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Revision of the South African genus *Epibrithus* Marshall (Curculionidae, Entiminae) with description of two new species

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Abstract. The monotypic genus *Epibrithus* (Curculionidae: Entiminae) was described by Marshall for *Epibrithus pustulatus* Marshall, 1955, a species from the Citrusdal region in a Western inland region of the Cape Floristic Region. This paper provides the re-description of the genus, the re-description of *E. pustulatus* and the description of two new species, *Epibrithus longicarinatus* Haran & Hansen sp. nov. and *Epibrithus boroveci* Haran & Hansen sp. nov. from South Africa. The species can most readily be distinguished on features of ventrite 5 of males, and features of the aedeagus and copulatory sclerites. COI data supports the morphological divisions. Based on morphological examination, we propose to transfer the genus to the tribe Oosomini until larger molecular revisions can confirm tribal relationships. *Epibrithus* appears to be native to a small area in the valleys/mountain slopes of the Western part of the Cape Floristic region. Adult *Epibrithus* appear to favour dense shrubs and trees, are rarely obtained in the field, and are scarce in collections.

Keywords. Cape Floristic Region, conservation, endemism, Oosomini, integrative taxonomy.

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Introduction

Weevils (Coleoptera: Curculionidae) are a hyperdiverse family of beetles, of which the largest subfamily is Entiminae Schoenherr, 1823 (Oberprieler *et al.* 2007). Several tribes of Entiminae, like Embrithini Marshall, 1942, Oosomini Lacordaire, 1863 and Tanyrhynchini Schoenherr, 1826 are afro-tropical in distribution (Alonso-Zarazaga & Lyal 1999; Marvaldi *et al.* 2014), and South Africa boasts a rich species diversity. New species of entimine, genera and even tribes are constantly being described from South Africa (Borovec *et al.* 2009; Borovec 2019a, 2019b; Borovec & Oberprieler 2013; Borovec & Skuhrovec 2018, 2019; Haran *et al.* 2020; Meregalli *et al.* 2021; Hévin *et al.* 2022). Even taxa previously considered monotypic can show a surprisingly high diversity upon detailed morphological and molecular examination (Haran *et al.* 2020; Hévin *et al.* 2022). The Cape Floristic Region (CFR) in the Western

and Eastern Cape Provinces is a small floristic kingdom that nevertheless has an impressively high biodiversity and endemism (Goldblatt & Manning 2002; Mittermeier *et al.* 2004), including amongst others some entimine taxa (Oberprieler 1988; Hévin *et al.* 2022).

Sir Guy Anstruther Knox Marshall (1955) described the monotypic genus *Epibrithus* and the species *Epibrithus pustulatus* Marshall, 1955, in the subfamily Otiorhynchinae Schoenherr, 1826 (now Otiorhynchini in Entiminae; Alonso-Zarazaga & Lyal 1999). The close morphological relationship to the genus *Embrithes* Schoenherr, 1842, is noted, but the tribal placement of *Epibrithus* is not discussed (Marshall 1955). The name '*Epibrithus humeralis* Marshall, 1955' appears on several biodiversity databases; this is an error for *Embrithes humeralis* Marshall, 1955, described in the same publication. Alonso-Zarazaga & Lyal (1999) listed *Epibrithus* under Embrithini Marshall, 1942, but Borovec & Oberprieler (2013) excluded *Epibrithus* from Embrithini based on the absence of metatibial corbels and the rostrum not being dorsally separated from the head. At present, the tribal placement of this genus is uncertain (Borovec & Oberprieler 2013). The genus description by Marshall (1955) is brief, based on one species, and some of the original description (e.g., connate claws) was found to be difficult to interpret when observing specimens under high magnification. Apart from the original description and sampling locality (Olifants River between Citrusdal and Clanwilliam, Western Cape Province), very little is known about the genus.

Specimens clearly differing from the species description of *E. pustulatus* were sampled from the Western Cape Province during recent collection trips. Given the newly discovered species and the brief genus description by Marshall (1955), the present study provides a re-description of the genus and *E. pustulatus*, a description of two new species, an illustrated key to males, and molecular data to distinguish species together with a discussion on the tribal placement of the genus.

Material and methods

Sampling, preparation and taxonomic treatment

Specimens were collected opportunistically by sweeping/beating of vegetation in suitable habitat in the Greater Cape Floristic Region. Freshly collected specimens were stored in 96% ethanol at ambient temperature until mounting. Dry-mounted specimens were borrowed from collections housed in some South African museums (Iziko South African Museum, Capetown) and the private collection of R. Borovec. *Epibrithus* are rarely found in the field and very few specimens are available in collections. In all, 28 specimens were examined directly, and a further 6 specimens were examined from high quality photographs provided by NHMUK.

