

Research article

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A new species of *Ischnostomiella* Krikken, 1978 from the Limpopo Province of South Africa (Scarabaeidae: Cetoniinae, Xiphoscelidini)

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Abstract

A female putative specimen of “*Ischnostoma luridipennis* Burmeister, 1842” from northern South Africa (Limpopo) was recently studied by the authors among material traced and housed temporarily in the Windhoek Museum (Namibia), as part of an old and unrecorded loan from the Zoology Museum of the Lund University (Sweden). A close analysis of this specimen has revealed that it actually represents a new species of *Ischnostomiella* Krikken, 1978, here described as *I. rudebecki* sp. nov. The new species differs from the two other species currently known in this genus, *I. denticeps* Krikken, 1978 and *I. weneri* Beinholdner, 2005, mainly by its remarkable testaceous-orange colour, its clypeal U-shape, the poorly developed elytral costae and the complete absence of any brown cretaceous maculation. The species appears to be myrmecophilous, the holotype having been retrieved from a pugnacious ant [*Anoplolepis custodiens* (Smith, 1858)] nest, and the known distribution thus far is the lowveld of the Limpopo Province in north-eastern South Africa.

Key words: Fruit chafers, biodiversity, endemic species, Afrotropical Region, southern Africa, myrmecophily.

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Introduction

In his account of the results of the Swedish Expedition to Southern Africa undertaken during the period 1950-1951, Schein (1960) reported the description of a female specimen attributed to the Ichneostomina species “*Ischnostoma luridipennis* Burmeister, 1842”, collected near Pietersburg (now Polokwane) in the Limpopo Province of South Africa by Dr Gustaf Rudebeck. The specimen was not illustrated in this report, and later on Holm (1992) in his revision of the genus *Ichneostoma* Gory & Percheron, 1833 concluded that the specimen should belong to the newly described *I. stobbiai* Holm, 1992, since the distribution of *I. luridipennis* was by then known to be restricted to the north-eastern Cape region. Both species, along with another six have recently been placed within the newly described genus *Mzansica* Perissinotto, 2020, which is regarded to be essentially endemic to South Africa. Perissinotto (2020) also mentioned this specimen in his review and came to the conclusion that biogeographically it could

not represent any of the *Mzansica* species known at that stage, and therefore most likely represented a new species.

The repository of the above specimen was not specifically stated by Schein (1960) and Holm (1992) referred to it simply as “(teste Schein 1961: 90)”. It was obviously originally housed in the Zoology Museum of the University of Lund, Sweden (MZLU), but it has now been found at the National Museum of Namibia, Windhoek (SMWN) in a box belonging to that institution as part of a large loan of unreturned material taken by Eugene Marais during the 1980s-1990s from worldwide collections, in order to complete his work on the Cetoniinae of southern Africa with Erik Holm. It is fortunately in good condition to allow an adequate description of what is certainly an extremely interesting species of *Ischnostomiella* Krikken, 1978, yet unknown to science.

The genus *Ischnostomiella* was erected by Krikken (1978) to accommodate the unique characteristics of a specimen originating from Windhoek, Namibia. It was initially placed within the Ichneostomina (Goliathini) and

subsequently moved along with its sister genus *Protoclitia* Krikken, 1978 to the Xiphoscelidini by Krikken (1984) himself. This tribe exhibits a number of key pleiomorphic characters, including lack of a distinct mesometasternal protrusion and other derivative features as well as presence of subcontiguous middle coxae and extremely shallow posthumeral emarginations (Krikken, 1984). Thus, species are of extraordinary importance, in terms of the general phylogeny and taxonomy of the Cetoninae. The new species is hereby described as *I. rudebecki* sp. nov., along with a review of the only other two species currently included in the genus *Ischnostomiella*, namely *I. denticeps*, Krikken, 1978 and *I. weneri* Beinhundner, 2005.

Materials and Methods

Specimens for comparative taxonomic revision were either analysed directly or through high-resolution photographic material kindly provided by the curators or owners of the collections where they are currently deposited. Original collecting data accompanying each specimen were also obtained from key holders of material of interest.

Taxonomic as well as distribution and ecological data were obtained from key literature sources providing quality illustrations and collecting data, mainly Schein (1960), Krikken (1978), Holm & Marais (1992), Sakai & Nagai (1998) and Beinhundner (2005, 2017). For each taxon, data records are reported with the number of individuals and their respective sex, if verified. Otherwise, such details are omitted and only a generalized reference to an unspecified number (n) of individuals (inds) is given.

