Studies on chevron crickets: Minarisoma gen. nov. (Orthoptera, Anostostomatidae), a new genus and a new species from South Africa

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Abstract

A new genus, Minarisoma gen. nov., is described to include three small species of South African distribution: Minarisoma landecki sp. nov. (type species), Minarisoma crassipes comb. nov., and M. tigrinum comb. nov. These species were previously assigned to the genus Onosandrus. Minarisoma gen. nov. marks the ninth genus of king crickets known from southern Africa. A comprehensive key to the identification of species within this newly established taxon is presented. In conclusion, the taxonomic relationships of South African taxa are discussed.

Keywords

anostostomatids, king crickets, Onosandrus, phallic complex, taxonomy

Introduction

Chevron crickets, commonly known as king crickets in South Africa, have been the subject of extensive research on the African continent, making it the focal point for taxonomic investigations. Consequently, the country has been found to boast a rich diversity, with 34 recorded species distributed across eight genera. The current genera inhabiting South Africa include Bochus Périnigüey (1916 (1), Borborothis Brunner von Wattenwyl, 1888 (1), Henicus Gray, 1837 (5), Libanasa Walker, 1869 (4), Libanasisidis Périnigüey, 1916 (2), Nasidius Stål, 1876 (8), Onosandridus Périnigüey, 1916 (4), and Onosandrus Stål, 1876 (9) (Cigliano et al. 2023, Cadena-Castañeda and Hemp 2024).

Key contributions to the understanding of Anostostomatidae in South Africa include the seminal works of Brunner von Wattenwyl (1888), who conducted comprehensive, worldwide taxonomic studies on the Stenopelmatoidea, which includes Anostostomatidae, documenting numerous taxa within South Africa. Périnigüey (1916) furthered this knowledge by describing six currently recognized species and contributing three of the eight known genera. Karny (1929) expanded the taxonomy, initially incorporating what is now classified as Anostostomatidae within Gryllacrididae. Karny described eight species validated for the country, providing distributional data and taxonomic keys.

Following a period of limited research, new insights emerged in the 21st century. Toms (2001) documented seven genera and 44 species based on Johns’ (1997) data. Brettschneider et al. (2007) conducted a comprehensive review confirming the presence of eight genera (including Bochus, overlooked by Toms in 2001) and presenting an identification key for South African anostostomatids.

Despite a more extensive focus on South African taxa compared to other African countries, the taxonomy of chevron crickets remains notably perplexing. This complexity arises from the description of many taxa with only one sex documented and, in cases of sexual dimorphism, the intricate nature of association and comparison among species. Compounding this issue is the fact that type specimens, in numerous instances, were inadequately characterized and lacked sufficient imagery for effective comparison. This deficiency hampers the identification process when juxtaposed with more thoroughly documented Orthoptera groups, impeding the precise delineation of new taxa and hindering comprehensive insights into this fauna.

Within the framework of this study on chevron crickets, we introduce a new genus, aiming to elucidate the taxonomy of Onosandrus crassipes Brunner von Wattenwyl, 1888 and O. tigrinum Karny, 1929, alongside the description of a new species. This effort represents a continuation of previous contributions to the exploration of anostostomatids spearheaded by the primary author of this paper (Cadena-Castañeda and Cortés-Torres 2013, Gorochov and Cadena-Castañeda 2016, Cadena-Castañeda and Monzón-Sierra 2017, Cadena-Castañeda and Weissman 2020, Cadena-Castañeda et al. 2020, 2022a, b, Mendes et al. 2020, Cadena-Castañeda and Hemp 2024).
Materials and methods

Material studied.—Type specimens of Onosandrus crassipes Brunner von Wattenwyl, 1888, O. tigrinum Karny, 1929, and Minarisoma landecki sp. nov.

