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Author: Bilton, David T.

Source: African Invertebrates, 56(1) : 181-190

Published By: KwaZulu-Natal Museum

URL: https://doi.org/10.5733/afin.056.0114

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African Invertebrates Vol. 56 (1): 181–190 Pietermaritzburg 30 June 2015

Two new species of madicolous water beetle from South Africa (Coleoptera: Hydraenidae)

David T. Bilton

Marine Biology and Ecology Research Centre, Plymouth University, Drake Circus, Plymouth PL4 8AA, UK.
E-mail: d.bilton@plymouth.ac.uk

ABSTRACT

Coelometopon glenavoni sp. n. and *Oomtelecopon disjunctum* sp. n., two madicolous hydraenid beetles are described from the Eastern and Western Cape provinces of South Africa respectively. Diagnostic notes are provided for both species, together with a discussion of the ecology and biogeography of the two genera.

KEY WORDS: Afrotropical Region, South Africa , Coleoptera, Hydraenidae, *Coelometopon*, *Oomtelecopon*, new species, ecology.

INTRODUCTION

Madicolous, or wet-rock seepage habitats (Vaillant 1956) have been shown to harbour a highly distinctive, and often poorly known aquatic beetle fauna in many parts of the world (e.g. Ribera *et al*. 2002; Ribera & Bilton 2007; Spangler & Steiner 2005; Balke *et al*. 2008; Hájek & Fikáček 2008; Clarkson & Short 2012; Fikáček *et al*. 2012). The Cape region of South Africa is particularly rich in madicolous beetle taxa, especially in the family Hydraenidae (e.g. Perkins & Balfour-Brown 1994; Bilton 2014). *Coelometopon* Janssens and *Oomtelecopon* Perkins are closely related hydraenid genera, both of which are madicoles restricted to southern and eastern Africa, most species being endemic to South Africa (Perkins 2005). Here *Coelometopon glenavoni* sp. n. and *Oomtelecopon disjunctum* sp. n. are described from the Eastern and Western Cape provinces respectively. Comparative notes are provided which will allow these species to be distinguished from their congeners, together with a brief discussion of their biogeography and ecology.

MATERIAL AND METHODS

Beetles were collected by hand from wet rock faces. Specimens were studied using a Leica MZ8 stereomicroscope, with a Fluopac FP1 fluorescent illuminator. Habitus photographs were taken with a Canon EOS 600D camera fitted to a Leica Z6 Apo macroscope, fitted with a 2× objective lens. Specimens were illuminated using a Leica LED5000 HDI dome illuminator to avoid shadow.

Genitalia were mounted on glass slides in Kisser's glycerol gelatine (see Riedel 2005) and imaged using an Olympus CX31 microscope with the same camera. All image stacks were produced by hand, and combined using Zerene Stacker software.

Exact label data are cited for specimens.

Collection codes

CDTB – Collection D.T. Bilton, Plymouth, UK;
SAMC – Iziko South African Museum, Cape Town, South Africa;

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MCZ – Museum of Comparative Zoology, Harvard University, Cambridge, MA, USA;
NHMUK – Natural History Museum, London, UK;
NMW – Naturhistorisches Museum Wien, Vienna, Austria;
OUMNH – Oxford University Museum of Natural History, Oxford, UK;
SANC – South African National Collection of Insects, Pretoria, South Africa;
TMSA – National Museum of Natural History, Ditsong Museums of South Africa (former Transvaal Museum), Pretoria, South Africa.

Abbreviations

TL – Total length (labrum to elytral apex);
EL – Elytral length;
MW – Maximum width.

TAXONOMY

Order Coleoptera
Family Hydraenidae

Coelometopon glenavoni sp. n.

Figs 1–3

Etymology: Named after the type locality - Glen Avon Falls.

Diagnosis: A member of the *endroedyi* group of *Coelometopon* (see Perkins 2005), with pronotal granulation sparse, especially posteriorly. Elytral intervals 1 and 3 with longitudinal granule/setal rows throughout their length; interval 7 with continuous row of granules/setae, edge of interval 8 with unilinear row of granules. Aedeagus characteristic.