The specific terminology used by Krikken (1984) and Holm and Marais (1992) for the Cetoninae morphology is followed in this study for the description of specimen characters. Total individual length (TL) and maximum width (MW) were measured using a Vernier calliper, from the anterior margin of the clypeus to the apex of the pygidium and at the widest point of the elytra, respectively. Photos of specimen dorsal, lateral and ventral habitus were taken with an Amscope MU500-HS digital microscope camera attached to an Olympus SZ51 dissecting microscope. In order to increase the clarity of resolution, the background, pin holes and other disruptive features were removed from each photo using Microsoft Word 2010 (Picture Tools). The camera's built-in AmLite software was used to obtain z-stacking composite images.

Specimen repositories are abbreviated as follows:
 BMCS—Jonathan Ball and Andre Marais Private Collection, Cape Town, South Africa;
 GBEG—Gerhard Beinhundner Private Collection, Euerbach, Germany;
 KSTJ—Kaoru Sakai Private Collection, Tokyo, Japan;

KWPG—Ex Karl Werner Private Collection, Peiting, Germany;
 MNHN—Museum national d'Histoire naturelle, Paris, France;
 MRAC—Musée Royal de l'Afrique Centrale, Tervuren, Belgium;
 MZLU—Zoology Museum, University of Lund, Sweden;
 NSTJ—Nozomu Sasaki Private Collection, Tokyo, Japan;
 PMBC—Petr Malec Private Collection, Brno, Czech Republic;
 RPS—Renzo Perissinotto Research Material, Gqeberha, South Africa;
 SAMC—Iziko South African Museum, Cape Town, South Africa;
 SANC—South African National Collection, Pretoria, South Africa;
 SMWN—National Museum of Namibia, Windhoek, Namibia;
 SRSF—Sébastien Rojkoff, Sourcieux-les-Mines, France;
 TGMF—Thierry Garnier Private Collection, Montpellier, France;
 TMSA—Ditsong National Museum of Natural History, Pretoria, South Africa;
 ZSMC—Zoologische Staatssammlung München, Munich, Germany.

Results and Taxonomy

Ischnostomiella rudebecki sp. nov.

(Figs 1, 3)

Diagnosis. *Ischnostomiella rudebecki* differs drastically in its chromatic pattern from both species already known in this genus, *I. denticeps* and *I. weneri*, which are black to partially brown-orange (but see exception below, under *I. denticeps*) by comparison with the prevailing testaceous-orange colour of the new species (Figs 1-2). The pronotum of *I. rudebecki* also exhibits apical and basal margins substantially more deflected than observed in either of the two other species, with the apical being markedly concave and the basal convex, rather than straight (Figs 1-2). The clypeal denticles of *I. rudebecki* end up turning slightly outwards, while in the other two species, these are either parallel or inwardly bent, and the apical margin between the denticles is U-shaped in the new species, by comparison with the semicircular shape of *I. weneri* and the V-shape of *I. denticeps* (cf. Beinhundner 2005, figs. 2 and 11). Finally, the presence of poorly developed elytral costae 1-5 in *I. rudebecki* sets this species as intermediate between *I. weneri*, which completely lacks elytral costae and *I. denticeps* which conversely shows a marked development in this area (Figs 1-2; cf. Beinhundner 2005, figs 4 and 13). On the other hand, the extremely short protibial spur of *I. rudebecki*, combined with the rather marked convexity of the lateral margins of its pronotum, makes it closer to *I. weneri* than to *I. denticeps*, as perhaps already suggested by their respective geographic distributions (Fig. 3).

