



# *Colophon scholtzi* sp. nov.: a newly described highly threatened stag beetle (Coleoptera: Lucanidae) from South Africa

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A highly threatened and range-restricted, mountain-relic stag beetle species in the genus *Colophon* Gray, 1832 (Coleoptera: Lucanidae), *Colophon scholtzi* Roets & Durie sp. nov. is described from a peak in the Riviersonderend Mountain range of South Africa. It is morphologically allied to species in the *Colophon stokoei* Barnard, 1929 species complex that are confined to the neighbouring Hottentots-Holland Mountain range. *Colophon scholtzi* seems highly range-restricted and rare as no living specimens have been observed on the single peak from where the only known fragments were collected, despite repeated surveys over the past 12 years.

## INTRODUCTION

*Colophon* Gray, 1832 (Coleoptera: Lucanidae) consists of 21 species each of which is restricted to a single, or only a few neighbouring high-elevation mountain peaks in the biologically diverse Fynbos biome at the southern tip of Africa (Endrödy-Younga 1988; Bartolozzi 1995; Mizukami 1996; Bartolozzi 2005; Jacobs et al. 2015). The genus was hypothesized to have a lower-elevation origin and populations withdrew up onto cooler mountain peaks that experienced regular summer fog following progressively warmer climatic conditions since the Pleistocene (Endrödy-Younga 1988; Switala et al. 2014). All species are apterous, and speciation has occurred after the separation of populations on isolated mountain peaks from the mid-to-late Miocene (Switala et al. 2014). Further threats to populations are posed by climate change and the destruction of the little remaining suitable habitat for the construction of mobile telephone repeater stations (Geertsema and Owen 2007). Natural rarity and impending threats to populations afforded the classification of most species as endangered or critically endangered following criteria set by the International Union for Conservation and Nature (IUCN). Their desirability for the illegal insect trade also led to all species being listed in the Convention on International Trade in Endangered Species (CITES) as category III.

Difficulty in the accessibility of high mountain peaks, their highly seasonal adult activity periods (Roets et al. 2013) and rarity means that very limited material of most *Colophon* species is available for scientific study. Therefore, little is known about the taxonomy, life history and biology of *Colophon* in general. Adults are active during warmer months (October to March) and under low light conditions such as when mountains are covered with fog (e.g., *Colophon stokoei* Barnardi, 1929 and *Colophon izardi* Barnard, 1929; Geertsema and Owen 2007), at night (e.g., *Colophon westwoodi* Gray, 1832; Roets et al. 2013) or during dusk and dawn (e.g., *Colophon haughtoni* Barnard, 1929; Scholtz et al. 2021). However, this has not been intensively studied for any species other than *Colophon westwoodi*. Larvae have been collected from humus-rich soils and soils associated with the roots of Restionaceae plants (Scholtz & Endrödy-Younga 1994; Geertsema and Owen 2007; Switala et al. 2015).

*Colophon* species are separated into two distinct lineages (apomorphic and plesiomorphic) based on the symmetry of their aedeagus and anal sclerite (Endrödy-Younga 1988). This morphological grouping is also supported by molecular evidence (Switala et al. 2014). Morphological species delineation within these two major lineages requires examination of the male head, mentum, mandibles, and fore tibia. This is because other morphological features of males and most morphological features associated with females are nearly indistinguishable between species (Endrödy-Younga 1988; Jacobs et al. 2015). As with other Lucanidae, this likely points towards strong sexual selection on male morphological features associated with male-to-male combat (mandibles and head; Goyens et al. 2015) and with coupling for mating (anterior legs). These characters are considered robust indicators at the species level in *Colophon* (Barnard 1929; Endrödy-Younga 1988; Jacobs et al. 2015), to the point that some species have been described only from fragments. This is deemed necessary as living specimens for particularly rare or difficult-to-find species have not been collected. For example, *C. berrisfordi* Barnard, 1932 was described from a single male holotype fragment that consisted only of a head, pronotum and partial anterior legs (Barnard 1932).

As part of ongoing investigations to elucidate the distribution, ecology and biology of *Colophon*, an undescribed species was discovered on a mountain range that was not previously known to be inhabited by *Colophon*. The species is seemingly restricted to a single population on a peak that is subject to severe anthropogenic threats. By describing this species here, we wish to highlight the current threats to the continuous survival of this highly endangered species.

