIA: *Kagera Region*: ca 5 km E of Bhiaramulo, 2°38.159'S 31°20.789'E, 1427 m, 26.vii.2010, R.W. Sites & A. Mbogho, roadside pool with grasses, algae, lily pads, L-1154 (UMC; 3♀); Benako Reservoir, 2°28.081'S 30°51.355'E, 1492 m, 26.vii.2010, R.W. Sites & A. Mbogho, marginal vegetation on dam, L-1156 (UMC; 3♂, 7♀, 1 nymph); Kareng'e, 3°07.936'S 31°04.530'E, 1234 m, 27.vii.2010, R.W. Sites & A. Mbogho, shallow pools with heavy vegetation and cattle use, L-1157 (UMC; 1♂, 2♀). *Kigoma Region*: W of Kibondo, Mpemvyi River, 3°44.028'S 30°41.945'E, 1225 m, 27.vii.2010, R.W. Sites & A. Mbogho, pooled areas of slow stream, L-1160 (UMC; 1♀); Nyakivaya Lake, ca 5 km N of Kasulu, 4°16.455'S 30°26.111'E, 1165 m, 27.vii.2010, R.W. Sites & A. Mbogho, shallow small lake with heavy vegetation, L-1161 (UMC; 19♂, 15♀, 14 nymphs); Luchugi River, 4°31.733'S 30°09.699'E, 1217 m, 27.vii.2010, R.W. Sites & A. Mbogho, small stream, L-1162 (UMC; 1♂); 15 km N of Kigoma, Mungonya River, 4°50.337'S 29°40.001'E, 806 m, 28.vii.2010, R.W. Sites & A. Mbogho, muddy bank with sparse marginal vegetation, L-1169 (UMC; 2♂, 6♀); Msimba, ca 18 km N of Kigoma, 4°51.058'S 29°42.552'E, 807 m, 28.vii.2010, R.W. Sites & A. Mbogho, very slowly flowing stream with marginal vegetation, L-1170 (UMC; 15♂, 7♀); Katosho Reservoir, 8 km E of Kigoma, 4°51.221'S 29°39.436'E, 802 m, 28.vii.2010, R.W. Sites & A. Mbogho, emergent dead tall grasses in turbid reservoir, L-1171 (UMC; 2♂, 2♀); Gombe National Park, Mwagongo, Nkonya River, 4°37.351'S 29°38.319'E, 775 m, 29.vii.2010, R.W. Sites & A. Mbogho, gravel/rocky clear stream with sparse marginal veg. L-1173 (UMC; 4♂, 1♀); Gombe National Park, Rutanga stream, 4°39.111'S 29°37.660'E, 776 m, 29.vii.2010, R.W. Sites & A. Mbogho, sandy & muddy stream with heavy vegetation, L-1175 (UMC; 1♂, 1♀). *Iringa Region*: Tanganyika, Ikoga Marshes, 8°20'S 34°30'E, 3500 ft, 9.viii.1959 (UMC; 1♂); same locality, 19–20.viii.1959 (UMC; 2♀). *Mara Region*: Tairo, ca 5 km E of Bunda, 2°33.827'S 33°45.695'E, 1230 m, 24.vii.2010, R.W. Sites & A. Mbogho, heavily vegetated pond margins, L-1146 (UMC; 1♂, 2♀, 4 nymphs); Ushashi, ca 5 km N of Nyiando, 2°00.540'S 33°55.241'E, 1344 m, 24.vii.2010, R.W. Sites & A. Mbogho, vegetated pond margins, L-1147 (UMC; 2♂, 3♀). *Mbeya Region*: 1 km N of Nyenjele, Muwawa River, 8°55.289'S 32°21.583'E, 1448 m, 3.viii.2010, R.W. Sites & A. Mbogho, pool with overhanging grasses, L-1206 (NMSA, UMC; 12♂, 15♀); Itunga inlet, Lake Nyassa, 9°35.094'S 33°56.769'E, 482 m, 4.viii.2010, R.W. Sites & A. Mbogho, heavy marginal vegetation at boat ramp, L-1208 (UMC; 10♂, 10♀, 2



Figs 20–22. (20) *Macrocoris flavicollis* female from L-1260, (21) *Macrocoris laticollis* male from L-1156, (22) *Naucoris obscuratus* female from Lake Rukwa, Tanzania. Sizes are proportionate among figures.

nymphs). *Morogoro Region*: Mikumi National Park, 7°21.608'S 37°03.337'E, 529 m, 7.viii.2010, R.W. Sites & A. Mbogho, heavily vegetated seasonal pond, L-1219 (UMC; 1 nymph); ca 21 miles NW of Morogoro, 6°29.634'S 37°33.465'E, 372 m, 7.viii.2010, R.W. Sites & A. Mbogho, heavily vegetated pond ringed with reed grass, L-1220 (UMC; 2♂, 2 nymphs); Kisawasawa River at Kisawasawa, 7°50.596'S 36°52.311'E, 326 m, 8.viii.2013, R.W. Sites, A. Mbogho & G. Rwegasira, vegetated margins of sandy stream, L-1625 (UMC; 1♂, 4♀); Sonjo River at Sonjo, 7°48.490'S 36°53.785'E, 320 m, 8.viii.2013, R.W. Sites, A. Mbogho & G. Rwegasira, vegetated margins of rocky stream, L-1626 (UMC; 1♀); Sumbugulu River at Kidatu, 7°43.371'S 36°56.013'E, 306 m, 8.viii.2013, R.W. Sites, A. Mbogho & G. Rwegasira, veg margins of rocky stream, L-1627 (UMC; 2♂, 3♀); Kiberege River at Kiberege, 7°56.871'S 36°51.378'E, 299 m, 8.viii.2013, R.W. Sites, A. Mbogho & G. Rwegasira, vegetated margins of sandy stream, L-1628 (UMC; 1♂, 3♀); Mbasa River at Mahandaki, 8°23.638'S 36°38.707'E, 299 m, 9.viii.2013, R.W. Sites, A. Mbogho & G. Rwegasira, muddy impoundment of slow stream, L-1630 (UMC; 2♀). *Mwanza Region*: Kisesa, ca 20 km NE Mwanza, 2°33.345'S 33°03.652'E, 1230 m, 24.vii.2010, R.W. Sites & A. Mbogho, vegetated pond margins, L-1144 (UMC; 9♂, 5♀, 6 nymphs); near Kashishi, 2°16.239'S 33°48.314'E, 1344 m, 24.vii.2010, R.W. Sites & A. Mbogho, vegetated pond margins L-1149 (UMC; 1♂); Nyanguge, 2°32.619'S 33°13.181'E, 1159 m, 24.vii.2010, R.W. Sites & A. Mbogho, large vegetated pond, no cattle usage, L-1151 (UMC; 12♂, 8♀, 1 nymph). *Rukwa Region*: 5°12.863'S 30°23.357'E, 1206 m, 30.vii.2010, R.W. Sites & A. Mbogho, slow stream pools with algae & overhanging vegetation, L-1184 (UMC; 1♀); 93 km N of Mpanda, Kapipula stream, 5°42.233'S 30°41.563'E, 1326 m, 30.vii.2010, R.W. Sites & A. Mbogho, stream wetland with dense emergent grasses, L-1186 (UMC; 2♂); 57 km N of Mpanda, Masito/Ogala, 5°56.742'S 30°57.812'E, 1144 m, 30.vii.2010, R.W. Sites & A. Mbogho, slow stream, coarse roots at margin, L-1187 (UMC; 1♂); Sau River at Kasunga, 8°03.444'S 31°30.112'E, 1795 m, 2.viii.2010, R.W. Sites & A. Mbogho, marginal dense vegetation in cattle pool of stream, L-1200 (UMC; 3♀); Kamawe River at Puwi, 8°21.029'S 31°50.054'E, 1598 m, 3.viii.2010, R.W. Sites & A. Mbogho, clear stream, marginal vegetation, some rocks, L-1205 (UMC; 2♀). *Ruvuma Region*: ca 5 km N of Songea, Luwila River, 10°37.510'S 35°39.199'E, 1086 m, 5.viii.2010, R.W. Sites & A. Mbogho, slow sandy stream with overhanging vegetation, L-1210 (UMC, 1♂, 1♀); 20 km N of Songea, Lumecha River at Samangula, 10°30.149'S 35°40.268'E, 994 m, 5.viii.2010, R.W. Sites & A. Mbogho, overhanging grasses, L-1211 (UMC; 2♂, 1♀); Hanga River at Ngadinda, 10°10.264'S 35°39.611'E, 777 m, 5.viii.2010, R.W. Sites & A. Mbogho, overhanging vegetation and matete, L-1213 (UMC; 1♀). *Singida Region*: Kipumbuiko River, 5°05.667'S 34°45.940'E, 1516 m, 8.viii.2010; R.W. Sites & A. Mbogho, shallow silty stream with algae & *Typha angustifolia*, L-1225 (UMC; 2♂, 1♀). *Tanga Region*: Kihuuwi River at Timba, 5°07.683'S 38°41.418'E, 174 m, 15.viii.2010, R.W. Sites & A. Mbogho, marginal grasses with silty/rocky bottom, L-1260 (UMC; 1♀). *ZANZIBAR: Kaskazini Region*: Kitope River at Zingwezingwe Bridge, 6°00.963'S 39°14.734'E, 39 m, 17.viii.2010, R.W. Sites & A. Mbogho, discontinuous pools with aquatic veg and grasses, L-1265 (UMC; 2♀); Kitope River at Mkaratini Bridge, 6°00.714'S 39°14.841'E, 30 m, 17.viii.2010, R.W. Sites & A. Mbogho, discontinuous pools with aquatic vegetation and grasses, L-1266 (UMC; 2♀).