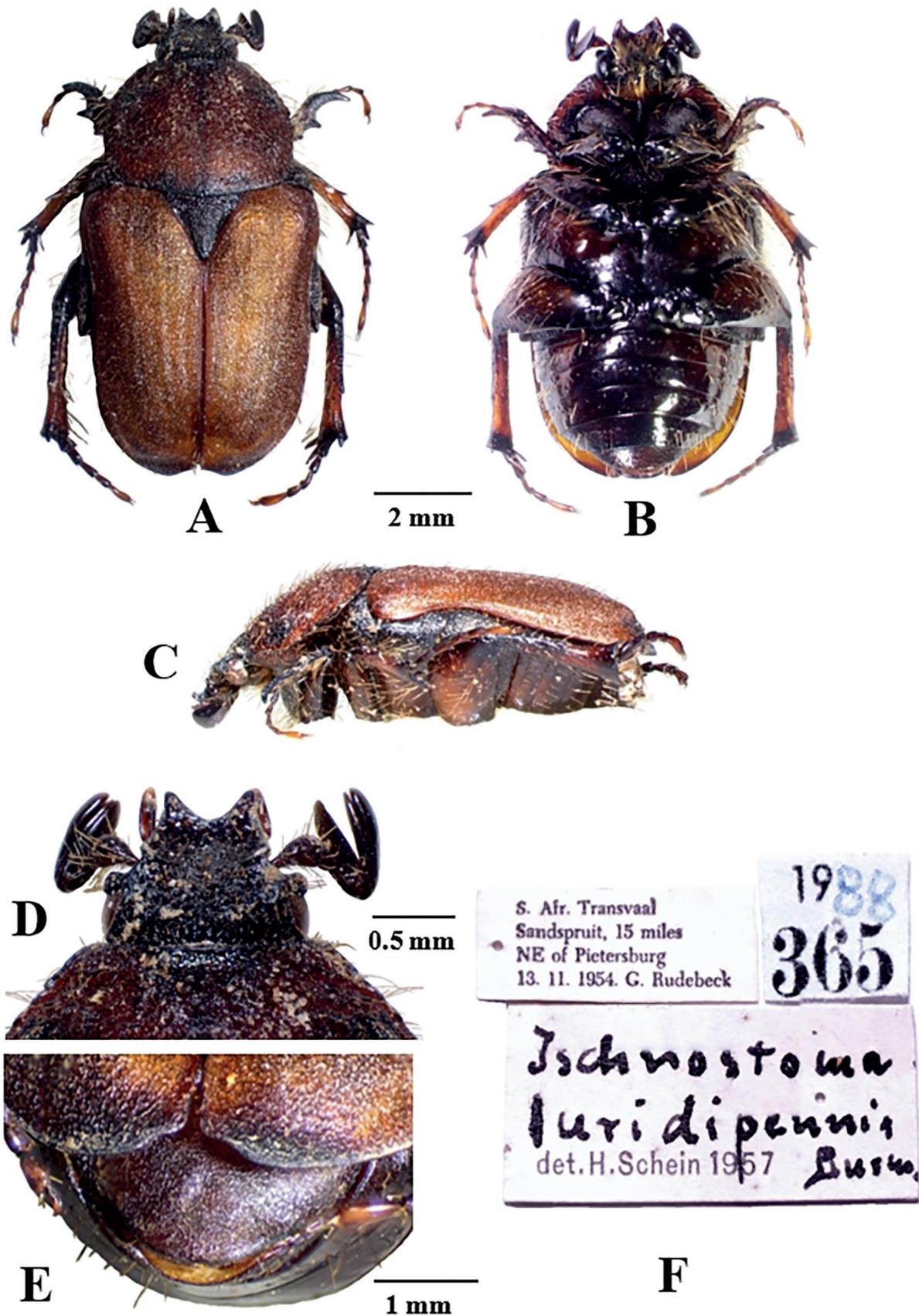


Fig. 1 – *Ischnostomiella rudebecki* sp. nov., Holotype ♀: A) dorsal habitus; B) ventral habitus; C) lateral habitus; D) clypeus; E) pygidium; F) specimen labels. Photos: John Irish.

Description of holotype ♀

Size: TL = 9.3 mm; MW = 4.5 mm.

Dorsum. Body shape flattish and moderately elongate, with widest part at margin of humeral callus; testaceous-orange, matte and entirely covered in dense microsculpture; with black prevailing on head, scutellum as well as marginal and apical areas, spreading along median line on pronotum; with long but thin tawny setae across entire surface, most dense on pronotum and margins, becoming shorter along elytral declivities and virtually absent on disc (Fig. 1 A, C).

Head. Black, with dense but minute knobby sculpture and few, scattered but long setae; clypeal surface concave with lateral and anterior margins smoothly upturned, lateral margins initially tapering towards apex, then becoming parallel leading to apical upturned denticles; anterior margin U-shaped; with medium to long tawny setae scattered across entire surface; antennal clubs black to dark brown, approximately as long as pedicel and flagellum combined; pedicel and flagellum black to dark brown with several light setae of medium to long length (Fig. 1 A, C).