Genital preparations.—Genital dissections followed the methodology outlined in Cadena-Castañeda (2015). The nomenclature for genital structures adheres to Chamorro-Rengifo and Lopes-Andrade’s system (2014). External components include the dorsal fold (df), dorsal lobe (dl), lower folds of the ventral lobe (fwvl), titillatory structure (ti), upper folds of the ventral lobe (upvl), titillator sclerite (ts), lateral folds of the dorsal lobe (idl), fore fold of the dorsal lobe (fdl), and sclerotized plate of the dorsal lobe (spdl). Internal components encompassed the ejaculatory duct (ejd), ejaculatory vesicles (ejv), and sclerite of the ventral fold of the dorsal lobe (vs).

Photographic procedure.—Lateral and dorsal body view photographs were captured using a Canon RP digital camera, while other morphological characters were documented using an AmScope MU1803 camera attached to a Carl Zeiss Stemi 305 Trinocular Stereomicroscope.

Measurements.—Measurements were recorded in millimeters (mm) using the following criteria: the length of the body (lb) measured from the frons to the abdominal apex, excluding the ovipositor or wings; the dorsal length of the pronotum (pr), defined as the maximum distance between the anterior and posterior pronotal margins; the length of the hind femur (hf), measured from the base to the genicular lobes; the length of the hind tibia (ht), from the genicular lobe to the apex; and the length of the subgenital plate (sp), corresponding to the distance from its base to its apex; length of ovipositor (ov), direct distance from its base to its apex.


Results

Taxonomy

Order Orthoptera Olivier, 1789
Suborder Ensifera Chopard, 1921
Superfamily Stenopelmatoidea Burmeister, 1838
Family Anostostomatidae Saussure, 1859
Subfamily Anostostomatinae Saussure, 1859

Minarisoma Cadena-Castañeda & Hemp, gen. nov.
https://zoobank.org/089DB3C6-6213-497A-BF1A-8FCB4638F9E3

Type species.—Minarisoma landecki sp. nov.

Generic diagnosis and comparison.—Minarisoma gen. nov. differs from the South African genera Libanusa, Henicus, and Nasidius in that it does not have sexual dimorphism in the head or jaws. Libanusa is from the new genus by the presence of an additional projection of the male’s jaws.

The genus most closely resembling Minarisoma gen. nov. is the East African genus Tryposoma Cadena-Castañeda & Hemp, 2024. Both genera lack sexual dimorphism in the head or jaws, and the arrangement of hind tibia spurs exhibits remarkable similarity. However, Minarisoma gen. nov. differs by its smaller size (15–18 mm) compared to the larger Tryposoma (28–40 mm). Notably, Minarisoma gen. nov. lacks a tympanum at the fore tibia, and its tenth tergite hooks are closely positioned, while Tryposoma possesses a tympanum and a membranous space between the hooks.

Both genera share similarities in terms of male genital morphology, featuring a ventral projection of df and the presence of a sclerotized plate spdl. However, the structure of spdl differs between Minarisoma gen. nov. and Tryposoma; in Minarisoma gen. nov., it is shoulder blade-shaped, while in Tryposoma, it is thin and ribbon-shaped. Additionally, the ti in Tryposoma is sclerotized, and the TS is predominantly membranous with conspicuous microstructures. Conversely, in the new genus Minarisoma gen. nov., the ES and ejv are conspicuous and elongated, while the ejd lacks sclerotized areas, and ejv are rounded and small.

Included species.—Minarisoma landecki sp. nov. (type species), M. crassipes (Brunner von Wattenwyl, 1888) comb. nov., and M. tigrinum (Karny, 1929) comb. nov.

Etymology.—From Latin minare = smaller and Greek -soma = body, since the new genus is generally of small body size. The gender of the name is being established as neuter.

Description.—Small size (15–18 mm). Coloration yellowish-brown or golden-brown, with darker brown stripes on the tergites (Figs 1A, B). Females of lighter coloration than males; dorsal surface may vary in shades of brown or reddish-brown (Figs 1C, 4, 7A–C). Head. Dorsally and frontally smooth, with frons higher than wide (Figs 1B, 2B, 7C). Laterally widened (Figs 2B, 5A, 7A), fastigium rounded, 1.5 times as broad as first antennal segment (Figs 2A, 5B, 7C). Eyes frontally elevated, dorsally unpigmented (Figs 2A, 5B, 7B). Ocelli conspicuous, round, all similar in size (Figs 2A, 5B). Scapus and pedicellus unarmed, and antennae exceed length of body (Figs 1, 5A). Mandibles and maxilla symmetrical, without any sexual specialization (Figs 2A, 5B, 7C). Ventral process extended beside base of labial segment in front of base of labium. Palpi thin, elongated, fully pilose, and dilated at apex (Fig. 2B).