Extralimital material examined: [BOTSWANA]: V.-L. Kal. Exp., Tsotsorogo Pan, 17/6-/9/7/30 (TMSA, 1♀). [DEMOCRATIC REPUBLIC OF CONGO]: Coll. Mus. Tervuren, Katanga: Mwadingusha, 27-V-1965, W. Verheyen (RMCA; 1♀). KENYA: 31 m W of Eldoret, 5500', 19 VI 1964, E.S. Brown 799, B.M. 1966-102 (BMNH; 2♂, 2♀). [MALAWI]: Nyasaland, S.W. of Lake Chilwa, 9 Jan. 1914, S. A. Neave (BMNH; 1♀); Nyasaland, Mlanje, 4 X 13, 2300 ft., S. A. Neave, 1914-75 (BMNH; 1♀). NIGERIA: N. Nigeria, Azare, 1928-1929, Dr. L.I. Lloyd / Pres. by Imp. Inst. Ent. B. M. 1936-11 (BMNH; 4♂, 3♀); R. Matagi, 28 mls from Kano, iv.1963 / Mr. & Mrs. Omer-Cooper, B. M. 1969-138 (BMNH; 1♀); Kadura, Kontagora Rd., 3. iv.1963 / (15) pools bridge over tributary / Mr. & Mrs. Omer-Cooper, B. M. 1969-138 (BMNH; 1♀). SOUTH AFRICA: Natal, 13 mi. SW Empangeni, III-24-1968, Paul Spangler (UMC, 3♀); Natal, Richard's Bay, 28°48'S 32°06'E, 20-I-2008, P.E. Reavell / Sontulu pan scirpetum (PRC; 1♀); kz-natal, between Empangeni & Richards Bay, unnamed pan, 28°50'S 32°00'E, 15 m asl, 14-IV-89, P.E. Reavell / *Ludwigia* zone (PRC; 1♂); Natal #13G, Empangeni, 28°38'S 31°42'E, 150 m, 7-IV-87, P.E. Reavell / *Leersia hexandra* bed, golf pond (PRC; 1♂); KZ-Natal, Nyala Game Reserve 28°39'S 31°40'E, 100 m, Date: 12-XI-89, P.E. Reavell / Mbondwe pan (PRC; 1♂); Lake Banghazi Natal RSA, 2 V 1989, C.C. Appleton / Collection of D.H. Jacobs (DHJC; 1♀). SUDAN: A.E. Sudan, Equatorial Prov., Li Rangu, 15 mls. from Yambio, Feb.-March 1948 / from streams / P.H. Abbott Coll., B.M. 1948-306 (BMNH; 1♂, 3♀); Equatoria, i.1954, Nyangwara / Mr. & Mrs. Omer-Cooper, B. M. 1969-138 (BMNH; 1♀). UGANDA: Kampala, viii.1932, G.L.R. Hancock, NA.2 / Pres. by Imp. Inst. Ent. B. M. 1936-585 (BMNH; 1♂). [ZIMBABWE]: S. Rhodesia, Glyro River, Byo-Wankie Rd., Sept. 1948 / J. Omer-Cooper, B. M. 1969-138 (BMNH; 1♀); St. between Salisbury + Bromly, 12.xi.1948 / Mr. & Mrs. Omer-Cooper, B. M. 1969-138 (BMNH; 1♀); Inyagui Riv., Sept. 1948 / J. Omer-Cooper, B. M. 1969-138 (BMNH; 1♂).

Distribution: In addition to Madagascar and Zanzibar, from which *M. flavicollis* was described (Signoret 1861), this species has been recorded from Sudan (Linnavuori 1971, 1981) west through Chad (Poisson 1949; Linnavuori 1981), Central African Republic, Nigeria (Linnavuori 1981), Benin (Poisson 1951a), and Ivory Coast (Linnavuori 1981), south through Uganda, Kenya (Montandon 1914; Poisson 1967), Congo (Poisson 1967; Linnavuori 1971), Tanzania (Poisson 1963), Rwanda (Poisson 1949), Democratic Republic of the Congo (Poisson 1949, 1963), and Mozambique (Montandon 1899). We also have examined specimens from Botswana, Malawi, and South Africa. In Tanzania, *M. flavicollis* occurs throughout the country wherever appropriate vegetated lentic habitat is found. Specifically, we collected it from Kagera, Kigoma, Mara, Mbeya, Morogoro, Mwanza, Rukwa, Ruvuma, Singida, Tanga, and Kaskazini regions. It was not collected from Arusha, Dodoma, Kilimanjaro, and Manyara regions.

Discussion: *Macrocoris flavicollis* was described by Signoret (1861) from specimens from Madagascar and Zanzibar. Specimens that we collected in Zanzibar agree with the original description and generally match the type housed at NHMW and specimens identified by Montandon, Poisson and others.

Poisson (1948b) indicated that size (8–10 mm) and pigmentation of the species are variable, and later (Poisson 1949) described two subspecies of *M. flavicollis* based on pronotum characteristics and body size. More specifically, *M. f. chariensis* Poisson is known from only the Chari Basin of Chad and has the pronotum clear yellow with few or no small black spots and is smaller in body size. *M. f. uelei* Poisson has the pronotum with larger, confluent black spots and the anterior black spots on the posterior lobe are larger than are those of the nominate subspecies. This subspecies was described from Uele in the Democratic Republic of the Congo (Poisson 1949) and also is known from Chad (Bebedja), Ivory Coast, and central Sudan; it was found among *Ceratophyllum* and other vegetation and in a swimming pool (Linnavuori 1981). *M. f. flavicollis* is known from eastern Sudan south throughout most of Africa south of the ranges of *M. f. chariensis* and *M. f. uelei* and was recorded from marginal emergent vegetation in pans and a marsh as deep as 2.5 feet in Zimbabwe (Weir 1966). Linnavuori (1981) reported that this subspecies occurs among vegetation in eutrophic waters.

Macrocoris laticollis Montandon, 1909

Figs 21, 30

Macrocoris laticollis: Montandon 1909: 59–61.

Diagnosis: This species can be distinguished from *M. flavicollis* by the profusion of small, dark punctation on the pronotum and by the dark posterolateral corners of the connexiva (Fig. 21).

Material examined: TANZANIA: *Kagera Region*: ca 5 km E of Bhiaramulo, 2°38.159'S 31°20.789'E, 1427 m, 26.vii.2010, R.W. Sites & A. Mbogho, roadside pool with grasses, algae, lily pads, L-1154 (UMC; 1 nymph); Benako Reservoir, 2°28.081'S 30°51.355'E, 1492 m, 26.vii.2010, R.W. Sites & A. Mbogho, marginal vegetation on dam, L-1156 (UMC; 7♂, 4♀, 45 nymphs).

