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Two new species of *Diaphorocellus* Simon, 1893 from Madagascar (Araneae, Palpimanidae)

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Abstract

Two new species of the palpimanid genus *Diaphorocellus* Simon, 1893, *D. isalo* **sp. nov.** (♂♀), and *D. jocquei* **sp. nov.** (♂♀), are described from central and eastern parts of Madagascar, respectively. Along with *D. rufus* (Tullgren, 1910), these new species can be distinguished from other congeners by possessing a finely and densely spotted colouration of the abdomen. They differ from one another, as well from *D. rufus*, by the eye group configuration and by the structure of the male and female copulatory organs. Diagnoses and illustrations presenting the diagnostic characters of *D. isalo* **sp. nov.** and *D. jocquei* **sp. nov.** are provided. The genus now includes six African species.

Keywords

Afrotropic realm, Chediminae, endogyne, palp-footed spiders, taxonomy

Introduction

The spider family Palpimanidae is relatively well represented in mainland Africa, where it comprises 13 genera and 53 species vs. 18 and 150 respectively, known for the entire world (World Spider Catalog 2019). Palpimanids have also been found in several insular territories/countries located near the African continent: São Tomé and Príncipe (Simon 1907), the Seychelles (Simon 1898; Platnick 1979; Saaristo 2010) and Socotra (Pocock 1899, Zonstein et al. 2018). However, to date, no named species of the Palpimanidae have been reported from the largest of the regional islands, Madagascar, although the occurrence of *Diaphorocellus* spp. on this island was first noted by Wood et al. (2018).

The present study, which seeks to fill this gap, is based on the examination of palpimanid specimens deposited in the Royal Museum for Central Africa, Tervuren, Belgium (RMCA). Along with other African palpimanids kept in the RMCA spider collection, several species of *Diaphorocellus* Simon, 1893 were identified during the study. Two of these species, originated from Madagascar, were found to be new to science and are described below.

Currently, *Diaphorocellus* is a small African genus of palpimanid spiders previously known to include four species whose known distribution is restricted to Tanzania, Botswana, Namibia and South Africa (World Spider Catalog 2019). The aim of this paper is to provide a detailed description of the two new species and to update the diagnostic characters of the genus.

Material and methods

The origin of the material used in this study is noted above.

Photographs were taken using an Olympus SZX16 stereomicroscope with a Canon-7D camera and final images were compiled using Zerene Stacker 1.04 software (https://zerenesystems.com). Scanning electron micrographs were made using a JEOL JSM-5200 scanning microscope at the Zoological Museum, University of Turku, Finland. Illustrations of scuta and endogynes were made after maceration in a 20% potassium hydroxide aqueous solution and exposure for a few minutes in an alcohol solution of Chlorazol Black. Endogynes were photographed on slides with either an Olympus SZX16 or an Olympus BH-2. Background maps were taken from https://www.simplemappr.net (Shorthouse 2010).

Measurements were made to an accuracy of 0.01 mm. Lengths of leg and palp segments were measured on the dorsal side, from the midpoint of the anterior margin to the midpoint of the posterior margin. All measurements are given in millimetres. Terminology partially follows Zonstein et al. (2016).

The following abbreviations (except those encoded in the captions) are used in the article: **ALE** – anterior lateral eye(s), **AME** – anterior median eye(s), **CH** – carapace height, **CL** – carapace length, **CW** – carapace width, **CyL** – clypeus length, **L/W** – ratio length/width, **PLE** – posterior lateral eye(s), **PME** – posterior median eye(s), **TL** – total length of body in dorsal view.

Taxonomy

Family Palpimanidae Thorell, 1870
Subfamily Chediminae Simon, 1893

Genus *Diaphorocellus* Simon, 1893

Diaphorocellus Simon, 1893: 314; Platnick 1975: 5; Zonstein et al. 2016: 96.

Type species. *Diaphorocellus biplagiatus* Simon, 1893, by monotypy.

Notes. *Diaphorocellus* appears to be an exclusively Afrotropical chedimine genus that comprises six species: *D. albooculatus* Lawrence, 1927 (Namibia), *D. biplagiatus* Simon, 1893 (South Africa), *D. helveolus* (Simon, 1910) (Botswana), *D. isalo* sp. nov. (Madagascar), *D. jocquei* sp. nov. (Madagascar) and *D. rufus* (Tullgren, 1910) (Tanzania). Within the genus, the first three species have a bicoloured dorsal abdominal pattern (presenting a broad longitudinal pale stripe against a dark background, the pale stripe is usually separated into two by a wide dark bridge). These congeners differ from the remaining three species, which have a uniformly and finely spotted abdominal colouration. To date, only the type species, *D. biplagiatus*, has been redescribed in detail (Zonstein et al. 2016).

Diaphorocellus isalo sp. nov.

http:/zoobank.org/6B99BCC0-B4BC-4865-8E19-7AF5E7591989
Figs 1A–D, 2A–B, 3A–B, 4A–C, 5A–B, 6A, 7A–D, 8A, 9

Etymology. The specific name is a toponym referring to the type locality, Isalo.

Types. ***Holotype*** ♂, and paratype ♀ from Madagascar, Fianarantsoa Province, Isalo, 22°38'S, 45°21'E, 20.iii.1994, A. Pauly (RMCA ARA 201275).

Diagnosis. The holotype male of *D. isalo* sp. nov. can be distinguished from the males of *D. jocquei* sp. n. by its larger size (CL 2.25 vs. 2.0), by presence of the cymbial spines vs. absence, and by the tapering prolateral arm of the tegular apophysis vs. widened arm. Females of these two species clearly differ in the shape of the membranous sacs of the endogyne: small globular in *D. isalo* sp. nov. vs. large subconical in *D. jocquei* sp. nov. In *D. isalo* sp. nov. the PME almost touch each other, while in *D. isalo* sp. nov. these eyes are slightly distant from each other (Figs 2A–B cf. Figs 2C–D). Additionally, *D. isalo* sp. nov. differs from *D. biplagiatus* by possessing a finely spotted dorsal abdominal pattern, as well as by lacking very long retrolateral setae of the male palp, by having a short palpal femur (length/width ratio 2.3 vs. 3.2) and by presence of the membranous sacs in the endogyne (vs. absent). Other diagnostic characters of *D. isalo* sp. nov. are noted in the Discussion.

Description. ***Male.*** RMCA ARA 201275 (holotype).

Habitus: as in Figs 1A–B. *Colour in alcohol*: carapace, chelicerae and dorsal abdominal scutum dark carmine brown; legs I intense reddish orange; palps and legs II–IV

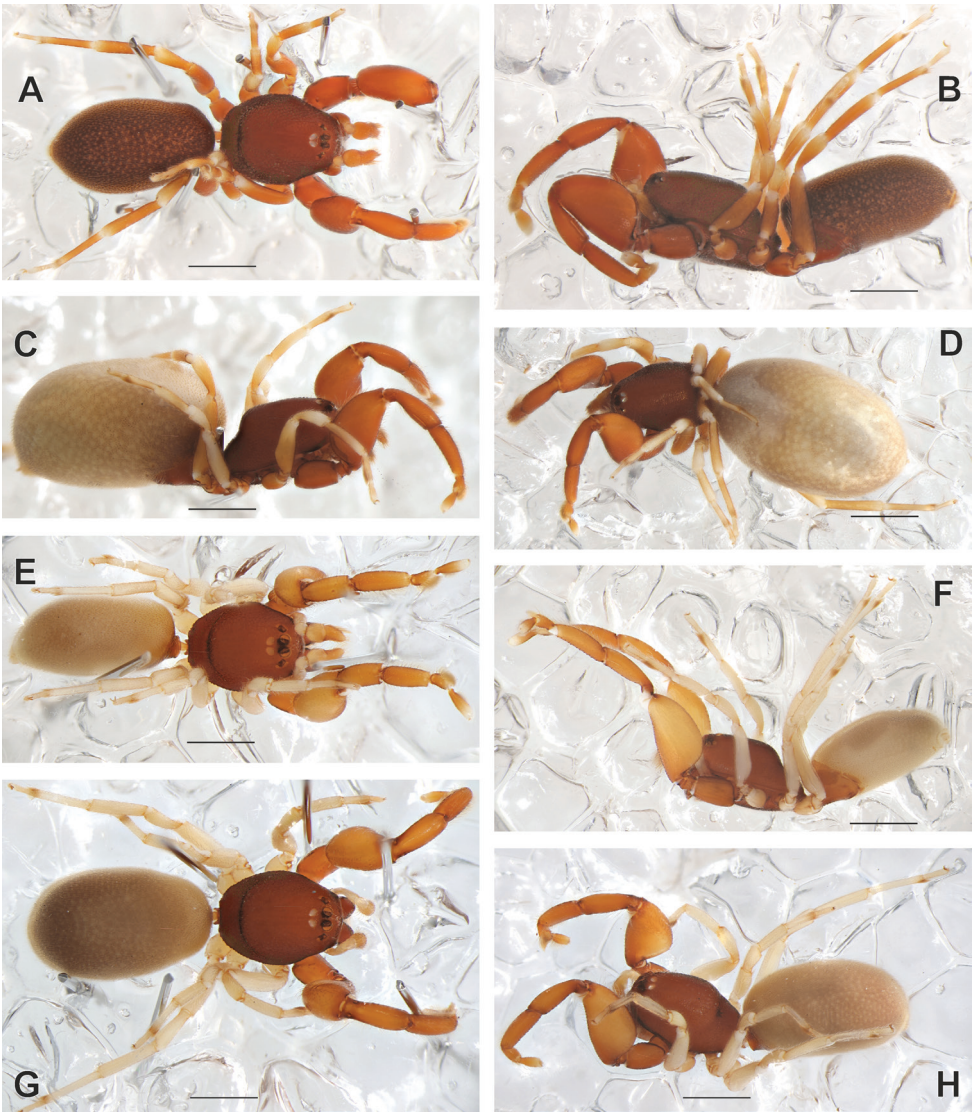

Figure 1. Habitus of *Diaphorocellus isalo* sp. n (**A–D**) and *D. jocquei* sp. n. (**E–H**). **A, E** male, dorsal **B, F** male, lateral **C, H** female, lateral **D, G** female, dorsal. Scale bar: 1.0 mm.

light to medium yellowish orange; sternum, labium, maxillae and ventral abdominal scutum reddish brown; abdomen dorsally dark brown with numerous light yellowish brown spots, ventrally uniformly medium yellowish brown. *Measurements*: TL 4.50, CL 2.10, CW 1.45, CH 0.95, CyL 0.29, Femur I L/W 1.88 (1.50/0.80). *Carapace*: with rather coarse granulations (Fig. 2A). *Eyes*: AME 0.14, ALE 0.09, PME 0.13, PLE 0.07, AME–AME 0.04, AME–ALE 0.07, PLE–PME 0.14, PME–PME 0.01.

Copulatory organs. Palp as shown in Figs 4A–C, 5A–B, 6A. Femur 2.6 times longer than wide, 1.2 times longer than cymbium; patella globular, thinner than femur; tibia swollen, as long as wide, 1.4 times wider than femur. Cymbium antero-retrolaterally

with tight bunch of strong spines, retrolaterally with dense brush of thick setae. Bulb globular, partly embedded into tibia, with two long (longer than tegulum) extensions: tegular apophysis and embolus. Tegular apophysis with two arms, pro- and retrolateral; prolateral arm with kind of comb on inner side; both arms bent on tip. Embolus located prolaterally, flat and long, almost as long as tegular apophysis.

Leg measurements: male RMCA ARA 201275 (female RMCA ARA 201275 in brackets):

	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
Palp	0.53 (0.63)	0.16 (0.27)	0.34 (0.35)	–	0.44 (0.42)	1.47 (1.67)
I	1.50 (1.63)	1.05 (1.25)	0.93 (1.05)	0.33 (0.40)	0.43 (0.45)	4.24 (4.78)
II	1.05 (1.25)	0.63 (0.63)	0.70 (0.88)	0.50 (0.58)	0.38 (0.40)	3.26 (3.74)
III	0.90 (1.00)	0.50 (0.58)	0.65 (0.70)	0.55 (0.63)	0.38 (0.35)	2.98 (3.26)
IV	1.25 (1.50)	0.70 (0.88)	1.00 (1.25)	0.88 (1.05)	0.45 (0.43)	4.28 (5.11)

***Female*.** RMCA ARA 201275 (paratype).

Habitus: as in Figs 1C–D. *Colour in alcohol*: as in male, but legs II–IV and abdomen paler. *Measurements*: TL 6.50, CL 2.25, CW 1.55, CH 0.85, CyL 0.31, Femur I L/W 1.85 (1.63/0.88). *Carapace*: longer, with less coarse granulations than in male (Fig. 2B). *Eyes*: AME 0.12, ALE 0.07, PLE 0.07, PME 0.13, AME–AME 0.04, AME–ALE 0.07, PME–PLE 0.14, PME–PME 0.01. Epigastral scutum entire (fused dorsally), with a pair of round plaque-like structures dorsally, book lung operculum large, extends above petiolar orifice.

Copulatory organs: as in Figs 3B, 7A–D, 8A. Epigastral plate in intact specimen accompanied by 2 pairs of sclerites lying on postgastrum (posterior from epigastral furrow): two small dot-like median sclerites and pair of longitudinal sclerites. Endogyne formed by pair of complex receptacles. Receptacle (*Re*) consists of complex sclerotised base and transparent, membranous cylindric sac (Figs 7A–D). Each receptacle accompanied by brushes of fine threads and 3 grape-shaped glands attached to receptacles by long thread-like stems.

Note. Following maceration of the epigastral scutum, two additional pairs of dot-like sclerites were revealed (Fig. 7C).

Habitat. According to the collecting data, the specimens were found near a natural pool in a rocky massif.

Distribution. Known only from the type locality (Fig. 9).

***Diaphorocellus jocquei* sp. nov.**

http:/zoobank.org/EED2889D-011A-4F9F-9D7F-5C1D9A364734

Figs 1E–H, 2C–D, 3C–D, 4D–F, 5C–D, 6B–C, 7E–F, 8B, 9

Etymology. The specific name is a patronym in honour of the prominent Belgian arachnologist, Dr Rudy Jocqué, for his highly significant contribution to the study of African spiders.

Figure 2. Prosoma, dorsal of *Diaphorocellus isalo* sp. nov. (**A–B**) and *D. jocquei* sp. nov. (**C–D**). **A, C** male **B, D** female. Scale bar: 0.5 mm.

Types. ***Holotype*** ♂, Madagascar, Tamatave Province, Mahavelona ("Foulpointe", as labelled), 17°40'S, 49°31'E, 25.xi.1993, A. Pauly (RMCA ARA 200305). ***Paratypes*****:** 1♀, collected together with the holotype (both deposited in the same vial); 1♂,

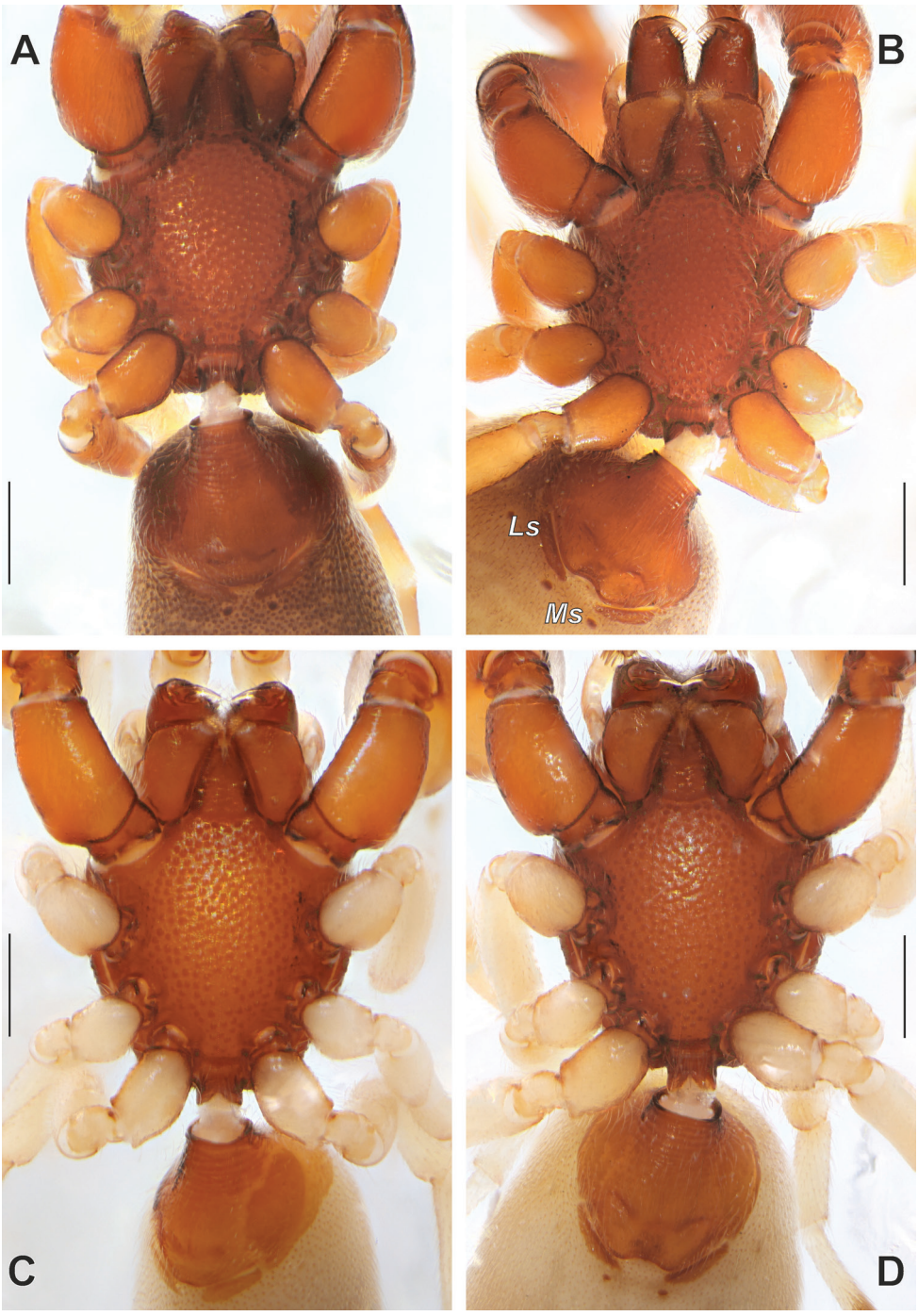

Figure 3. Prosoma, ventral of *Diaphorocellus isalo* sp. nov. (**A–B**) and *D. jocquei* sp. nov. (**C–D**). **A, C** male **B, D** female. Scale bar: 0.5 mm.

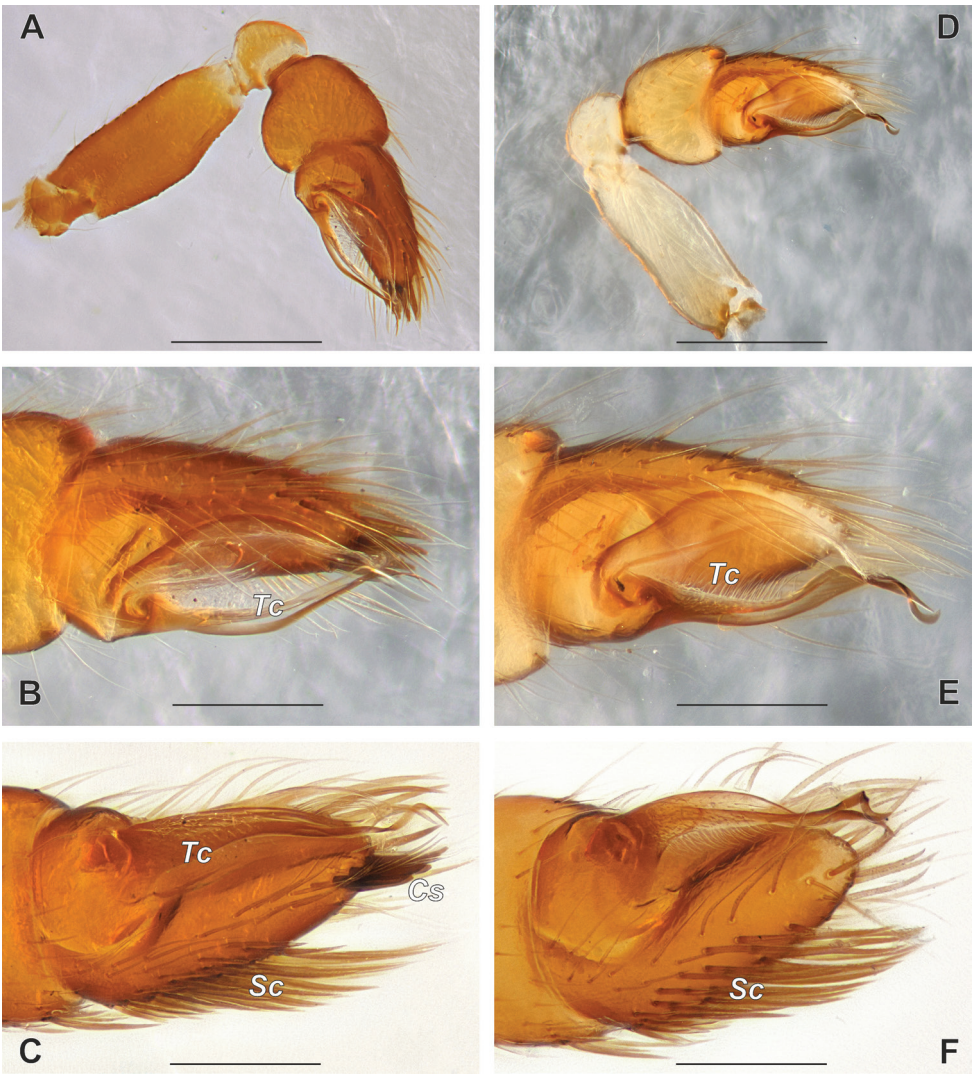

Figure 4. Male palp of *Diaphorocellus isalo* sp. nov. (**A–C**) and *D. jocquei* sp. nov. (**D–F**). **A, D** entire palp, prolateral **B, E** terminal part, prolateral **C, F** terminal part, ventro-retrolateral. Abbreviations: *Cs* cymbial spines; *Sc* brush of thick setae on cymbium; *Tc* comb of prolateral arm of tegular apophysis. Scale bar: 0.2 mm.

1♀, same collecting data but xii.1993 (RMCA ARA 177889); 1♀, same collecting data but xi.1994 (RMCA ARA 206925).

Diagnosis. The new species can be distinguished from *D. isalo* sp. nov. by its smaller size and by the shape of the copulatory organs (the latter also distinguishes this new species from non-Malagasy congeners). Males of *D. jocquei* sp. nov. are characterised by the absence of cymbial spines (vs. present), and by a less dense cymbial brush composed of stronger setae (Figs 4F cf. Fig. 4C). Females of these two species clearly differ in the shape of the membranous sacs: large subconical sacs in *D. jocquei* sp. nov.