Thorax. Pronotum smooth, not covering the mesonotum. Lateral margin of the pronotum is slightly rounded, and the pronotal disc displays a slight curvature at the anterior margin, while the posterior margin is almost straight (Figs 1B, 4B, 7B). Lateral lobe of pronotum wider than high, with a nearly straight dorsal margin and a slight convexity at the ventral margin. Ventral edge of the mesopleuron forms a weakly projecting rounded flap (Fig. 2B). Prosternum bears a pair of short cone-like processes. Mesosternal bispinose, with horizontally compressed spines and slightly backward-bent apices. Metasternum bears thorn-like processes with acute backward-bent tips and a broad laterally compressed base. Wings are absent. Legs. Fore and mid coxae are armed with one prominent lateral spine having a broad and pointed base. Fore and mid femora unarmored but with two longitudinal parallel carinae at the ventral margin. Fore tibiae armed with an inner dorsal spur at the middle of its length, ventrally with four or five spines on each ventral margin. Mid tibiae with spines along the dorso- and ventrolateral margins. Tympanum absent (Figs 2B, 5A). Hind femur with 12–14 distinct chevron ridges well-separated by a medial groove extending from base to the distal edge of the
chevron area. Apical spurs of the hind tibia fully movable within insertion rings. Dorsal subapical pair is relatively short, prolateral apical spur slightly shorter than the metatarsus, and retrolateral apical spur reaches about to the middle of the second tarsomere. A short ventroapical pair and an even shorter subapical ventral pair are present (Figs 1A, C, 4A, 5A). 

**Abdomen. Male.** Individuals have pegs on the first three abdominal tergites, with few and sparse spinules likely to serve as stridulatory area. Sternites broaden distally. Ninth tergite slightly produced and with posterior undulations (Fig. 2D, E). Tenth tergite characterized by two small and well-sclerotized hooks joining together dorsally. Epiproct rounded, conspicuous, and wider than long (Figs 2E, 5C). Paraprocts latero-laterally flattened, flexible, and armed at apex by a well-sclerotized spine (Fig. 2C). Cerci setose, thin, and moderately elongated (Fig. 2F).

**Subgenital plate** quadrangular, posterior margin straight; styli short, emerging before apex of subgenital plate (Figs 2G, 5D).

**Female.** Pegs as in the male on first three abdominal tergites. Ovipositor about two-thirds the length of the hind femur, dorsal valves protruding from ventral valve at apex, sharply narrowing to the apex of the ovipositor (Fig. 2H, I). Subgenital plate wider than long and triangular shaped (Figs 2I, 4C). **Male genitalia** with several sclerotized and membranous structures, such as **T1** and **TS** structures, forming a peduncular system with few and small-sized denticulate microstructures (Fig. 3A). **SP.dl** usually shoulder-blade shaped. Dorsal lobe membranous but covered by circular microstructures (Fig. 3A); **ejd** wide and with a pair of **ES** (Fig. 3C), **ejd** present and elongated (Figs 3B, C). **df** extends toward the anterior margin and curves inwards, with a rounded edge and few microstructures (Fig. 3B).

**Distribution.** —Africa, South Africa, between Eastern Cape and Free State.

**Key to species**

1. Hind margins of all tergites with well-defined blackish cross-bands. Ovipositor almost as long as or even longer than the hind femur. Female subgenital plate triangular and sharply pointed. Males unknown ........................................... *M. tigrinum* comb. nov.  
   - Hind margins of tergites not or hardly darkened. Ovipositor shorter than hind femur. Female subgenital plate with rounded apex. Males unknown ................................................................. 2
   - Males with the ninth tergite narrow, not projecting, with two reddish callosities on the distal edge. Tenth tergite with the posterior edge notched in the middle, dividing this segment (Fig. 5C). Female subgenital plate with rounded apex and without undulations (Fig. 4C) .......................................................... *M. crassipes* comb. nov.
   - Males with the ninth tergite projecting on the last segment, distally truncated and without callosities (Fig. 2D, E). Tenth tergite without notch on the posterior edge (Fig. 2F). Female subgenital plate with a rounded and slightly wavy apex (Fig. 2I) ............... *M. landecki* sp. nov.