Extralimital material examined: [DEMOCRATIC REPUBLIC OF CONGO]: Musée du Congo, Sandoa, IX 1930 F. G. Overlaet / R. Poisson det., 1945, *Macrocoris laticollis* Mont. *mongai* nov. subsp. (UMC; 1♀); Musée du Congo, Katanga : Kazenze, 20-VIII-1931, G. F. de Witte / R. Poisson det., 1945, *Macrocoris laticollis* Mont. *mongai* nov. subsp. / R. det. 5305 (UMC; 1♂); Musée du Congo, Katanga : Nyonga, V-1925, G. F. de Witte / *Macrocoris laticollis* Mont., Det. R. Poisson 1958 (UMC; 1♂).

Distribution: This species is known from Angola (Montandon 1909), Cameroon (Poisson 1948a), Central African Republic (Linnavuori 1981), the Republic of Congo (Poisson 1967), and Democratic Republic of Congo (Poisson 1948b). It was reported among vegetation in a brook (Linnavuori 1981). In Tanzania, we found this species in only two localities; most specimens were collected among dense marginal vegetation on a dam in Kagera Region. This is the first report of this species from Tanzania.

Discussion: Species in this genus are distinguished based on characteristics of pronotum punctation and maculation, connexiva coloration, and characters related to male genitalia and medial lobes of the 8th abdominal tergum. Poisson (1959) presented a key to the species of *Macrocoris* in which the first couplet divided the taxa based on connexival colour pattern; one group was concolorous or nearly so, and the other had the posterolateral corners black or densely maculated. We have found this distinction to be ambiguous and not reliable. Many specimens in the RMCA identified by Poisson himself as *M. laticollis* and *M. laticollis mongai* have variously darkened posterolateral corners of the connexiva, although his key requires that they be considered concolorous or nearly so. Our specimens agree with specimens identified by Poisson rather than his key in this feature. Further, the right medial lobe of abdominal segment 8 in our specimens appears similar to that of *M. laticollis* in Poisson slides in the Drake Collection at the USNM; although the digitate medial extension is gently arcuate, it does not taper to a point but is broadly rounded apically. Pending taxonomic revision, we provisionally identify our specimens as *M. laticollis*.

The subspecies *M. laticollis mongai* was referenced by Poisson (1948b) and later described (Poisson 1949) from Monga, Uele District in the Democratic Republic of Congo. Males can be distinguished from those of the nominate subspecies by the shape of the parameres and denticulation of the right medial lobe of the 8th tergum.

Genus *Naucoris* Geoffroy, 1762

This widespread genus (see discussion of the genus *Aneurocoris*) is in need of revision and no literature is available to aid in the identification of the African species other than mostly very old, cursory original descriptions, a few scattered records (e.g., Poisson 1967), and a comparative treatment of three species from Sudan (Linnavuori 1971).

Seven species of *Naucoris* are known from mainland Africa and two others are endemic to Madagascar. Of the seven mainland species, two from southern Africa that might also occur in Tanzania are known in the literature from only their original descriptions of over 150 years ago, each of which is fewer than twenty words in length and of limited value for identification: *Naucoris fuscipennis* Schaum from Mozambique and *Naucoris planus* Germar from South Africa.

Naucoris obscuratus Montandon, 1913

Figs 10, 22, 30

Naucoris obscuratus: Montandon 1913b: 220–222.

Diagnosis: *Naucoris obscuratus* is much flatter than the dorsally convex *Macrocoris* and *Neomacrocoris* and body length is only 6.5–8.7 mm. Further, males do not have abdominal tergites 7 and 8 modified, whereas those of the other genera have medial lobes with modifications that are species specific. Males have parameres that are well developed and crisscrossing (Fig. 10), whereas *Macrocoris* has smaller parameres that do not cross and *Neomacrocoris* lacks parameres.

Material examined: TANZANIA: *Kagera Region*: Benako Reservoir, 2°28.081'S 30°51.355'E, 1492 m, 26.vii.2010, R.W. Sites & A. Mbogho, marginal vegetation on dam, L-1156 (UMC; 1♀). *Kigoma Region*: Nyakivaya Lake, ca 5 km N of Kasulu town, 4°16.455'S 30°26.111'E, 1165 m, 27.vii.2010, R.W. Sites & A. Mbogho, shallow small lake with heavy vegetation, L-1161 (UMC; 2♂, 1 nymph). *Kilimanjaro Region*: Jiwemawe Reservoir at Ndungu, 4°25.496'S 38°05.201'E, 515 m, 13.viii.2010, R.W. Sites & A. Mbogho, vegetated margins of reservoir & below spillway, L-1251 (UMC; 2♂, 1♀, 5 nymphs). *Mara Region*: Ushashi, ca 5 km N of Nyiendo, 2°00.540'S 33°55.241'E, 1344 m, 24.vii.2010, R.W. Sites & A. Mbogho, vegetated pond margins, L-1147 (UMC; 3♂, 1♀, 3 nymphs). *Mbeya Region*: Lake Nyassa, Itunga inlet, 9°35.094'S 33°56.769'E, 482 m, 4.viii.2010, R.W. Sites & A. Mbogho, heavy marginal vegetation at boat ramp, L-1208 (UMC; 1♂). *Morogoro Region*: Kikwawila River at Kikwawila, 8°05.630'S 36°43.362'E, 269 m, 8.viii.2013, R.W. Sites & G. Rwegasira, water lettuce, L-1629 (UMC, 1♀). *Pwani Region*: pond by Ruvu River W of Bagamoyo, 6°28.545'S 38°50.614'E, 2 m, 16.viii.2010, R.W. Sites & A. Mbogho, water lettuce and other vegetation, L-1263 (UMC; 1♂, 2♀, 6 nymphs, 1 exuvium). *Tanga Region*: Gomba River, 2 km S of Chekelei, 4°50.284'S 38°18.774'E, 412 m, 14.viii.2010, R.W. Sites & A. Mbogho, grassy overhangs in irrigation canal, L-1255 (UMC; 2♂, 1♀).

Distribution: In the original description, Montandon (1913b) reported the distribution as from Sudan to Lake Tanganyika, Egypt, Nigeria, and South Africa, and this was largely repeated by Poisson (1967). The East African countries of Uganda and Kenya were added by Montandon (1914) and Poisson (1963), respectively. The Republic of the Congo was added in the description of the subspecies *N. o. nanus* (Poisson 1960a). West Africa was added (Linnavuori 1971) and was followed by specific country records for Ivory Coast, Ghana, Nigeria, and Chad (Linnavuori 1981). During this study, *N. obscuratus* was found in scattered locations throughout Tanzania. More specifically, it was collected from eight localities in Kagera, Kigoma, Kilimanjaro, Mara, Mbeya, Morogoro, Pwani, and Tanga regions.

Discussion: This species is common in eutrophic rivers and normally is found among vegetation and debris (Linnavuori 1971) in rivers, lakes, and pools (Linnavuori 1981). *N. obscuratus* is the only member of the genus *Naucoris* known from Tanzania. Even though *N. obscuratus* has been recorded from Sudan to South Africa, we collected it at only a few localities in Tanzania. Montandon (1913b) listed this species from six localities, including “Hego Tanganika”, which Poisson (1967) repeated and referred to the Tanganyika record as “lac Tanganyika”. Because Lake Tanganyika borders four countries,

this record was not specific to a particular country. Thus, the collections reported here represent the first definitive records of *N. obscuratus* from Tanzania. Our determination of *N. obscuratus* is based on comparison with specimens identified by Linnavuori and that our specimens agree with the Linnavuori (1971) redescription, although our specimens are slightly longer than 8.0 mm that he reported. Our determination is provisional until the identities of *N. fuscipennis* and *N. planus* are clarified.

Genus *Neomacrocoris* Montandon, 1913

The genus *Neomacrocoris* is sister to *Macrocoris* and also endemic to Africa. It is prevalent among marginal vegetation in slow reaches of streams from Sierra Leone east to Sudan and south to South Africa, but can also occur in vegetated lentic habitats. In support of the field work reported here, we found it necessary to revise *Neomacrocoris* (Sites & Mbogho 2012) in order to treat the naucorid species from Tanzania. Six species of *Neomacrocoris* are now known from Tanzania, including two new species that were described in the revision (Sites & Mbogho 2012). Generally for species recognition, males are required because features of the genitalia and the right medial lobe of the 7th abdominal tergum (pseudostrigil) are diagnostic. Females generally must be matched with identifiable males. However, males are not known for *N. usambaricus*.