Pronotum. Brownish-orange, darker than elytra, with black pigmentation widespread in apical, basal and marginal areas, also flowing down along median line towards disc centre; with median line smoothly hollowed; (Fig. 1 A); with very round lateral margins and median transverse apical ridge thin, but moderately elevated; basal margin smoothly rounded at sides and gently convexing anteriorly of scutellum; with numerous medium length tawny setae, becoming longer along lateral margins and with dense knobby to umbilical microsculpture across entire surface.

Elytra. Testaceous-orange, with black lining along apical margin and declivity; entirely covered in knobby microsculpture (Fig. 1A, C); costae 1-5 poorly raised and barely noticeable, arcuate inwardly; posthumeral arch moderately sinuate and exposing hypertrophic metacoxa below; with few light setae of medium size scattered along lateral and apical declivities, becoming longer along margins.

Scutellum. Triangular equilateral, with smoothly angulate apex and lateral margins slightly concaving at centre; entirely black and completely covered in dense knobby microsculpture and with few tawny setae of medium length; lateral grooves with large incavations at centre, becoming narrow and obsolete around basal and apical margins.

Pygidium. Black to dark brown; hemicircular, smoothly rounded at apex and elongate at base; with deep bilateral depressions on basal corners and shallow elliptical depression at centre; with fine umbilical to rugulose sculpture across entire surface; sparse but rather long tawny setae only along apical margin.

Legs. Protibiae black, but meso- and metatibiae testaceous-orange at centre with black to dark brown base and apex; femora dark brown with orange portions, metafemur hypertrophic; tarsomeres long and slender, black at base (1st) becoming progressively more infused with

testaceous-orange pigmentation to finally entirely testaceous at apex (5th); with long tawny setae scattered on all surfaces, becoming particularly long and dense on inner surfaces of meso- and metatibiae; protibia tridentate, with distal tooth hypertrophic, mid one moderately developed and proximal one extremely reduced, all teeth blunt and smoothly rounded at apex, protibial spur extremely reduced in size and barely noticeable; mesotibia with one sharp and large median outer denticle and set of double denticles at apex, shorter than spurs; metatibia with external carina exhibiting tiny denticles, with last one moderately developed but blunt, also two apical bidentate pairs with fossorial structure, and pair of longer but blunt spurs (Fig. 1 A-C).

Venter. Surface shiny, largely black, becoming brown along margins and on metafemora and metasterna; with sparse, small scattered round punctures exhibiting long tawny setae emerging at centre, mainly on femora, metasterna and edge of abdominal sternites; meso-metasternal process narrow, shiny and glabrous, with mesosternal lobe extremely reduced, with short protuberance protruding slightly downwards; abdominal sternites shiny and moderately convexed at centre, with transverse rows of hemipunctures bearing medium to long tawny, flat setae.

Derivatio nominis. The species is named after Dr Gustaf Rudebeck, co-leader of the Swedish Expedition to Southern Africa and co-author of the book series "South African Animal Life". Dr Rudebeck himself collected the female holotype during a survey in 1954.

Distribution. The holotype ♀ is still the only specimen currently known for this new species and was collected near Polokwane, in the Limpopo Province of South Africa. (Fig. 3).

Type series: Holotype ♀, S. Afr. Transvaal, Sandspruit, 15 miles NE of Pietersburg, 13.11.1954, G. Rudebeck / 1988, 365 / *Ischnostoma luridipennis* Burm., det. H. Schein 1957 (currently in SMWN, to be returned to MZLU via SANC).

Remarks. In his original description of the specimen, Schein (1960) reported that it was collected under stones, within a nest of the pugnacious ant species "*Plagiolepis* (*Zealleyella*) *custodiens*", [currently recognized as *Anoplolepis custodiens* (Smith, 1858)], as identified by H. Andree at the South African Museum in Cape Town. It was also observed that the ants apparently tolerated the beetle, rather than attacking it (Schein 1960).

The type specimen was collected in November, coinciding with the onset of the rainy season in the collection area (Tyson 1991). Apart from the above report of apparent myrmecophily, nothing else is known about the biology of this species and its larval stages remain unknown.

Ischnostomiella denticeps Krikken, 1978

(Figs 2, 3)

Ischnostomiella denticeps Krikken, 1978: 269; Holm & Marais 1992: 17; Sakai & Nagai 1998: 1666; Krajcik 1999: 1; Beinhundner 2005: 79; 2017: 366.