**Minarisoma landecki** Cadena-Castañeda & Hemp, sp. nov.  
https://zoobank.org/E73C0A5D-4115-4CB3-89E8-4CF46BC67823

**Type material.** —Holotype: SOUTH AFRICA ♂; Eastern Cape, 6.25 km NNW Paterson Sundays Riv. Valley. Pure Nature Familodge Farm; PF16; sclerophyllic vegetation on rock south of the valley; -33.39194, 25.92374; 427 m.; 27 Feb. – 9 Mar. 2020; I Landeck leg.; CAUD. **Paratypes**—SOUTH AFRICA ♂; same data as holotype; but with an additional label, DNA_IL-2020_SA_058. Libanasa sp.; CAUD. • 2♂, 3♀; same data as holotype; CIL • 1♀; Eastern Cape, 6.25 km NNW Paterson Sundays Riv. Valley. Pure Nature Familodge Farm; PF18, sclerophyllic vegetation on rock south of the valley; -33.39381, 25.93145; 412 m.; 27 Feb. – 9 Mar. 2020; I Landeck leg.; CIL • 1♂; Eastern Cape, 6.25 km NNW Paterson Sundays Riv. Valley. Pure Nature Familodge Farm; northern slope of the valley, Fynbos, rocky; -33.385601, 25.936866; 436 m.; 1 Mar. 2020; I Landeck leg.; CIL.

**Etymology.** —We dedicate this species to Ingmar Landeck who collected all the specimens studied here.

**Description.** —Male. Medium size (21 mm). General coloration yellowish with brown spots (Figs 1A, B). Face with four greyish-brown stripes (Fig. 2A), vertex and most tergites dorsally brown. Corners of base of clypeus with a black spot (Fig. 2A). Ocelli yellow; eyes black, discolored on dorsal edge (Fig. 2B). Antennae yellowish brown throughout their length without color variations in sections of antennomeres. Lateral surface of thorax and abdomen ochre (Fig. 2B). Fore and mid femora with lateral sides ochre and with brown dorsal and ventral edges. Fore and mid
Fig. 2. *Minarisoma landecki* sp. nov. A. Face; B. Head and pronotum in lateral view; C. Male paraprocts detail in lateral view; D–G. Male terminalia in dorsal, axial and ventral views, respectively; H, I Female terminalia in axial and lateral view; J. Subgenital plate of female.
tibiae predominantly brown. First half of hind femur yellow, last half darkened to brown. Sternites light yellow, as are the palps and the terminalia. **Head.** Fastigium of vertex not projected, almost as wide as scapus (Fig. 2A). Fastigium of frons rounded (Fig. 2A), touching fastigium of vertex (Fig. 2B). Scapus two times wider and longer than pedicel (Fig. 2A). Compound eye oval, black with white dorsal edge (Fig. 2B). Clypeus as wide as high, subtriangular, lateral margin gradually narrowing toward apical margin, slightly curved; apical margin arched; labrum ovoid and twice as long as wide (Fig. 2A). Maxillary palp long, exceeding length of fore tibia, last palpomere rounded and conspicuously widening at apex (Fig. 2B). **Thorax.** Pronotum with anterior and lateral margins rounded, posterior margin straight, lateral lobe wider than high. Mesonotum and metanotum like pronotum, the first a little wider than the latter (Fig. 1B). Mesopleural projection small, rounded, and slightly prominent (Fig. 2B). **Legs.** Coxae, fore and mid legs covered by hairs. Fore and mid femora dorsally rounded with anterior, posterolateral, and ventral margins flattened. Fore tibiae armed with four spurs on each ventral margin, dorsally with a spur at middle section of tibia; apically with two small spurs on inner and outer sides, ventral spurs two times longer than dorsal spurs (Fig. 2B). Mid tibiae armed with four spurs on each ventral margin; dorsally armed with three spurs on inner side and two ones on outer side, spines alternate on each dorsal margin; apically with two mid-sized spurs on inner and outer sides, both similar in length. Hind femur unarmed and with 14 chevron ridges (Fig. 1A). Hind tibiae dorsally with 12 spines on inner side and 14 on outer side, ventrally armed with a medium-sized spur in middle at outer side. **Abdomen.** Tergites of similar width and length. Ninth tergite angulated, slightly produced, partially covering the hooks of the tenth tergite (Fig. 2D), distally truncate and slightly undulating (Fig. 2E). Tenth tergite narrow, with two joining black hooks curved dorsally (Fig. 2F). Epiproct conspicuous, cover-
ing the paraprocts, apex rounded (Fig. 2E, F). Paraprocts falciform and oblong with a sclerotized mid-line in lateral view ending in a sclerotized spine at apex. Spine of the paraproct slightly furcated at apex (Fig. 2C). Cerci as long as subgenital plate and covered by many hairs (Fig. 2F, G). Subgenital plate laterally upcurved and rounded around the phallos (Fig. 2E–G). Male genitalia.(dl surface displays numerous ovoid and small-sized microstructures. Posterior border of dl projects towards the anterior margin and curves backward and downward. ti and TS structures form a peduncular system with few and small-sized denticulate structures, which surrounded ventrally and laterally by ldl. ti mostly membranous. TS sclerotized and w-shaped in dorsal view. A shoulder blade-shaped Sp.dl present on the dl (Fig. 3A). up.vl have a rounded distal margin, while the lw.vl membranous and possess an angled posterior margin (Fig. 3B). ej1. ejy conspicuous, ovoid, and elongated (Fig. 3B, C). VS membranous and internally covers the TS. fdl is “U”-shaped and surrounds the base of TS (Fig. 3C).