Description:

Measurements: Holotype TL = 2.45 mm; EL = 1.55 mm; MW = 0.95 mm. Paratype males TL = 2.35–2.55 mm; EL = 1.5–1.6 mm; MW = 0.95–1.00 mm. Paratype females TL = 2.65–2.8 mm; EL = 1.65–1.80 mm; MW = 0.95–1.05 mm.

Colour: Dorsum dark brown to black, legs dark yellowish-brown, tarsi and femoro-tibial junctions darker brown. Maxillary palpi dark brown to black. Antennal club black, stem segments paler brown. Venter brown to dark brown.

Head: Broadly triangular, broadest at hind margin of eyes and narrowing to labral apex. Eyes slightly raised, protruding, and occupying approximately ⅓ of side margin of head. Labrum transverse, with marked semicircular apicomedian emargination. Anterior and lateral margins evenly rounded. Anterior margin either side of apicomedian emargination raised, to form upturned projections. Basolateral margins with upturned, horn-like projections, furnished with tubercles and dense, short, stout curved setae. Upper surface of labrum shining, devoid of microreticulation and with scattered decumbent setae, especially around anterior projections. Clypeus with front angles produced and front margin arcuate. Dorsal surface shining with sparse granules, each bearing curved setae. Frontoclypeal suture arcuate, distinctly impressed. Frons and vertex granulate, granules denser than on clypeus and larger in posterior half of vertex. Each granule bearing a short curved seta. Setae stouter and longer in front of and around interior margins of eyes. Small black ocellus visible interior to each eye, in posterior part of vertex.

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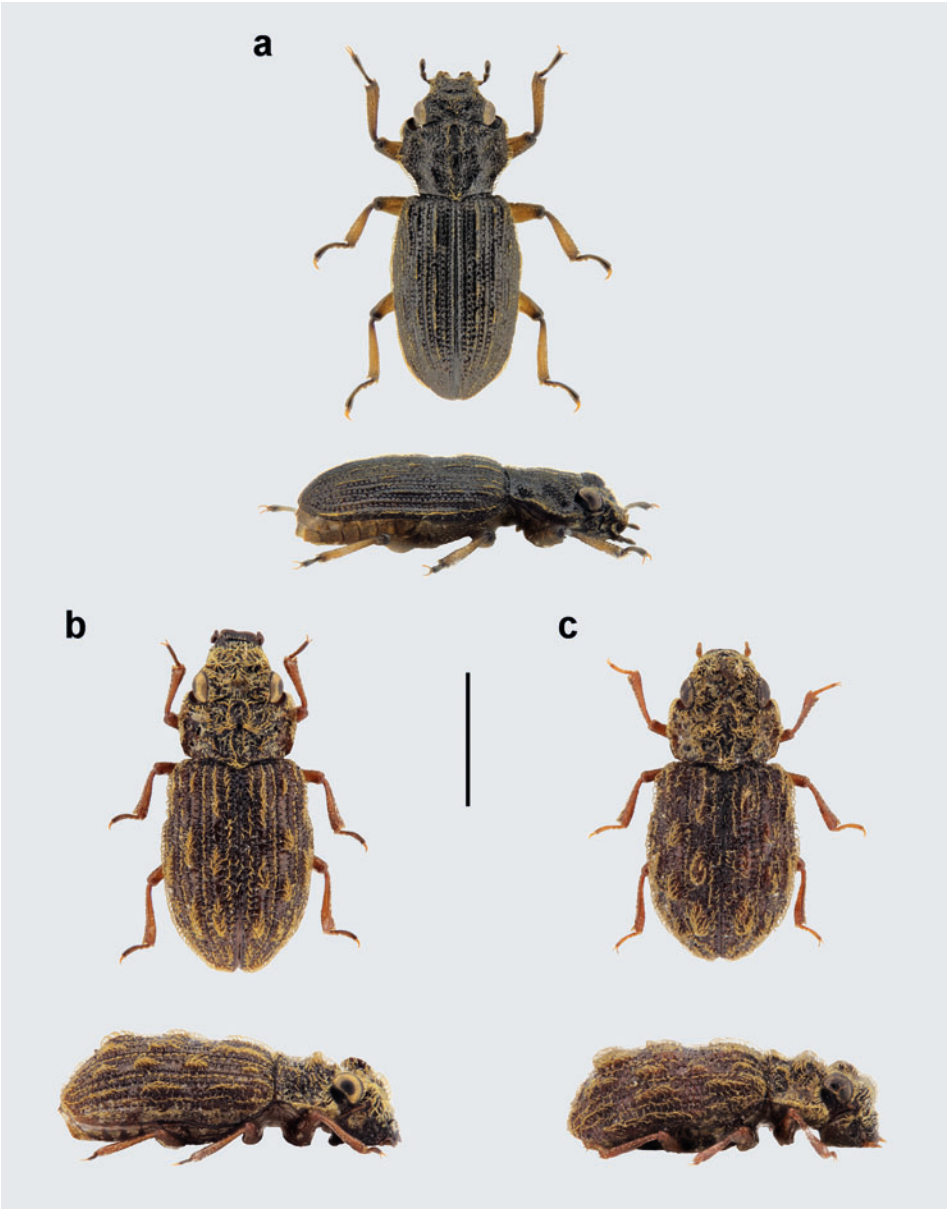