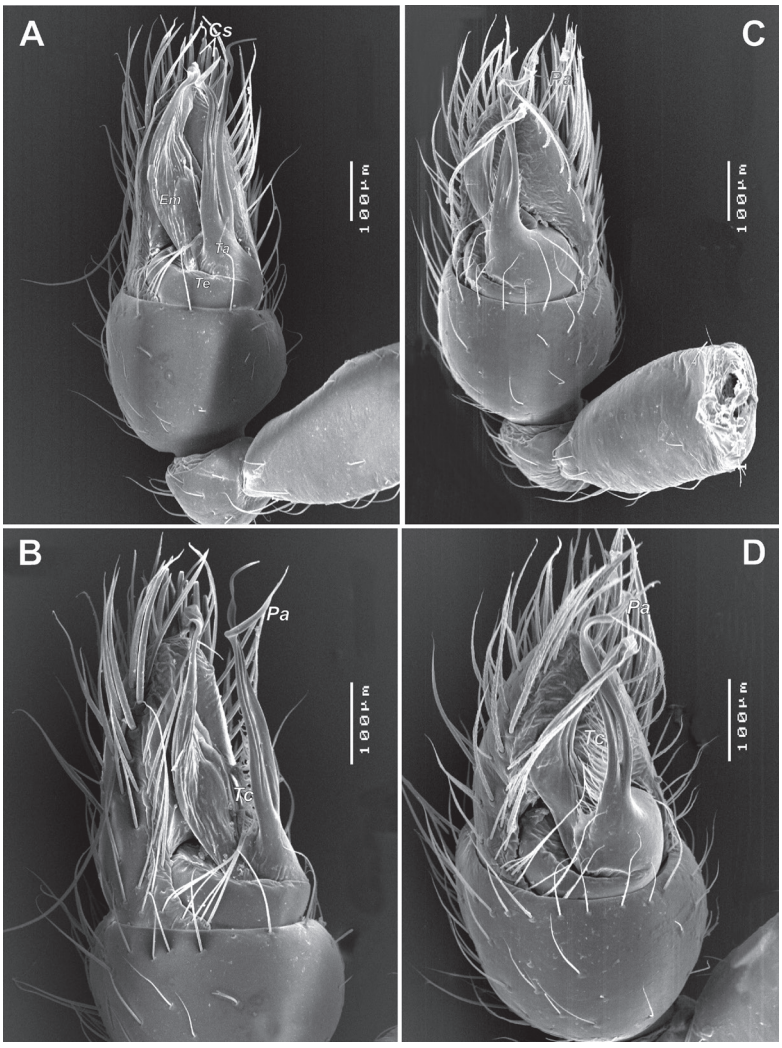

Figure 5. SEM micrograph of the male palp of *Diaphorocellus isalo* sp. nov. (**A–B**) and *D. jocquei* sp. nov. (**C–D**). **A, C** entire palp, ventral **B, C** terminal part, prolateral. Abbreviations: *Cs* cymbial spines; *Em* embolus; *Pa* prolateral arm of tegular apophysis; *Ta* tegular apophysis; *Tc* comb of prolateral arm of tegular apophysis; *Te* tegulum.

vs. globular ones in *D. isalo* sp. nov. In *D. jocquei* sp. nov. the PME are slightly distant from each other, while in *D. isalo* sp. nov. these eyes almost touch each other (Figs 2C–D cf. Figs 2A–B). Additionally, *D. jocquei* sp. nov. differs from *D. biplagiatus* by possessing a finely spotted dorsal abdominal pattern, as well as by lacking very long retrolateral setae of the male palp, by having a shorter palpal femur (length/width ratio 2.8 vs. 3.2) and by presence of the membranous sacs in the endogyne (vs. absent). Other diagnostic characters of *D. jocquei* sp. nov. are noted in the Discussion.

Description. ***Male.*** RMCA ARA 200305 (holotype).

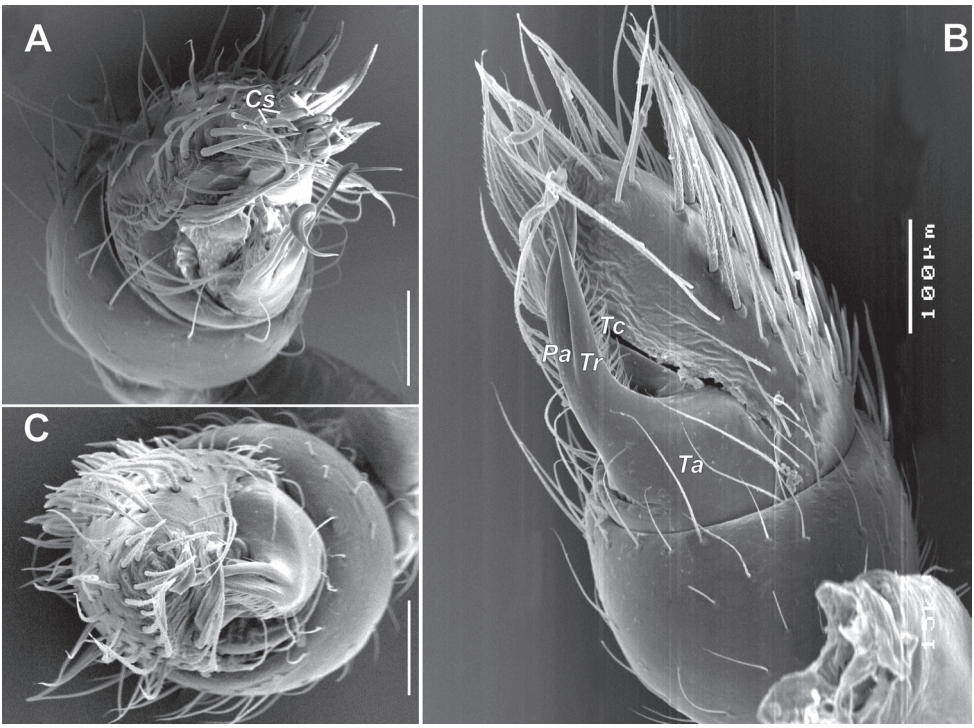

Figure 6. SEM micrograph of the male palp of *Diaphorocellus isalo* sp. nov. (**A**) and *D. jocquei* sp. nov. (**B–C**). **A, C** anterior **B** ventro-retrolateral. Abbreviations: *Cs* cymbial spines; *Pa* prolateral arm of tegular apophysis; *Tc* comb of prolateral arm of tegular apophysis; *Tr* retrolateral arm of tegular apophysis. Scale bar: 0.1 mm.

Habitus: as in Figs 1E–F. *Colour in alcohol*: carapace and chelicerae deep scarlet red; legs I and abdominal scuta intense reddish orange; palps and legs II–IV pale milky orange; sternum, labium, maxillae and pedicel tube medium scarlet red; abdomen dorsally very pale brown with small and dense even paler whitish spots, ventrally uniformly pale milky orange, entirely covered with short and relatively dense brownish setae. *Measurements*: TL 4.35. CL 2.0, CW 1.85, CH 0.38, CyL 0.32, Femur I L/W 2.09 (1.63/0.78). *Carapace*: with moderately coarse granulations (Fig. 3C). *Eyes*: AME 0.18, ALE 0.13, PME 0.09, PLE 0.07; AME–AME 0.09, AME–ALE 0.09, AME–PME 0.07, PLE–PME 0.09, PME–PME 0.02.

Copulatory organs: Palp as shown in Figs 4D–F, 5C–D, 6B–C. Femur 2.7 times longer than wide and 1.34 times longer than cymbium; patella globular, thinner than femur; tibia swollen, as long as wide, 1.55 times wider than femur. Cymbium retrolaterally with relatively sparse brush of strong setae. Bulb globular, partly embedded into the tibia; with 2 long (longer than tegulum) outgrowths: tegular apophysis and embolus. Tegular apophysis with 2 arms, pro- and retrolateral: prolateral arm with kind of comb on inner side; both arms bent on tip. Embolus located prolaterally, flat and long, almost as long as tegular apophysis.

Leg measurements: male RMCA ARA 200305 (female RMCA ARA 200305 in brackets):

	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
Palp	0.58 (0.63)	0.19 (0.16)	0.30 (0.38)	–	0.43 (0.40)	1.50 (1.57)
I	1.63 (1.43)	1.40 (1.05)	0.93 (0.83)	0.40 (0.38)	0.50 (0.40)	4.86 (4.09)
II	1.08 (1.00)	0.60 (0.63)	0.75 (0.68)	0.60 (0.50)	0.38 (0.38)	3.41 (3.19)
III	0.88 (0.93)	0.55 (0.53)	0.63 (0.60)	0.63 (0.60)	0.35 (0.35)	3.04 (3.01)
IV	1.40 (1.25)	0.78 (0.65)	1.03 (1.08)	0.95 (0.95)	0.43 (0.45)	4.59 (4.38)

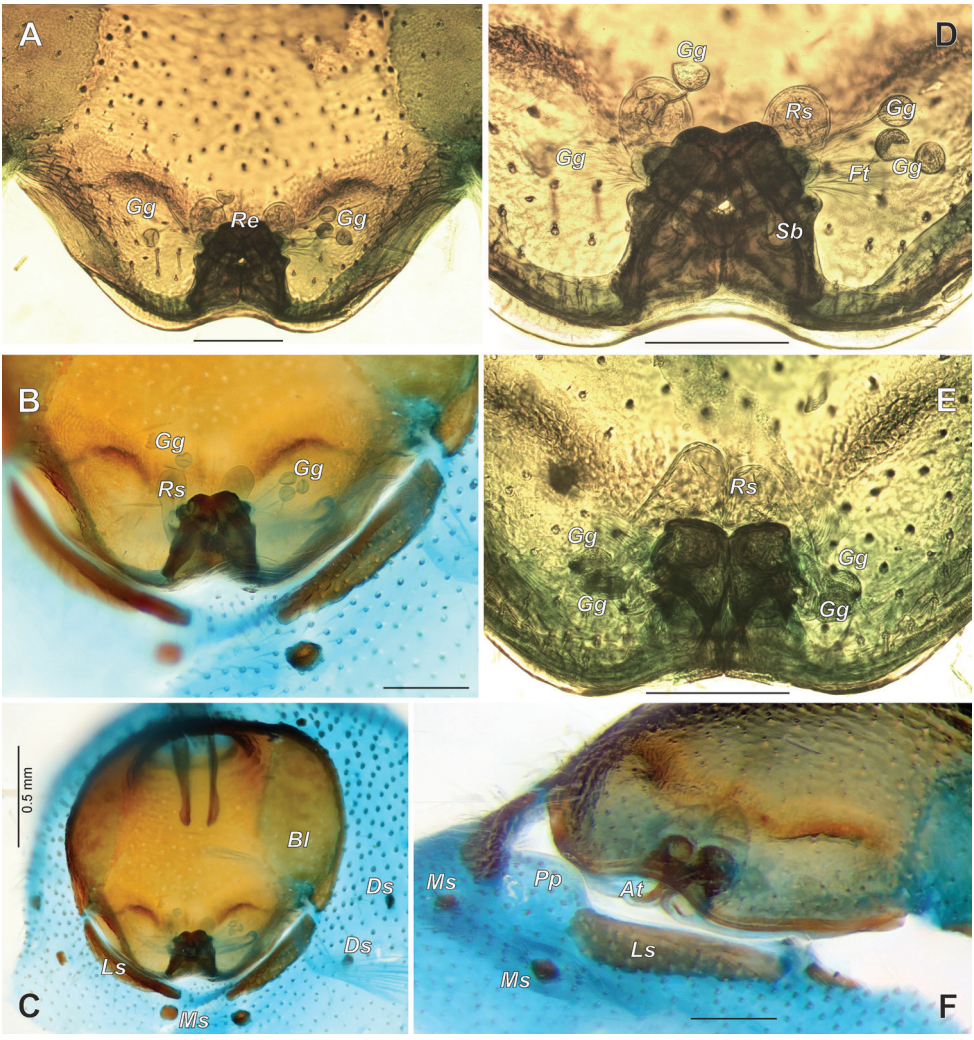

Figure 7. Female copulatory organs of *Diaphorocellus isalo* sp. nov. (**A–D**) and *D. jocquei* sp. nov. (**E–F**). **A, D, E** endogyne, ventral **B–C** epigastral scutum and anterior part of postgaster, ventral **E** – entire epigastral scutum and terminal part of postgaster showing 4 pairs of postgastral sclerites **F** epigastral sclerite and part of postgaster, postero-lateral, showing atrium and corresponding postgastral stopper. Abbreviations: *At* atrium; *Bl* book lung operculum; *Ft* fine threads; *Gg* grape-shaped glands; *Ls* longitudinal sclerites; *Ms* median sclerites; *Pp* postgastral plug; *Re* receptacle; *Rs* membranous cylindrical sac of receptacle; *Sb* sclerotised base. Scale bars: 0.5 mm.

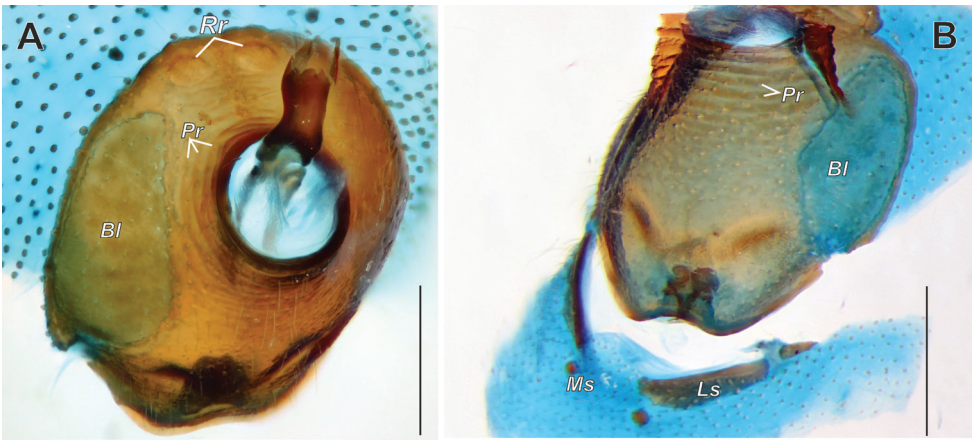

Figure 8. Anterior part of abdomen of *Diaphorocellus isalo* sp. nov. (**A**) and *D. jocquei* sp. nov. (**B**). **A** entire scutum, antero-lateral, showing large book-lungs (*Bl*) and round structures (*Rs*) **B** epigastral scutum and part of postgaster, postero-ventral. Abbreviations: *At* atrium; *Bl* book lung operculum; *Ls* longitudinal sclerite; *Ms* median sclerite; *Pr* ridges on the petiolar tube; *Rr* round rear structure. Scale bars: 1.0 mm.

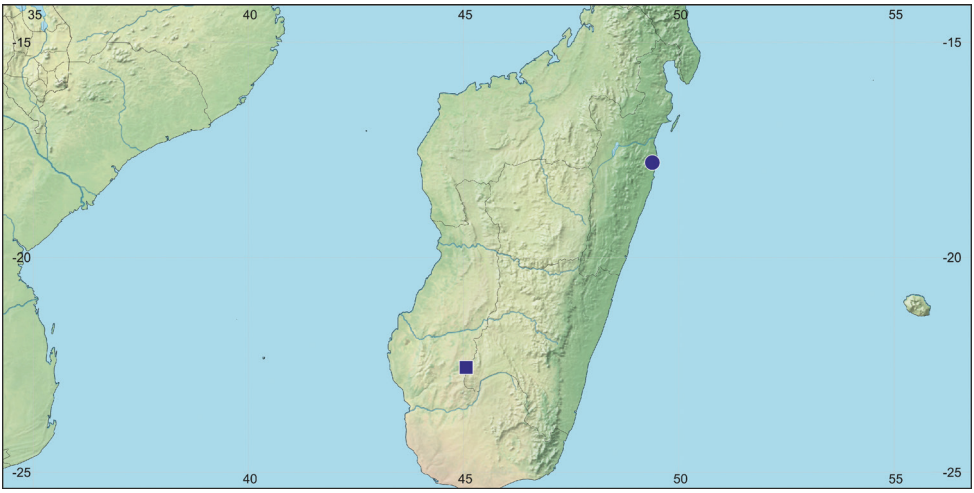

Figure 9. Records of *Diaphorocellus isalo* sp. nov. (square) and *D. jocquei* sp. nov. (circle).

Female. RMCA ARA 200305 (paratype).

Habitus: as in Figs 1G–H. *Colour in alcohol*: as in male, but entire body and legs I coloured slightly darker. *Measurements*: TL 4.75. CL 2.00, CW 1.40, CH 0.80, CyL 0.29, Femur I L/W 1.79 (1.43/0.80). *Carapace*: longer, with less coarse granulations than in male (Fig. 2D). *Eyes*: AME 0.16, ALE 0.09, PME 0.09, PLE 0.14; AME–AME 0.09, AME–ALE 0.07, AME–PME 0.09, PME–PLE 0.17, PME–PME 0.02.

Copulatory organs: as in Figs 3D, 7E–F, 8B. Epigastral plate in intact specimen (before dissection) accompanied by 2 pairs of sclerites lying on postgaster (posterior to epigastral furrow): two small dot-like median sclerites and pair of longitudinal scle-

rites. Atrium broad, postgastral plug weakly sclerotised. Endogyne formed by pair of complex receptacles. Receptacle consists of complex sclerotised base and transparent, membranous subconical sac (Fig. 7G). Each receptacle accompanied by brushes of fine threads and 3 grape-shaped glands attached to receptacles by short thread-like stems.

Habitat. According to the collecting data, the specimens were found in the litter and mosses on a forest floor, and in a fern thicket dominated by *Asplenium* sp.

Distribution. Known only from the type locality (Fig. 9).

Discussion

The Malagasy palpimanid species here described were assigned to *Diaphorocellus* because they possess similarly large PMEs (nearly equal in size to AMEs), which almost touch each other. All other eight-eyed chedimine palpimanids have PMEs that are more distant from each other and appear considerably smaller than the AMEs (Jézéquel 1964, fig. 5a–c; Benoit 1974, figs 6, 10; Deeleman-Reinhold 2001, fig. 76; Zonstein and Marusik 2013, figs. 3–6, 10, 12; 2017b, fig. 2A,C; Murphy and Roberts 2015, pl. 238; Marusik and Zonstein 2018, figs 1–3, 6); Zonstein et al. 2018, figs 4, 5).

Additionally, the structure of the male copulatory organs in *D. isalo* sp. nov. and *D. jocquei* sp. nov. appears to be much closer to that known for *D. biplagiatus* (Figs 4–6 cf. Zonstein et al. 2016, figs 11–15, 17, 18), than to the corresponding palpal structures in other chedimine genera. Within the Chediminae, only members of *Diaphorocellus* are known to possess such long and thin accessory structures, which distinguish this group from other chedimine palpimanids (cf. Jézéquel 1964, figs 2, 4, 7, 9, 11; Benoit 1974, figs 8, 9, 12, 13; Deeleman-Reinhold 2001, fig. 77; Zonstein and Marusik 2013, figs. 38–48; 2017a, figs 32–35, 49–54, 58–66; 2017b, fig. 2A,C; Marusik and Zonstein 2018, figs 8, 10, 11, 14–18; Zonstein et al. 2018, figs 8–11).

The same is true regarding the similar structure of the vulva (with the receptacles closely adjoining one another) in *Diaphorocellus isalo* sp. nov., *D. jocquei* sp. nov. and *D. biplagiatus* (Fig. 7A–F cf. Zonstein et al. 2016, figs 20, 23–26). It should be noted that not all the figures provided by Zonstein et al. (2016) are correct. When describing the female copulatory organs of *D. biplagiatus*, we also erroneously included two figures (Op. cit., figs 21, 22) of *Palpimanus* sp. (from Israel) labelled as belonging to *D. biplagiatus*.

Both the new species from Madagascar certainly differ from *D. biplagiatus* in lacking a contrasting abdominal pattern, in possessing untouching posterior median eyes, shorter male palpal tibia (femur 1.2 longer than cymbium vs. 1.7), lack of long retrolateral tibial setae of the male palpal tibia, and the tegulum strongly embedded in the cymbium. The two new species feature an epigastral scutum with an extended petiolar tube; this tube and part of the scutum are provided with about 9–10 circular or subcircular ridges (Fig. 8). They differ from the similarly coloured *D. rufus* in eye sizes and arrangement. In both *D. isalo* sp. nov. and *D. jocquei* sp. nov. the distance PLE–PME only slightly exceeds the diameter of PLE, while in *D. rufus*, according to Tullgren (1910), the corresponding distance is 1.5 times as long as the diameter of PLE.

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RESEARCH ARTICLE

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New data on dragonflies (Odonata) of Mozambique, with a new country record of *Phyllogomphus selysi* Schouteden, 1933

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Abstract

Thirty dragonfly species were collected at 11 localities, mostly situated in central provinces of Mozambique, in the Gorongosa National Park, adjacent areas and the Chimanimani National Reserve buffer zone. These data include a new country record of *Phyllogomphus selysi* and records of several other species that have rarely been recorded so far in relatively poorly-explored Mozambique, such as *Atoconeura biordinata*, *Hadrothemis scabrifrons*, *Gynacantha manderica*, *Gomphidia quarrei* and *Olpogastra lugubris*. Faunistic considerations are given with some remarks on morphological traits.

Keywords

Africa, Afrotropical fauna, zoogeography, Zygoptera, Anisoptera

Introduction

The first synthetic paper on the odonate fauna of Mozambique was published almost forty years ago (Pinhey 1981). Since then, only very little data, both current and old revised data, have been dispersed in several, partly taxonomic papers (e.g. Dijkstra 2006, 2007a, 2007b, Mens et al. 2016, Jocque et al. 2018). The most recent Mozambican list

of species, including 136 species, was presented in the Eastern African synthesis (Dijkstra and Clausnitzer 2014). The distribution of species in Mozambique is illustrated on the updated maps of the ADDO (African Dragonflies and Damselflies Online) website. These maps are based on and refer to the Odonata Database of Africa (ODA, see Kipping et al. 2009, Clausnitzer et al. 2012) and include still-unpublished data.

Mozambique has been relatively weakly explored by researchers due to its hardly accessible vast interior and a long and violent civil-war. As a consequence, the knowledge of Mozambican Odonata is still poor compared to some adjacent countries, such as South Africa (Tarboton and Tarboton 2019), Zimbabwe (Pinhey 1984, Dijkstra 2019), Malawi (Pinhey 1966, 1979, Dijkstra 2019) and Zambia (e.g. Dijkstra et al. 2015, Bernard and Daraż 2018, Bernard et al. 2018; Jens Kipping, unpublished data in ODA). This disproportion is obvious with the relatively low number of both recorded species (compare country species lists in Dijkstra and Clausnitzer 2014) and known localities, even for some potentially widespread and quite common species (see ADDO website). This diagnosis is also supported by: a) a relatively low number of records (2,043) from Mozambique in ODA, i.e. less than one third of Zambian records (ODA, Jens Kipping, pers. comm.); b) new country records for Mozambique, relatively easily obtained during unfocused studies on Odonata (Jocque et al. 2018, this paper); and c) much larger numbers of localities of some species (e.g. *Anax ephippiger*, *Diplacodes luminans* and *Zygonyx torridus*) in adjacent countries (see ADDO). Publication of new data from several localities in Mozambique represents a step in addressing this disparity of data.

Material and methods

The analysed collection of dragonflies mostly originates from the Sofala and Manica provinces in the central parts of the country and, marginally, from the northern Cabo Delgado province. Dragonflies were mostly collected in the Gorongosa National Park, its buffer zone and an area known as Coutada 12 (a former hunting concession that is currently administered by Gorongosa NP and will eventually become part of it). Some data were also collected in the buffer zone of the Chimanimani National Reserve and in the Quirimbas National Park. Numbers of localities are given in square brackets in the Results section following. The specimens were collected by the second author between May 2015 and May 2019, as part of larger surveys that focused on insect (especially Lepidoptera) biodiversity.

Collected males are abbreviated to M and females to F. The specimens are in the collection of Marek Bąkowski in the Nature Collections of the Faculty of Biology, Adam Mickiewicz University in Poznań, Poland.

Dimensions are given in millimetres. The following abbreviations are used: S1–10 = abdominal segments 1–10; Fw = forewing; Hw = hindwing (when used with a number means hindwing length); Ax = antenodal cross-veins; Px = postnodal cross-veins.

Data on the distribution of Odonata in Mozambique and adjacent countries were taken from the Odonata Database of Africa (ODA), illustrated on maps of the ADDO website.

Localities

[1.] Manica Province: Sussundenga District: Chimanimani National Reserve buffer zone, Nhahomba Ranger Camp (19°35.14'S, 33°05.09'E, 606 m a.s.l.).
[2.] Manica Province: Sussundenga District: Chimanimani National Reserve buffer zone, Moribane Forest, Ndzou Camp (19°44.08'S, 33°20.16'E, 593 m a.s.l.).
[3.] Sofala Province: Gorongosa District: Gorongosa National Park, Murombodzi Waterfall (18°29.00'S, 34°02.57'E, 842 m a.s.l.).
[4.] Sofala Province: Gorongosa District: Gorongosa National Park, Bunga Camp (18°35.98'S, 34°20.23'E, 80 m a.s.l.).
[5.] Sofala Province: Gorongosa District: Gorongosa National Park, Chitengo Camp (18°58.76'S, 34°21.12'E, 38 m a.s.l.).
[6.] Sofala Province: Cheringoma District: Gorongosa National Park buffer zone, near Codzo (=Khodzue) Gorge (18°33.90'S, 34°52.41'E, 216 m a.s.l.).
[7.] Sofala Province: Cheringoma District: Massiabosa, Swanepoel Concession (18°33.09'S, 35°01.80'E, 240 m a.s.l.).
[8.] Sofala Province: Cheringoma District: Coutada 12, Nyago hunting camp (18°39.64'S, 35°27.33'E, 213 m a.s.l.).
[9.] Sofala Province: Cheringoma District: Coutada 12, near Pauei, (18°25.51'S, 35°20.90'E, 152 m a.s.l.).
[10.] Sofala Province: Cheringoma District: Coutada 12, Inhamitanga Forest (18°14.27'S, 35°19.79'E, 213 m a.s.l.).
[11.] Cabo Delgado Province: Ancuabe District: Quirimbas National Park, Taratibu Hills (12°48.97'S, 39°41.72'E, 336 m a.s.l.).