Neomacrocoris bondelaufa Sites, 2012

Figs 12, 26, 30

Neomacrocoris bondelaufa: Sites in Sites & Mbogho 2012: 6–9.

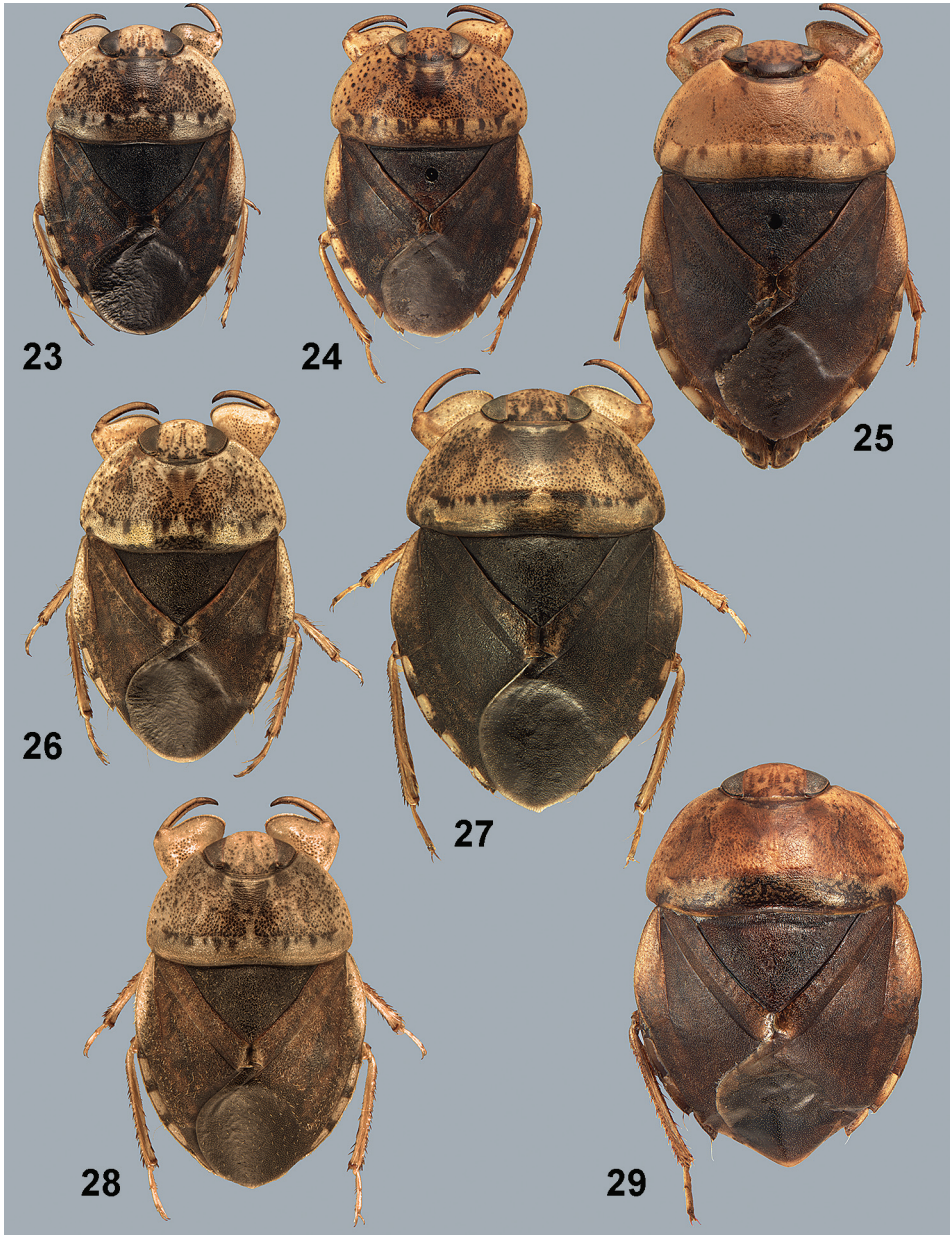
Diagnosis: Among similar sized congeners in Tanzania, *N. bondelaufa* is nearly indistinguishable superficially from *N. handlirschi* and *N. parviceps* without examination of the male phallosoma and pseudostrigil. However, fresh specimens of *N. parviceps* are brownish red on the abdominal sternum (more evident with immersion in ethanol), whereas *N. bondelaufa* and *N. handlirschi* are brown. *N. handlirschi* generally has sparse, thick hairs on the embolium, corium, clavus, membrane and scutellum, whereas the other two species have the short, thick hairs restricted to the embolium and adjacent areas of the corium. Beyond these diagnostic characters, females must be associated with males for identification. Specifically, the phallosoma has a strong gibbosity to the right and ventrally in *N. bondelaufa* (Fig. 12) and directly to the right in *N. handlirschi*, whereas it has an elongate flange to the right in *N. parviceps*. Further, the left side of the shaft of the phallosoma beyond the gibbosity is arcuate and the left side of the apex appears flattened in dorsal view in *N. bondelaufa*, whereas the shaft is straight and the flattening is on the distal margin in *N. handlirschi*. The apex appears flattened on the left side in dorsal view in *N. parviceps*.

Holotype (examined): TANZANIA: *Rukwa Region*: Sau River at Kasunga, 8°03.444'S 31°30.112'E, 1795 m, 2.viii.2010, R.W. Sites & A. Mbogho, marginal dense veget. in cattle pool of stream, L-1200 (UMC; ♂).

Paratypes (examined): same data as holotype (NHMW, NMSA, RMCA, UMC, USNM; 18♂, 21♀). *Rukwa Region*: Kapipula stream, 93 km N of Mpanda, 5°42.233'S 30°41.563'E, 1326 m, 30.vii.2010, R.W. Sites & A. Mbogho, stream wetland with dense emergent grasses, L-1186 (UMC; 5♂, 8♀). *Kigoma Region*: Kazuramimba, 5°00.155'S 30°00.971'E, 1082 m, 30.vii.2010, R.W. Sites & A. Mbogho, muddy pools of small stream with marginal vegetation, L-1182 (UMC; 4♂).

Material examined: TANZANIA: *Kagera Region*: Kareng'e, 3°07.936'S 31°04.530'E, 1234 m, 27.vii.2010, R.W. Sites & A. Mbogho, shallow pools with heavy vegetation and cattle use, L-1157 (UMC; 1♂, 3♀). *Kigoma Region*: W of Kibondo, Mpemvyi River, 3°44.028'S 30°41.945'E, 1225 m, 27.vii.2010, R.W. Sites

& A. Mbogho, pooled areas of slow stream, L-1160 (UMC; 1♀); Luchugi River, 4°31.733'S 30°09.699'E, 1217 m, 27.vii.2010, R.W. Sites & A. Mbogho, small stream, L-1162 (UMC; 1♂, 2♀); tributary to Kalembele River, 4°40.743'S 30°03.994'E, 1244 m, 27.vii.2010, R.W. Sites & A. Mbogho, irrigation canal, L-1163



Figs 23–29. (23) *Neomacrocoris parviceps parviceps*, (24) *Neomacrocoris parviceps ocellatus*, (25) *Neomacrocoris usambaricus*, (26) *Neomacrocoris bondelaufa*, (27) *Neomacrocoris vuga*, (28) *Neomacrocoris handlirschi*, (29) *Neomacrocoris karimii*. Sizes are proportionate among figures. (Figs 24–30 reproduced from Sites & Mbogho (2012), with permission by Magnolia Press.)