Fig. 1. Habitus of *Coelometopon* and *Oomtelecopon* species. (a) *C. glenavoni* sp. n., holotype; (b) *O. disjunctum* sp. n., holotype; (c) *O. setosus*. Scale bar = 1 mm.

Pronotum: Transverse, cordiform, broadest at middle. Sides roundly produced at widest part, narrowing strongly to protruding front angles, and weakly emarginated in front of and behind middle. Hind angles obtuse. Front margin broadly sinuate in middle half, then strongly curved forwards to front angles. Hind margin sinuate around acuminate middle. Lateral margins strongly granulate, granules larger and denser in front half,

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where they are spaced approximately one granule's width apart. Granules weaker, somewhat obsolete in posterior half, and spaced 2–3 granules' widths apart. Each granule bearing a long curved yellowish seta. Median longitudinal furrow of disc shallow, interrupted in middle. Anterior and posterior admedian fovea shallow, anterior fovea opening anterolaterally. Anterior adlateral fovea shallow and broadly open laterally; posterior adlateral fovea deeper, opening laterally to pronotal margin. Dorsal surface of pronotum shining, without microreticulation. Granulate throughout, each granule bearing a curved decumbent seta. Granules sparser on areas between ademdian and adlateral fovea, especially posteriorly. Densest either side of median furrow and in and lateral to adlateral fovea.

Elytra: Elongate, widest approximately ⅓ behind shoulder, where pseudepipleuron formed from 8th interval is broadest, and widens somewhat abruptly when viewed from above. Sides almost parallel-sided behind this widest point, weakly narrowing to posterior ⅙, and then strongly rounded to conjointly rounded apices. Sides of elytra granulate, granules spaced ½ – 1 granule's width apart, and bearing long, curved, yellow setae. Elytra with some intervals bearing low costae, all costae with rows of long, golden setae. Costae most strongly raised on interval 2; less so on intervals 4–6. Second elytral interval costate in 3–4 sections; 3 on left and 4 on right hand sides of holotype. Interval 4 costate at shoulder, opposite first non-costate part of interval 2, then in 3 further sections. Costae very low posteriorly, but row of setae reaching elytral apex. Interval 5 costate at shoulder. Interval 6 with 4 weak costae. Interval 7 raised slightly throughout, with row of short, decumbent yellow setae. Interval 1 slightly raised, with longitudinal row of setose granules throughout. Interval 3 flat, but with similar granules and setae. Interval with similar granules and setae behind costae on shoulder.