The abdomens of adult specimens were removed and digested in KOH to obtain clean genitalic structures, commonly used to distinguish between closely related species in Entiminae (Borovec & Skuhrovec 2018; Borovec 2019b; Haran *et al.* 2020). Most morphological characters used to distinguish between species of *Epibrithus* are found on the ventrites and aedeagus (penis, tegmen and copulatory sclerite) of male specimens. The copulatory sclerite was carefully removed from the teguments of the endophallus. The habitus, ventrites and genitalic structures were photographed using a Keyence® VHX5000 imaging system. Measurements were taken using an optical micrometer. Body length refers to the distance from the apical margin of head excluding the rostrum to the apex of the elytra in dorsal view. Rostrum length refers to the distance between the anterior margin of the eyes and the apex of the rostrum including the closed mandibles. The length of the elytra refers to the distance from the anterior part of the scutellum to the apex of the elytra in dorsal view. The length of the penis refers to the distance (measured laterally due to strong dorsoventral curvature of penis) between the base and the apex of the penis body (apodemes excluded). The width to length ratio (w/l) was measured at the widest point of the rostrum, prothorax, the elytra and the penis (body). The terminology used follows Lyal (2024). The anterior of the aedeagus

is defined for when extruded. The regions of the copulatory sclerite are defined as in Haran *et al.* (2020). The female terminalia are not examined in the context of the study. All voucher specimens were mounted, dried and deposited at CBGP, Montpellier, France, in the CIRAD collection (https://doi.org/10.15454/D6XAKL), and at the Iziko South African Museum, Cape Town, South Africa.

The description of *Epibrithus* by Marshall (1955) was based on the one species, *E. pustulatus*, known at the time. Two other species have since been collected, and the genus is redescribed to include these species. Species description includes features variable between species. The identity of *E. pustulatus* is based on the examination of the holotype housed at SAMC, and the original description (Marshall 1955). The new species are authored by the last and first authors of this study.

Molecular analysis

For each species, 1–2 specimens were sequenced for the 658bp mitochondrial cytochrome c oxidase subunit I (COI) gene region fragment to support the interspecific distances identified from the morphological examination (Hebert *et al.* 2003).

DNA was extracted from a hind leg using the DNeasy Blood & Tissue kit (Qiagen, Hilden, Germany). A two-step PCR strategy with the overlapping fragments using MG2_LCO1490 × Ill_C_R and BF3 × BR2 primer sets respectively was conducted (Appendix 1), using a slightly modified Galan *et al.* (2018) protocol. Briefly, DNA from a hind leg was extracted using a 96-well plate animal genomic DNA miniprep kit (Biobasic) following the manufacturer's instructions, with an overnight lysis step. For library construction, the protocol by Galan *et al.* (2018) was used, modifying the annealing step for PCR1 (at 48°C for 120 s). Libraries were pooled in equimolar concentrations and paired-end sequenced on a MiSeq flow cell with a 500-cycle Reagent Kit v2 (Illumina). The bioinformatic steps were done as for Sow *et al.* (2019) and the two overlapping fragments were then manually merged and checked to produce the 658bp barcode. Barcode sequences were aligned and manually checked using CodonCode Aligner ver. 3.7.1 (CodonCode Corporation, Centerville, MA, USA) to verify the absence of pseudogenes using standard detection methods (Haran *et al.* 2015). Sequences are available in supplementary material of this article (Appendix 2). Uncorrected p-distance values of pairwise genetic distances between species were computed using Mega 7 (Kumar *et al.* 2016). A preliminary maximum likelihood phylogenetic tree was constructed using PhyML (Guindon & Gascuel 2003) with 1000 bootstrap replicates, using a COI sequence of *Phlyctinus callosus* Schoenherr, 1826 as outgroup (Haran *et al.* 2020).

Abbreviation of repositories

CBGP = Centre de Biologie pour la Gestion des Populations, Montpellier, France
CMNC = Canadian Museum of Nature Collection, Ottawa, Canada
NHMUK = Natural History Museum, London, United Kingdom
RB = Roman Borovec private collection, Sloupno, Czech Republic
SAMC = Iziko South African Museum, Cape Town, South Africa
SANC = South African National Collection of Insects, Pretoria, South Africa
TMSA = Ditsong National Museum of Natural History, Pretoria, South Africa (formerly Transvaal Museum).

Results

Taxonomic account

Class Insecta Linnaeus, 1758
Order Coleoptera Linnaeus, 1758
Superfamily Curculionoidea Latreille, 1802
Family Curculionidae Latreille, 1802
Subfamily Entiminae Schoenherr, 1823
Tribe Oosomini Lacordaire, 1863

Genus ***Epibrithus*** Marshall, 1955

Epibrithus Marshall, 1955: 7.

Type species

Epibrithus pustulatus Marshall, 1955, by original description.

Redescription (♂♀)

Measurements. Medium-sized weevils, body length 6.6–9.44 mm.