(UMC; 4♂, 1♀, 1 nymph); Kalembe River, 4°40.813'S 30°03.964'E, 1249 m, 27.vii.2010, marginal vegetation in slow current, R.W. Sites & A. Mbogho, L-1164 (UMC; 2♂). *Mara Region*: Ushashi, ca 5 km N of Nyiengo, 2°00.540'S 33°55.241'E, 1344 m, 24.vii.2010, R.W. Sites & A. Mbogho, vegetated pond margins, L-1147 (UMC; 1♀). *Mbeya Region*: 1 km N of Nyenjeje, Muwawa River, 8°55.289'S 32°21.583'E, 1448 m, 3.viii.2010, R.W. Sites & A. Mbogho, pool with overhanging grasses, L-1206 (UMC; 2♂). *Rukwa Region*: 110 km N of Mpanda, 5°37.745'S 30°36.039'E, 1295 m, 30.vii.2010, R.W. Sites & A. Mbogho, shallow creek with muddy bottom and marginal grasses, L-1185 (UMC; 1♀); 57 km N of Mpanda, stream between Masito & Ogala, 5°56.742'S 30°57.812'E, 1144 m, 30.vii.2010, R.W. Sites & A. Mbogho, slow stream, coarse roots at margin, L-1187 (UMC; 1♂, 1♀); 20 km SW of Sumbawanga, Katuka River at Katuka, 8°06.641'S 31°31.786'E, 1858 m, 2.viii.2010, R.W. Sites & A. Mbogho, pools of stream and narrow channel with dense vegetation, L-1201 (UMC; 1♂, 1♀); Msanzi River at Msanzi, 8°11.411'S 31°31.295'E, 1778 m, 2.viii.2010, R.W. Sites & A. Mbogho, rocks, mud, gravel, sand, marginal grasses, L-1202 (UMC; 1♂, 1♀); Kamawe River at Puwi, 8°21.029'S 31°50.054'E, 1598 m, 3.viii.2010, R.W. Sites & A. Mbogho, clear stream, marginal vegetation, some rocks, L-1205 (UMC; 2♂, 1♀).

Extralimital material examined: [DEMOCRATIC REPUBLIC OF CONGO]: Musée du Congo Belge, Elisabethville, 12-VI-1920 (J. Sporcq.) / R. Poisson det., 1945, *Neomacrocoris parviceps* Mont. / R. Det 5305 L (RMCA; 1♂); same data, 10-VI-1920 (RMCA; 1♀); Musée du Congo, Dilolo, -VIII-IX-1931, G.F. DeWitte / Poisson det., 1945, *Neomacrocoris parviceps* Mont. / R. Det 5305 L (RMCA; 1♂). SOUTH AFRICA: Swaziland, Malolotja, Res. Dam at Camp, 7-4-97 / 26°09'S 31°08'E, 1800 m.a.s.l. (PRC; 1♂).

Distribution: This species is known only from streams along the Rift Valley of western Tanzania and southern Democratic Republic of Congo, and from South Africa.

Discussion: Prior to our revision, *N. bondelaufa* was unrecognized as distinct from other superficially similar species. It was described from streams of the Rift Valley of western Tanzania and collected syntopically with the congeners *N. handlirschi* at L-1202 and *N. parviceps* at L-1157, 1164, 1182, and 1202.

Neomacrocoris handlirschi (Montandon, 1909)

Figs 28, 30

Macrocoris handlirschi Montandon, 1909: 55–57.

Neomacrocoris handlirschi: Montandon 1913a: 22: 332.

Neomacrocoris handlirschi armatus Poisson, 1948: Sites & Mbogho 2012: 10–15 (junior synonym).

Diagnosis: This species may be distinguished from all Tanzanian congeners by dorsal vestiture; in addition to elongate thin hairs on the hemelytra, shorter, thicker hairs are sparsely but generally distributed, including on the embolium, corium, clavus, membrane, and scutellum (Fig. 28). Further, there is slight flattening of the pronotum and consistency in embolar curvature. Condition of the phallosoma and pseudostrigil (Sites & Mbogho 2012: figs 11, 12) are diagnostic for the male. The female subgenital plate is gently sinuate to the distal spatulate process and the posterolateral corners of mediosternite VI are slightly expanded and deflexed.

Lectotype (examined): [SOUTH AFRICA: *Eastern Cape*:] 'Algoa Bay [33°40'S 25°50'E], Capland, Dr. Brauns, 25 5 [18]98/ *Macrocoris handlirschi* Montandon type 1909' (NHMW; ♀).

Material examined: TANZANIA: *Kigoma Region*: Gombe National Park, Mitumba stream, 4°38.405'S 29°37.823'E, 776 m, 29.vii.2010, R.W. Sites & A. Mbogho, heavily vegetated narrow forest stream, L-1174 (UMC; 7♂, 5♀, 6 nymphs). *Rukwa Region*: Msanzi River at Msanzi, 8°11.411'S 31°31.295'E, 1778 m, 2.viii.2010, R.W. Sites & A. Mbogho, rocks, mud, gravel, sand, marginal grasses, L-1202 (UMC; 2♂, 1♀).

Extralimital material examined: CENTRAL AFRICAN REPUBLIC: Bébouira-Bossanggoa, 1 June 1973, Linnavuori (NMWC; 1♂). DEMOCRATIC REPUBLIC OF CONGO: Kinshasa Prov., Brique River at Kimwenza, 4°27.876'S 015°16.649'E, 318 m, 2.viii.2012, Sites, Shepard, Pwema, Siasia, small heavily vegetated stream with sandy-mud substrate, L-1424 (UMC; 5♂, 2♀); Matadi, 1937, Dr. Darteville / Poisson to Drake Coll 1979 (USNM; 1♂); Musée du Congo, Katanga : Kazenza, 19 August 1931, G. F. de Witte, R. Det. 7126 B (RMCA; 2♀); Congo Belge: Poisson to Drake Coll 1979 (USNM; 2♂); P.N.U., Lusinga (Kamalongiru), 22 June 1945, G. F. de Witte:154 / R. Poisson det., 1951, *Neomacrocoris handlirschi*

handlirschi Mont. (NMWC; 1♂); P.N.U., Lusinga (1760 m), 20 March 1947, Mis. G.F. de Witte: 79a / R. Poisson det., 1951, *Neomacrocoris handlirschi handlirschi* Mont. (NMWC; 1♀). CONGO: Poisson to Drake Coll 1979 (USNM; 1♂). [UGANDA]: Albert Nyanza N.E. Riv. Waki, Alluoud 1909 / *Neomacrocoris handlirschi* Montand det. Montandon 1913 / Poisson to Drake Coll 1979 (USNM; 1♂). [ZAMBIA]: Kaombe, 11062010#1 (PRC; 1♀). [ZIMBABWE]: Salisbury, Mashonald. 1898 (BMNH; 1♂); S. Rhodesia, Inyangombi Falls Inyanga, 15 ii 1948, Mr. & Mrs. Omer-Cooper, B.M. 1969-138 (BMNH; 1♂, 3♀; UMC, 1♀); Inyamaziwa, Inyanga, TMSA (TMSA; 2♂, 4♀; UMC, 1♀).

Distribution: The species occurs from eastern Sudan (Linnavuori 1981) and the Democratic Republic of the Congo and Uganda south to South Africa. As such, *N. handlirschi* and *N. parviceps* might have the widest distribution of any species of *Neomacrocoris*. In Tanzania, Poisson (1963) reported *N. handlirschi* from the Usambara Mountains. We collected *N. handlirschi* syntopically with *N. bondelaufa* at L-1202 and with *N. parviceps* at L-1174 and 1202. All three species were collected together in the Msanzi River in Rukwa Region (L-1202). This species was collected in densely vegetated stream margins with muddy/gravelly substrate.

Discussion: This species originally was described as *M. handlirschi* from southern South Africa (Montandon 1909). Four years later, this and two other species of *Macrocoris* were transferred to the new genus *Neomacrocoris* by Montandon (1913a). Montandon (1909) described the species from a series but did not designate a type specimen. Sites and Mbogho (2012) located a single syntype in the Naturhistorisches Museum in Vienna and designated it as the lectotype. Poisson (1948b) reported that the species has a wide size range of 8.5–10 mm length and 5.2–5.3 mm width. Poisson (1948b) also noted a slight indication of a posterior transverse furrow of the pronotal disc.

N. handlirschi var. *armatus* was described by Poisson (1948b) from seven localities in the Belgian Congo and distinguished from the nominate form by the presence of denticles on the left medial lobe of the 7th abdominal tergum in males. This variety was considered a valid subspecies because it was described prior to 1961 (ICZN 1999). Sites and Mbogho (2012) discovered both subspecies co-occurring in a stream in Gombe National Park and synonymised *N. h. armatus* with the nominotypical subspecies. As a consequence, there are no longer subspecific designations for *N. handlirschi*.