Venter: Mentum transverse, produced apicomedially and with broad, shallow depression posteriorly either side of midline. Shining, with weak, transverse microreticulation and sparse medium punctures bearing decumbent white setae. Submentum triangular, shining, with weak microreticulation; transverse in front, isodiametric behind. Genal ridges distinct, broadly curved from central junction, shining, with microreticulation reduced to transverse ridges. Gula dull, with scale-like vestiture. Prosternum flat, with trace of median ridge anterior to procoxae; dull, with scale-like vestiture. Pronotal hypomera broad, shining, with weak isodiametric microreticulation. Elytral epipleura and pseudepipleura shining; pseudepipleura broad, especially around anterior ⅓, but continued to approximately ⅛ from apex. Mesoventrite dull, with similar scale-like vestiture; raised into small projection between mesocoxae. Metaventrite with anterior ⅕, immediately behind mesocoxae, dull, with scale-like vestiture. This section separated from posterior ⅘ of ventrite by strong arcuate carinae behind each coxa. Posterior part of ventrite shining, with weak isodiametric microreticulation towards sides. With shallow elongately rounded central depression occupying posterior half of ventrite. Area around and in front of depression with close, medium punctures, each bearing a long, white recumbent seta. Sides of shining part of metaventrite with sparse but very coarse punctures, bearing shorter, decumbent setae. Abdominal ventrite 1 with strong oblique carina behind each coxa. Abdominal ventrites 1–6 shining, with weak isodiametric microreticulation. Ventrites 1–5 with loose transverse rows of punctures bearing long whitish decumbent setae. Ventrite 6 with punctures and setae throughout.

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Aedeagus: Elongate, main piece strongly sinuate, ridged process rounded, gonopore process angled strongly to left in ventral view (Fig 2a). Membranous process broadly triangular, also angled strongly to left in ventral view, and obscured by gonopore process in lateral view. Parameres reaching angular process, and with thickened apices bearing long bristles.

Females: Slightly larger than males — see above. Pseudepipleuron of elytral interval 8 broader than in males. Labrum lacking protuberances and stout erect setae. Last ventrite with small but distinct apicomedian emargination. Last tergite weakly bilobed, each lobe bearing a group of 4–6 short, stout spines.

Variation: Holotype and many of the paratype series are slightly teneral; older paratypes are therefore somewhat darker brown both dorsally and ventrally, with reddish-brown legs. Dorsal setae, and granulation weaker on these older individuals, the pronotum in particular appearing to have large, shining, non-granulate areas posterolaterally on the disc.

Comparison: A member of the *endroedyi* group of *Coelometopon*, which would key to *C. natalensis* in Perkins (2005). It can be distinguished from *natalensis* by the sparser granulation of the pronotum, especially posteriorly. The aedeagus of *C. glenavoni* sp. n. differs from *C. natalensis* in the more rounded shape of the ridged process in lateral view as well as the different curvature of the main piece, with a longer, thinner straight section before the ridged process in *C. glenavoni* sp. n. In addition the position of the membranous process differs between the two species, being right dorsolateral in ventral view in *C. natalensis* and instead angled towards the left in *C. glenavoni* sp. n. The new species is also morphologically close to *C. brincki* Perkins, from which it can be distinguished externally by the continuous row of granules/setae on elytral interval 7 (interrupted in basal ⅓ in *C. brincki*), as well as the unilinear row of granules on the edge of elytral interval 8. The aedeagus of *C. brincki* also resembles that of the new species, but in *brincki* the ridged process is more distinctly angulate, and the curvature of the main piece is less severe, with a shallower angle between the basal and apical sections, and a much shorter apical section before the ridged process than in *C. glenavoni* sp. n.

Holotype: ♂ SOUTH AFRICA: '31/xii/2013 South Africa EC, Somerset East Boschberg, Glen Avon Falls wet rock face, D T Bilton leg.' (genitalia extracted and mounted on same card) and red holotype label (SAMC).

Paratypes: 10♂ 10♀, Same data as holotype (CDTB, MCZ, NHMUK, NMW, OUMNH, SAMC, SANC, TMSA). All with red paratype labels.