Results

Sixty four individuals representing 30 dragonfly species were collected at 11 localities. The species marked by an asterisk (*) are commented on in the Discussion.

Suborder: Zygoptera
Family: Calopterygidae
Phaon iridipennis (Burmeister, 1839)
[3.] 6 May 2019, 1 M.

Family: Chlorocyphidae
Chlorocypha consueta (Karsch, 1899)
[3.] 6 May 2019, 1 F.
[5.] 21 April–09 May 2019, 1 M.

Platycypha caligata (Selys, 1853)
[1.] 26 November–02 December 2018, 1 M, 1 F.
[3.] 6 May 2019, 1 M, 1 F.

Family: Coenagrionidae

Ceriagrion glabrum (Burmeister, 1839)

[5.] 22–25 November 2018, 1 M; 21 April–09 May 2019, 1 M.

Pseudagrion kersteni (Gerstäcker, 1869)

[3.] 6 May 2019, 1 M.

Suborder: Anisoptera

Family: Aeshnidae

Anax ephippiger (Burmeister, 1839)

[2.] 2–8 December 2018, 1 M.

[5.] 22–25 November 2018, 1 M.

Gynacantha manderica Grünberg, 1902 *

[5.] 21 April–09 May 2019, 3 F, with a typical combination of species-specific traits (see also Dijkstra 2005), i.e.: a) the two small blackish dots in humeral and metapleural fossae; b) 14–17 Fw Ax; c) Hw 39.8–40.1 mm; d) legs quite colourful: femora mostly warm brown, tibiae longitudinally interspersed pale yellow and black, exactly as in Dijkstra (2005), tarsi black and also blackish zones around joints femur/tibia and tibia/tarsus; e) diagnostic T-mark on frons, exactly as in Dijkstra (2005).

Family: Gomphidae

Gomphidia quarrei (Schouteden, 1934) *

[1.] 26 November–02 December 2018, 1 F.

Paragomphus genei (Selys, 1841)

[5.] 22–25 November 2018, 1 M.

Phyllogomphus selysi Schouteden, 1933 *

[5.] 22–25 November 2018, 1 M (Fig. 1).

As *P. selysi* is a variable species, described under several synonymic names (Dijkstra et al. 2006), some species-specific traits of the collected specimen are worth noticing (compare Dijkstra et al. 2006 and Dijkstra and Clausnitzer 2014): a) Hw 41.7 mm; b) face light, postclypeus yellow with two small dark dots; c) pterostigma dark brown with black veins; d) the pale postdorsal stripe fused with the collar; e) S8 with large dark brown to basally blackish foliations; f) S10 enlarged, characteristically bent down, not humped basally, with almost straight profile of dorsal ridge (Fig. 1a); g) cerci about 2x as long as epiproct (Fig. 1a); in dorsal view, lyrate, dilated in proximal parts and strikingly slender in distal parts with outward-directed and pointed apices (Fig. 1b); in lateral view, with bulbous rounded ventral swelling in proximal part (Fig. 1a); h) posterior hamule slender with almost straight posterior border and small rapidly bent

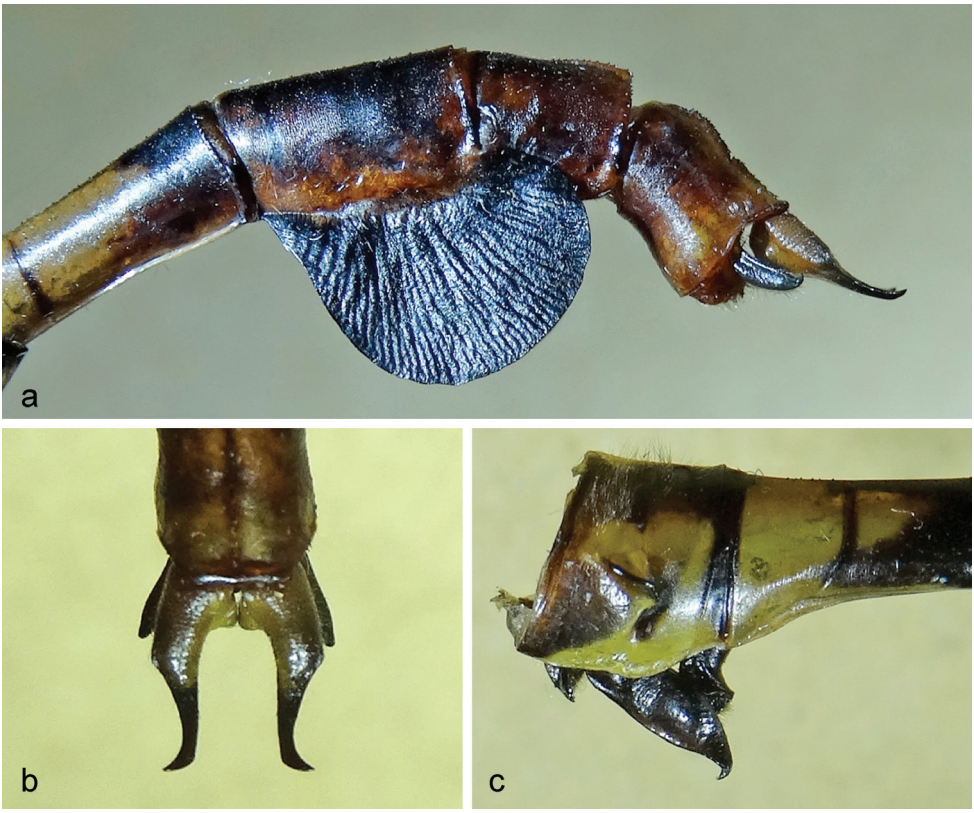

Figure 1. *Phyllogomphus selysi*, selected species-specific traits of a male from the Gorongosa National Park, Mozambique: **a** distal segments of abdomen (S7–10) and appendages in lateral view **b** appendages in dorsal view **c** secondary genitalia in lateral view (photo. R. Bernard).

distal 'claw' (Fig. 1c); i) inner branch of anterior hamule longer than outer, but this difference is not as large as in Dijkstra and Clausnitzer (2014).

Family: Libellulidae

Acisoma variegatum Kirby, 1898 *

[5.] 21 April–09 May 2019, 3 M.

Atoconeura biordinata Karsch, 1899 *

[3.] 26–27 April 2019, 1 F.

Identified on the basis of the following trait combination (compare Dijkstra 2006): a) labrum almost all black, only a small pale area at the base; b) mesepisternum without a transverse pale streak-hyphen bordering antealar sinus; c) face frontal shields partly pale (pale areas more elongated than in the figure in Dijkstra 2006), contrasting with darkened areas below, along lower border of antefrons (versus an opposite pattern in *Atoconeura pseudeudoxia* with frons palest along lower border and rather gradually dark-

ening dorsally); d) antero-lateral (external) borders of postclypeus not darkened; e) relatively small size, Hw 30.6 mm versus larger *A. pseudeudoxia*, at least 34 mm; f) points of vulvar scale wide apart, partially hidden under tergite, space between them wide, > 60° (as in the figure in Dijkstra 2006, but arms more convex internally); g) 8 Px, as in other non-Zimbabwean populations of *biordinata* versus 7 Px in the 'Chirinda' population of the species in Zimbabwe; h) Fw triangles crossed (with two cells), as in other non-Zimbabwean populations of the species versus uncrossed triangles in the 'Chirinda' population in Zimbabwe; i) 9 and 10.5 Fw Ax, i.e. in the *biordinata* range 9–11 (seldom 12) versus *pseudeudoxia* 12–14 (seldom 11); within the *biordinata* species, the number of Fw Ax is closer to the 'Chirinda' population in Zimbabwe (9–10) than to non-Zimbabwean populations (11); j) all Fw Ax + Fw Px = 35.5, i.e. in the *biordinata* range 32–44 versus *pseudeudoxia* 39–47; k) pattern of yellow spots on abdomen similar to published figures (some small differences) and especially to the female on the photograph in the ADDO website. A characteristic C-shaped yellow spot on metepisternum below metastigma is present in both the new female and the photographed female and males in the ADDO website (Dijkstra 2019). This feature is worth noticing as potentially helpful (diagnostic?) in the species identification. This C-spot has a ventral arm thicker and more convex and a dorsal arm thinner and dorsally concave.

There are also some small differences between the new female and males illustrated in publications (Dijkstra 2006, Dijkstra and Clausnitzer 2014), i.e.: a) antero-internal borders of postclypeus shortly thickened and darkened, but these darkened sections wide apart and there is no joining dark bar in the central part of postclypeus; b) black 'bottle' figure on labium with other proportions than in the literature figures, closer to illustrations of *pseudeudoxia*, i.e. with a longer thin 'neck' that is of the same length as the thick 'body'. These differences may reflect the intraspecific variation or intersexual differences.

Crocothemis erythraea (Brullé, 1832)
[5.] 21 April–09 May 2019, 1 M, 2 F immature.

Diplacodes lefebvrii (Rambur, 1842)
[5.] 22–25 November 2018, 1 M; 21 April–09 May 2019, 1 M immature.
[8.] 9–16 April 2016, 1 M.
[10.] 9–14 April 2018, 1 M.

Diplacodes luminans (Karsch, 1893)
[5.] 3–8 April 2018, 1 F; 22–25 November 2018, 1 F.
[9.] 14–19 April 2018, 2 M.

Hadrothemis scabrifrons Ris, 1910 *
[2.] 2–8 December 2018, 1 M (Fig. 2).

Hemistigma albipunctum (Rambur, 1842)
[5.] 3–8 April 2018, 1 M.

Figure 2. *Hadrothemis scabrifrons*, a male from Ndzou Camp in the Chimanimani National Reserve buffer zone, Mozambique (photo. R. Bernard).

[6.] 14–25 April 2017, 1 F.
[10.] 9–14 April 2018, 1 F.

Olpogastra lugubris Karsch, 1895 *
[5.] 22–25 November 2018, 1 M.

Orthetrum abbotti Calvert, 1892
[11.] 19–25 March 2018, 1 M.

Orthetrum julia Kirby, 1900 (ssp. *falsum*)
[3.] 26–27 April 2019, 1 M teneral; 6 May 2019, 1 M.
[5.] 21 April–09 May 2019, 1 M.

Orthetrum stemmale (Burmeister, 1839)
[3.] 26–27 April 2019, 1 M teneral.

Orthetrum trinacria (Selys, 1841)
[5.] 21 April–09 May 2019, 1 F.

Palpopleura lucia (Drury, 1773)
[5.] 3–8 April 2018, 1 F; 21 April–09 May 2019, 1 M immature, 1 F.
[6.] 14–25 April 2017, 1 M.

[7.] 10–13 April 2017, 1 F.

Palpopleura portia (Drury, 1773)
[2.] 2–8 December 2018, 1 M.

Pantala flavescens (Fabricius, 1798)
[2.] 2–8 December 2018, 1 M.
[5.] 28 March–15 April 2016, 1 M.

Rhyothemis semihyalina (Desjardins, 1832)
[4.] 21 April–5 May 2015, 1 F.
[5.] 28 March–15 April 2016, 1 F; 22–25 November 2018, 1 M; 21 April–9 May 2019, 1 M.

Tramea basilaris (Palisot de Beauvois, 1817)
[2.] 2–8 December 2018, 1 M.
[3.] 26–27 April 2019, 1 F.
[5.] 22–25 November 2018, 1 M.

Trithemis arteriosa (Burmeister, 1839)
[1.] 26 November–2 December 2018, 1 M immature.
[11.] 19–25 March 2018, 1 M.

Urothemis assignata (Selys, 1872)
[4.] 21 April–5 May 2015, 1 F.
[5.] 18–24 April 2016, 1 M; 3–8 April 2018, 1 F; 22–25 November 2018, 1 M; 21 April–9 May 2019, 1 F.

Zygonyx torridus (Kirby, 1889)
[1.] 26 November–2 December 2018, 1 M.

Discussion

The most recent list of dragonfly species for Mozambique included 136 species (Dijkstra and Clausnitzer 2014) and two further species have been added by Jocque et al. (2018). Our new country record of *Phyllogomphus selysi* is, therefore, the 139th species recorded for Mozambique.

P. selysi is widely distributed in the Afrotropics, mostly south of the Equator. The new locality is situated far from the nearest known sites (Fig. 3a), ca. 360 km to the SSW of Mount Mulanje in south-eastern Malawi where it was labelled as '*latifasciae*' (Dijkstra et al. 2006) and ca. 575 km to the NE of the nearest locality in NE South Africa (Tarboton and Tarboton 2019). It should be noted that the current

distribution map for this species in the ADDO website does not include two Malawian localities (Lake Malawi-Senga Bay and Mount Mulanje), i.e. one pre-1990 record and one since-1990 record given in Dijkstra et al. (2006); these have been added to our map (Fig. 3a).

Atoconeura biordinata is a mostly East African species that also penetrates southern areas of Central Africa. It was previously known from three localities in northern Mozambique: two in Mount Namuli, i.e. Khurukani Stream, 1490 m a.s.l. and Muretha Plateau, 1870 m a.s.l. (Dijkstra 2006) and one in Mount Chitagal (Jocque et al. 2018). The species was also given from Penhalonga ('X 1943') in the Mozambican midwest (Pinhey 1981), but with evidently Zimbabwean coordinates. The same locality with the same date and coordinates was repeated for Zimbabwe (Pinhey 1984). In the Zimbabwean synthesis, the locality Penhalonga is described as "Olim in Moçambique", i.e. "Formerly in Mozambique". As the country border has been stable for a long time, Pinhey's note can only be understood as a locality erroneously attached to Mozambique in the Mozambican synthesis (Pinhey 1981). The Penhalonga settlement is in Zimbabwe, but the Penhalonga valley is situated on both sides of the border. Pinhey probably could not decide whether these old records should be attached to Mozambique or Zimbabwe. However, the above-mentioned note in the Zimbabwean synthesis (Pinhey 1984) shows that he definitely assigned this species locality to Zimbabwe. 'Penhalonga' belonged to a greater group of localities of *A. biordinata* that were discovered in the eastern highlands of Zimbabwe (Pinhey 1984). The species is associated with fast flowing stony/rocky streams in bushy or forested mountainous areas at elevations higher than 1000 m (Dijkstra 2006), so the new record (842 m) represents a low altitudinal range limit of the species occurrence. The species distribution in Mozambique, the new Gorongosa locality inclusive, has a strikingly insular pattern following the distribution of isolated massifs. The Gorongosa locality is situated on a hypothetical route of species expansion drawn by Dijkstra (2006) and the collected female has features of both the Zimbabwean 'Chirinda' population and non-Zimbabwean populations, being closer to the latter.

Hadrothemis scabrifrons is a large, spectacular libellulid (Fig. 2), mainly known from coastal Kenya and East Tanzania and rarely recorded out of these areas (Dijkstra 2019). It was found only at single sites in Zimbabwe, Zambia and Malawi (Fig. 3b) (Pinhey 1966, 1984). In Mozambique, *H. scabrifrons* was recorded only in the 1960s at four localities (Fig. 3b) in the central part of the country (Pinhey 1981). One of them, roughly localised by Pinhey as the Mussapa River Forest, Serra Rotanda, was probably situated several km from the new locality, somewhere in the northern foreground of the Chimanimani Mountains.

The three species, commented on below, most probably are much more common in Mozambique than collected data show. However, *Gomphidia quarrei*, as the species of strong flowing waters (streams and smaller rivers), may be uncommon in large flat areas of the country where such waters are scarce.

Gynacantha manderica is widely distributed in the Afrotropics, in Mozambique previously known from four localities, three old ones (Pinhey 1981) and one so far

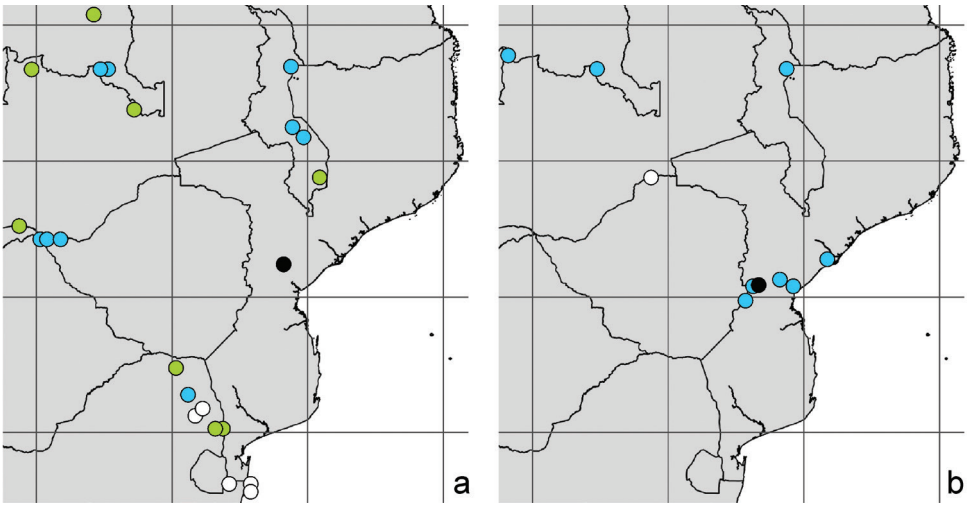

Figure 3. Distribution of **a** *Phyllogomphus selysi* and **b** *Hadrothemis scabrifrons* in Mozambique and surrounding areas of the south-eastern Afrotropics. The black dot – the new locality. Other points – other data according to literature and Odonata Database of Africa (J. Kipping pers. comm., Clausnitzer et al. 2012), mostly drawn from the ADDO (African Dragonflies and Damselflies Online) website: blue – pre-1990 records; green – vetted since-1990 records; white – unvetted since-1990 records.

unpublished, recently found in the borderland of the Massingir and Chókwè Districts (ODA, Jens Kipping pers. comm., data author: Gerhard Diedericks). Three of these localities are situated in southern Mozambique and one (Dombe) in the central parts of the country. The new locality is situated ca. 150 km NE of Dombe.

Gomphidia quarrei is widely distributed in the Afrotropics, mostly south of the Equator. In Mozambique, it was previously known only from two localities in the mid-western parts of the country, one of them being the type locality for the subspecies *confinii* (Pinhey 1981). The new locality is situated probably only several km from one of these localities, i.e. from the Inhamadzi (Nhamadzi) River. This old record was, however, incoherently localised: Pinhey gave it for Mozambique but with coordinates from Zimbabwe (19°45', 32°45'). In fact, the Inhamadzi (Nhamadzi) River, a tributary of the Mussapa River, is wholly situated in Mozambique, near Caricanhi, not far to the east of the Zimbabwean border.

Olpogastra lugubris is widespread in the Afrotropics, but was rarely recorded in Mozambique. Only two localities were found in the central part of the country, Dombe and Dondo Forest (Pinhey 1981), with another unpublished record in the southern Bilene Macia District (ODA, Jens Kipping pers. comm., data author: Gerhard Diedericks). The new locality is situated ca. 80 km NNW of Dondo Forest.

Due to the thorough revision of the genus *Acisoma*, three continental African species have finally been recognised (Mens et al. 2016). The species-name *Acisoma panorpoides* Rambur, previously used by Pinhey (1981) for this area, appears to cover two of them, *A. inflatum* Selys, 1889 and *A. variegatum*. Only several out of many Mozambican records of the old '*A. panorpoides*' (Pinhey 1981) have been verified, all being

A. variegatum. The verified localities are situated in the north-western, central and far southern areas of the country (Mens et al. 2016). *A. variegatum* most probably is quite common in Mozambique, but collecting new data, such as the new Gorongosa locality, is necessary to complete the distribution picture after the taxonomic changes and to assess the actual status of *A. variegatum* and *A. inflatum*, the latter still not confirmed for the country.

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RESEARCH ARTICLE

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A survey of grassland Asilidae (Diptera) at Jacana Eco Estate, Hilton, South Africa

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Abstract

A year-long survey of grassland Asilidae was undertaken at Jacana Eco Estate, Hilton, KwaZulu-Natal, South Africa. The following 18 species of Asilidae, in alphabetical order, were encountered: *Caenoura annulitarsis* (Loew, 1858), *Damalis monochaetes* Londt, 1989, *Dasophrys androclea* (Walker, 1849), *Dasophrys fortis* Londt, 1981, *Dasophrys tarsalis* (Ricardo, 1920), *Dasophrys umbripennis* Londt, 1981, *Dysclytus firmatus* (Walker, 1857), *Euscelidia vallis* Dikow, 2003, *Ischiolobos mesotopos* Londt, 2005, *Leptogaster* sp., *Melouromyia natalensis* (Ricardo, 1919), *Microstylum* sp., *Neolophonotus hirsutus* (Ricardo, 1920), *Neolophonotus variabilis* Londt, 1986, *Neolophonotus wroughtoni* (Ricardo, 1920), *Pegesimallus bicolor* (Loew, 1858), *Pegesimallus pedunculatus* (Loew, 1858), *Rhipidocephala obscurata* Oldroyd, 1966. Their flight periods were recorded and tabulated. The variety and numbers encountered suggest that the grassland invertebrate community is healthy and that the grassland is worthy of its conservation status.

Keywords

Africa, Asilidae, Grassland, seasonal incidence, conservation

Introduction

Grassland is one of South Africa's most neglected and threatened biomes. Human development has placed the biome at great risk of being severely compromised (Van Oudtshoorn 1999, Van Wyk and Smith 2001). Very few studies aimed at understanding the many invertebrates associated with the savannah biome have been undertaken.

An understanding of the role that predatory insects, like Assassin Flies (Diptera: Asilidae), play within grassland invertebrate communities, is likely to contribute towards a greater appreciation of the complexity of this threatened biome and, hopefully, lead to the implementation of effective management practices.

In 2018, it came to the author's attention that a relatively small housing development was taking place in Hilton, a small village on the outskirts of Pietermaritzburg, in the midlands of KwaZulu-Natal, South Africa. The developers of what is now called the Jacana Eco Estate, the Kotze Family Trust, had been given permission to build a number of houses on Portion 25 of Erf 330 Hilton. The area, which is dominated by grassland, is currently bordered by a few houses and an area that used to be a pine plantation. The grassland had been minimally impacted by human activity and was, therefore, considered one of the better pieces of relatively unspoilt grassland in the area. An Environmental Management Plan had been compiled in 2016 by Environmental Planning Services, Glenwood, Durban and this was to be implemented throughout the development phase and subsequently by the owners of houses built on the estate and adjacent to the grassland.

Having undertaken a survey of grassland Asilidae at Queen Elizabeth Park, in Pietermaritzburg (Londt 2002b), which had produced some interesting and unique observations, it was decided to approach the developers for permission to conduct a similar year-long survey at Jacana Eco Estate, as it was believed that this could add to an understanding that the area should be properly conserved for future generations.

When approached, Mr Paul Kotze, of the Kotze Family Trust, kindly gave permission for weekly sampling of Asilidae to commence at the start of 2019. The results of this year-long survey are here presented.

Jacana Eco Estate

The Jacana Eco Estate, hereafter merely called Jacana, is situated at ca. 29°32'35"S, 30°17'38"E (Fig. 1). The grassland area, which is divided into two parts, or fields, separated by an access road linking the entrance to the estate with the houses built along its north-western boundary, slopes downwards from the north-eastern boundary (altitude 1132 m asl) to the south-western boundary (altitude 1107 m asl). The highest part of the grassland is some 25 m higher than the lowest section. The upper field is larger than the lower field and more exposed to wind. The lower field is bordered by housing and trees outside the estate and is somewhat sheltered from wind. The lower field is also more inundated by alien invasive plants.