Remarks. The total length of this species ranges from 8 to 12 mm, while its maximum width is 4.5-5.0 mm (Krikken 1978, Beinhundner 2017). The species exhibits a substantial degree of dorsal polychromatism, with most specimens being completely black to dark brown (Fig. 2 A, C), but a

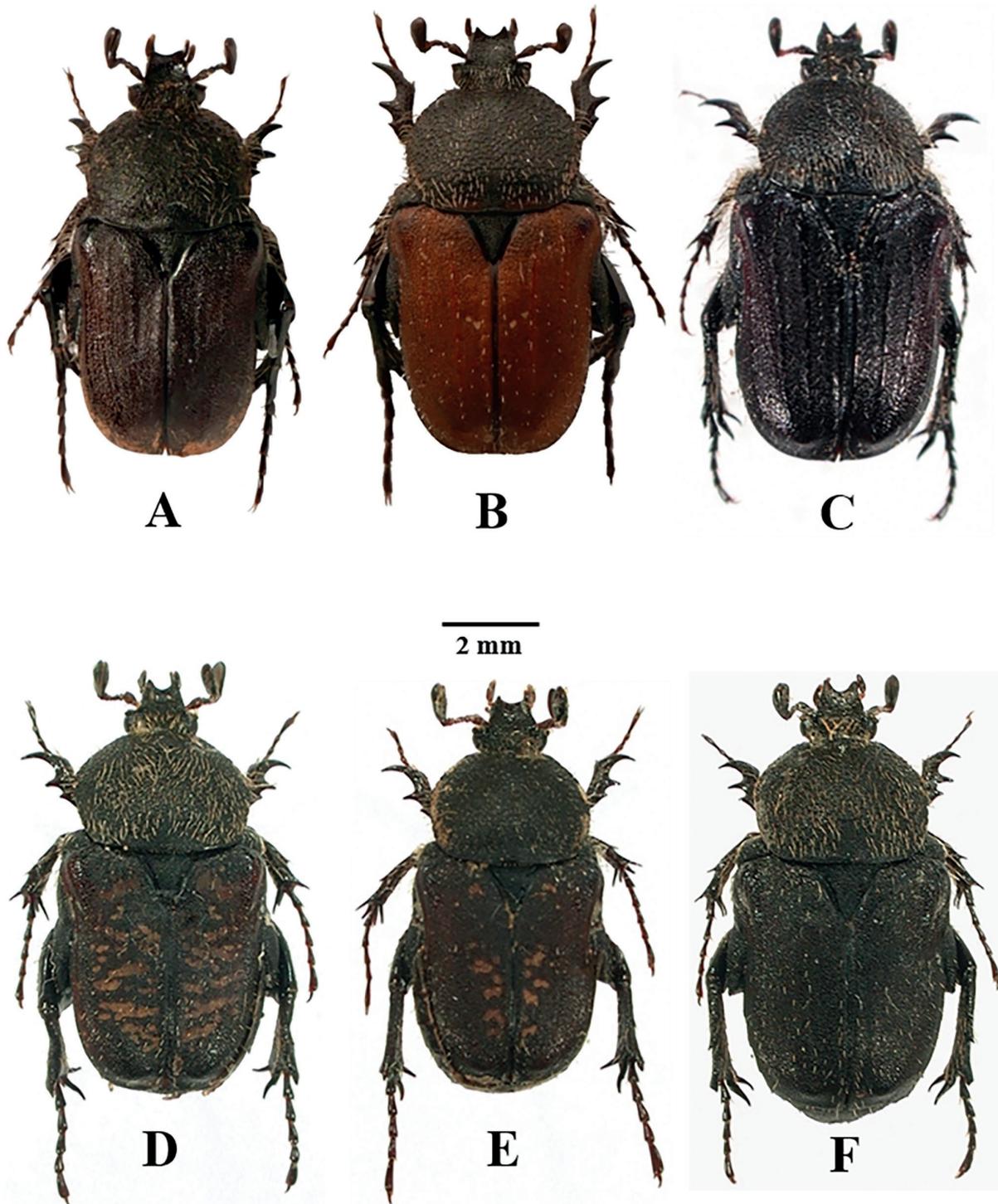


Fig. 2 – A, dark ♂, Namibia, Karibib; B, brown-orange ♂, *ibidem*; C, dark ♀, Namibia, Omaruru. *I. wernerii* Beinhundner, 2005: D, Holotype ♂, Botswana, Gweta; E, Paratype ♂, *ibidem*; F, “allotype” ♀, *ibidem*.

minority actually possessing brown-orange elytra along with a dark pronotum, scutellum and head (Fig. 2 B). One male specimen housed in the SMWN actually resembles closely the dorsal chromatic pattern of *I. rudebecki*, in that it exhibits predominantly testaceous-orange pronotum, elytra, tarsi and tibiae. It differs, however, from the new species in all the other diagnostic characters highlighted above.