Distribution: Known only from the type locality, on wet rock faces beside Glen Avon Falls, a permanent waterfall on the southern slopes of the Boschberg close to Somerset East. The Boschberg is part of the Sneeuberg mountain complex of Great Escarpment of South Africa, forming part of the south-eastern connection between the Cape Floristic Region (CFR) and the Afromontane region of southern Africa (Clark *et al*. 2011). Moist valleys on the southern margins of the Boschberg support relictual patches of Southern Mistbelt Forest, as well as a number of endemic and relictual plants and invertebrates (e.g. Herbert 2007). A number of plant, and possibly bird taxa appear to have moved between the CFR and southern Great Escarpment via the Boschberg, which likely provides a similar route for mesic invertebrate groups such as *Coelometopon*. On the basis of morphology the two apparent closest relatives of *C. glenavoni* (*C. brincki* and *C. natalensis*) are both found much further to the east.

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Ecology: Found on damp rock faces in the spray zone of Glen Avon Falls waterfall. Specimens were taken from damp areas of seepage separated from the main falls, and were not present in wet areas beside the falls themselves. *C. glenavoni* sp. n. was the most abundant water beetle present at the site, occurring together with *Anacaena glabriventris* Komarek, *Enochrus* (*Methydrus*) sp., *Discozantanea* sp. (1 female only), *C. clandestinum* Perkins and *C. endroedyi* Perkins. For *C. clandestinum* this represents a significant westward range extension.

Oomtelecopon disjunctum sp. n.

Figs 1–2

Etymology: Named in reference to the distribution, which is apparently disjunct from that of its morphologically closest relative, *O. setosus*.

Diagnosis: A small *Oomtelecopon* (TL = 2.5 mm); dorsum reddish brown, with strong elytral callosities and long, curved, golden setae. Relatively elongate, and relatively flat in lateral view. Aedeagus characteristic.

Description:

Measurements: Holotype TL = 2.5 mm; EL = 1.55 mm; MW = 1.15 mm.

Colour: Dorsum reddish brown to black, with dense golden yellow setae. Legs and antennal stems dark reddish brown, maxillary palpi and antennal club darker. Venter reddish brown, mentum and parts of genae darker brown.

Head: Broadly triangular, broadest at central margin of eyes and narrowing somewhat to labral apex. Eyes raised, strongly protruding above vertex, and occupying just over ⅓ of side margin of head. Labrum transverse, with rounded apicomedian emargination. Shining and lacking microreticualtion, with medium, moderate punctures, each bearing a small, arcuate recumbent seta. Frons with lateral setose callosity in front of each eye, resembling a bottlebrush. Central vertex with a broad cavity between eyes. Maxillary palps very short, last segment narrower than penultimate and narrowed to bluntly pointed apex.

Pronotum: Transverse, sides emarginated behind protruding anterior angles, then straight to broadly rounded posterior angles. Hind margin broadly sinuate around centre. Disc with raised low tubercles each side of centre. Upper surface shining, with traces of microreticulation towards lateral margins. With long, arcuate golden yellow setae, setae denser and longer on tubercles and along lateral margins.

Elytra: Elongate, almost parallel-sided in anterior ⅔ then evenly rounded to apex. Elytral intervals 2, 4 and 6 with strongly setose low, elongate callosities. Callosities strongest on interval 2, weakest on interval 6, interval 4 intermediate. Odd-numbered elytral intervals with row of widely-spaced granules, each bearing a long arcuate golden yellow seta. Surface shining, lacking microreticulation.

Venter: Mentum transverse, 1.4× wider than long, trapezoidal and narrowed slightly towards the front with a very weak apicomedian projection, and with transverse depression either side of centre in posterior half. Weakly shining, with strong isodiametric microreticulation, and sparse, medium punctures, each bearing a flattened, white decumbent seta. Similar but shorter, curved white setae along anterior margin, in two fields,