While a fairly comprehensive Biodiversity Assessment had been carried out by Dr JH Grobler in October 2007 of the 'Bracken Ridge Development (Hilton Erf. 330) Pietermaritzburg' (Grobler 2007), which included the area now separated off as Jacana, this was confined to a zoological assessment and did not cover botanical matters. However, a copy of an undated 'Vegetation Report', conducted during or after 2015 by Roderick Collett, a lecturer in Veld Management at Cedara College, was given to me by Paul Kotze that contains a list of grasses found in the area (Table 1).

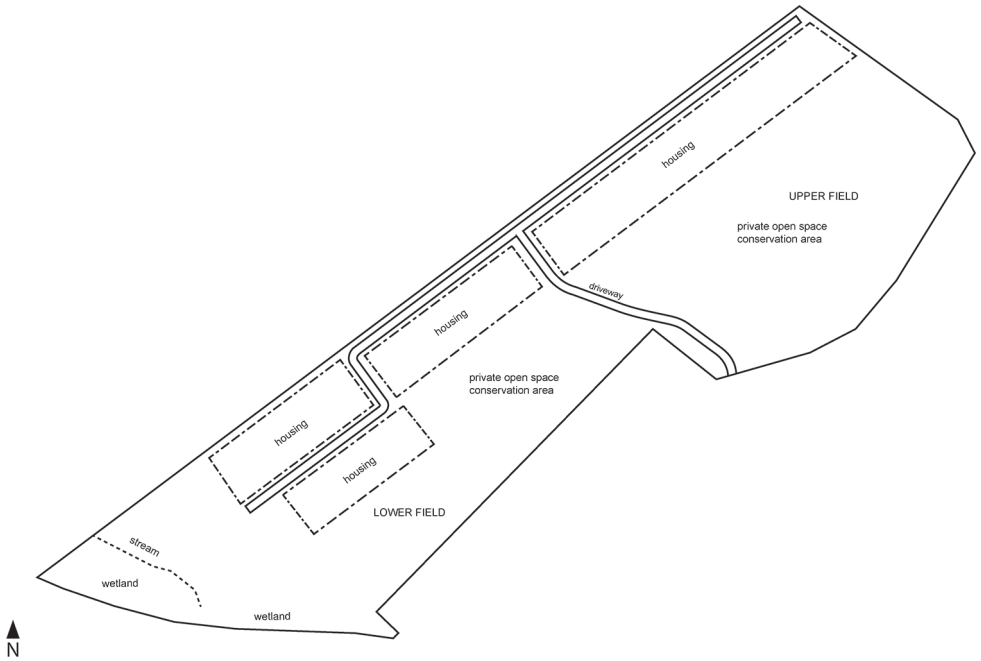


Figure 1. Jacana Eco Estate showing area of conserved grassland separated by an access road into upper and lower fields. Map: B. Muller.

Table 1. Grasses likely to be encountered at Jacana Eco Estate as listed by Roderick Collett (alphabetically within categories), together with common names as provided by Van Oudtshoorn (1992) and definitions of categories.

Increaser I	*Alloteropsis semialata* (Black-seed Grass); *Digitaria tricholaenoides* (Purple Finger Grass); *Eulalia villosa* (Golden Velvet Grass); *Setaria nigrirostris* (Black-seed Bristle Grass); *Trachypogon spicatus* (Giant Spear Grass); *Tristachya leucothrix* (Hairy Trident Grass)
Decreaser	*Brachiaria serrata* (Velvet Signal Grass); *Diheteropogon amplectens* (Broad-leaved Bluestem); *Monocymbium ceresiiforme* (Boat Grass); *Themeda triandra* (Red Grass)
Increaser 11a	*Eragrostis capensis* (Heart-seed Love Grass); *Harpochloa falx* (caterpillar Grass); *Heteropogon contortus* (Spear Grass)
Increaser 11b	*Eragrostis curvula* (Weeping Love Grass); *Eragrostis plana* (Tough Love Grass); *Eragrostic racemosa* (Narrow Heart Love Grass); *Hyparrhenia hirta* (Common Thatching Grass); *Sporobolus africanus* (Ratstail Dropseed)
Increaser 11c	*Microchloa caffra* (Pincushion Grass); *Paspalum scrobiculatum* (Veld Paspalum)
Increaser 111	*Aristida junciformis* (Gongoni Three-awn); *Diheteropogon filifolius* (Thread-leaved Bluestem); *Elionurus muticus* (Wire Grass)

Definitions:
Decreaser: A dominant grass in good, well-managed veld that will decrease under any form of mismanagement, such as severe disturbance, untimely burn, overgrazing or under-utilisation.
Increaser: A grass species that will increase under any type of mismanagement or disturbance.
There are two types of increasers: Increaser I: A grass species that will increase under conditions of underutilisation or understocking or on an area which is selectively undergrazed. Increaser II: A grass species that is dominant in poor veld or that will increase under any form of overgrazing or disturbance.
There are three types of Increaser IIs: Increaser IIa: A species that increases with mild overgrazing. Increaser IIb: A species that increases with moderate overgrazing. Increaser IIc: A species that increases with severe overgrazing.

In addition to the above documentation, I was given a copy of an unpublished Environmental Management Plan for Hilton Green, compiled in 2016 by Environmental Planning Services (197 Masizi Kunene Road, Glenwood, Durban), relating to Portion 25 of Erf 330, Hilton. While this document was intended to guide the developer during the building phase of Jacana, it contained no environmental information relating specifically to the proposed Eco Estate.

While undertaking the asilid survey, the grassland was burned in keeping with conventional management practices. The upper part of the lower field, below the access road, was burned at the end of August (week 35) while the lower part of this area was burned a week later, during the first week of September (week 36). The entire upper field, above the access road, was then burned in early October (week 41). Although some flowering plants, other than grasses, were encountered throughout the survey, many appeared soon after these burns. The following list of plants, photographed at Jacana, is by no means exhaustive, but is provided in order to stimulate further interest in what the Eco Estate has to offer botanically. Where known, common names, as recorded by Pooley (1998), are provided in brackets: *Acalypha punctata* (Sticky Brooms and Brushes), *Afroaster* sp., *Apodolirion buchananii* (Natal Crocus), *Berkheya echinacea*, *Berkheya setifera* (Buffalotongue Berkheya), *Berkheya* sp., *Brunsvigia* ? *undulata* (Ruby Brunsvigia), *Chlorophytum* sp. (Chlorophytum), *Clutia cordata* (Grassland Clutia), *Commelina africana* (Yellow Commelina), *Crotalaria dura* (Wild Lucerne), *Dierama nixonianum*, *Dierama reynoldsii* (Hairbells, Wand-flowers), *Eriosema cordatum* (Heart-leaved Eriosema), *Gladiolus longicollis* (Honey Flower), *Hebenstretia* sp. (Katstert), *Helichrysum acutatum* (Sticky Everlasting), *Helichrysum ecklonis*, *Heliophila rigidiuscula* (Grassland Blue Cross Flower), *Hesperantha baurii*, *Hilliardiella* sp., *Justicia Andromeda*, *Kniphofia laxiflora* (Slender Poker), *Leobordea pulchra*, *Moraea moggii*, *Orthochilus foliosus*, *Pentanisia prunelloides* (Broad-leaved Pentanisia), *Rabdosiella calycina* (Uplands Fly Bush), *Rhynchosia villosa* (Giant Hairy-leaved Rhynchosia), *Senecio glaberrimus*, *Tephrosia macropoda* (Creeping Tephrosia), *Trachyandra asperata* and *Watsonia densiplora* (Natal Watsonia).

Materials and methods

Asilidae were sampled using a standard, hand-held, 30 cm diameter, 120 cm long entomological net. While walking, the vegetation was visually scanned (in order to spot larger, more active species) and swept with the net (in order to collect small species adapted for living within the vegetation) for an hour, one morning per week (usually on a Monday). While most of the Asilidae collected were merely identified, counted and released, a few representatives of each species were kept in order to verify identifications. Retained specimens were mounted, labelled and incorporated into the Diptera collection of the KwaZulu-Natal Museum, Pietermaritzburg, at the end of the survey.

Weather, being an important factor, was monitored, with care being taken to sample at more or less the same time of day (between 10:00 h and 14:00 h) and when the vegetation was dry. Sampling was not possible on 4 weeks of the year (weeks 4, 24, 29, 44)

Figures 2, 3. Grassland at Jacana Eco Estate: **2** summer condition (week 51) **3** winter condition (week 25). Photos: JGH Londt.

Table 2. Rainfall data (mm) for 2019 collected in Pietermaritzburg.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
93	143	82	116	26	0	2	19	34	39	199	126	**979**

due to other commitments. On each occasion, a thermometer was used to record ambient temperature, which ranged from 15 °C (week 26) to 33 °C (week 41). The mean temperature for all sampling occasions was 23 °C. Figs 2, 3 provide impressions of the grassland in mid-summer (week 51) and mid-winter (week 25).

Care was taken to transect the entire length of the area, spending roughly the same time in the two adjacent fields on each sampling occasion. The distance covered on each occasion was approximately 1.5 km (measured with a pedometer). With the scheduled burning of the vegetation during weeks 35, 36 and 41, sweeping had to be confined to suitable vegetation and greater emphasis placed on visual sightings of ground inhabiting species until the vegetation had recovered sufficiently for more standardised sampling.

Although rainfall data was not available for the Jacana study site, Table 2 provides data collected in Pietermaritzburg, some 8.7 km from the site. A similar rainfall pattern, considered normal, was experienced at the study site during the survey.

Results

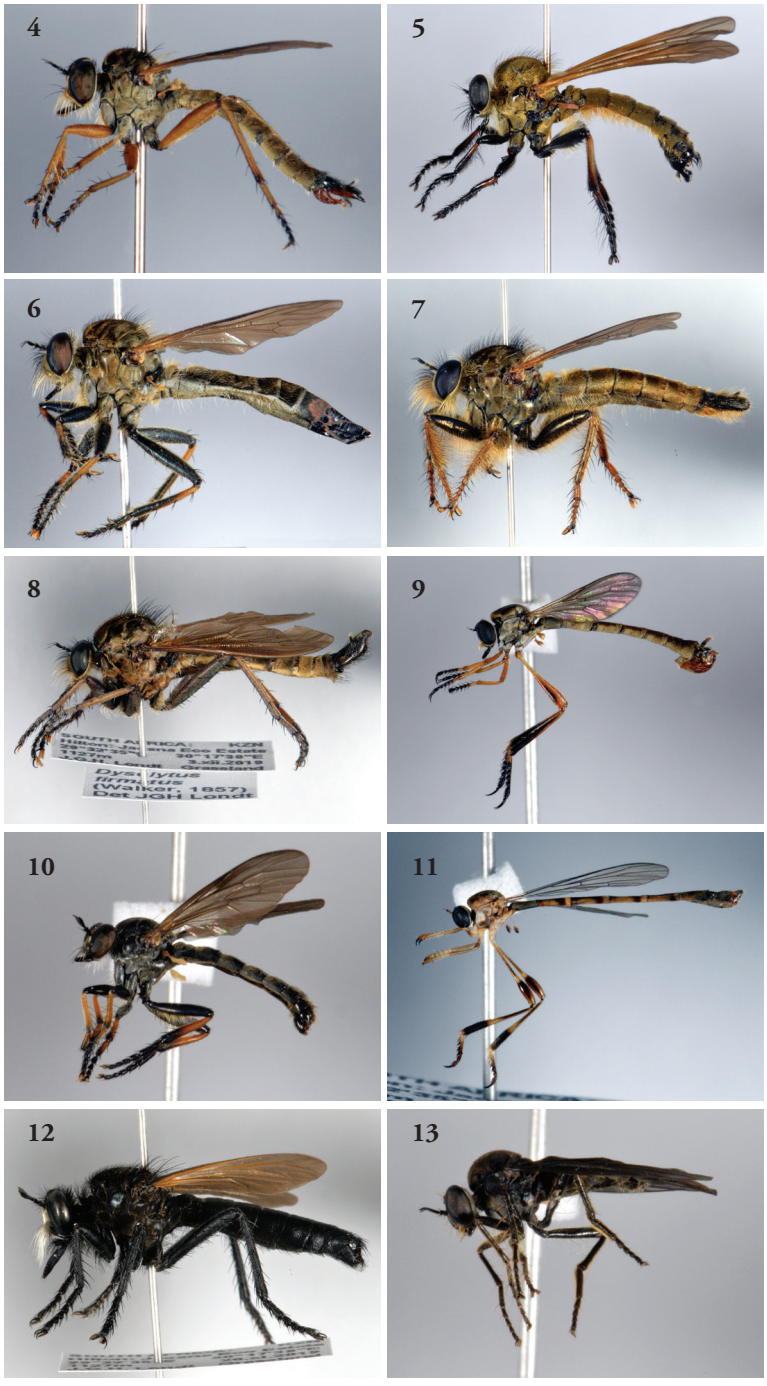
Eighteen species of Asilidae were collected during the year-long survey at Jacana (Table 3). These have been arranged in the order they were encountered. Comments on all the encountered species follow:

1. *Euscelidia vallis* Dikow, 2003

Fig. 9

Remarks. This species was positively identified by Dikow (pers com) who reviewed the extensive Afrotropical *Euscelidia* fauna, comprising over fifty species (Dikow 2003). The species was described, based on only three specimens, two from Mhlopeni Nature Reserve (29°00'S, 30°25'E), collected in February and one from Van Reenen (28°22'S, 29°23'E) collected in January.

Adults of this species were encountered in large numbers on the first sampling day and the species remained abundant for the following 11 weeks before numbers began to decrease from week 12. The species was poorly represented during weeks 13–15, before finally disappearing in week 16. The species was not collected throughout winter and most of spring, but reappeared in moderate numbers on week 42. The species was fairly common during weeks 42–47, before again being fairly abundant on week 48. For some unknown reason, the species suddenly disappeared from samples taken during weeks 49 and 50 before reappearing in low numbers on week 51 and in greater numbers on week 52.



Figures 4–13. Grassland inhabiting Asilidae encountered at Jacana Eco Estate (arranged alphabetically): **4** *Caenoura annulitarsis* (Loew, 1858) **5** *Damalis monochaetes* Londt, 1989 **6** *Dasophrys fortis* Londt, 1981 **7** *Dasophrys tarsalis* (Ricardo, 1920) **8** *Dysclytus firmatus* (Walker, 1857) **9** *Euscelidia vallis* Dikow, 2003 **10** *Ischiolobos mesotopos* Londt, 2005 **11** *Leptogaster* sp. **12** *Microstylum* sp. **13** *Rhipidocephala obscurata* Oldroyd, 1966. Photos: B. Muller.

Table 3. Species activity at Jacana Eco Estate throughout 2019. ■ – Abundant (> 10 specimens), ● – Common (< 10 > 2 specimens), • – Uncommon (< 3 specimens), x – No collection made. S = Summer, **A** = Autumn, W = Winter, **SP** = Spring. Species in order of appearance: 1 *Euscelidia vallis* 2 *Ischiolobos mesotopos* 3 *Pegesimallus bicolor* 4 *Caenoura annulitarsis* 5 *Pegesimallus pedunculatus* 6 *Melouromyia natalensis* *Damalis monochaetes* 8 *Dasophrys androclea* 9 *Dasophrys tarsalis* 10 *Neolophonotus wroughtoni* 11 *Dasophrys umbripennis* 12 *Neolophonotus hirsutus* 13 *Neolophonotus variabilis* 14 *Leptogaster* sp. 15 *Microstylum* sp. 16 *Dysclytus firmatus* 17 *Dasophrys fortis* 18 *Rhipidocephala obscurata*.

	Week																									
Species	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**
1	■	■	■	x	■	■	■	■	■	■	■	●	•	•	•	–	–	–	–	–	–	–	–	x	–	–
2	●	■	■	x	•	•	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–
3	•	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–
4	–	–	–	x	•	•	•	●	●	●	■	■	■	■	■	•	•	●	•	•	–	–	–	x	–	–
5	–	–	–	x	–	–	•	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–
6	–	–	–	x	–	–	•	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–
7	–	–	–	x	–	–	–	–	–	●	■	■	■	■	■	■	●	●	•	–	–	–	–	x	–	–
8	–	–	–	x	–	–	–	–	–	–	•	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–
9	–	–	–	x	–	–	–	–	–	–	–	●	■	■	■	●	•	●	–	–	•	–	–	x	–	–
10	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	•	•	–	x	–	–
11	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–
12	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–
13	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–
14	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–
15	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–
16	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–
17	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–
18	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–
Season	S	S	S	S	S	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	W	W	W	W	W	W	W	W
No. Sp.	**3**	**2**	**2**	**x**	**3**	**3**	**4**	**2**	**2**	**3**	**4**	**4**	**4**	**4**	**4**	**3**	**3**	**3**	**2**	**1**	**2**	**1**	**0**	**x**	**0**	**0**

	Week																								
Species	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**	**51**	**52**
1	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	●	●	x	●	•	●	■	–	–	•	■
2	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	•	●	●	●	■	■	■	■
3	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–
4	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–
5	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–
6	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–
7	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–
8	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–
9	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–
10	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–
11	–	•	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–
12	–	–	x	–	–	–	–	–	–	•	●	●	●	–	–	–	–	x	–	–	–	–	–	–	–	–
13	–	–	x	–	–	–	–	–	–	•	–	–	•	–	●	●	●	x	●	•	–	–	–	–	–	•
14	–	–	x	–	–	–	–	–	–	–	–	•	–	–	–	–	–	x	–	–	–	–	–	–	–	–
15	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	■	■	■	■	●	●	●	•
16	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	●	●	●	•	–	–	–
17	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	•	–
18	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	•	–
Season	W	W	W	W	W	**SP**	**SP**	**SP**	**SP**	**SP**	**SP**	**SP**	**SP**	**SP**	**SP**	**SP**	**SP**	**SP**	S	S	S	S	S	S	S	S
No. Sp.	**0**	**1**	**x**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**1**	**2**	**2**	**0**	**1**	**2**	**2**	**x**	**4**	**5**	**4**	**4**	**3**	**2**	**5**	**4**

Table 4. A comparison of Asilidae collected at two survey sites (species listed in the order collected at Jacana Eco Estate). Jacana data taken from Table 3 and Queen Elizabeth Park data from Fig. 4 of Londt (2002b). Weeks of activity calculated from both actual data and presumed occurrence when gaps in data occur. Weeks of activity (actual and presumed).

Species	Jacana Eco Estate	Queen Elizabeth Park
Euscelidia vallis	1–15, 42–52 (25 weeks)	1–18, 41–52 (29 weeks)
Ischiolobos mesotopos	1–6, 45–52 (14 weeks)	1–16, 52 (17 weeks)
Caenoura annulitarsis	5–20 (16 weeks)	1–20, 48–52 (25 weeks)
Dasophrus androclea	11 (1 week)	18 (1 week)
Neolophonotus wroughtoni	21–22 (2 weeks)	20–36 (17 weeks)
Leptogaster sp.	38 (1 week)	10–16 (7 weeks)
Microstylum sp.	45–52 (8 weeks)	45–49 (5 weeks)
Dasophrys fortis	51 (1 week)	13 (1 week)
Rhipidocephala obscurata	51 (1 week)	3–5, 48–52 (8 weeks)

This species was, without doubt, the most commonly encountered species, especially in the upper field, during the survey, being present for some 26 weeks of the year.

This small species was invariably swept from long grass with very few actually being sighted. None were encountered mating or with prey. The species appears to be largely confined to Londt's (1994) ecological category 4a (within grass).

Material from Jacana has been compared with specimens collected during the Queen Elizabeth Park survey (Londt 2002b) and found to be conspecific. Table 4 provides a comparison of flight periods with those recorded from Queen Elizabeth Park. Adults were encountered at approximately the same time of year and flight periods ranged from 25 weeks at Jacana to 29 weeks at Queen Elizabeth Park.

2. *Ischiolobos mesotopos* Londt, 2005

Fig. 10

Remarks. This species was described mainly on a good series of specimens collected during the year-long survey of a grassland within Queen Elizabeth Park (29°34'S, 30°19'E), Pietermaritzburg, when it was identified merely as "Species X" (Londt 2002b). The only other recorded localities were Hilton (29°32'S, 30°17'E), collected in November and Cumberland Nature Reserve (29°30'S, 30°30'E) collected in January and December.

Adults of this species were encountered in good numbers on the first sampling day and the species remained abundant for the following three to four weeks before numbers began to decrease in weeks five and six. From week seven through to week 44, the species was absent, only reappearing in week 45. By week 49, the species was again fairly abundantly represented. The flight period of this species was therefore 14 weeks. The species appeared to be fairly uniformly distributed in both the upper and lower fields.

This small species was invariably swept from long grass with very few actually being sighted. None were encountered mating or with prey. The species appears to be largely confined to Londt's (1994) ecological category 4a (within grass).

Table 4 provides a comparison of flight periods with those recorded from Queen Elizabeth Park (Londt 2002b). Adults were encountered at approximately the same time of year and flight periods ranged from 14 weeks at Jacana to 17 weeks at Queen Elizabeth Park.

3. *Pegesimallus bicolor* (Loew, 1858)

Remarks. This species was reviewed along with other Afrotropical species and recorded from a number of localities in KwaZulu-Natal and the Eastern Cape Province (Londt 1980). Amongst these localities was Otto's Bluff (29°32'S, 30°22'E) which is not far from Jacana. Recorded material has been collected in March, April, November and December.

Only a single adult female of this species was collected in the first week of the survey. The genus is not commonly encountered in grassland situations, species generally preferring indigenous forests and their margins (Londt's (1994), ecological category 5b (tips of shrubs and bushes)).

Members of the genus are active fliers and so it is highly likely that the encountered specimen was moving from one suitable habitat to another or had been swept into the area by wind.

4. *Caenoura annulitarsis* (Loew, 1858)

Fig. 4

Remarks. This fairly widely-distributed grassland species was reviewed by Londt (2002a). Found mainly in KwaZulu-Natal, the species has also been recorded from the surrounding provinces of Eastern Cape, Free State and Mpumalanga, as well as the neighbouring countries of Lesotho and Zimbabwe. Londt (2002a) gives adult activity data that includes all months from November to May, based mainly on material gathered during a grassland survey undertaken in 2000 at Queen Elizabeth Park (29°34'S, 30°19'E) in Pietermaritzburg (Londt 2002b).

At Jacana, adults of this species were encountered in low numbers on week five of the survey. By week eight, numbers had increased and by week 11, the species was considered abundant. Numbers began to decline from week 16 and the species had disappeared by week 21; the total flight period of adults being 16 weeks. The species was more commonly encountered in the upper field.

This relatively small species was invariably swept from grass with very few actually being sighted. None were encountered mating or with prey. The species appears to be largely confined to Londt's (1994) ecological category 4a (within grass).

Table 4 provides a comparison of flight periods with those recorded from Queen Elizabeth Park (Londt 2002b). Adults were encountered at approximately the same time of year, but flight periods ranged from 16 weeks at Jacana to 25 weeks at Queen Elizabeth Park.

5. *Pegesimallus pedunculatus* (Loew, 1858)

Remarks. This widely-distributed and commonly encountered Southern African species was reviewed along with other Afrotropical species and recorded from many South African localities, as well as some in the neighbouring countries of Mozambique, Namibia and Zimbabwe (Londt 1980). The species has been commonly encountered in the Pietermaritzburg area where it is also known to frequent suburban gardens and has been recorded from October through to April.

A single adult female of this species was collected in week seven of the survey. The genus is not commonly encountered in grassland situations, but generally prefers indigenous forests and their margins (Londt's (1994) ecological category 5b (tips of shrubs and bushes)). This species may also be commonly encountered in suburban gardens.

Members of the genus are active fliers and so it is highly likely that the encountered specimen was moving from one suitable habitat to another or had been swept into the area by wind.

6. *Melouromyia natalensis* (Ricardo, 1919)

Remarks. This widely-distributed and fairly commonly encountered Southern African species was reviewed by Londt (2002a). It has been recorded from KwaZulu-Natal, as well as provinces to the north, including Mpumalanga, Gauteng, Northwest Province and Limpopo. There are also records from Swaziland, Botswana and Zimbabwe. The species has been recorded from Pietermaritzburg and so there was no surprise encountering it at Jacana Eco-estate.

A single adult female of this species was collected in week seven of the survey.

Londt (2002a) reports the species as normally being associated with woodland habitats and has been collected in suburban gardens in Pietermaritzburg. Its occurrence in the Jacana Eco-estate's grassland is viewed as fortuitous.