The period of adult activity seems centred around late spring to early summer (Nov-Jan), most likely coinciding with the peak period of rainfall in the region. Holm and Marais (1992) reported that females were caught in flight, while Thierry Garnier found his series near Omaruru dead on top of a building roof (pers. comm.). One specimen from Windhoek has actually been found on *Acacia* sp. (= *Vachellia*) flowers, thus suggesting a potential feeding ability. All pre-adult stages of the species remain unknown.

Distribution. The species appears to be restricted to the central mountainous region of western Namibia, from the Khomas Hochland to the Erongoberge (Fig. 3).

Data records. Type series: Holotype ♂, **Namibia (Sudwestafrika)**, Windhoek, SE 22 17 Ca, 18-23.XII.1973, no H15555 (SMWN); Paratype ♂, **Namibia (S.W Africa)**, Okanjande, Burgeon (Sakai & Nagai 1998: Pl. 142, fig. 130; MRAC). Other records: 2 ♂+1 ♀, **Central Namibia**, Reg. Omaruru, Epako Lodge, 01.1996, found dead on a roof, T. Garnier leg. (TGMF); 1 ♂, *ibidem* (RPGS); 2 ♀, *ibidem* (GBEG); 1 ♂+1 ♀, *ibidem*, 01.1997, T. Garnier leg. (TGMF); 2 ♀, *ibidem* (GBEG); 1 ♂, Namibia Central, 28 Km South Karibib, 7.III.2018, S Prepsl leg. (PMBC); 1 ♂, Südwestafrika, Windhoek, S.O. 2217Ca, 6.XII.1970, Akazienblüte, R. Oberprieler, *Ischnostomiella denticeps* m., det. J. Krikken 1981 (SMWN); 1 ♀, *ibidem*, 3.I.1971, im Flug, R. Oberprieler, *Ischnostomiella denticeps* m., det. J. Krikken 1981 (SMWN).

***Ischnostomiella wernerii* Beinhundner, 2005**

(Fig. 2 C, D)

Ischnostomiella wernerii Beinhundner 2005: 78; Beinhundner 2017: 367.

Remarks. The total length of this species ranges from 8 to 12.5 mm, while its maximum width is 4.0-7.0 mm (Beinhundner 2005, Beinhundner 2017). Specimens regularly exhibit a cretaceous maculation on their elytra, which can vary widely in extent (Fig. 2 D-F; cf. also Beinhundner 2017: 367, figs 1-5). Unfortunately, the collectors of the rather numerous type series have not revealed if the specimens were caught in flight, on the ground or otherwise. Like for *I. denticeps*, there is still no knowledge on the immature stages of this species.

Distribution. This species is currently known only from the type locality of Gweta, situated in north-eastern Botswana (Fig. 3).

Data records. Type series: Holotype ♂, Botswana, near Gweta, 30.11.2003, K. Werner & P. Srmrz leg. (TMSA); “allotype” ♀, *ibidem* (TMSA); Paratypes: 1 ♂, *ibidem* (MNHN); 1 ♂, *ibidem* (SAMC); 1 ♂, *ibidem* (SMWN); 1 ♂, *ibidem* (ZSMC); 5 ♂+2 ♀, *ibidem* (GBEG); 20 inds., *ibidem* (KWPG), 4 ♂, *ibidem* (BMCS), 1 ♂, *ibidem* (NSTJ); 1 ♂, *ibidem* (KSTJ); 1 ♂+1 ♀, *ibidem* (RPGS); 1 ♂, *ibidem* (TGMF).