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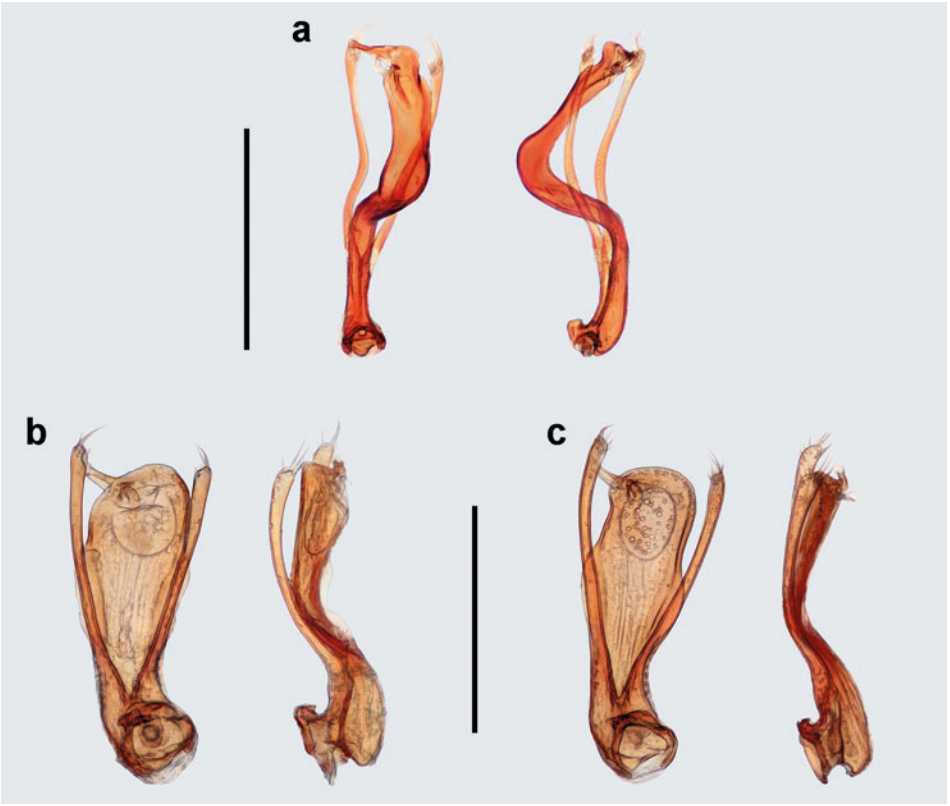


Fig. 2. Aedeagi of *Coleometopon* and *Oomtelecopon* species. (a) *C. glenavoni* sp. n., holotype; (b) *O. disjunctum* sp. n. holotype; (c) *O. setosus*. Scale bars (a) = 500 µm, (b, c) = 250 µm.

with gap in centre. Submentum triangular, strongly transverse; shining, with strong, rugose isodiametric microreticulation and small, sparse white decumbent setae close to posterior margins. Genae strongly microreticulate, dull, rugose; posterolateral ridges strongly developed and expanded. Central cavity between lobes of genal ridges large, elongate, trapezoidal. Prosternum short, with traces of weak, low central ridge anterior to procoxae. Pronotal hypomeron strongly setose anteriorly, glabrous posteriorly, the two areas separated by a strong carina. Shining, with weak isodiametric microreticulation in both areas. Mesoventral process pentagonal, elongate, with long, curved white setae. Metaventrite shining, punctate, punctures bearing long flattened white decumbent setae. Weak isodiametric microreticulation visible between punctures. Abdominal ventrites shining, with weak isodiametric microreticulation. Punctate, punctures bearing long flattened decumbent setae, longer than those on metaventrite. Abdominal ventrite 1 with strong oblique carina behind each coxa. Abdominal ventrite 6 with carina running along basal margin. Last tergite with exposed surface vertical; free margin arcuate. Tibia slender, flat on inner surface, as in other species of the genus.