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## METHODS

Fragments of a *Colophon* species were observed on a peak in the Riviersonderend Mountain range in 2010. Previously, no *Colophon* species were known to inhabit this mountain range despite previous searches (Barnard 1932). This prompted repeated visits for several years afterwards to confirm the presence of living specimens. Survey intensity was increased during the summer months of 2021/2022 and 2022/2023 after collection permits had been obtained from authorities (Cape Nature: CN44-87-26707). Despite numerous visits during peak *Colophon* activity season (November–February) and during both the day, evenings and at night, no living specimens have been observed. However, fragments were collected during these recent surveys. Fragments were only observed on a single peak in this mountain range and were absent from two other peaks visited that are at similar elevations. Close morphological inspection of the collected fragments confirmed that they belonged to a previously undescribed species that we describe here as new. For ease of comparison to other taxa, terminology and style follow that of Endrödy-Younga (1988) and Jacobs et al. (2015). Type materials have been deposited in the Iziko South African Museum, Cape Town, South Africa (ISAM). As is custom for newly described species in this highly sought-after genus (Jacobs et al. 2015), precise locality data were omitted here but will be available to researchers after obtaining approval from conservation authorities.

## DESCRIPTION

### *Colophon scholtzi* Roets & Durie sp. nov. (Figure 1)

**Specimens examined:** This description is not solely based on the description of the holotype specimen, but on all the fragments collected combined. Holotype: 1♂ fragment containing head, pronotum and abdomen, no legs: ISAM; Paratypes: 1♂ anterior body fragmented into head and pronotum with partial front legs: ISAM; 1♂ partial head: ISAM, 2♂ pronota with partial legs: ISAM, 1♀ pronotum and posterior body with partial legs, no head: ISAM.

**Colour:** Black, often with dark reddish-brown mandibles and legs.

**Size:** 18.16–23.04 mm (estimated from partial fragments), pronotal width: 9.29–9.74 mm.

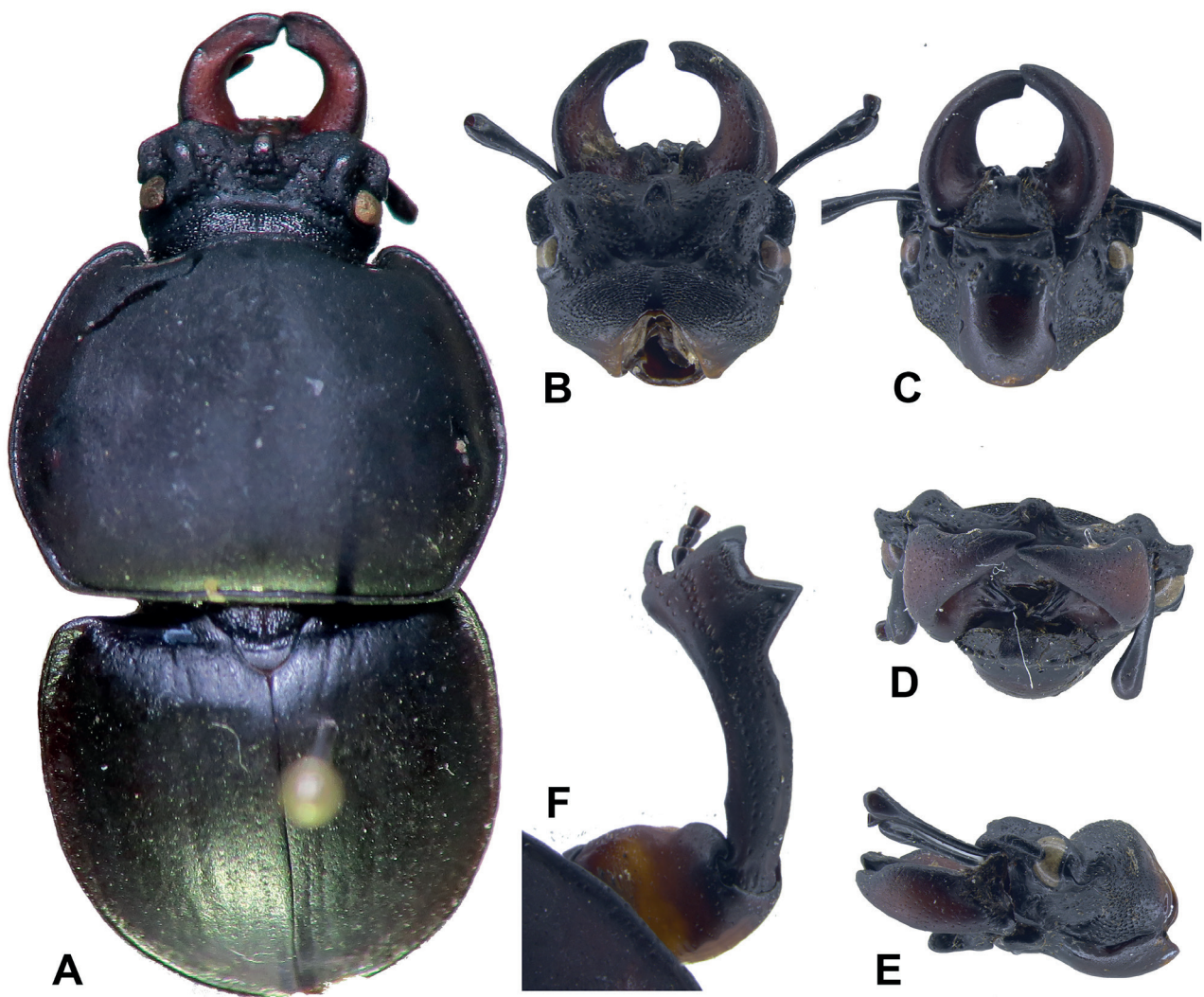
**Body:** Convex, dull black.