Discussion

As already reported by Krikken (1984) and Holm & Marais (1992), adult Xiphoscelidini generally do not seem to be flower or fruit visitors, but are rather found under herbivore dung or in termite nests. The new species of *Ischnostomiella* Krikken, 1978 described here, adds further information on the ecology of this unusual tribe of the Cetoniinae, in that the holotype female was actually retrieved from a nest of pugnacious ants. Combining this with ecological knowledge gathered for at least three species of *Xiphoscelis* Burmeister, 1842 and one species of *Callophylla* Moser 1916, it is now becoming more evident that members of the tribe may be more strongly associated with fossorial social insects than previously known. Perissinotto & Šípek (2019) reported on the association of *Xiphoscelis schuckardi* Burmeister, 1842, *X. braunsi* Perissinotto & Šípek, 2019 and *X. namibica* Perissinotto, 2019 with the termite *Microhodothermes viator* (Latreille, 1804) (cf. also Péringuey 1907; Holm & Marais 1992; Holm & Stobbia 1995). *Callophylla costata* Moser, 1916 has also been found inside termite nests in southern Cameroon, as already mentioned in Perissinotto (2019).

Some progress has also been achieved on the taxonomic composition and the phylogenesis of the Xiphoscelidini. In his suprageneric reorganization of the Cetoniinae systematics, Krikken (1984) had included as many as 16 genera in this tribe, most of which had previously been grouped with the Ichnestomina in the Goliathini by Schenkling (1921). This cluster comprised not only the proper Afrotropical genera, but also a few genera from the Madagascan subregion and Australia, thereby suggesting a potential new Gondwanaland relationship among the Cetoniinae. However, the same author had warned that a set of common adult synapomorphies could not be found to tie all these genera consistently in one single tribe or subtribe, and therefore further recombinations could be expected as arising from future detailed analyses. Indeed, recent reviews of the Afrotropical region have left within this tribe only three genera in southern Africa, namely, *Ischnostomiella*, *Protoclita* Krikken, 1978 and *Xiphoscelis* (Holm & Marais 1992) and another three in central Africa, namely *Aporecolpa* Lansberge, 1886, *Myodermidius* Bourgoïn, 1920 and *Callophylla* (Sakai & Nagai