7. *Damalis monochaetes* Londt, 1989
Fig. 5

Remarks. *Damalus* Fabricius, 1805, was revised by Londt (1989) who described *monochaetes* from material collected mainly in the midlands of KwaZulu-Natal, the holotype

having been collected at the Doreen Clarke Nature Reserve (29°34'41"S, 30°17'19"E), not far from Jacana.

Adults of this species were first encountered, in moderate numbers, in week 10. The species then became abundant over the following six weeks (weeks 11–16). Numbers then diminished over the next three weeks (17–19) and none were encountered on and after week 20. The species was almost entirely confined to the lower field in an area adjacent to trees bordering the estate (most species appear to inhabit vegetation adjacent to wooded areas).

This moderately sized, rather active species was almost invariably seen flying over the vegetation and was easy to catch. Although none were encountered with prey, tail-to-tail mating pairs were commonly observed. The species appears to be largely confined to Londt's (1994) ecological category 4b (grass tips).

8. *Dasophrys androclea* (Walker 1849)

Remarks. Afrotropical *Dasophrys* Loew, 1858 were revised by Londt (1981), with *androclea* being recorded from a number of localities in KwaZulu-Natal, including the Pietermaritzburg area where it is usually encountered in indigenous forest situations, as well as suburbia. A single specimen was collected during a grassland survey conducted at Queen Elizabeth Park (Londt 2002b) and so its occurrence at Jacana Eco Estate was not entirely unexpected.

A single adult male of this species was collected in week 11 of the Jacana survey.

Londt (1981) records the species as having been encountered during every month of the year except for August and September. Records and personal experience, suggest that the species is usually associated with woodland habitats, as well as suburban gardens in Pietermaritzburg. Its occurrence in the Jacana grassland is viewed as fortuitous as the species would probably best be placed in Londt's (1994) ecological category 5a (tips of shrubs and bushes) or 6a (within trees).

Table 4 provides a comparison of flight periods with those recorded for Queen Elizabeth Park (Londt 2002b). While the single adult collected at Jacana was found in week 11, the species was recorded in week 18 at Queen Elizabeth Park, also based on a single specimen.

9. *Dasophrys tarsalis* (Ricardo, 1920)

Fig. 7

Remarks. Afrotropical *Dasophrys* Loew, 1858 were revised by Londt (1981), with *tarsalis* being recorded from a number of localities in KwaZulu-Natal, situated mainly in the so called 'midlands' which lie a short distance north-west of Hilton. However, the nearest recorded locality to Jacana is 'The Start', a stud farm ca. 20 km NE of Howick (ca. 29°23'57"S, 30°17'21"E). Its occurrence at Jacana Eco Estate was unexpected, but hardly surprising.

Adults of this species were common to abundant between the late autumn weeks 12 and 18. None were encountered in weeks 19 and 20, while a single specimen was found in week 21. All specimens were collected in the lower field.

This moderately large species was almost invariably encountered flying fairly close to the ground where individuals perched on low vegetation. None were encountered mating or with prey. The species appears to be largely confined to Londt's (1994) ecological category 4a (within grass). The female's laterally compressed ovipositor is probably an adaptation for oviposition in grass.

10. *Neolophonotus wroughtoni* (Ricardo, 1920)

Remarks. This species, a member of the large *comatus* species group, was reviewed by Londt (1988). The species, described on material from Willowgrange (ca. 29°06'S, 29°57'E) near Estcourt in KwaZulu-Natal, is fairly widely distributed throughout the eastern parts of southern Africa and has been collected in every month of the year except February. The species is common in Pietermaritzburg and surrounding area.

Only two specimens were collected during the winter at Jacana, one each on weeks 21 and 22, respectively. Adults were found resting on the ground and clearly belong to Londt's (1994) ecological category 1c (open ground). The fact that there is very little open ground at Jacana may explain the apparent rarity at this site.

Table 4 provides a comparison of flight periods with those recorded from Queen Elizabeth Park (Londt 2002b). While the species was only encountered on weeks 21–22 at Jacana, it was encountered between weeks 20 and 36 at Queen Elizabeth Park. The difference may be due to the fact that there was more open ground at Queen Elizabeth Park, mainly in the form of pathways.

11. *Dasophrys umbripennis* Londt, 1981

Remarks. This species was originally described mainly from the Pietermaritzburg district (Londt 1981).

A single adult male was collected in week 28.

This distinctive species was swept from long grass. Its patterned wings are almost certainly an adaptation to forest or forest margin habitats, i.e. Londt's (1994) ecological category 5b (within shrubs and bushes) and so the Jacana specimen was certainly out of its previously recorded 'preferred' habitat.

12. *Neolophonotus hirsutus* (Ricardo, 1920)

Remarks. This species, reviewed by Londt (1988), is currently a KwaZulu-Natal endemic, apparently limited largely to higher altitude areas of the province. Its near-

est recorded locality to Jacana is the Umgeni Valley Nature Reserve (ca. 29°28'32"S, 30°14'21"E) on the outskirts of Howick.

Adults of this species were encountered in low to moderate numbers during the four spring weeks 36–39. All encountered individuals were found in the lower field, especially in areas that had recently been burned.

This small to medium-sized species was invariably found resting on the ground or on vegetation close to the ground. While two specimens were collected with Diptera prey, others were swept from long grass with very few actually being sighted. The species appears to be largely confined to Londt's (1994) ecological category 1c (open ground).

13. *Neolophonotus variabilis* Londt, 1986

Remarks. This somewhat variable species, a member of the *suillus* species group, was described using many specimens collected mainly in KwaZulu-Natal, but also recorded from various localities in the Eastern and Western Cape provinces (Londt 1986), most being at relatively high altitudes. While not previously recorded from Hilton or Pietermaritzburg, the closest recorded localities are Bulwer (ca. 29°48'27"S, 29°45'36"E) and New Hanover (ca. 29°21'08"S, 30°31'26"E).

Single specimens were collected at Jacana in weeks 36 and 39, fair numbers were then encountered in weeks 41–45 and a single specimen was collected in week 46. Although the species was not encountered in weeks 47–51, a single specimen was netted in week 52. Although the flight period spanned some 17 weeks (from week 36 to 52), the species appeared to be most active in late spring between weeks 41–45. All encountered individuals were found in the lower field.

This species was usually observed resting on the ground or on vegetation close to the ground and is considered belonging to Londt's (1994) ecological category 1c (open ground). None were found with prey.

14. *Leptogaster* sp.

Fig. 11

Remarks. *Leptogaster* Meigen, 1803 is a large genus, with over 50 described Afrotropical species, that is in need of modern revision (Londt and Dikow 2017). There are many unidentified southern African specimens in the KwaZulu-Natal Museum's collection and in other collections around the globe. The Jacana species cannot be identified specifically at present. Londt (2002b) recorded a species as occurring at Queen Elizabeth Park which was tentatively identified as 'sp. 1 near *maculipennis* Janssens, 1957'.

A single male specimen, requiring specific identification, was collected in Jacana's upper field on week 38 of the survey.

This small species was swept from long grass and is considered to belong to Londt's (1994) ecological category 4a (within grass).

A comparison of material from Jacana and Queen Elizabeth Park strongly suggests that only a single species is involved. While Table 4 provides a comparison of the recorded flight periods, these do not appear to overlap.

15. *Microstylum* sp.
Fig. 12

Remarks. *Microstylum* Macquart, 1838, with 90 catalogued Afrotropical species, 79 listed as valid and 11 as synonyms (Oldroyd 1980), is in great need of modern revision. Oldroyd (1980) lists 39 species as occurring in South Africa alone and so a revision of these large and impressive flies is seen as a high priority. In the absence of any modern keys, no specific name can even be suggested for the species encountered at Jacana. A very similar looking species was collected during a grassland survey undertaken at Queen Elizabeth Park in Pietermaritzburg (Londt 2002b).

Adults of this summer active species were encountered in large numbers from week 45 through to week 48 when numbers declined. The species was 'uncommon' in week 52, the last week of the survey, with only a single specimen being seen and captured.

This large, almost entirely black species was invariably seen flying strongly over the vegetation, mainly in the lower field. Although a number of mating pairs were encountered, none were observed feeding. The species appears to be best accommodated within Londt's (1994) ecological category 4b (grass tips).

Although Table 4 provides a comparison of flight periods with those recorded for a species collected at Queen Elizabeth Park (Londt 2002b), a comparison of specimens does not provide sufficient evidence to suggest that these species are conspecific. However, the flight periods were remarkably similar, being weeks 45–52 at Jacana and weeks 45–49 at Queen Elizabeth Park (note that no sampling was undertaken on weeks 50 and 51 of the Queen Elizabeth Park survey).

16. *Dysclytus firmatus* (Walker, 1857)
Fig. 8

Remarks. *Dysclytus* Loew, 1858, is currently monotypic, with *firmatus* being considered the only valid species. In his handling of the genus, Londt (1979) records the species from only two relatively small areas, one in KwaZulu-Natal Province (Durban, Isipingo and Tongaat) and the other in eastern Mpumalanga Province (Ngondwana (= Ngodwana), Kaapsehoop, Waterval Onder and Elandshoek). Although a few more recently collected specimens are to be found in the KwaZulu-Natal Museum's collection, none have previously been collected in the Hilton or Pietermaritzburg area.

Adults of this species had a relatively short period of activity in summer, being encountered in fair numbers in weeks 46–48, while a single specimen was collected in week 49. The species was invariably encountered in the lower field.

This fairly large and distinctive species was almost invariably seen flying over or between grass clumps and coming to rest on vegetation. While none were encountered mating, one female was collected with prey, a small cicada (Cicadidae). The species appears to be largely confined to Londt's (1994) ecological category 4b (grass tips). The female's laterally compressed ovipositor suggests oviposition in grass.

17. *Dasophrys fortis* Londt, 1981

Fig. 6

Remarks. Londt (1981) revised the genus and provided a key for the identification of species. However, the key requires male specimens. Although the single female, swept from grass in week 51 of the survey, cannot be keyed out confidently, its rather short ovipositor (length:breadth ratio ca. 2.3) suggests that it belongs to the grassland species *D. fortis* Londt, 1981. For the present, this Jacana female will be assigned to *D. fortis* until this identification can be disproved.

This female is almost certainly confined to Londt's (1994) ecological category 4a (within grass). Table 4 provides a comparison of flight periods with those recorded from Queen Elizabeth Park (Londt 2002b) where it was only collected on week 13.

18. *Rhipidocephala obscurata* Oldroyd, 1966

Fig. 13

Remarks. Oldroyd (1966) reviewed the genus and later (1980) catalogued 26 then considered valid species, together with three listed as synonyms. Material collected during the Queen Elizabeth Park survey was keyed out to *R. obscurata*, an identification that needs confirmation.

Although a single female, swept from grass on week 51 of the Jacana survey, keys out to *R. obscurata* using Oldroyd's (1966) key, the identification may be questionable as Oldroyd's types all come from the Kariba area (ca. 16°31'S, 28°51'E) in Zimbabwe.

The species is probably confined to Londt's (1994) ecological category 4a (within grass) or 4b (grass tips).

Table 4 provides a comparison of flight information for both the Jacana and Queen Elizabeth Park (Londt 2002b) surveys. While the only encountered Jacana specimen was collected on week 51, the species was recorded over an eight week period, between weeks 3–5 and 48–52, at Queen Elizabeth Park.

Discussion

Eighteen species of Asilidae were encountered at Jacana, two fewer than recorded during an earlier survey at Queen Elizabeth Park (Londt 2002b). While some of these

species are more commonly associated with forests and their margins, the majority are clearly restricted to the grassland biome. The fact that Asilidae are predators and, therefore, rely on healthy populations of insect prey, suggests that the relatively unspoiled grasslands surveyed can be considered reasonably well managed. Clearly, comparative surveys involving spoiled and rehabilitated grasslands would further add to a better understanding of the value of assessments of the kind reported in this publication.

Although 18 species were encountered during the survey, the largest number encountered on any one occasion was five, less than a third of the species inhabiting the area. It is, therefore, obvious that a proper understanding of the invertebrate fauna of any particular locality probably requires a number of strategically planned sampling occasions.

Of particular interest, but not unexpected, is the fact that very few Asilidae were encountered during winter (weeks 19–31) and early spring (weeks 32–35). The planned burning of the grassland which took place during the spring weeks of 35, 36 and 41 appears to have had little impact on asilid populations. While some ground inhabiting species of *Neolophonotus* were encountered in spring and the emergence of *E. vallis*, a dominant grass inhabiting species, commenced on week 42, the burning of the grassland did not appear to have any significant impact on asilid life cycles. However, the fact that *E. vallis* began emerging at the time of the last burn (week 41) strongly suggests that earlier burns, timed with the end of winter or start of spring, would be preferable.

Also of interest was the fact that some species appeared to be mostly confined to either the upper or lower fields. The upper field, being larger, higher and more exposed may be more suitable for some species while the lower field, being lower and more protected by bordering trees may offer more suitable environmental conditions for other species. Another possible factor which may be of importance is the existence of the access road that separates the fields. This roadway, which has been lined with trees, may well constitute a barrier restricting dispersal between the two fields. Efforts to minimise the possible impact of this access road should be contemplated.

While a more detailed comparison of the results obtained during the survey of Queen Elizabeth Park (Londt 2002b) and Jacana Eco Estate could prove interesting, this would only be feasible when far more is known about the specific environmental requirements of each asilid species involved. Although Queen Elizabeth Park is only five kilometres south-east of Jacana Eco Estate and experiences similar weather patterns, Jacana Eco Estate, with an altitude of over 1100 m, is some 200 m higher than the site at Queen Elizabeth Park which lies at approximately 900 m. There are likely to be significant differences in the botanical characteristics of the two sites and these would almost certainly impact on the composition of the asilid faunas involved. In the absence of such information, comparisons of any kind would be tenuous at best.

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Primary types in the collection of molluscs in the KwaZulu-Natal Museum: Patellogastropoda and Lepetellida

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Abstract

All primary (name-bearing) types of Patelloidea, Lottioidea, Fissurelloidea and Scissurelloidea deposited in the KwaZulu-Natal Museum are presented. The reference to the original publication, including the original generic position, the type locality, the collector and the cited dimensions of the type specimen(s), is provided for each species, followed by information from the label for each type in the NMSA collection (type locality, collector and catalogue number), size of the type specimen, brief remarks and colour photographs.

Keywords

Fissurelloidea, Lottioidea, Mollusca, Patelloidea, Scissurelloidea

Introduction

All primary (name-bearing) types of Patellogastropoda (Patellidae and Lottiidae) and part of Vetigastropoda (Lepetellida: Fissurelloidea and Scissurelloidea) deposited in the KwaZulu-Natal Museum (NMSA) were annotated and illustrated here in accordance with the ICZN (International Code of Zoological Nomenclature) recommendation 72F.4, as the third part of the ongoing revision of the primary type material deposited in NMSA. The historical review of NMSA collection of molluscs can be found in our

first publication on the subject (see Muratov and Davis 2011), where we presented illustrated annotations on primary types of Scaphopoda and Cephalopoda. Second publication was on Polyplacophora (Muratov 2014).

Five shells of *"Acmaea" albonotata* E.A. Smith, 1901 (NMSA–MOL 01284/T525) from the type locality were labelled "syntypes" by A.C. Bruggen. However, after examination of the original description (E.A. Smith 1901: 107, Pl. I, figs 14, 16) and the original label, it became apparent that the shells deposited in NMSA were not seen by Smith. In addition, the shells in NMSA differ in shape, size and sculpture from the original description. Thus, since they are not types, they are not illustrated here.

The "neotype" of *"Patella" obtecta* Krauss, 1848: 47–48, Tab. III, fig. 11 (NMSA–MOL 0D2159/T3291) was erroneously (ICZN 75.8) designated (Robson 1986: 313 (figs 20–23), 315) since syntypes still exist in Museum für Naturkunde, Berlin (ZMB/Moll-28428) and in Museum of Comparative Zoology, Cambridge (MCZ: Mala: 152477/Acc 1173) and thus, is not illustrated here.

Material and methods

The collection of the primary types of Patelloidea, Lottioidea, Fissurelloidea and Scissurelloidea in the KwaZulu-Natal Museum consists of 19 holotypes, one syntype and one neotype, all collected along the eastern coastline of South Africa, from Sodwana Bay in the north to Port Alfred in the south.

The reference to the original publication, including the original generic position, the type locality, the collector and the cited dimensions of the primary type specimen(s), is provided for each species. This information on the original description is followed by the details from the label for each type in the NMSA collection (type locality, collector and catalogue number) and measured dimensions of the type illustrated in this publication. The types are empty dry shells and the number of specimens is one, if not stated otherwise. Types in NMSA historically were given two catalogue numbers: standard, the same as for non-types and an additional number with "T" prefix, to highlight its type status. All standard NMSA numbers are now given in the new format: with added "NMSA-MOL 0" prefix. However, in references to previous publications, all numbers are given in the historical format. Comprehensive labels of the types were not produced by authors of original descriptions, except for *Diodora fuscocrenulata* E.A. Smith, 1906. All standard museum labels were produced by collection managers after types were received from authors. All information given for each type was copied from the labels and hand-written catalogue, not from the original descriptions. Provincial names were standardised based on their current status. Comprehensive information on paratypes is given in addition, because original descriptions often lack some information from labels and catalogue books. Paratypes, however, were not illustrated here. Types in other collections were not verified unless they were required to clarify the status of types deposited in NMSA. The current status of each species is based here on the most recent comprehensive publication found and the complete synonymy is not given since this is not a taxonomic revision.

All shells were measured under a stereomicroscope using an ocular micrometer, separately calibrated for each standard magnification against a Vernier Calliper. Shells larger than 10 mm were measured by the same Calliper. All scales were individually calculated for each illustrated shell and corresponding scales for each photograph were resized to match the illustrated scale. All shell sizes are given using the following template: *D*×*sD*×*H*, where *D* is major diameter, *sD* is smaller diameter (90° to *D*) and *H* is height. None of the shells were cleaned to avoid possible damage and none of the shells were damaged during preparation of this publication.

The following acronyms and abbreviations are used: **ICZN** – International Code of Zoological Nomenclature; MN – research vessel *Meiring Naudé*; n/d – no data; **NHMUK** – The Natural History Museum, London, UK (formerly known as **BNHM** and **BMNH**) and **NMSA** – The KwaZulu-Natal Museum, Pietermaritzburg, South Africa (formerly known as Natal Museum).

List of primary types

Class Gastropoda Cuvier, 1795
Subclass Patellogastropoda Lindberg, 1986
Superfamily Patelloidea Rafinesque, 1815
Family Patellidae Rafinesque, 1815

Patella aphanes Robson, 1986

aphanes Robson, 1986: 306, figs 1–3 (holotype), figs 4–11 (paratypes) [*Patella*, Hibberdene, Natal South Coast (G. Robson, 15 October 1985): 22.1×17.4×9.7 mm].

Material examined. ***Holotype.*** South Africa • KwaZulu-Natal, Hibberdene; 15 Oct. 1985; G. Robson leg.; on *Perna perna*, LST rocks; T3285; NMSA–MOL 0D2155 (soft parts in ethanol); Fig. 1 (21.8×17.3×8.6 mm).

Paratypes. South Africa • KwaZulu-Natal, Cape Vidal; 16 Nov. 1971; R. Kilburn leg.; T3324; NMSA–MOL 009440.

South Africa • KwaZulu-Natal, Mapelane; Nov. 1983; R. Kilburn leg.; T3325; NMSA–MOL 0B6945.

South Africa • KwaZulu-Natal, Chaka's Rock, intertidal zone, 24 Feb. 1985; D. Herbert leg.; on *Perna perna*; T3296; NMSA–MOL 0D0489.

South Africa • 2; KwaZulu-Natal, Reunion Rocks, intertidal zone; 7 Feb. 1985; R. Kilburn, D. Herbert, R. Fregona leg.; T3322; NMSA–MOL 0D0361.

South Africa • 7 of 8; same data as holotype, figured (figs 4–11) in the original description; T3295; NMSA–MOL 0D2156.

South Africa • 40 in ethanol; same data as holotype (mussel-dwelling); T3327; NMSA–MOL 0S2157.

South Africa • 10 in ethanol; same data as holotype (*Lithophyllum* coated rocks); T3328; NMSA–MOL 0D2158.

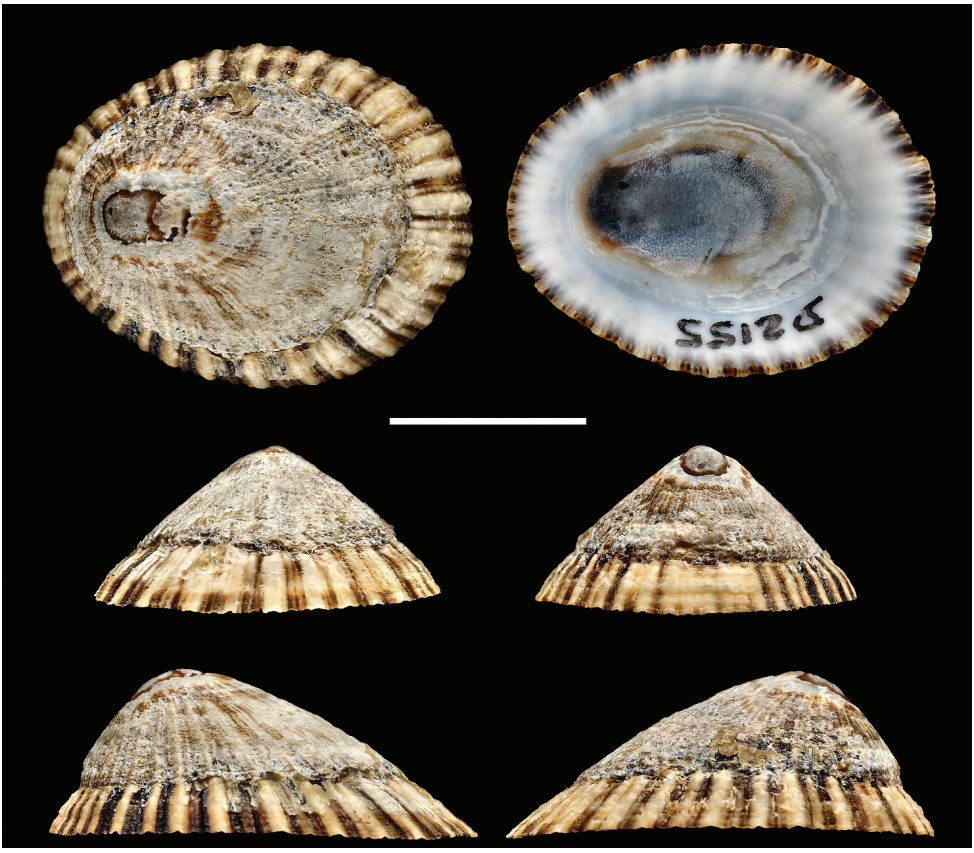

Figure 1. *Patella aphanes* Robson, 1986. Holotype T3285/NMSA-MOL 0D2155. Scale bar: 10 mm.

South Africa • 2 of 3; KwaZulu-Natal, Port Edward; Jul. 1977; Marais leg.; T3286; NMSA–MOL 0A6281.

South Africa • 14 of 18 in ethanol, one without soft parts; KwaZulu-Natal, Port Edward; 27–28 Aug. 1977; Marais leg.; on *Perna*; T4328; NMSA–MOL 0D2170.

South Africa • Eastern Cape, Lwandile/Mdumbi; Jul. 1981; R. Kilburn, R. Fregona leg.; T3326; NMSA–MOL 0C0148.

South Africa • 5; Eastern Cape, Coffee Bay; Y. McLellan leg.; ex Albany Mus. 1980; T3321; NMSA–MOL 0B6182.

South Africa • 4; Eastern Cape, Mkambati area, Mgwetyane R. mouth; R. Kilburn leg.; Aug. 1983; T3320; NMSA–MOL 0C5767.

South Africa • 3; Eastern Cape, Dwesa; May 1984; R. Kilburn leg.; Beach drift; T3323; NMSA–MOL 0C5909.

Current status. *Scutellastra aphanes* (Robson, 1986); Nakano and Ozawa (2007).