**Head:** Transversely oblong, with a concave and declivous anterior margin, with a median horn-like projection and an oblique ridge over the eye, no tubercles present; frons surface pitted.

**Antennae:** Elbowed, antennomeres of club cannot be folded together.

**Mandibles:** Short and simple, each sickle-shaped; dorsal surface of apical portion depressed.

**Mentum:** Thick and projecting prominently in lateral view; evenly elevating from base in lateral view; anterior surface



**Figure 1.** *Colophon scholtzi* sp. nov. A: Dorsal aspect of male holotype. B: Dorsal aspect of male head. C: Ventral aspect of male head. D: Frontal aspect of male head. E: Lateral aspect of male head. F: Dorsal aspect of male front leg.

narrow; anterior margin weakly bifid; ventral surface deeply impressed on either side of a projecting median ridge; ridge broad at base, strongly narrowing towards apex; impressed sides of mentum with large and dense punctures and with scattered short, yellow setae.

**Pronotum:** Lateral margins evenly arcuate, shallowly emarginate near posterior angle.

**Legs:** Male protibia curved and dilated towards the apex; apicoventral process is broadly rounded; apex is externally bidentate, proximal without a semicircular excision as is found in other species in the *C. stokoei* species complex, dorsal surface keeled, ventral surface strongly keeled on inner edge from base to about a third of tibial length, small concavity distal to the keel along the inner edge, distal area of ventral side of tibial surface strongly concave, with a short forwardly directed tooth near insertion of tarsus.

**Male genitalia:** Aedeagus not known but based on the symmetrical anal sternite it will likely be of the symmetrical type as with all other members of the *C. stokoei* species complex.

**Female:** Only known from 1 partial fragment (headless). Morphologically similar to all other species in the *C. stokoei* species complex.

#### Distribution

Riviersonderend Mountains, Western Cape Province, South Africa.

#### Etymology

This species is named after Professor Clarke Scholtz in recognition of a lifetime of contributions to our knowledge of the Scarabaeoidea including *Colophon*.

#### Comments

Male colouring, at least of the fragments collected, seems to follow that of *Colophon switalae* Jacobs & Scholtz, 2015. The mandibles and the ventral side of the legs, in this case particularly the femora, are dark reddish-brown in colour. Despite extensive searches, fragments of *C. scholtzi* were collected from a geographically limited area. The current known area of extent and area of occupancy is less than 1 km<sup>2</sup>. This area is however also highly transformed by anthropogenic activities, further reducing the suitable habitat and increasing the vulnerability of *C. scholtzi* to extinction. We believe this justifies an IUCN red list status of Critically Endangered (Blab(v) & B2ab(v)) and a ToPS status of Critically Endangered.

#### Diagnostic characters to differentiate between *C. scholtzi* and similar species

*Colophon scholtzi* is morphologically most similar to species in the *C. stokoei* Barnard complex. All species in this complex, including *Colophon deschodti* Jacobs & Scholtz, 2015 *C. stokoei*, *Colophon struempheri* Jacobs & Scholtz, 2015 and *C. switalae* have sickle-shaped mandibles and the mentum prominently thickened (Jacobs et al. 2015, figures in Table 1). The shape of the mentum in *C. scholtzi* is however diagnostic in that the ventral surface, like that of *C. struempheri*, is deeply impressed on either side of a projecting median ridge, but unlike *C. struempheri* the ridge is broad at the base and narrows strongly towards the apex (the mentum of *C. struempheri* nearly equally broad at the base and the apex) (Jacobs et al. 2015, figures in Table 1). The shape of the male protibia differs from other species in the *C. stokoei* complex in that there is no semicircular excision proximal to the bidentate apex on the external side (Jacobs et al. 2015, Figures 1d, 2c, 3d and 4c). *Colophon scholtzi* is easily distinguished from all

other currently described *Colophon* species by the presence of a distinct horn-like protrusion on the anterior margin of the male head (Figure 1f).

#### AUTHOR CONTRIBUTIONS

JID: conceptualization, data curation, methodology, writing (original draft, review and editing)

JSP: conceptualization, methodology, resources, supervision, writing (review and editing)

RJB: resources, methodology, writing (review and editing)

FR: conceptualization, data curation, funding acquisition, investigation, methodology, project administration, resources, supervision, writing (review and editing)

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