Non-genitalic attributes are available to characterize this species, including pronotum flattening and short, thick setae on the scutellum, embolium, clavus, corium, and membrane. Female specimens from our collections from Tanzania and others from Zambia, Zimbabwe, and northeastern and western Democratic Republic of the Congo have the posterolateral corners of mediosternite VI slightly expanded and deflexed. Females from elsewhere in the range of this species do not exhibit the expanded, deflexed corners of female mediosternite VI.

Neomacrocoris karimii Poisson, 1963

Figs 11, 29, 30

Neomacrocoris karimii: Poisson 1963: 1173, 1189–1191.

Diagnosis: The body is large and ovate (Fig. 29) and the flattened left side of the apex of the male phallosoma (Fig. 11) is distinct. Because the only specimen is the male holotype, structure of the female subgenital plate is not known.

Holotype (examined): TANGANYIKA, ruisselet de karini /type /*Neomacrocoris karinii* Poiss. (NMHN, ♂ body; USNM, slide-mounted abdominal segments 7–8 and aedeagus).

Distribution: Usambara Mountains near Karimi Tea Estate.

Discussion: This species is known from only a single male specimen from the Usambara Mountains. The locality in the original description was given as a small stream over rocks near the route of Muheza to Amani on the road to the Karimi Tea Estate. We sampled all streams that crossed the roads in this area, but were unable to find this species. In fact, we found very few insects overall, probably because of the heavy red siltation resulting from the agricultural activity of the tea plantation. At nearby streams slightly further south, we found specimens of *Neomacrocoris parviceps* at L-1260 and 1261. The type specimen is housed in the MNHN, but is missing the posterior abdominal segments. Two microscope slides containing the aedeagus (Fig. 11) and segments 7–8 of this specimen are housed in the Drake Collection in the USNM. Thus, the only known specimen of this species is being curated in museums on two continents. The different components of the specimen were reunited in the revision of *Neomacrocoris* (Sites & Mbogho 2012) and here. Further west in the Usambara Mountains, we collected an undescribed species (recently described as *N. vuga* in the revision) that superficially resembled *N. karimii*. Only by using male genitalia is it possible to distinguish these two species.

Neomacrocoris parviceps parviceps (Montandon, 1900)

Figs 13, 23, 30

Macrocoris parviceps Montandon, 1900: 422.

Neomacrocoris parviceps: Montandon 1913a: 332.

Diagnosis: Live specimens in Tanzania have a brownish red abdominal sternum which becomes more evident with immersion in ethanol. Thick setae on the hemelytra that are characteristic of *N. handlirschi* are restricted to the embolium and adjacent areas of the corium in *N. parviceps*. The longitudinal flange and shape of the apex of the phallosoma are diagnostic (Fig. 13) and the pseudostrigil has a distinct impression in the lateral ¼. The lateral margin of the female subgenital plate is sinuate and continuous without projections.

Lectotype (examined): [TANZANIA]: ‘Dar-es-Salaam [6°53’S 39°16’E], R.V.Benningsen / *Macrocoris parviceps* Mtd. type. 1900. det. Montand. / *Neomacrocoris parviceps* Mtd. det. Montandon 1913. / ‘*Macrocoris parviceps*’ Montd / Hung. Nat. Hist. Mus. Budapest coll. Hemiptera’ (HNHM; ♀).

Material examined: TANZANIA: *Kagera Region*: approx. 5 km E of Bhiaramulo, 2°38.159’S 31°20.789’E, 1427 m, 26.vii.2010, R.W. Sites & A. Mbogho, roadside pool with grasses, algae, lily pads, L-1154 (UMC; 2♂); Karege, 3°07.936’S 31°04.530’E, 1234 m, 27.vii.2010, R.W. Sites & A. Mbogho, shallow pools with heavy vegetation and cattle use, L-1157 (UMC; 34♂, 13♀). *Kigoma Region*: 15 km N of Kigoma, Mungonya River, 4°50.337’S 29°40.001’E, 806 m, 28.vii.2010, R.W. Sites & A. Mbogho, muddy bank with sparse marginal vegetation, L-1169 (UMC; 1♂); Gombe National Park, Mitumba stream, 4°38.405’S 29°37.823’E, 776 m, 29.vii.2010, R.W. Sites & A. Mbogho, heavily vegetated narrow forest stream, L-1174 (UMC; 1♂); Kazuramimba, 5°00.155’S 30°00.971’E, 1082 m, 30.vii.2010, R.W. Sites & A. Mbogho, muddy pools of small stream with marginal vegetation, L-1182 (UMC; 1♂). *Mbeya Region*: Tanganyika, Maji Moto, 8°38’S 33°40’E, 3700 ft, 9.viii.1959, Cambridge E. African Exped., B.M. 1960-50 (BMNH; 1♂). *Morogoro Region*: Mikumi National Park, 7°21.608’S 37°03.337’E, 529 m, 7.viii.2010, R.W. Sites & A. Mbogho, heavily vegetated seasonal pond, L-1219 (UMC; 1♀); Kilombero District, Mwaya River at Mang’ula, 7°50.945’S 36°53.201’E, 313 m, 7.viii.2013, R.W. Sites, A. Mbogho & G. Rwegasira, muddy/vegetated margins of sand/gravel stream, L-1623 (UMC; 40♂, 30♀); Kisawasawa River at Kisawasawa, 7°50.596’S 36°52.311’E, 326 m, 8.viii.2013, R.W. Sites, A. Mbogho & G. Rwegasira, vegetated margins of sandy stream, L-1625 (UMC; 14♂, 15♀); Sonjo River at Sonjo, 7°48.490’S 36°53.785’E, 320 m, 8.viii.2013, R.W. Sites, A. Mbogho & G. Rwegasira, vegetated margins of rocky stream, L-1626 (UMC; 20♂, 14♀); Sumbugulu River at Kidatu, 7°43.371’S 36°56.013’E, 306 m, 8.viii.2013, R.W. Sites, A. Mbogho & G. Rwegasira, veg margins of rocky stream, L-1627 (UMC, 7♂, 9♀); Kiberege River at Kiberege, 7°56.871’S 36°51.378’E, 299 m, 8.viii.2013, R.W. Sites, A. Mbogho & G. Rwegasira, vegetated margins of sandy stream, L-1628 (UMC, 4♂, 4♀); Ilahi River at Iraguwa, 8°30.336’S 36°31.660’E, 313 m, 9.viii.2013,

R.W. Sites & G. Rwegasira, muddy stream with vegetated margins, L-1633 (UMC, 2♀). *Rukwa Region*: ca 54 km E of Karema, 6°37.275'S 30°39.593'E, 1086 m, 31.vii.2010, R.W. Sites & A. Mbogho, shaded stream, negligible flow, L-1193 (UMC; 2♂, 1♀); Mpanda, Kasimba River, 6°21.602'S 31°04.382'E, 1064 m, 1.viii.2010, R.W. Sites & A. Mbogho, grasses hanging into river, L-1195 (UMC; 1♂); Msanzi River at Msanzi, 8°11.411'S 31°31.295'E, 1778 m, 2.viii.2010, R.W. Sites & A. Mbogho, rocks, mud, gravel, sand, marginal grasses, L-1202 (UMC; 1♂); Tanganyika, Rukwa Valley, 9.xi.1963, E.S. Brown, 536, B.M. 1966-102 (BMNH; 3♂, 2♀). *Ruvuma Region*: 20 km N of Songea, Lumecha River at Samangula, 10°30.149'S 35°40.268'E, 994 m, 5.viii.2010, R.W. Sites & A. Mbogho, overhanging grasses, L-1211 (UMC; 2♂, 5♀). *Tanga Region*: river from Soni to Mombo, 2 km E of Vuga Junction, 4°52.040'S 38°20.906'E, 460 m, 14.viii.2010, R.W. Sites & A. Mbogho, grassy overhangs in rocky stream, L-1253 (UMC; 10♂, 11♀); Kwamaluli River at Mbagai, 4°58.561'S 38°23.154'E, 465 m, 14.viii.2010, R.W. Sites & A. Mbogho, shaded narrow stream with overhanging veg and undercuts, L-1256 (UMC; 6♂, 6♀); Kihuuwi River at Timba, 5°07.683'S 38°41.418'E, 174 m, 15.viii.2010, R.W. Sites & A. Mbogho, marginal grasses with silty/rocky bottom, L-1260 (UMC; 3♂, 3♀); Jembe stream at Muheza, 5°10.260'S 38°47.106'E, 182 m, 15.viii.2010, R.W. Sites & A. Mbogho, grassy overhangs in urban stream, L-1261 (UMC; 1♀). *Kaskazini Region*: Kitepo River at Zingwezingwe Bridge, 6°00.963'S 39°14.734'E, 39 m, 17.viii.2010, R.W. Sites & A. Mbogho, discontinuous pools with aquatic vegetation and grasses, L-1265 (UMC; 4♂, 2♀, 3 nymphs); Kitepo River at Mkaratini Bridge, 6°00.714'S 39°14.841'E, 30 m, 17.viii.2010, R.W. Sites & A. Mbogho, discontinuous pools with aquatic veg and grasses, L-1266 (UMC; 4♂, 4♀). *Kusini Region*: Mwera River at Mwera, 6°08.811'S 39°16.264'E, 23 m, 17.viii.2010, R.W. Sites & A. Mbogho, flooded vegetated field margin, L-1267 (UMC; 2♂, 3♀).