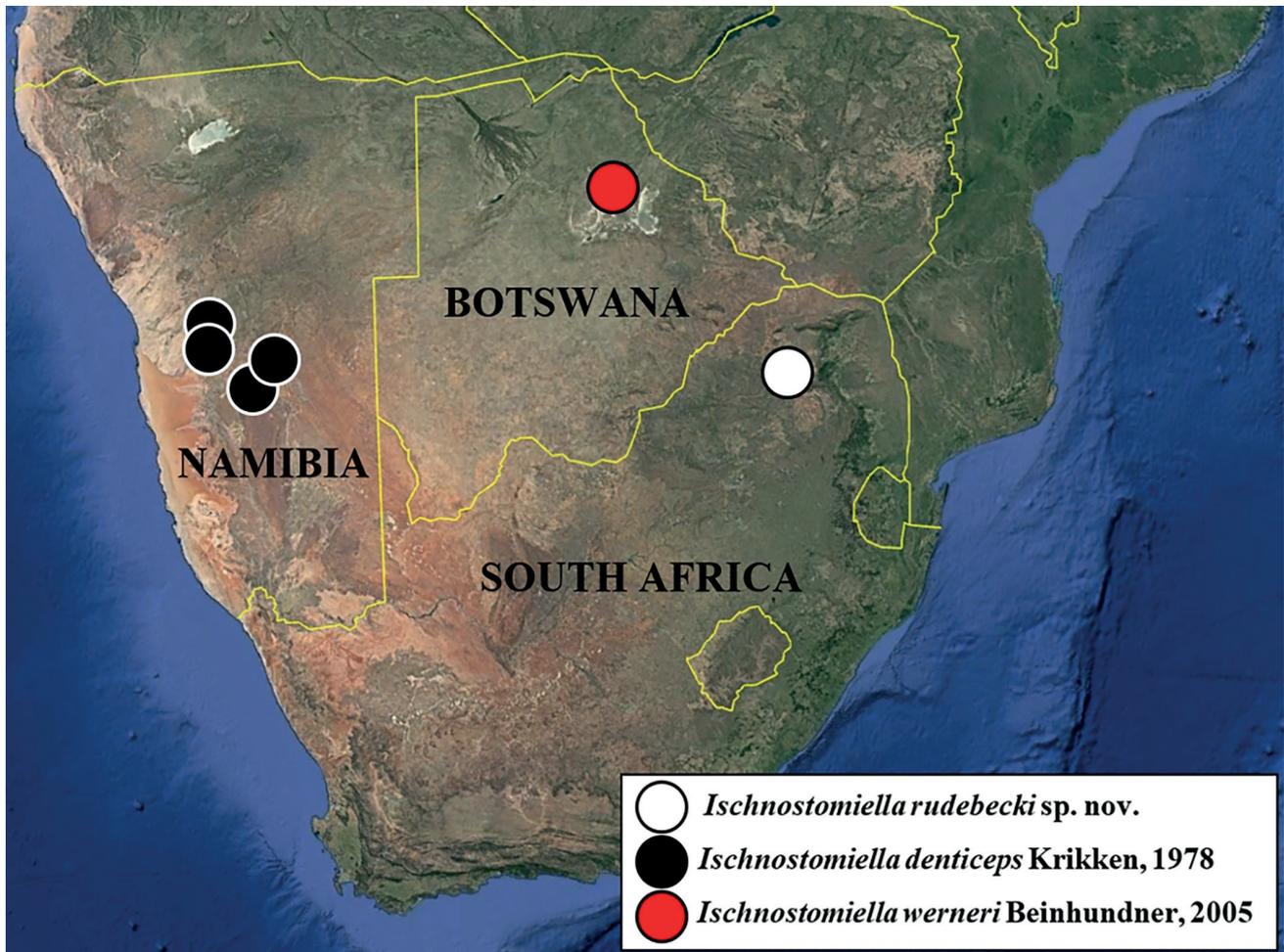


Fig. 3 – Distribution range of the three species of *Ischnostomiella* Krikken, 1978 within the southern African region. (Map: Google Earth Pro with image from Landsat/Copernicus 12/14/2015).

1998; Krajcik 1999; Beinhundner 2017), although the last one appeared under the Cetoniini in Krajcik (1999) and Beinhundner (2017).

While no further phylogenetic study has apparently been carried out in this respect on the Madagascan genera potentially involved in this tribe, namely *Plochiliana* Ruter, 1978 and *Scheinia* Ruter, 1958 (Krikken 1984), the Australian genera in or near “*Pseudoclitaria* auctorum”, have now been resolved, at least in part. Moeseneder & Hutchinson (2016), for instance, have recently erected the new genus *Navigator* Moeseneder & Hutchinson, 2016 to accommodate two of the species previously grouped in *Pseudoclitaria* Poll, 1886 and have argued for its placement in the tribe Schizorhinini, rather than Xiphoscelidini, mainly on the basis that the type genus of the latter tribe, *Xiphoscelis*, is founded on some characters that are not present in *Navigator*. This point has also been stressed by Krikken (2018) in his revision of the Australian Cetoniinae genera, where he points out that the configuration of the mesometasternal transition and other features previously considered key in the allocation of genera to the Xiphoscelidini will “certainly need reconsideration [...] in a broader context”.

Back to the Afrotropical situation, in the early taxonomic classifications of the Cetoniinae and long before the discovery of *Ischnostomiella*, *Protoclita* and *Meridioclitia* Krikken, 1982, the genera *Xiphoscelis*, *Ichnestoma* Gory & Percheron, 1833 and *Heteroclitia* Burmeister, 1842 were all classified together under the Xiphoscelidini or Ichnestomina (e.g., Burmeister 1842; Schenkling 1921; Krikken 1984). Holm & Marais (1992) virtually dismantled the tribe Xiphoscelidini, arguing that it needed to be “resolved into ancestors of the various subtribes”. This resulted in the removal of most of the genera, with only *Xiphoscelis* and what they regarded as its “precursors”, namely *Ischnostomiella* and *Protoclita*, remaining in the Xiphoscelidina. This explains the sequence of appearance of genera in their book. More recently, however, an analysis of larval characters undertaken by Perissinotto & Sipek (2019) on some key genera, has shown the existence of key synapomorphies between *Xiphoscelis*, *Heteroclitia* and *Meridioclitia*, thus grouping them into a shared clade. More revealing, even *Ichnestoma* was identified as a sister genus to the clade comprised of all the above-mentioned genera. Unfortunately, neither *Ischnostomiella*, neither

Proclita were available for this analysis at the time, but the results certainly suggest that we may have come in full circle, with the potential to rehabilitate much of the original configurations of Schenkling (1921) and Krikken (1984). What still remains to be determined is whether the Xiphoscelidini indeed occupy a basal placement in the evolutionary history of the Cetoniinae (e.g., Holm & Marais 1992; Perissinotto et al. 2003).

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