Female. Similar to male in shape and size. Last tergites without modifications (Fig. 1C). Cerci thin and medium-sized. Epiproct ovoid and broader than long (Fig. 2H). Ovipositor elongated, measuring approximately two-thirds the length of hind femur, and exhibits a gradual curvature ascending from the base to apex. Dorsal valves extend beyond the ventral valves at the apex, creating a distinctive sharp narrowing of ovipositor apex (Fig. 2I). Subgenital plate triangular shape with a rounded apex and subtle undulations (Fig. 3J).


Habitat. — According to the National Vegetation Map (SANBI 2006–2018), the region where all specimens have been collected falls within the Albany Thicket Biome, specifically classified as the Albany Valley Thicket (AT18) vegetation type. The farm’s expansive terrain, situated in a complete section of a small valley (Sundays River Formation, sandstone/siltstone), contributes to a rich and diverse vegetation. The landscape exhibits a spectrum of habitats, ranging from confined areas with Fynbos vegetation on the rocky upper edges of the valley to thickets covering the valley slopes. Additionally, there are small forested areas on edaphically suitable sites, open sclerophyll vegetation on dry rocky slopes, and dense Sweet Thorn Woodland on weathered soils at the valley’s bottom (Fig. 4A).

The observed species predominantly occupies the crevice system between large boulders and cavities under rocks at the base of the slope. A few specimens were discovered on the rocky upper edges of the valley, where Fynbos vegetation prevails. During the night, the specimens were noted to move freely among stones and boulders on exposed, litter-free, weathered soil with limited ground vegetation cover.

Phenology. — Adult specimens were discovered between February and early March (Fig. 4B), with an observed sex ratio of approximately 1:5 (males:females) when specimens were located outside crevices during the nighttime. Unfortunately, field data for the remaining months of the year are not available. Apart from two nymphs collected in February/March, there is no information regarding the presence of earlier developmental stages.

Comments. — Given that Waggie Onderplaas Farm shares a direct border with the Greater Addo Elephant National Park, it is reasonable to infer that the species is present in suitable habitats, at least within this protected area. Moreover, outside of nature conservation areas, the species is likely to be threatened by habitat destruction, as its habitat is not extensively utilized for grazing by livestock such as cattle.