Remarks. There are 18 paratypes in ethanol mentioned in the original description under A6281/T3286. However, this number refers to 3 paratypes (T3286/NMSA–MOL 0A6281), one of which was donated to Drivas (12 Oct. 1988), which are shells without soft parts, not in ethanol. There are 14 specimens in ethanol with the catalogue

number NMSA–MOL 0D2170. Since these are the only other specimens of *S. aphanes* in ethanol, which in addition match the locality and collector as in the original description, they are assumed to be paratypes and were given new type number T4328 in preparation of this manuscript. There are another two shells in NMSA–MOL 0D489 paratype lot that were not chosen as paratypes. Prefix "C" was omitted in the original description for C5909. Figured paratypes were given wrong number (D2157/T3327 instead of D2156/T3295) in the original description (Robson 1986: figs 4–11). One (of originally eight paratypes: T3295/NMSA–MOL 0D2156) was sent in 1990 to Zoological Museum of Moscow University.

Superfamily Lottioidea Gray, 1840
Family Lottiidae Gray, 1840

***Acmaea* (*Tectura*) *maraisi* Kilburn, 1977**

maraisi R.N. Kilburn, 1977: 174, figs 1–3 (holotype) [*Acmaea* (*Tectura*), TRANSKEI: Mzamba (Fossil Head), near the Mtamvuna River mouth (J.P. Marais): 3.2×3.0×2.3 mm].

Material examined. ***Holotype*.** South Africa • Eastern Cape, Mzamba, beach drift; Apr. 1976; J.P. Marais leg.; don. J.P. Marais, 06 May 1976; T2051; NMSA–MOL 0A4585; Fig. 2 (3.65×2.96×2.19 mm).

***Paratypes*.** South Africa • 10; same data as holotype; T2061; NMSA–MOL 0A5051.

South Africa • Eastern Cape, Mzamba; May 1977; R. Kilburn leg.; T2148; NMSA–MOL 0A5848.

Current status. *Asteracmea maraisi* (Kilburn, 1977); WoRMS Editorial Board (2020).

Remarks. Generic position of this species remains uncertain. Its relation to *Asteracmea* has been suggested in the original description (Kilburn 1977: 175) but formal decision is awaiting proper revision of this group. Overexposed areas were intentionally introduced on Fig. 2 to show otherwise barely visible details of sculpture.

Subclass Vetigastropoda Salvini-Plawen, 1980
Order Lepetellida Moskalev, 1971
Superfamily Fissurelloidea J. Fleming, 1822
Family Fissurellidae J. Fleming, 1822
Subfamily Diodorinae Odhner, 1932

***Glyphis fuscocrenulata* E.A. Smith, 1906**

fuscocrenulata E.A. Smith, 1906: 56–57, Pl VIII, fig. 6 [*Glyphis*, Port Shepstone and Umkomaas, Natal: 16×11.25×6 mm].

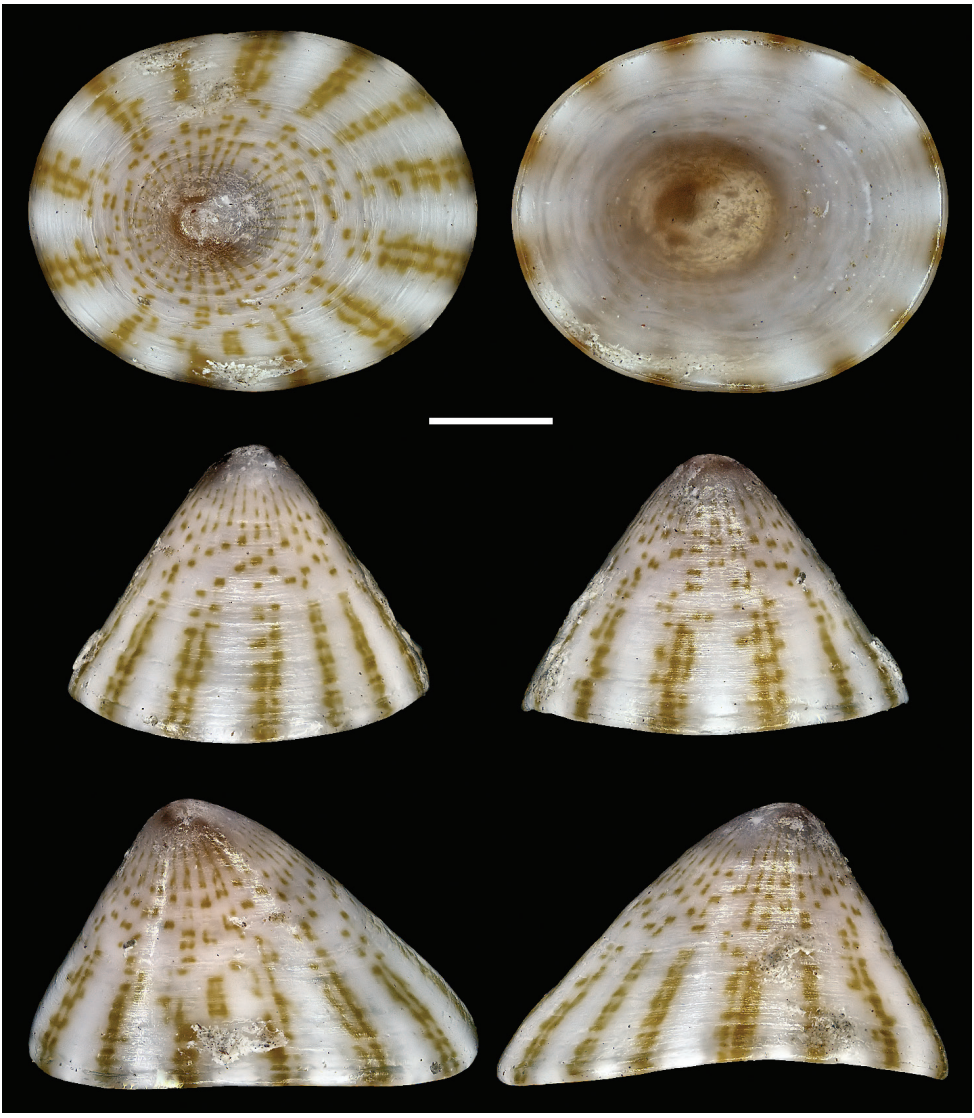

Figure 2. *Acmaea* (*Tectura*) *maraisi* Kilburn, 1977. Holotype T2051/NMSA-MOL 0A4585. Scale bar: 1 mm.

Material examined. ***Syntype.*** South Africa • KwaZulu-Natal, Umkomaas; H.C. Burnup leg.; T524; NMSA–MOL 001270; Fig. 3 (14.13×9.65×5 mm).

Current status. *Diodora fuscocrenulata* (E. A. Smith, 1906); Herbert (2015).

Remarks. The shell (NMSA–MOL 001270) from Umkomaas and two of three shells (NHMUK: 1906.6.23.15–17) from Port Shepstone in the Natural History Museum (London, UK) were not explicitly mentioned in the original description. The sentence "However, the specimen described appears to be fairly mature" (Smith 1906:

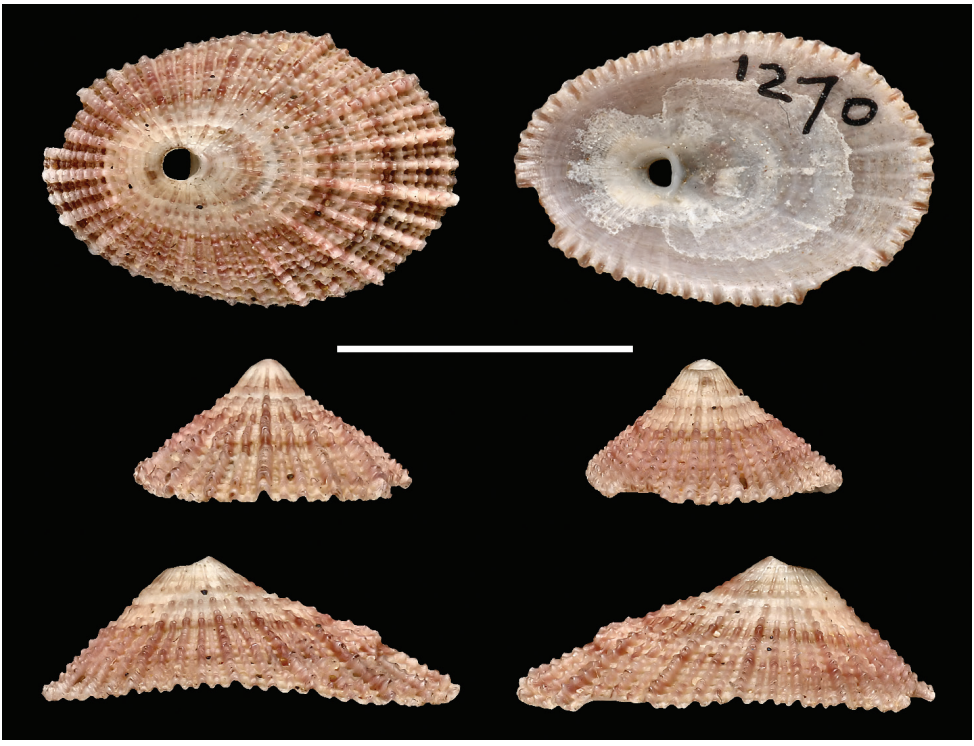

Figure 3. *Glyphis fuscocrenulata* E.A. Smith, 1906. Syntype T524/NMSA-MOL 001270. Scale bar: 10 mm.

57) implies that the description was based on one shell, which makes it holotype by monotypy (ICZN 73.1.2.). However, Smith was aware that the shell from Umkomaas belongs to the same species, as indicated in the description: "Hab. – Port Shepstone and Umkomaas, Natal" (Smith 1906: 57), which suggests that the shell from Umkomaas is part of the type series (see the Example for ICZN 72.4.1.1). We have not made changes in nomenclature and treat all four shells as syntypes, thereby not restricting possibilities in the next taxonomic revision.

Diodora procurva Herbert, 1989

procurva Herbert, 1989: 173, figs 1–3, 7 (holotype), 4–6 (paratype) [*Diodora*, off Mbashe River, Transkei (32°18.2'S, 29°04.1'E), 200–220 m, sponge rubble. Dredged R.V. *Meiring Naudé*: 31.4×21.8 mm, height 21.7 mm].

Material examined. ***Holotype.*** South Africa • Eastern Cape, off Mbashe River, 32°18.2'S, 29°04.1'E, depth 200–220 m, station Q1; 18 Jul. 1982; dredged MN; sponge rubble; T124; NMSA–MOL 0E5938 (ex C1984); Fig. 4 (31.5×21.9×21.6 mm).

Paratypes. South Africa • 2; same data as holotype; T125; NMSA–MOL 0C1984.

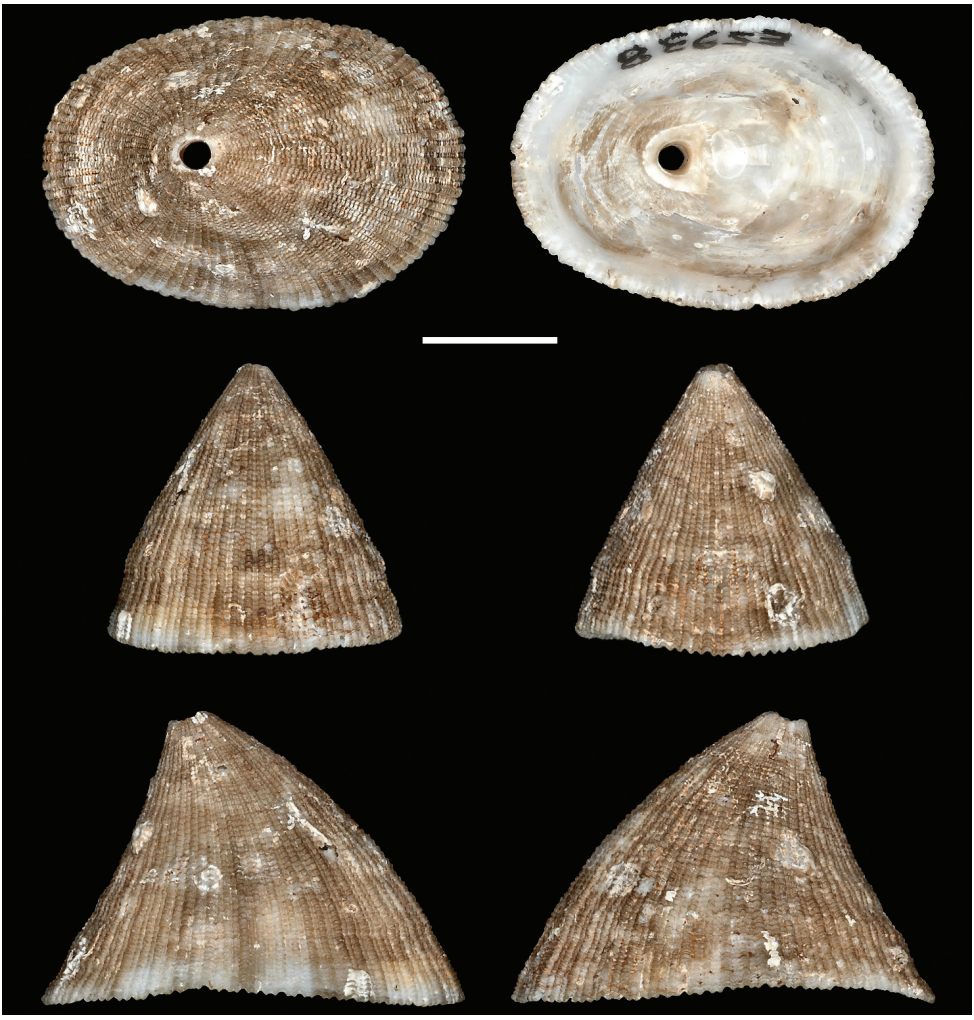

Figure 4. *Diodora procurva* Herbert, 1989. Holotype T124/NMSA-MOL 0E5938. Scale bar: 10 mm

South Africa • Eastern Cape, off Nqabara Point, 32°25.9'S, 28°56.5'E, depth 130–150 m, station S7; 9 Jun 1983; dredged MN; sponges and stylasterids; T126; NMSA–MOL 0C5036.

South Africa • Eastern Cape, off Qora River, 32°55.6'S, 28°49.0'E, depth 480–490 m, station U14; 14 Jul. 1984; dredged MN; sandy mud; T128; NMSA–MOL 0C6310.

South Africa • KwaZulu-Natal, S.E. of Sheffield Beach, 29°33.5'S, 31°47.0'E, depth 180 m, station XX135; 14 Jun. 1988; dredged MN; sponge rubble; T127; NMSA–MOL 0E4598. Figured (figs 4, 5) in the original description.

South Africa • 5; KwaZulu-Natal, S.E. of Neill Peak (Cunge), 28°44.4'S, 32°32.2'E, depth 320–340 m, station ZP5; 12 Jun. 1988; dredged MN; sandy mud; T129; NMSA–MOL 0E3970.

Current status. *Diodora procurva* Herbert, 1989; original combination.

Subfamily Emarginulinae Children, 1834

***Emarginula connelli* Kilburn, 1978**

connelli Kilburn, 1978: 437–439, Pl. 4b, f [*Emarginula*, off Sodwana Bay, Zululand in 100 m (ex C.S.I.R. Water Research): 6.9×4.8×5.2 mm].

Material examined. *Holotype*. South Africa • KwaZulu-Natal, Sodwana Bay, depth 100 m, station G3; ex C.S.I.R. Water Research; T2199; NMSA–MOL 0A5762; Fig. 5 (6.84×4.83×4.99 mm).

Figure 5. *Emarginula connelli* Kilburn, 1978. Holotype T2199/NMSA-MOL 0A5762. Scale bar: 5 mm.

Current status. *Emarginula connelli* Kilburn, 1978; original combination.

Remarks. Was known in 1978 only from the type locality. However, one paratype of *Emarginula thorektes* Kilburn, 1978 (T2192/NMSA–MOL 0A5764) from Port Edward (see below) is *Emarginula connelli* Kilburn, 1978.

Emarginula koon Kilburn, 1978

koon Kilburn, 1978: 439–440, Pl. 5, 10 [*Emarginula*, Shelly Beach, near Port Shepstone (don. R. Cock): 18.0×12.9×7.9 mm].

Material examined. ***Holotype.*** South Africa • KwaZulu-Natal, Shelly Beach, near Port Shepstone; don. R. Cock, Nov. 1975; T2196; NMSA–MOL 0B0147; Fig. 6 (18×12.9×8 mm).

Paratypes. South Africa • 2; Same data as holotype; T2195; NMSA–MOL 0A3724.

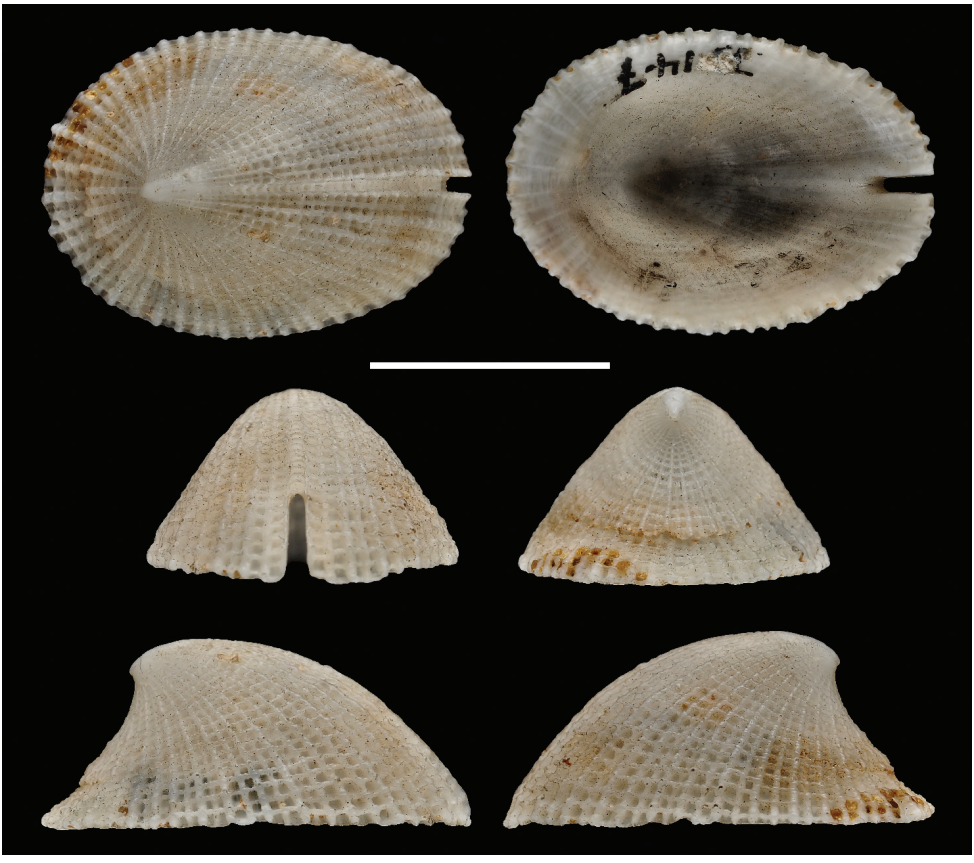

Figure 6. *Emarginula koon* Kilburn, 1978. Holotype T2196/NMSA-MOL 0B147. Scale bar: 10 mm.

South Africa • KwaZulu-Natal, Port Shepstone; H. Burnup leg.; T2194; NMSA–MOL 003067.

South Africa • Eastern Cape, Mzamba; 25–26 Sep. 1976; R. Kilburn leg.; T2151; NMSA–MOL 0A6238.

South Africa • KwaZulu-Natal, Durban; J.F. Quekett, collection of Burnup; T2198; NMSA–MOL 001280.

South Africa • KwaZulu-Natal, south coast, Palm Beach; R. Cock leg.; T2197; NMSA–MOL 006385.

Current status. *Emarginula koon* Kilburn, 1978; original combination.

Emarginula *mcclurgi* Kilburn, 1978

macclurgi Kilburn, 1978: 443–444, Pl. 7 [*Emarginula*, off St Lucia Lighthouse, Zululand, in 100 m, mud and pebble bottom (C.S.I.R Water Research bottom sample): 8.7×6.7×4.0 mm].

Material examined. ***Holotype.*** South Africa • KwaZulu-Natal, St Lucia Lighthouse, depth 100 m, station F3; ex C.S.I.R Water Research; mud and pebbles; T2190; NMSA–MOL 0A5726; Fig. 7 (8.5×6.7×4.1 mm).

Current status. *Emarginula macclurgi* Kilburn, 1978; original combination.

Remarks. Subsequent to the original description, at which time *Emarginula macclurgi* was only known by a single specimen, this species has been collected along the eastern coast of South Africa, from Mission Rocks in the northern KwaZulu-Natal (28°17.5'S, 32°34.2'E) to Mbashe River in the south (32°20.6'S, 29°00.2'E) in depths ranging from 60 to 175 m.

Emarginula phrygium Herbert & Kilburn, 1986

phrygium Herbert & Kilburn, 1986: 10, figs 30–34 [*Emarginula*, off Qora River, Transkei (32°34.0'S, 28°49.7'E), depth 400–420 m. Coarse, slightly muddy sand (dredged *Meiring Naudé*): 5.8×4.7, height 3.7 mm].

Material examined. ***Holotype.*** South Africa • Eastern Cape, off Qora River, 32°34.0'S, 28°49.7'E, depth 400–420 m, station U13, 12 Jul. 1984; dredged MN; coarse slightly muddy sand; T3012; NMSA–MOL 0C0684; Fig. 8 (5.68×4.67×3.6 mm).

Current status. *Emarginula phrygium* Herbert & Kilburn, 1986; original combination.

Emarginula thorektes Kilburn, 1978

thorektes Kilburn, 1978: 440–442, Pl. 6a,b (holotype), 6c (paratype) [*Emarginula*, Shelly Beach, near Port Shepstone (leg. L. and R. Cock): 8.7×5.8×4.0 mm].

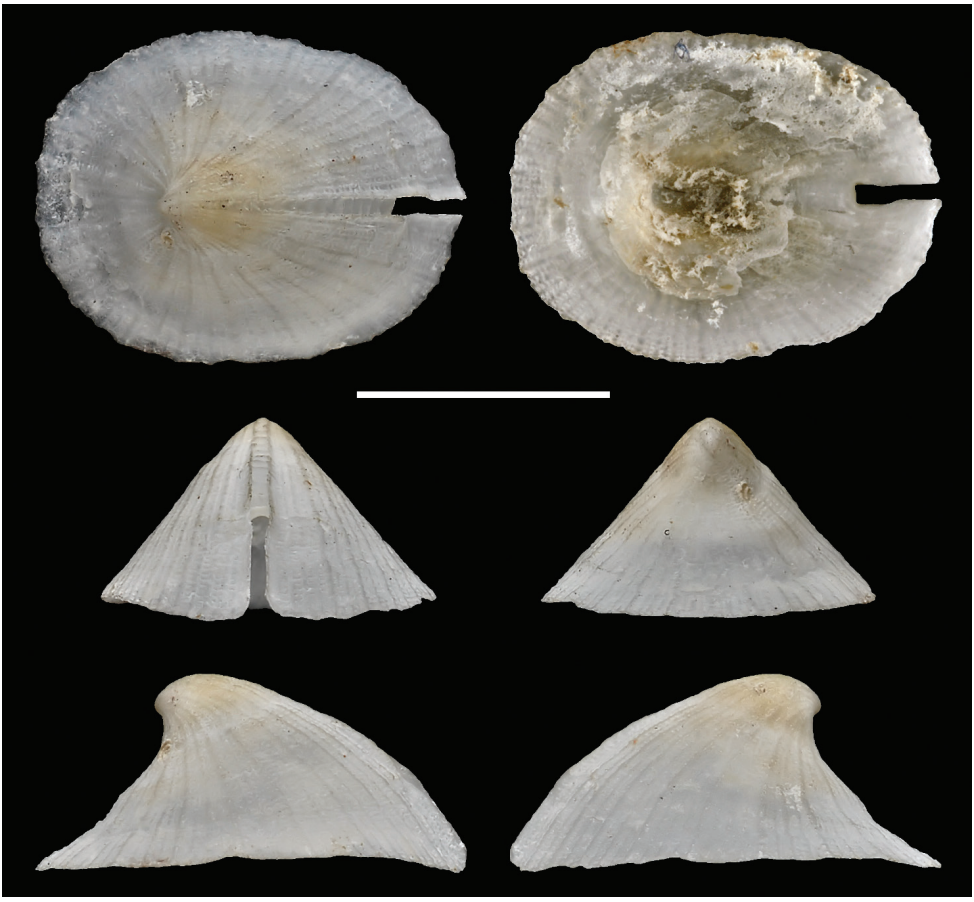

Figure 7. *Emarginula mcclurgi* Kilburn, 1978. Holotype T2190/NMSA-MOL 0A5726. Scale bar: 5 mm.