Extralimital material examined: CONGO: Poisson to Drake Coll 1979 (USNM; 3♂, 2♀). [DEMOCRATIC REPUBLIC OF CONGO]: Katanda.r.Nyamurag., 30 June 1934, G.F. de Witte, Parc. Nat. Albert, 851, Coll. Mus. Tervuren, R. Poisson det. 1945 (RMCA; 1♂); Camp Ruindi (1000), 20-28 XI 1934, G.F. de Witte, Parc. Nat. Albert, 798, Coll. Mus. Tervuren, R. Poisson det. 1945 (RMCA; 1♂); same data but with 828 replacing 798 (RMCA; 1♀); Camp Ruindi, 1000, 20/28-XI-1934, G.F. de Witte, Parc. Nat. Albert, 799 / R. Poisson det. 1945, *Neomacrocoris parviceps* Montandon (NMWC; 1♂). GHANA: Greater Accra Region, Dangme West District, Dodowa Subdistrict, Apese Abominya, Lat: 5.95861111000, Lon: -0.01163889000, 4 January 2004, R. Merritt & R. Kimbirauskas (UMC; 1♂). SOUTH AFRICA: B.M. 1926-40, Estcourt, Aug. (BMNH; 1♂); KZ-Natal., Southern Drakensburg, Herbst cattle farm, 2000 m, Sourveld grassland & dam, 8 November 2005, P.E. Reavell / clay dam (PRC; 1♂ 1♀). UGANDA: Namanve Swamp, Kampala, 1.xi.1932, G.L.R. Hancock, B.M. 1933-585, NA 10, 1-XI-32, Pres. By Imp. Inst. Ent. B.M. 1933-585 (BMNH; 1♂); Namanve, 7 VIII 1932, G.L.R. Hancock, No 29, Pres. By Imp. Inst. Ent. B.M. 1933-585 (BMNH; 1♂); Namanve, 6 VII 1932, G.L.R. Hancock, No 17, Pres. By Imp. Inst. Ent. B.M. 1935-32 (BMNH, 1♂). UPPER VOLTA [BURKINA FASO]: Bobo Dioulasso (UMC; 1♂).

Distribution: The type locality is Dar es Salaam, Tanzania, and the lectotype is housed in the Hungarian Natural History Museum in Budapest. This species is known from Sudan (Linnavuori 1981) west to Ivory Coast and south to South Africa (Sites & Mbogho 2012) and was considered to be widespread in East Africa (Poisson 1948b). In Tanzania, it is widespread and occurs from Zanzibar west to streams flowing into Lake Tanganyika in Kigoma and Rukwa Regions, and from near Lake Victoria south to Ruvuma Region.

Discussion: *Neomacrocoris parviceps* and *N. handlirschi* are the most widely distributed species of the genus in Africa. *N. parviceps* is the most common species of *Neomacrocoris* in Tanzania and is one of the most easily recognized in the field because of its reddish-orange colored abdominal sterna. Because it occurs so widely throughout sub-Saharan Africa, it is subject to substantial variation in size and pigmentation over its range. In Tanzania, we collected it in vegetated margins of streams and pools where water flow was minimal. It appears to do well in areas that are disturbed or frequented by cattle. We collected it together with *N. bondelaufa* and *N. handlirschi* separately at various locations and all three together at Msanzi River at Msanzi, and with *Macrocoris flavicollis* at seven sites including in Zanzibar. It was collected also at the type locality of *N. vuga*.

Neomacrocoris parviceps ocellatus Poisson, 1948

Fig. 24

Neomacrocoris parviceps ocellatus: Poisson 1948b: 212.

Diagnosis: This subspecies differs from the nominate subspecies by more pronounced dark spots laterally on the pronotum and a more clear claval commissure than those of the nominate subspecies (Fig. 24).

Extralimital material examined: CONGO: B. gde forme a Gnoapointa / *Neomacrocoris parviceps ocellatus* nov. / Poisson to Drake Coll 1979 (USNM; 1♂); Congo / *Neomacrocoris parviceps ocellatus* / Poisson to Drake Coll 1979 (USNM; 1♂).

Distribution: This subspecies has been recorded from only Maua, Kilimanjaro Region. We have seen specimens labelled Congo, but with a specific locality that we have been unable to locate.

Discussion: The subspecies *N. p. ocellatus* was described by Poisson (1948b); however, the description of its morphology consisted of a habitus line diagram and one sentence. Although he gave no distribution information, he later reported the subspecies from Maua in Kilimanjaro Region (Poisson 1963). We collected throughout the area near Maua and did not find specimens of any species of Naucoridae. In our collections and all museums examined, we have seen no specimens of *N. p. ocellatus* from Tanzania; all specimens were *N. p. parviceps*.

Although he initially described it as a variety (“var. *ocellatus* nov.”), Poisson referred to the alternate condition as *N. parviceps parviceps*, implicitly conferring to it subspecific rank. Because the variety was described prior to 1961 it is considered a valid subspecies (ICZN 1999). In later papers, he referred to it more deliberately as a subspecies (*N. p. ocellatus*) (Poisson 1949).

Neomacrocoris usambaricus Montandon, 1913

Figs 5, 25

Neomacrocoris usambaricus: Montandon 1913a: 332–334; Sites & Mbogho 2012: 30–33 (neotype designation).

Diagnosis: Although it is large, *N. usambaricus* is not in the group of distinctly large and ovate species which includes *N. karimii* and *N. vuga* (see below). The pronotum is largely devoid of dark maculation (Fig. 25). Currently, only the female is known and lateral margins of the subgenital plate are gently sinuate to the distal spatulate process and without projections. Body length of the neotype is 10.96 mm.

Neotype (examined): [DEMOCRATIC REPUBLIC OF CONGO]: ‘Tuevo [5°S 13°E], 2-VIII-1911, R. Mayné / R. det., A, 202 / *Neomacrocoris usambaricus* 1913 Montandon, det Montandon 1914’ (RMCA; ♀).

Distribution: Originally reported from W. Usambara of Tanzania and also known from Tuevo in Democratic Republic of the Congo.

Discussion: This species was described by Montandon when he established the genus, and subsequently was designated the type species of the genus by Štys and Jansson (1988). Montandon reported only one specimen from West Usambara in the original description and that it was deposited in the “Deutsches Nat. Mus. Berlin.” This and many other museum collections throughout Europe, Africa, and the United States were queried or searched for the type, but it was not located (Sites & Mbogho 2012). As a consequence, a neotype from Tuevo, Democratic Republic of the Congo was established.

The neotype is a female determined by Montandon, thus it is the only known specimen and males are not known at this time. Despite our collections in several streams in the area of West Usambara, nothing resembling the neotype was found.

Neomacrocoris vuga Sites, 2012

Figs 6, 14, 27, 30

Neomacrocoris vuga: Sites in Sites & Mbogho 2012: 34–37.

Diagnosis: *Neomacrocoris vuga* is large and ovate (Fig. 27) as is *N. karimii*, but can be distinguished by the male genitalia. Specifically, the apex of the phallosoma is strongly and sharply hooked to the left (Fig. 14). The female subgenital plate is broad and has a strong mid-lateral projection before narrowing to the distal spatulate process (Fig. 6).