Aedeagus: Moderately elongate, main piece asymmetrical, but with broadly rounded apex (Fig. 2b). Irregular ventrolateral expansions of main piece begin approximately ⅓

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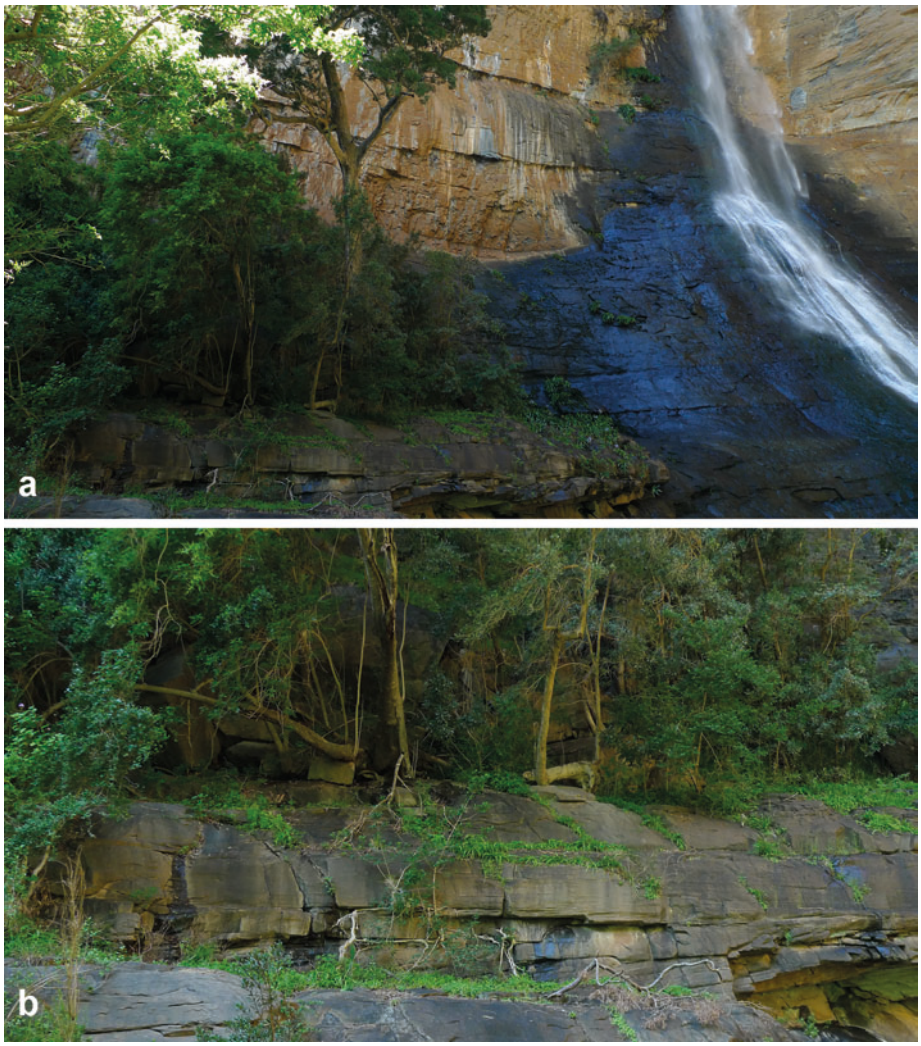


Fig. 3. Type locality of *C. glenavoni* sp. n., Glen Avon Falls, Boschberg, Somerset East. (a) general view of falls and surrounding habitat; (b) close up of rockfaces with seepages occupied by *Coelometopon*.

of the distance between the apex and the base of the parameres, and are visible beyond the margin of the parameres in both lateral and ventral views. Gonopore process angles to the left in ventral view; membranous process attaching towards the centre of the apex of the main piece, broad and short and just visible in lateral view. Roughly circular internal structure visible inside main piece in ventral view. Parameres with setose apices, extending just beyond apex of the main piece.

Female: Putative female slightly broader and more arched than male.

Comparison: The new species is morphologically closest to *O. setosus* (Figs 1c, 2c), sharing with it a similar body size, reddish brown dorsal coloration, and having a similar arrangement of dorsal callosities on the elytra, and similarly constructed male genitalia.