Material examined. ***Holotype.*** South Africa • KwaZulu-Natal, Shelly Beach, near Port Shepstone; don. Mrs. R. Cock, Nov. 1975; T2193; NMSA–MOL 0A3829; Fig. 9 (8.5×5.7×3.4 mm).

Paratypes. South Africa • juvenile; KwaZulu-Natal, off Sodwana Bay, depth 50 m, ex C.S.I.R. Department of Water Research; shell and coral sand, foraminifera; T2191; NMSA–MOL 0A5763.

South Africa • KwaZulu-Natal, off Port Edward, depth 100 m; 18 Oct. 1976; ex C.S.I.R. Department of Water Research; fine shell sand; T2192; NMSA–MOL 0A5764.

Current status. *Emarginula thorektes* Kilburn, 1978; original combination.

Remarks. One paratype (T2192/NMSA–MOL 0A5764) is *Emarginula connelli* Kilburn, 1978 (first noticed by D. Herbert, as indicated in his handwriting in one of the reprints of the original descriptions of *thorektes* and *connelli* and on the additional label).

Figure 8. *Emarginula phrygium* Herbert & Kilburn, 1986. Holotype T3012/NMSA-MOL 0C6844. Scale bar: 5 mm.

Emarginula viridicana Herbert & Kilburn, 1986

viridicana Herbert & Kilburn, 1986: 12, figs 45, 46 (holotype), 47, 49–50 (paratypes) [*Emarginula*, off Park Rynie (approx. 30°21'S, 30°51'E), living, 110 m, sponge rubble. Dredged MN: 15.1×10.6, height 9.4 mm].

Material examined. *Holotype*. South Africa • soft parts in ethanol; KwaZulu-Natal, off Park Rynie, depth 110 m, dredged; 2 Mar. 1981; R. Kilburn leg.; sponge rubble; T3021; NMSA–MOL 0B8749; Fig. 10 (15.2×10.53×9.3 mm).

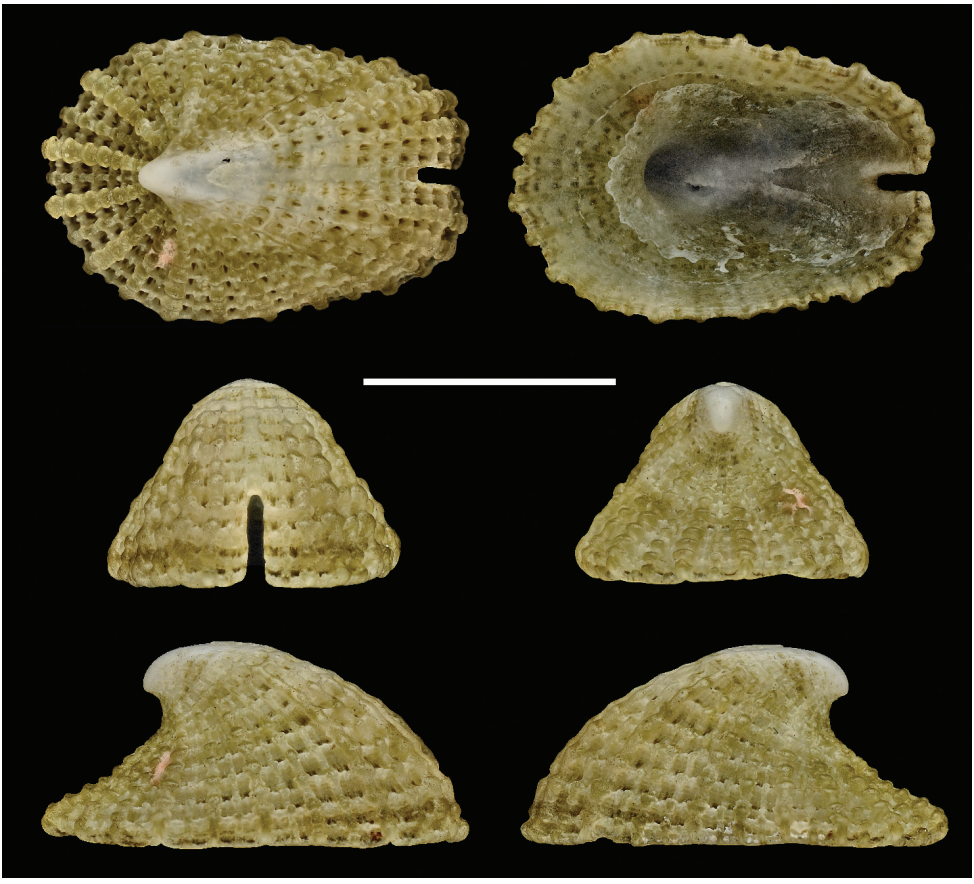

Figure 9. *Emarginula thorektes* Kilburn, 1978. Holotype T2193/NMSA-MOL 0A3829. Scale bar: 5 mm.

Paratypes. South Africa • soft parts in ethanol; same data as holotype; T3022; NMSA–MOL 0B9937.

South Africa • 2; dried soft parts; KwaZulu-Natal, off Park Rynie, depth 100 m; 2 Mar. 1981; dredged, R. Kilburn; sand and sponge rubble; T3023; NMSA–MOL 0B8750.

South Africa • dried soft parts; KwaZulu-Natal, off Park Rynie, depth 120 m, 2 Mar. 1981; dredged, R. Kilburn; rubble and solitary coral; T3024; NMSA–MOL 0B3800.

South Africa • KwaZulu-Natal, off Park Rynie, 30°22.8'S, 30°51.3'E, depth 142 m, station X5; 19 Aug. 1981; dredged MN; some sand, sponge rubble; T3025; NMSA–MOL 0B8745; figured (fig. 47) in the original description.

South Africa • KwaZulu-Natal, off Trafalgar, 31°01.2'S, 30°22.9'E, depth 120 m, station X4; 22 Jul. 1982; dredged MN; sand, sponge; T3026; NMSA–MOL 0B8762.

South Africa • soft parts in ethanol; KwaZulu-Natal, off Park Rynie, 30°23.8'S, 30°50.0'E, depth 101 m, station X10; 19 Aug. 1981; dredged MN; some sand, sponge rubble; T3027; NMSA–MOL 0C1557.

Figure 10. *Emarginula viridicana* Herbert & Kilburn, 1986. Holotype T3021/NMSA-MOL 0B8749. Scale bar: 10 mm.

South Africa • KwaZulu-Natal, off Park Rynie, 30°20.7'S, 30°51.6'E, depth 105 m, station XX18; 10 Jul. 1984; dredged MN; sponge rubble; T3028; NMSA–MOL 0B8541; figured (fig. 49) in the original description.

South Africa • soft parts in ethanol; KwaZulu-Natal, off Park Rynie, depth 100 m; 5 Mar. 1981; dredged, R. Kilburn sand; T3029; NMSA–MOL 0B8746; figured (fig. 50) in the original description.

South Africa • KwaZulu-Natal, off Park Rynie, depth 100 m; 4 Mar. 1981; dredged, R. Kilburn; sand, sponge rubble; T3036; NMSA–MOL 0B3726.

South Africa • Eastern Cape, off Mzamba River, 31°06.0'S, 30°18.3'E, depth 100 m, station XX2; 15 Jun. 1983; dredged MN; sponge rubble; T3035; NMSA–MOL 0C7102.

Current status. *Emarginula viridicana* Herbert & Kilburn, 1978; original combination.

Remarks. One paratype (NMSA–MOL 0B3800), of two, has been sent to NHMUK (registration number: NHMUK 1986090). Some specimens, including the holotype, were collected in March 1981 during one of the trial runs on *Meiring Naudé* prior to the first official *Meiring Naudé* research cruise in August 1981 (David G. Herbert, personal communication).

Puncturella (*Vacerrena*) *christiaensi* Kilburn, 1978

christiaensi Kilburn, 1978: 448, Plate 9c–e, 10 [*Puncturella* (*Vacerrena*), off Sordwana [sic] Bay, Zululand, 50 m, in shell grit (C.S.I.R. Department of Water Research): ~1.9×n/d×1.5 mm, basal length 1.65 mm].

Material examined. ***Holotype.*** South Africa • KwaZulu-Natal, off Sodwana Bay, depth 50 m, C.S.I.R. Water Res; shell grit; T2204; NMSA–MOL 0B230; Fig. 11 (1.92×1.45×1.41 mm; larger diameter (height) of aperture ("basal length") is 1.52 mm).

Paratypes. South Africa • 3 of 5; same data as holotype; T2205; NMSA–MOL 0A5084.

South Africa • 2; KwaZulu-Natal, off Kosi Bay, depth 50 m; C.S.I.R. Water Res; in shell drift; T2206; NMSA–MOL 0A5937.

Current status. *Vacerrena nana* (H. Adams, 1872); Herbert (2015).

Remarks. The shell of the holotype was damaged after the photos for the original description were made. The damage was first discovered in March 2012 by the first author and the part that was broken off was not located. Another set of dimensions (1.6×1.5 mm) is given in the figure captions for the plate 9(c–e) in the original description. We were unable to locate two out of five paratypes (T2205/NMSA 0A5084). Genus *Vacerrena* is probably related to *Cornisepta* (Fig. 12) and *Profundisepta* (Fig. 13) but is not transferred here to Zeidorinae because it is not a taxonomic revision and there is no reference that can be cited to indicate that it should be in Zeidorinae.

Subfamily Zeidorinae Naef, 1913

Fissurisepta onychoides Herbert & Kilburn, 1986

onychoides Herbert & Kilburn, 1986: 24, figs 87 (holotype), 88–89 (paratype) [*Fissurisepta*, off Shixini Point, Transkei, 32°31.2'S, 28°52.2'E, 300 m, course sand, broken shell. Dredged MN: 3.6×2.6 mm, height 4.9].

Material examined. ***Holotype.*** South Africa • Eastern Cape, off Shixini point, 32°31.2'S, 28°52.2'E, depth 300 m, station T14; 11 Jul. 1984; dredged MN; broken shell, course sand; T3017; NMSA–MOL 0C6365; Fig. 12 (3.65×2.59×5.01 mm).

Figure 11. *Puncturella* (*Vacerrena*) *christiaensi* Kilburn, 1978. Holotype T2204/NMSA-MOL 0B230. Scale bar: 1 mm.

Paratypes. South Africa • Eastern Cape, off Rame Head, 31°57.3'S, 29°25.5'E, depth 380 m, station K14; 20 Jul. 1982; dredged MN; coarse sand, old shell debris; T3016; NMSA–MOL 0C7156; figured (figs 88, 89) in the original description.

South Africa • same data as NMSA–MOL 0C7156; T3015; NMSA–MOL 0C2092.

South Africa • Eastern Cape, off Rame Head, 31°56.1'S, 29°26.5'E, depth 410–430 m, station K13; 20 Jul. 1982; dredged MN; stones, some sand; T3031; NMSA–MOL 0C7201.

Figure 12. *Fissurisepta onychoides* Herbert & Kilburn, 1986. Holotype T3017/NMSA-MOL 0C6365. Scale bar: 1 mm.

South Africa • Eastern Cape, off Whale Rock, 32°00.9'S, 29°21.8'E, depth 400–420 m, station M7, 20 Jul. 1982; dredged MN; coarse sand, old shell debris, stones; T3033; NMSA–MOL 0C7161.

South Africa • 3; Eastern Cape, off Stony Point, 32°37.5'S, 28°45.8'E, depth 390–400 m, station V11; 12 Jul. 1984; dredged MN; muddy sand, small stones; T3034; NMSA–MOL 0C7175.

South Africa • Eastern Cape, off Mgazi River, 31°44.8'S, 29°33.0'E, depth 370 m, station J8; 4 Jul. 1985; dredged MN; soft black mud, few rocks, large crinoids; T3086; NMSA–MOL 0C8823.

South Africa •3 Eastern Cape, off Mbashe River, 32°23.6'S, 28°59.2'E, depth 295–350 m, station Q17; 6 Jul. 1985; dredged MN; coarse sand; T3087; NMSA–MOL 0C9096.

South Africa • 5 of 6; KwaZulu-Natal, off Umlaas Canal, 30°02.2'S, 31°03.9'E, depth 250 m, station XX67; 9 Jul. 1985; dredged MN; coarse sand; T3085; NMSA–MOL 0D1421.

South Africa • 4 of 8 or 7; KwaZulu-Natal, off Amanzimtoti, 30°04.7'S, 31°03.3'E, depth 300–305 m, station XX66; 9 Jul. 1985; dredged MN; medium sand; T3084; NMSA–MOL 0D1312.

Current status. *Cornisepta onychoides* (Herbert & Kilburn, 1986); McLean and Geiger (1998); Herbert (2015).

Remarks. One paratype (T3085/NMSA–MOL 0D1421) was sent to Zoological Museum of Moscow University in 1990. Two, of supposedly eight, paratypes (T3084/NMSA–MOL 0D1312) have been sent to NHMUK (registration number: NHMUK 1986088) and one from the same lot, – to Humboldt University, Berlin (however, probably due to initial miscount, only four, not five, remain in NMSA).

Puncturella (*Puncturella*) *voraginosa* Herbert & Kilburn, 1986

voraginosa Herbert & Kilburn, 1986: 18, figs 66–70 [*Puncturella* (*Puncturella* s.l.), off Port Grosvenor, Transkei (29°57.6'S, 31°26.2'E) [sic], 100–115 m, sand, some mud, solitary corals and shells. Dredged MN: 2.3×1.7 mm, height 1.3 mm].

Material examined. ***Holotype*.** South Africa • Eastern Cape, off Port Grosvenor, 31°26.2'S, 29°57.6'E, depth 100–115 m, station D3; Aug. 1981; dredged MN; sand, some mud, solitary corals, shells; T3020; NMSA–MOL 0C1296; Fig. 13 (2.38×1.82×1.32 mm).

***Paratypes*.** South Africa • Eastern Cape, off Rame Head, 31°56.1'S, 29°26.5'E, depth 410–430 m, station K13; 20 Jul. 1982; dredged MN; stones, some sand; T3019; NMSA–MOL 0C7045.

South Africa • same data as paratype NMSA–MOL 0C7045; T3032; NMSA–MOL 0C7203.

South Africa • same data as paratype NMSA–MOL 0C7045; T3089; NMSA–MOL 0C7998.

South Africa • Eastern Cape, off Mgazi River, depth 180 m, 31°44.7'S, 29°33.7'E, station J1; 4 Jul. 1985; dredged MN; soft mud; T3040; NMSA–MOL 0C7355.

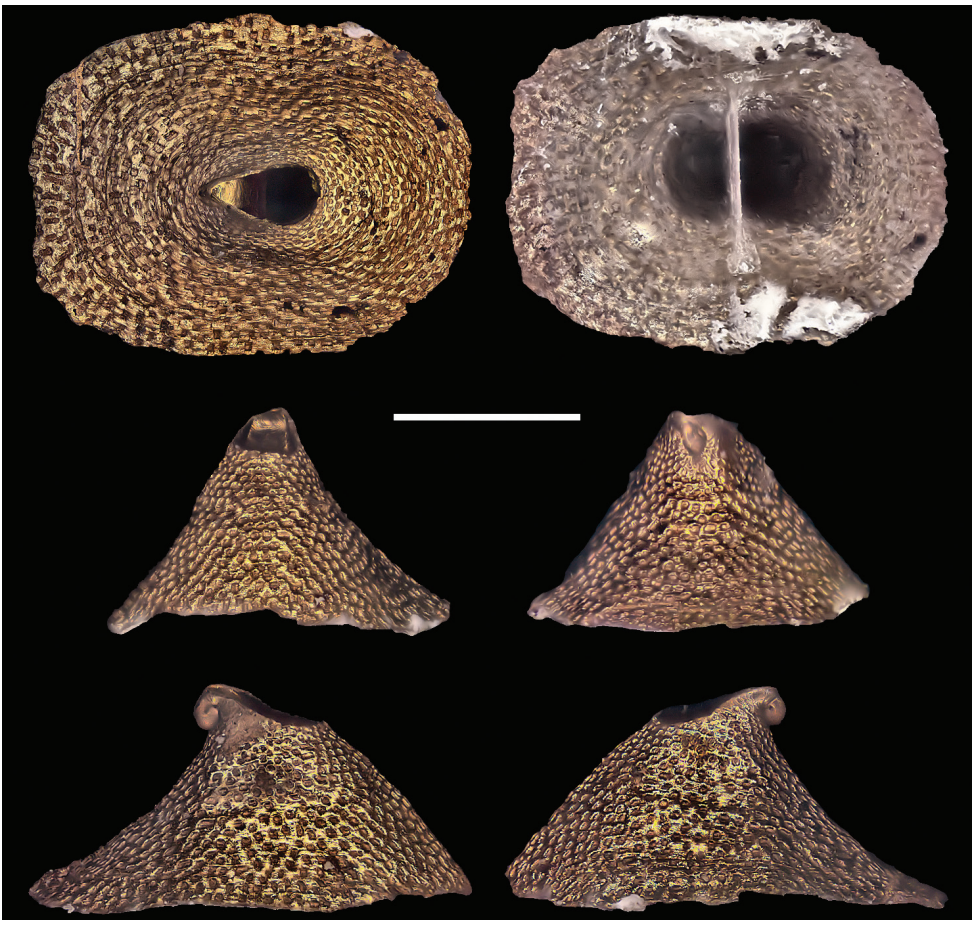

Figure 13. *Puncturella* (*Puncturella*) *voraginosa* Herbert & Kilburn, 1986. Holotype T3020/NMSA-MOL 0C1296. Scale bar: 1 mm.

South Africa • Eastern Cape, off Mgazi River, 31°44.8'S, 29°33.0'E, depth 370 m, station J8, 4 Jul. 1985; dredged MN; soft black mud, few rocks, large crinoids; TI083; NMSA–MOL 0C8824.

Current status. *Profundisepta voraginosa* (Herbert & Kilburn, 1986); Herbert (2015).

Remarks. South and East were reversed for the coordinates in the original description (that would place type locality to incorrect position ~40 km ESE off Durban at 438 m depth).

Puncturella (*Granopsis*) *serraticosta* Herbert & Kilburn, 1986

serraticosta Herbert & Kilburn, 1986: 20, figs 71–74 [*Puncturella* (*Cranopsis*), off Shixini Point, Transkei (32°31.6'S, 28°53.0'E), 500 m. Dredged MN: 10,0×6,9 mm, height 6,4 mm].

Material examined. ***Holotype.*** South Africa • Eastern Cape, off Shixini point, 32°31.6'S, 28°53.0'E, depth 500 m; station T17; 13 Jul. 1984; dredged MN; muddy sand, coral rubble; T3013; NMSA–MOL 0C7064; Fig. 14 (10×6.9×6.5 mm).

Paratypes. South Africa • same data as holotype; T3014; NMSA–MOL 0C7155.

Current status. *Puncturella serraticosta* Herbert & Kilburn, 1986; original combination.

Remarks. Another set of dimensions of the holotype is indicated in the figure caption of the original description: "9.9×6.9 mm, height 6.3 mm". *Cranopsis* A. Adams, 1860 has been synonymised with *Puncturella* R. T. Lowe, 1827 (Cunha et al. 2019).

Subfamily Rimulinae Anton, 1838

Rimula rhips Herbert & Kilburn, 1986

rhips Herbert & Kilburn, 1986: 25, figs 84–86 [*Rimula*, off Port Grosvenor, Transkei (39°57.2'S, 31°25.9'E) [sic], 120–128 m, coarse sand, some mud, solitary coral, shells. Dredged MN: 9.4×6.7×height 4.1 mm].

Material examined. ***Holotype.*** South Africa • Eastern Cape, Port Grosvenor, 31°25.9'S, 29°57.9'E, depth 120–128 m, station D2; Aug. 1981; dredged MN; coarse sand, some mud, solitary coral, shells; T3018; NMSA–MOL 0C1192; Fig. 15 (9.33×6.67×3.87 mm).

Current status. *Rimula rhips* Herbert & Kilburn, 1986; original combination.

Remarks. The coordinates in the original description were incorrectly recorded; latitude and longitude were swopped, and it should be 29°E instead of 39°S. Subsequent to the original description, at which time *Rimula rhips* was only known by a single specimen, this species has been collected between 40 and 128 m deep up to Boteler Point, 27°01.1'S, 32°55.2'E, close to the border between South Africa and Mozambique.

Subfamily Fissurellinae J. Fleming, 1822

Amblychilepas platyactis McLean & Kilburn, 1986

platyactis McLean & Kilburn, 1986: 9–11, figs 3 (paratype), 24 (holotype), 25 (paratype NMSA 6769/T3009) [*Amblychilepas*, Port Alfred, Eastern Cape Province, South Africa, collected by R. Kilburn,1966: 17.2×10.3×3.9 mm].

Material examined. ***Holotype.*** South Africa • soft parts in ethanol; Eastern Cape, Port Alfred; collected by R. Kilburn, 1966, donated in Sep. 1969; T2744; NMSA–MOL 0B6397; Fig. 16 (16.8×10.13×4 mm).

Paratypes. South Africa • soft parts in ethanol; Western Cape: Cape Peninsula, Kommetjie, C.M. Connolly leg.; T3008; NMSA-MOL 0B9916.

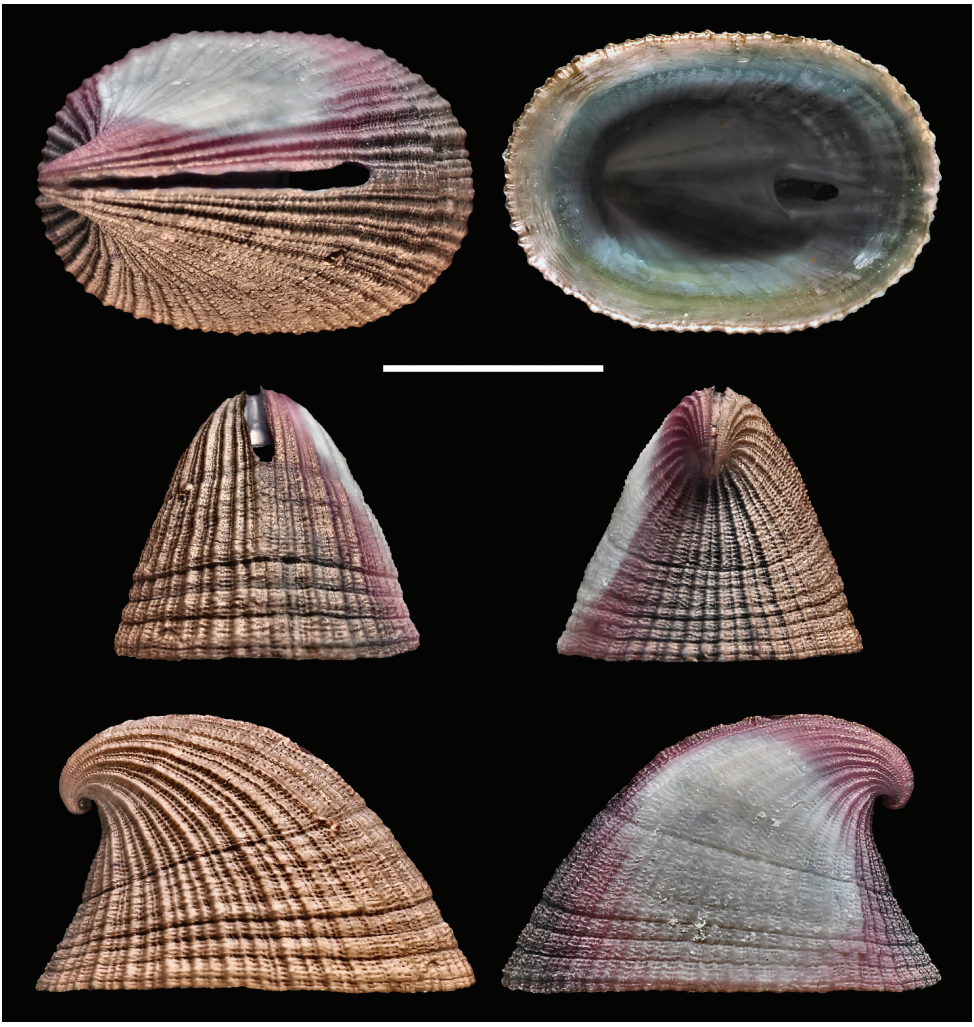

Figure 14. *Puncturella* (*Granopsis*) *serraticosta* Herbert & Kilburn, 1986. Holotype T3013/NMSA-MOL 0C7064. Scale bar: 5 mm.