In its habitat, the species was associated with at least one other anostostomatid species and crickets such as Cophogryllus sp. and Megoplistidae sp.

Minarisoma crassipes (Brunner von Wattenwyl, 1888), comb. nov.

Figs 5, 6

Comments. — This species was originally described by Brunner von Wattenwyl (1888) in his monograph based on a single female specimen (collection code 6720) from Grahamstown, Eastern Cape Province (Fig. 5). Subsequently, Karny (1930) reported a male specimen (collection code 17416), determined by Brunner von Wattenwyl, originating from Capland (the Cape). This male specimen had been transferred from the Museum of Lübeck, Germany, to the collection of the museum in Vienna, Austria (Fig. 6). However, upon morphological comparison with the female holotype of M. crassipes comb. nov., it is evident that it differs morphologically from the female of M. landecki sp. nov.

Comments.—This species was initially classified as belonging to the genus *Onosandrus* based on an adult female (Fig. 7) and an

*Minarisoma tigrinum* (Karny, 1929), comb. nov.

Fig. 7

*Fig. 5. Minarisoma crassipes* (Brunner von Wattenwyl, 1888) comb. nov. Female type. A. Habitus in lateral view; B. Habitus in dorsal view; C. Habitus in ventral view; D. Labels. (Photos M. Fianco)
immature female collected from Smithfield (Free State). Karny (1930) emphasized the resemblance between *M. tigrinum* *comb.* *nov.* and *M. crassipes* *comb.* *nov.*, noting a significant similarity between the two species. As underscored in this newly proposed genus, which encompasses the three species under study, there is a noticeable difference in the thickness of the hind femur compared to species previously assigned to *Onosandrus*.

The female of *M. tigrinum* *comb.* *nov.* deviates from the other two species within this new genus in terms of tergite coloration and the shape of the subgenital plate, as outlined in the species identification key.


**Discussion**

Recent exploration of king crickets has been limited. Confusion persists in the classification of certain genera, e.g., in *Onosandridus*, an inadequately defined genus that incorporated species based on females (Péringuey 1916), not aligning with the known

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**Fig. 6. Minarisoma crassipes** (Brunner von Wattenwyl, 1888) *comb.* *nov.* Male. A. Habitus in lateral view; B. Frons; C. Terminalia in dorsal; D. Ventral view; E. Labels. (Photos: M. Fianco).
Minarisoma gen. nov., the ninth known genus in South Africa, exhibits similarities with Tryposoma, found in East Africa. Both genera share a comparable shape and organization of tibial spurs, especially those on the hind tibia. The internal genitalia in males of both genera features sclerotized plates of the dorsal lobe (SP.dl), a
novel structure in Anostostomatidae genitalia previously observed only in the Lutosinae restricted to the Americas (Cadena-Castañeda et al. 2022b, Cadena-Castañeda and Hemp 2024). However, Minarisoma gen. nov. is smaller than Tryposoma. Additionally, the arrangement of the hooks on the tenth tergite aligns with that of other African Anostostomatini genera, with the hooks together in the middle of the last tergite, contrasting with Tryposoma species, which have a membranous region between the hooks.

*M. crassipes comb. nov.*, previously mentioned by Johns (1997), was proposed for inclusion in a new genus alongside "Dyscapna pulchriventris" (Griffini, 1914) (= *Naïsidius pulchriventris* Griffini, 1914) and two undescribed species from Tanzania (deposited in London and Copenhagen). While Johns’ suggestion partially applies, *Naïsidius pulchriventris* appropriately fits within its current placement. The two undescribed Tanzanian species may belong to *Tryposoma*, a genus exhibiting similarities. The taxonomic challenges evident in African anostostomatids underscore the need for in-depth studies on these inadequately known and delineated insects, in contrast to other global regions where more comprehensive efforts have been undertaken. Modern taxonomy, including additional characters such as male genitalia, has proven valuable in defining genera and establishing relationships between them (Gorochov and Cadena-Castañeda 2016, Cadena-Castañeda et al. 2022a, b).

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