Holotype (examined): TANZANIA: *Tanga Region*: river from Soni to Mombo, 2 km E of Vuga Junction, 4°52.040'S 38°20.906'E, 460 m, 14.viii.2010, R.W. Sites & A. Mbogho, grassy overhangs in rocky stream, L-1253 (UMC; ♂).

Paratypes (examined): same data as holotype (UMC; 1♂, 2♀); river from Soni to Mombo, Karese, 1 km E of Soni, 4°50.284'S 38°22.355'E, 1051 m, 14.viii.2010, R.W. Sites & A. Mbogho, vegetated overhangs and undercuts, L-1254 (UMC, USNM, NHMW; 1♂, 4♀).

Material examined: TANZANIA: *Tanga Region*: W. Usambara Mts, 4°44'S 38°22'E, 5100 ft, 10.viii. 1996, P. Cresswell, creek (CMNH; 1♀).

Extralimital material examined: KENYA: Museum Leiden, Taita Hills, Wusi; no jk 143, 29.XI.1974, ca 850 m, J. Krikken & A. L. van Berge Henegouwen, 3°27'S-38°21'E / rivulet in cult. area (RMNH; 1♂); Museum Leiden, E. le Moul, Kenya Nairobi, Ngong-Forest, Br. O, Afrika (RMNH; 1♂, 2♀).

Distribution: This species is known in Tanzania from the Usambara Mountains and just north in Kenya from the Taita Hills and Nairobi.

Discussion: This is a newly described species (Sites & Mbogho 2012) and was first found during these collections. This species occurred syntopically with *N. parviceps* at the type locality and was collected in dense, submerged vegetation along the margins of a small stream. We collected nine adults and many immatures at the type locality and another site further upstream. This species is superficially similar to *N. karimii*, which is known from the same general area of the Usambara Mountains in Tanzania, and *N. vaneyeni* from western Democratic Republic of Congo.

Species of possible occurrence in Tanzania

Because of longstanding difficulty with identifications and insufficient collecting, distributions of species of Naucoridae throughout Africa are poorly documented. Most species are known from only a few widely disjunct records. Although our sampling was extensive, it remains that additional species might occur in Tanzania that we did not collect. Given below is a list of species known from neighbouring countries that might also occur in Tanzania:

Aneurocoris marlieri Poisson, 1960. This species was described from the north-western-most point of Lake Tanganyika at Kivu, Uvira in the Democratic Republic of the Congo (Poisson 1960c). The species has not been recorded other than from the type series of one male and one female.

Laccocoris chinai Poisson, 1949. This species is widely distributed and known from Ethiopia, Parc National Albert in north-eastern Democratic Republic of the Congo, and South Africa (Linnavuori 1987).

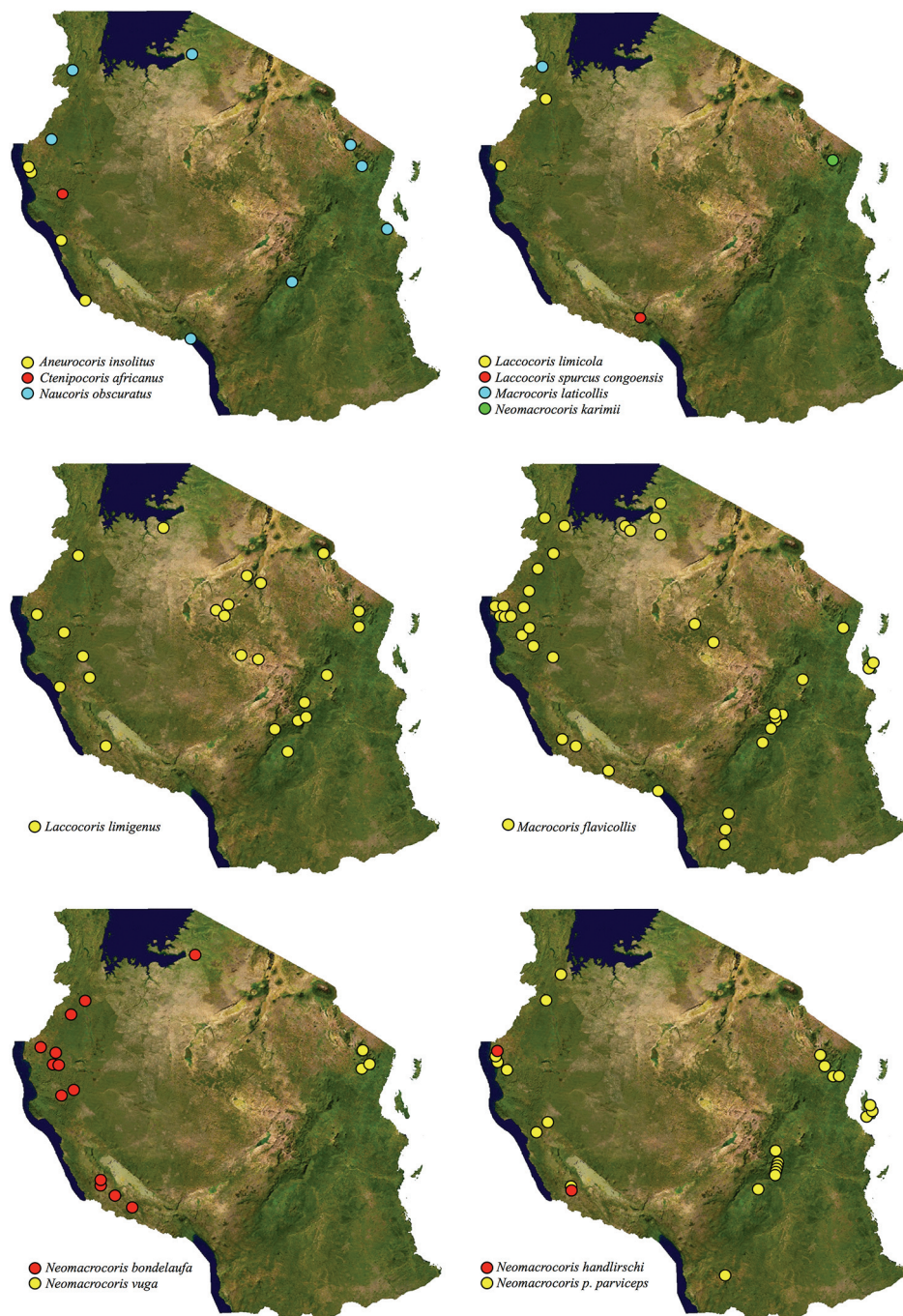


Fig. 30. Distribution maps of 13 species of Naucoridae known from Tanzania. Not included is *Neomacrocoris usambaricus*, which was recorded from West Usambara. (Map for *N. bondelaufa* and *N. vuga* is reproduced from Sites & Mbogho (2012), with permission by Magnolia Press.)

- Laccocoris salina* Poisson, 1940. This species is known from Salines de Mwashia, Katanga in southern Democratic Republic of the Congo (Poisson 1940).
- Macrocoris convexus* Montandon, 1897. This species is similar in appearance to *M. laticollis*. It is known from Uganda and Democratic Republic of the Congo (Poisson 1959).
- Naucoris fuscipennis* Schaum, 1853. The only known record of this species is the type specimen from Mozambique in the MNB.
- Naucoris kenyalis* Poisson, 1949. This insect was described as a subspecies of *N. obscuratus* but was elevated to the species rank by Linnavuori (1971). It is known from Kenya and Democratic Republic of the Congo (Poisson 1949).
- Neomacrocoris katangae* Poisson, 1966. This species is known only by the type specimen from Katanga in southern Democratic Republic of the Congo (Poisson 1966; Sites & Mbogho 2012).
- Neomacrocoris ndugai* Poisson, 1955. This species is very similar to *N. handlirschi* and can be distinguished from it only by male genitalia. It is known only by the type specimen from Nduga, Rwanda (Poisson 1955, Sites & Mbogho 2012).
- Neomacrocoris schaeferi* Sites, 2012. This species is known only by the type specimen from Namanve Swamp in southern Uganda (Sites & Mbogho 2012). RWS visited Namanve Swamp in August 2013 (L-1636); the swamp has been destroyed for commercial interests to the point that less than 1 % of the swamp remains. No specimens of *Neomacrocoris* were collected in the small tract of remaining swamp; thus, the species might be extirpated from its type locality.

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