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The two species differ in a number of characters, however. *O. disjunctum* sp. n. is more elongate than *O. setosus*, particularly on the elytra (Figs 1b, 1c). The new species is also flatter than *O. setosus*, on both the pronotum and elytra, and the elytral callosities are less bulbous (Figs 1b, 1c). In addition *O. disjunctum* sp. n. has somewhat longer legs than *O. setosus*, and a less setose ventral surface, particularly obvious on the mentum and the abdominal ventrites. Punctures on the metaventrite are shallower in the new species than in *O. setosus*, and the cavity between the genal lobes differs between the two species. In *O. setosus* this is relatively short and rounded, whilst in *O. disjunctum* it is more elongate and clearly trapezoidal in shape. The aedeagi of the two species (Figs 2b, 2c) differ in detail, *O. setosus* having a more markedly asymmetrical main piece, narrower in lateral view, with smaller, more regular ventrolateral expansions which barely protrude beyond the outer margins of the parameres. In addition the gonopore process of *O. setosus* is longer than that of the new species, and the membranous process is longer and narrower in lateral view, and situated closer to the lateral margin of the apex of the main piece. *O. disjunctum* is only known with certainty from the holotype, meaning that some of external differences between this species and *O. setosus* may need revisiting once further specimens become available. These characters, in particular the form of the aedeagus, appear to be relatively constant in specimens and populations of *O. setosus* examined, however, something which strongly suggests that the Mitchell's Pass specimen belongs to a different species.

Holotype: ♂ SOUTH AFRICA: '27/ix/2009 South Africa WC, Mitchells Pass on R46 ca. 5 km, SW of Ceres wet rock faces, D T Bilton leg.' (genitalia extracted and mounted on same card) and red holotype label (SAMC).

Additional material examined: ?♀ '26/ix/2012 South Africa WC, Bains Kloof Pass small stream, below Obiekwaberg above, Wellington D T Bilton leg.'

Additional material remarks: A female *Oomtelecopon*, with elytral callosities as in *O. disjunctum* sp. n., but more strongly elevated, and elytra more arched and broader than in the holotype. May belong to *O. disjunctum* sp. n., or another as yet undescribed species. Impossible to assign with certainty in the absence of males.

Distribution: Known with certainty only from the type locality, a wet rock face beside the R46 road at Mitchell's Pass in the Witzenberg mountains above Ceres; the possible female being found below Bains Kloof Pass in the adjacent Limietberg. As discussed above, on the basis of morphology the closest known relative of *O. disjunctum* sp. n. appears to be *O. setosus*, a species apparently restricted to Table Mountain, the Cape Peninsula and the far southwest of the Hottentots Holland range (Perkins 2005). Deep phylogeographic/phylogenetic divergence between populations in the Cape Peninsula/extreme SW Cape and elsewhere in the Cape fold mountains is observed in a number of taxa, including *Peripatopsis* velvet worms (McDonald & Daniels 2012; Daniels *et al*. 2013), and *Capensisbufo* and *Xenopus* toads (Evans *et al*. 1997; Tolley *et al*. 2010), some of which have differentiated into separate species.

Ecology: *O. disjunctum* sp. n. was collected from a moist rock wall with clay deposits, lacking flowing water, together with abundant *O. sebastiani* Perkins, from which it could be distinguished in the field by its noticeably smaller body size. In addition the new species was microsympatric with *Coelometopon blinkwater* Perkins and *Pneuminion velamen* Perkins. Further searches at the time of collecting, and in subsequent years across a range of microhabitats have failed to produce additional specimens, suggesting that this species may occur at low density. The possible female was taken from the green

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algal covered surface of a damp sandstone boulder beside a small fall on a stream heavily shaded by *Erica* and invasive *Acacia*, together with *Nucleotops nimbaceps* Perkins.

ACKNOWLEDGEMENTS

I am grateful to Dr Rebecca Bilton for her help in the field, and to Prof. Michael Samways (Stellenbosch University), Ruth-Mary Fisher (SAN Parks), Deon Hignet and Danelle Kleinhans (Cape Nature) and Alan Southwood (Environmental Affairs, Eastern Cape) for assistance with sampling permits. Reg en Helen Playdon are thanked for allowing access to Glen Avon Falls.

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