South Africa • 1 of 3, soft parts in ethanol; Eastern Cape, E. of East London, Kwelera; C.M. Connolly leg.; T3058; NMSA–MOL 0B9929; SEM of radula (largest); alc. vial also contains radula pieces; figured (fig. 3) in the original description.

South Africa • 6; Western Cape, False Bay, Simonstown, C.M. Connolly leg.; T3009; NMSA-MOL 006769; figured (fig. 25) in the original description.

Current status. *Amblychilepas platyactis* McLean & Kilburn, 1986; original combination.

Remarks. It could be difficult to recognise anterior and posterior ends in a side view of a shell of this species. The original description states that shell is "slightly narrowed anteriorly" (McLean and Kilburn 1986: 9) that makes it flatter (not higher) posteriorly. Only one of three of paratypes T3058/NMSA–MOL 0B9929 is in NMSA.

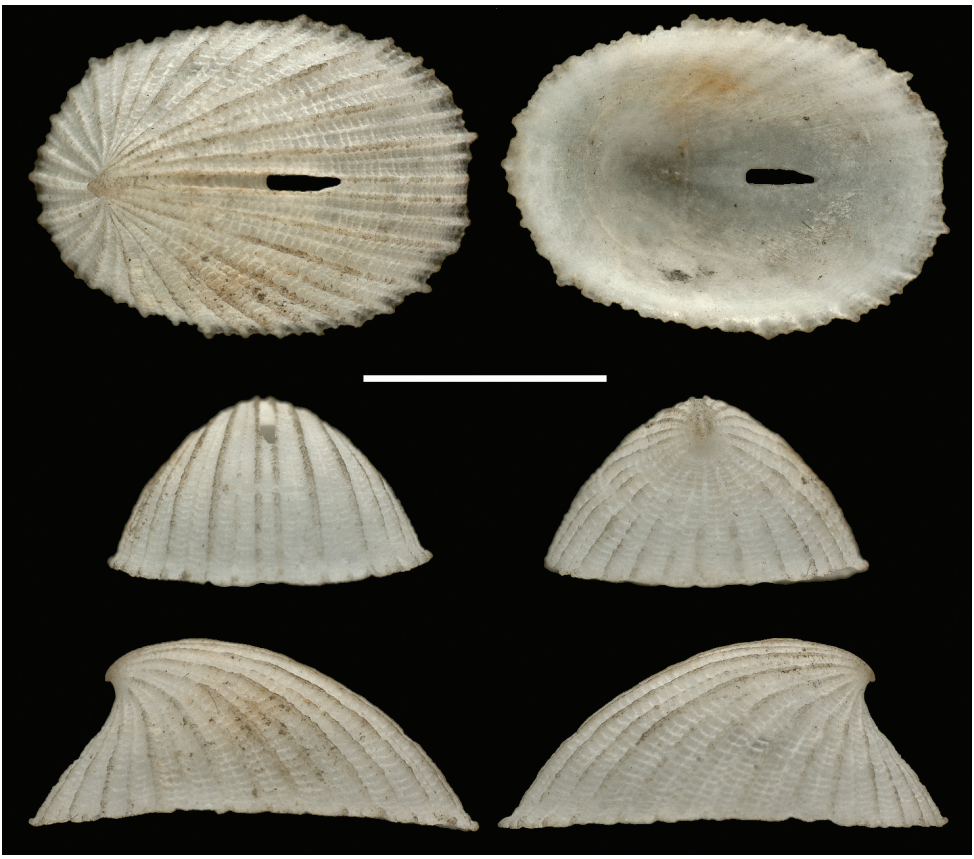

Figure 15. *Rimula rhips* Herbert & Kilburn, 1986. Holotype T3018/NMSA-MOL 0C1192. Scale bar: 5 mm.

Superfamily Scissurelloidea Gray, 1847
Family Anatomidae McLean, 1989

***Scissurella agulhasensis* Thiele, 1925**

agulhasensis Thiele, 1925: 41(7), Pl. 13(I), fig. 2 [*Scissurella*, From station 104 (35°16'S, 22°26.7'E, 155 m, in the Agulhas current (S.S. Valdivia): diameter 2.5 mm].

Material examined. ***Neotype.*** South Africa • Eastern Cape, off Mtamvuna River, 31°09.7'S, 30°15.3'E, depth 120–140 m, station A7; Aug. 1981; dredged MN; sponge rubble; T1916; NMSA–MOL 0W181 (ex NMSA C7967); Fig. 17 (2.28×2.1×2.1 mm).

Current status. *Anatoma agulhasensis* (Thiele, 1925); Geiger (2012).

Remarks. Neotype designated by Geiger and Jansen (2004: 6) because three syntypes hosted in the Zoological Museum Berlin were destroyed through Bynesian decay. Neotype was separated from NMSA C7967 (figured by Herbert 1986: 611–613, figs 3, 12, 14). Re-described by Geiger in 2012.

Figure 16. *Amblychilepas platyactis* McLean & Kilburn, 1986. Holotype T2744/NMSA-MOL 0B6397. Scale bar: 10 mm.

Anatoma yaroni Herbert, 1986

yaroni Herbert, 1986: 610, 613–617, figs 1, 2 (radula), 4 (paratype), 15,17 (paratype), 16 (holotype) [*Anatoma*, off Shixini Point, Transkei (32°31.7'S, 28°52.7'E), 490 m, muddy sand, coral rubble (dredged *Meiring Naudé*): 4.5×n/d×3.8 mm].

Material examined. ***Holotype.*** South Africa • Eastern Cape, off Shixini point, 32°31.7'S, 28°52.7'E, depth 490 m, station T18, 13 Jul. 1984; dredged MN; muddy sand, coral rubble; T3258; NMSA–MOL 0C6590; Fig. 18 (4.46×3.85×4 mm).

Paratypes. South Africa • same data as holotype; T3259; NMSA–MOL 0C9515.

South Africa • Eastern Cape, off Qora River, 32°35.4'S, 28°49.2'E, depth 450–460 m, station U15; 14 Jul. 1984; dredged MN; sandy mud; T3260; NMSA–MOL 0C6641.

South Africa • Eastern Cape, off Whale Rock, 32°02.0'S, 29°21.8'E, depth 430–450 m, station M19; 3 Jul. 1985; dredged MN; fine muddy sand, T3261; NMSA–MOL 0C9514.

South Africa • Eastern Cape, off Whale Rock, 32°00.9'S, 29°21.8'E, depth 400–420 m, station M7; 20 Jul. 1982; dredged MN; coarse sand, old shell debris, stones; T3262; NMSA–MOL 0C2046.

South Africa • 3; Eastern Cape, off Rame Head, 31°57.3'S, 29°25.5'E, depth 380 m, station K14; 20 Jul. 1982; dredged MN; coarse sand, old shell debris; T3263; NMSA–MOL 0C9512.

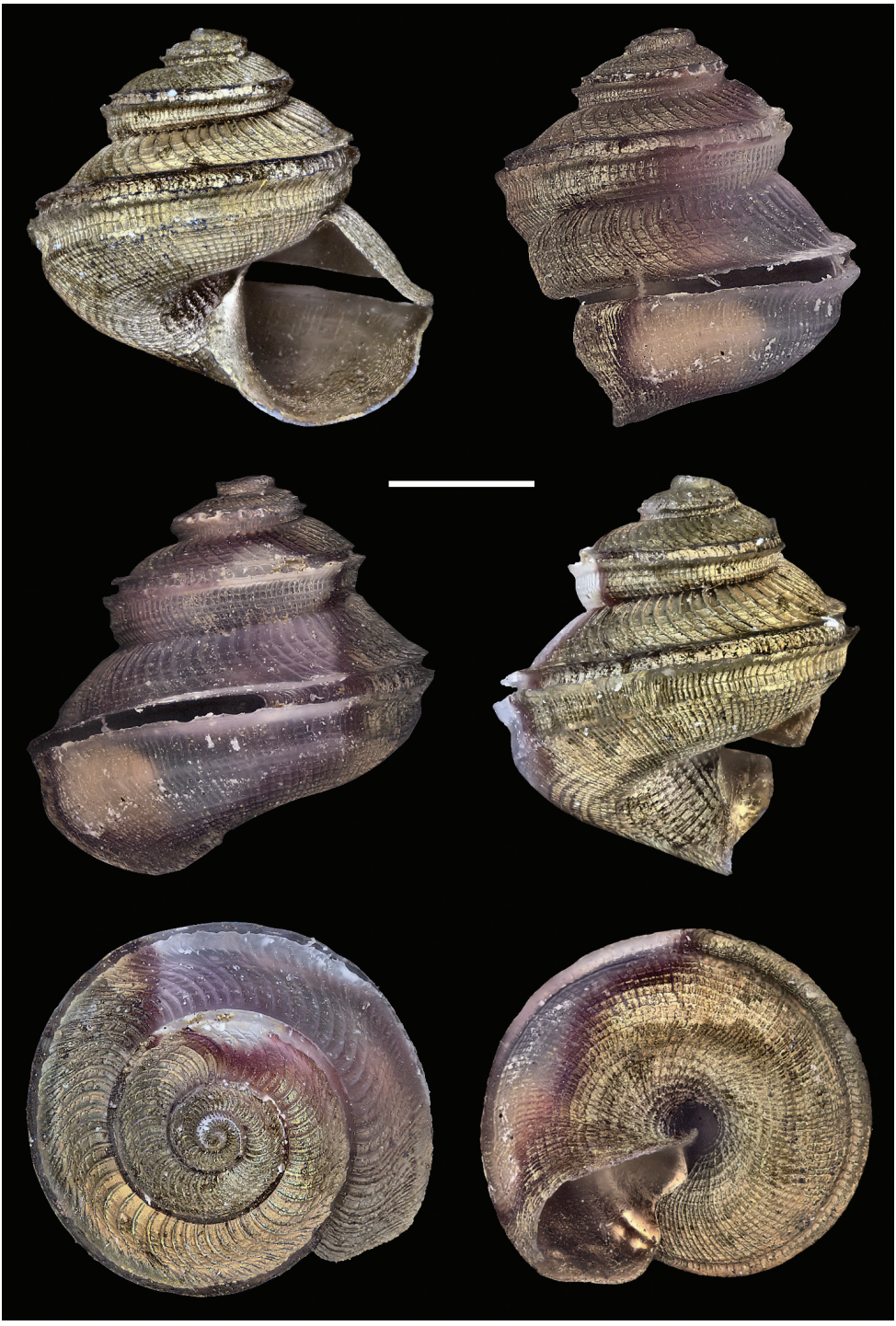

Figure 17. *Scissurella agulhasensis* Thiele, 1925. Neotype T1916/NMSA-MOL 0W181. Scale bar: 1 mm.

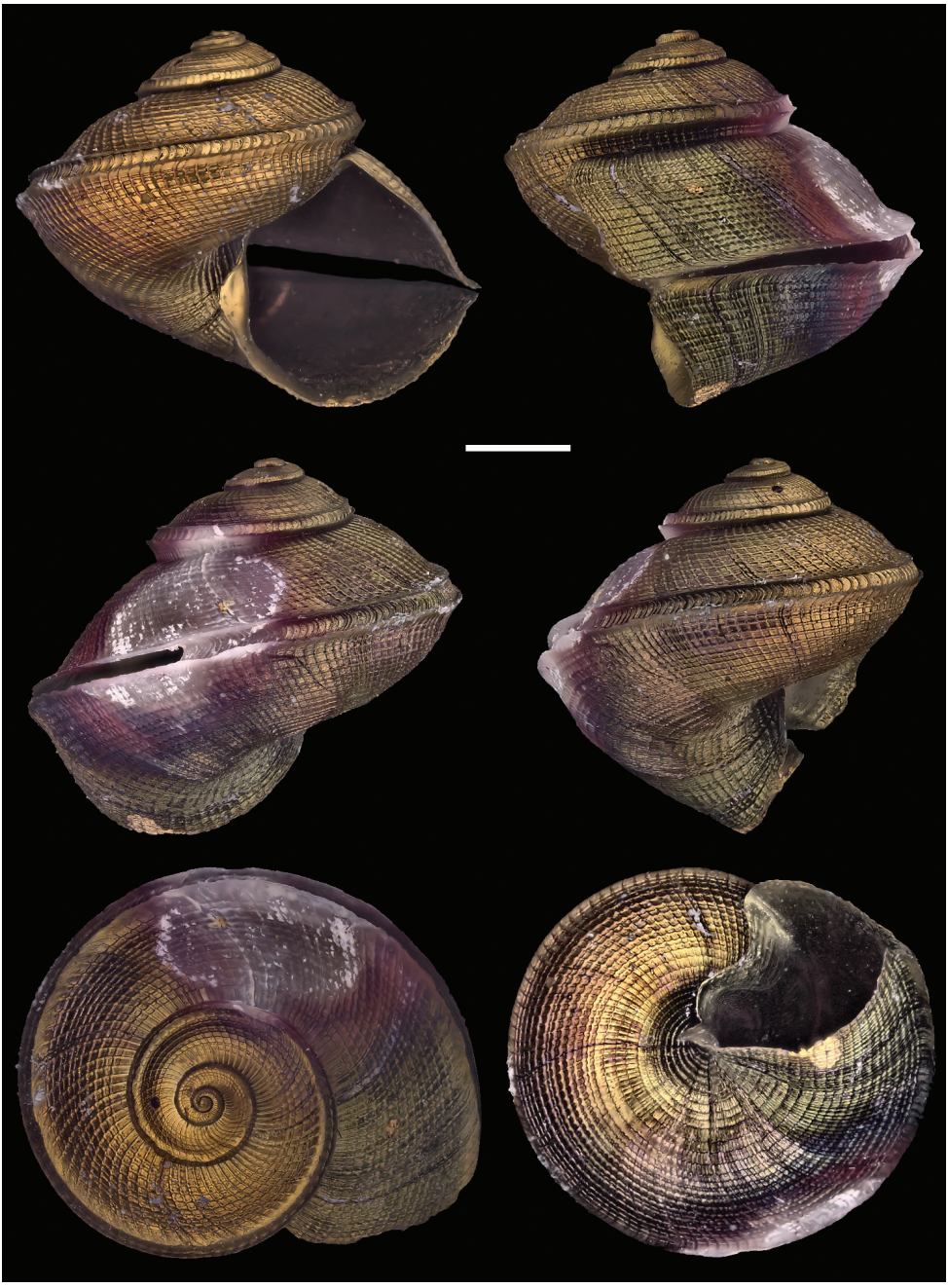

Figure 18. *Anatoma yaroni* Herbert, 1986. Holotype T3258/NMSA-MOL 0C6590. Scale bar: 1 mm.

South Africa • 3; Eastern Cape, off Stony Point, 32°37.8'S, 28°45.9'E, depth 395 m, station V7; 14 Jun. 1983; dredged MN; sponge and stone; T3264; NMSA–MOL 0C9511.

South Africa • 2; Eastern Cape, off Kei River, 32°50.0'S, 28°33.0'E, depth 450 m, station Z7; 14 Jul. 1984; dredged MN; muddy sand with stones; T3265; NMSA–MOL 0C6904; figured (figs 15, 17) in the original description.

South Africa • 2; Eastern Cape, off Qolora River, 32°47.6'S, 28°36.6'E, depth 510 m, station W13; 14 Jul. 1984; dredged MN; sandy mud; T3266; NMSA–MOL 0C7010.

South Africa • Eastern Cape, off Mendu Point, 32°22.0'S, 29°01.2'E, depth 405–420 m, station R8; 8 Jun. 1983; dredged MN; fine sand; T3267; NMSA–MOL 0C4991.

South Africa • Eastern Cape, off Mbashe River, 32°23.6'S, 28°59.2'E, depth 295–350 m, station Q17; 6 Jul. 1985; dredged MN; coarse sand; T3268; NMSA–MOL 0C9513.

South Africa • 2; Eastern Cape, off Nthlonyane River, 32°17.4'S, 29°05.6'E, depth 340–450 m, station P12; 5 Jul. 1985; dredged MN; dead *Dendrophyllia*; T3269; NMSA–MOL 0C8604.

South Africa • Eastern Cape, off Whale Rock, 32°02.3'S, 29°19.9'E, depth 350 m, station M15; 3 Jul. 1985; dredged MN; fine muddy sand; T3270; NMSA–MOL 0C9414; figured (fig. 4) in the original description.

South Africa • 12; Eastern Cape, off Shixini Point, 32°31.6'S, 28°53.0'E, depth 500 m, station T17; 13 Jul. 1984; dredged MN; muddy sand, coral rubble; T3256 NMSA–MOL 0C9534.

South Africa • 8; same data as holotype; T3257; NMSA–MOL 0C9535.

Current status. *Anatoma yaroni* Herbert, 1986; original combination.

Remarks. Radula, illustrated on the figures 1, 2 in the original publication, is from the specimen NMSA–MOL 0C9007 listed in the "Additional material" on the page 615 of the original publication (David G. Herbert, personal communication).

Family Scissurellidae Gray, 1847

***Scissurella maraisorum* Geiger, 2006**

maraisorum Geiger, 2006: 10–11, figs 7 (holotype), 8 (paratypes) [*Scissurella*, 20 m, Aliwal Shoal, KwaZulu-Natal south coast, Republic of South Africa. June 2003. 30.250°S, 30.817°E (col. J.P. and A.P. Marais): 0.72 mm].

Material examined. ***Holotype.*** South Africa • KwaZulu-Natal, Aliwal Shoal, 30.2507°S, 30.8177°E, depth 20 m; SCUBA diving, don. D. Geiger, 28 Mar. 2006; T1616; NMSA–MOL 0W3498; Fig. 19 (Larger diameter: 0.74 mm).

Paratypes. South Africa • 2; same data as holotype; T1617; NMSA–MOL 0W3499.

Current status. *Scissurella maraisorum* Geiger, 2006; original combination.

Remarks. The shell of the holotype is attached to the gelatine capsule and was not photographed to avoid possible damage. Visual examination confirms that it is the shell illustrated in the original description and larger diameter was measured using

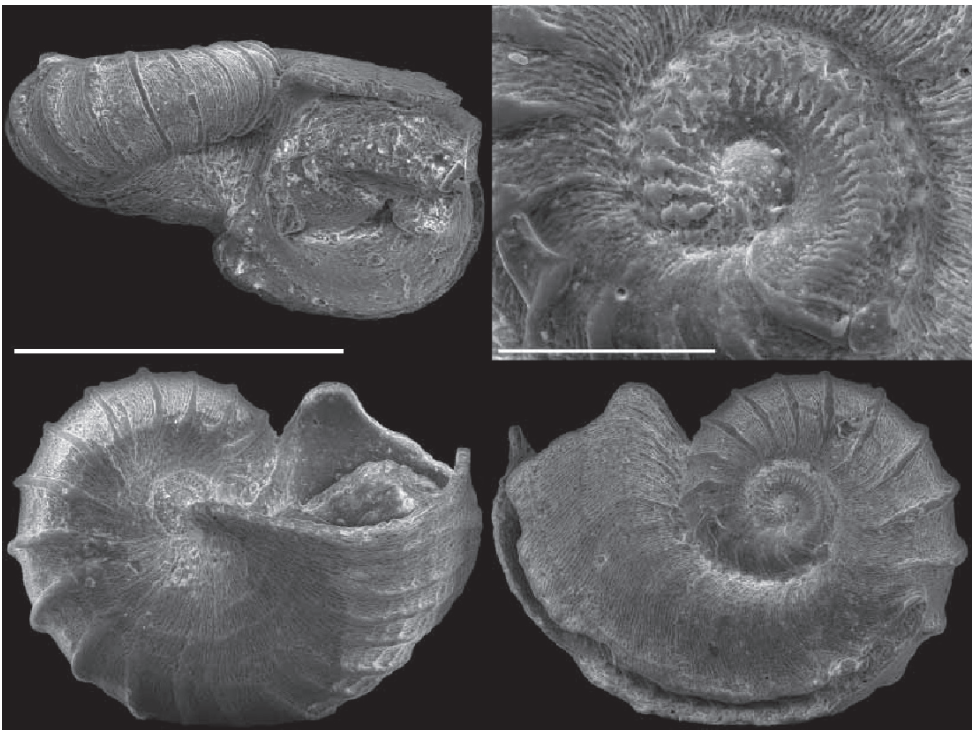

Figure 19. *Scissurella maraisorum* Geiger, 2006. Holotype T1616/NMSA-MOL 0W3498. Scale bars shell: 500 μm, protoconch: 100 μm. After Geiger (2006: 10, figure 7).

ocular micrometer, through the gelatine capsule. There are nine paratypes in other collections (see Geiger 2006: 10), all from the type locality. Coordinates were incorrectly rounded up in the original description.

Sinezona doliolum Herbert, 1986

doliolum Herbert, 1986: 625–626, figs 9, 28, 30 (holotype), 29, 31 (paratype) [*Sinezona*, off Mncwasa Point, Transkei (32°06.2'S, 29°06.5'E), 68 m, sand (dredged MN): diameter 0.9 mm, height 1.0 mm].

Material examined. ***Holotype*.** South Africa • Eastern Cape, off Mncwasa Point, 32°06.2'S, 29°06.5'E, depth 68 m, station N8; 19 Jul. 1982; dredged MN; sand; T3274; NMSA–MOL 0C8471; Fig. 20 (0.98×0.84×0.98 mm).

***Paratypes*.** South Africa • Eastern Cape, off Ubombo, 31°55.3'S, 29°21.4'E, depth 96 m, station L6; 16 Jul. 1982; dredged MN; sand and gravel, T3275; NMSA–MOL 0C7987; figured (figs 29, 31) in the original description.

Figure 20. *Sinezona doliolum* Herbert, 1986. Holotype T3274/NMSA-MOL 0C8471. Scale bar: 1 mm.

Figure 21. *Sukashitrochus maraisi* Herbert, 1986. Holotype T3271/NMSA-MOL 0D684. Scale bar: 1 mm.

South Africa • same data as holotype; T3276; NMSA–MOL 0C8470.

South Africa • 6; Eastern Cape, off Mtamvuna River, 31°08.6'S, 30°15.8'E, depth 106 m, station A11; 18 Aug. 1981; dredged MN some stones; T3277; NMSA–MOL 0C8020.

Current status. *Sinezona doliolum* Herbert, 1986; original combination.

Remarks. The damage to the shell of the holotype was first discovered in March 2012 by the first author and the part that was broken off was not located. In the original description the damage cannot be assessed because of the position of the shell. Diameter in the figure captions 28 and 30 in the original description is 0.95 mm.

***Sukashitrochus maraisi* Herbert, 1986**

maraisi Herbert, 1986: 629–631, figs 6, 37, 39 (holotype), 36, 38 (paratype) [*Sukashitrochus*, Mzamba, Transkei, beach drift (Marais 1976): diameter 1.5 mm, height 1.1 mm].

Material examined. ***Holotype*.** South Africa • Eastern Cape, Mzamba, beach drift; J.P. Marais leg.; Apr. 1976 (don. 6 May 1976; T3271; NMSA–MOL 0D0684; Fig. 21 (1.48×1.28×1.07 mm).

***Paratypes*.** South Africa • 2 same data as holotype; T3272; NMSA–MOL 0D0686.

South Africa • 2 same data as holotype; T3273; NMSA–MOL 0D0685; figured (figs 36, 37) in the original description.

South Africa • 10; Eastern Cape, Mzamba, beach drift; 12–30 May 1986; D. Herbert and R. Kilburn leg.; T3368; NMSA–MOL 0D3483.

Current status. *Sukashitrochus dorbignyi* (Audouin, 1826); Herbert (2015).

Remarks. Diameter in the figure captions 37 and 39 in the original description is 1.45 mm. Four paratypes mentioned in the original description collected at Mzamba, Eastern Cape are in the J. Marais collection and were not examined here.

Acknowledgements

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