Color end vestiture. Integument dark red to black; integument of abdomen red-brown to black, ventrite 5 (♂) usually lighter red than 1–4. Dorsal vestiture (head, pronotum, elytra) forming a dense cover of small, round to elliptical (slightly longer than wide) appressed brown to light grey scales, not completely covering the integument; callosities on elytra and tubercles of pronotum with tufts (elytra) or single (pronotum) suberect elongate scales generally darker than surrounding vestiture; base of interstriae 1 with scale cover less dense, revealing integument, scales on legs generally more elongate (approx. twice as long as wide), similar in colour to vestiture on dorsum. Ventral vestiture (head, thorax, coxa, ventrites) similar to dorsum, scales generally 2–3 times as large, and more elongate (longer than wide); ventrites with sparse, stout, elongate, suberect scales, similar colour to surrounding vestiture but without pearly sheen.

Head. Rostrum longer than wide (w/l ratio: 0.84–0.9), in dorsal view sides wider at antennal insertions than at base (♂ 1.12–1.31 ×; ♀ 1.21–1.27 ×), slightly concave in the basal ½ of length and strongly convex in apical ½, in lateral view slightly convex dorsally and concave ventrally (Figs 1–3); epifrons narrower than forehead, widening apicad, with a median longitudinal carina extending from frons to forehead mostly concealed by scales; frons Y-shaped, about ¾ as wide as width of eye in dorsal view, integument punctate, bearing 2 pairs of elongate setae; epistome widest at apex, semi-circular posteriorly with a carinate hind margin not extending backwards beyond the apex of pterygia, bilobate, bare of scales, micropunctate, with or without a pair of setae. Scrobes superficial, directed below middle of eye, densely covered with scales (Figs 1–3); mandibles trisetose, bare of scales; mentum bisetose; forehead flat or somewhat depressed in the middle, with an elongate median fovea. Vestiture of head made of dense appressed imbricate scales (as for elytra) and sparse elongate semi-erect flattened scales; lateral and ventral regions basal to frons with a line of very elongate, 5 × longer than wide flattened scales. Eyes convex, exceeding the lateral margin of the head capsule in dorsal view. Antennae robust; scape 0.73–0.83 × as long as funicle, slightly curved to nearly straight, cylindrical, moderately widening from base to apical ⅔, more so in apical ⅓, exceeding anterior margin of pronotum in repose; integument densely covered with elongate imbricate scales and stout downcurved scales. Funicle with segments 1–2 elongate, 1 longer than 2 (1.14–1.68 ×), segments 3–6 subequal in length, longer than wide, conical, segment 7 subequal or slightly longer than 6, with elongate scales and stout erect setae; club spindle-

shaped, segment 1 longer than 2, margins slightly sinuous, posterior ½ of segment 1 with vestiture as for funicle, rest of vestiture of club finely and densely setose.

Thorax. Pronotum slightly wider than long (w/l ratio: ♂ 1.18–1.25, ♀ 1.30–1.32) in dorsal view, widest slightly beyond middle of length, apical margin 0.83–0.87 × as wide as base, sides moderately to strongly convex; in lateral view convex dorsally, highest point at or just before to middle of length; integument closely set with small subcontiguous tubercles, the apex of which is glabrous or more or less covered with scales, and bearing a short, stout, suberect scale, median line with a groove not reaching base and apex of pronotum; noto-sternal suture distinct, sinuous, tubercles reduced or absent at and below the level of this suture. Prosternum and prosternellum forming low obtuse spine-like process on either side of base of procoxae, covered with scales on prosternum and glabrous on prosternellum; mesosternum with raised intercoxal process covered with scales; metasternum with carinate margins around base of mesocoxae, may also be raised into a low ridge between basal half of mesocoxae; mesepimera narrowly triangular posteriorly, mesoventrite reaching elytral margin at apex; metanepisternal suture distinct in apical ⅓–½, superficial in posterior ½–⅔.

Scutellum. Scutellar shield not exposed.

Elytra. Broadly ovate in dorsal view, (w/l ratio 0.63–0.73), sides sub-parallel or convex and widest beyond middle of length, apex ovately to broadly rounded; humeral angles obtuse, poorly distinct from lateral convexity, located at 0.12–0.19 of elytral length; width at humeral angles 1.59–1.79 × (♂), 1.99–2.02 × (♀) as wide as base of prothorax; in lateral view, dorsal line convex, reaching highest point in basal ⅓ or about apical ⅓ beyond start of declivity; declivity steep in male, almost vertical in female; base of interstriae 1 with integument distinct, sparsely covered with scales or glabrous; each elytron with 10 shallow, hardly distinct striae, punctures partly irregular, almost or entirely concealed with scales; the interstriae with rows of somewhat irregular obtuse callosities which sometimes coalesce longitudinally or laterally with those on adjoining intervals, each callosity with scales more erect on posterior declivity than on base of elytra.

Metathoracic wings. Absent.

Legs. Robust. Procoxae contiguous, mesocoxae separated by approximately ⅕ × the width of a mesocoxa; femora clavate, unarmed, metafemora not reaching apex of elytra; tibiae slightly downcurved to nearly straight, internal margin bisinuate with a row of dark red to black denticles and generally with a row of 1–5 black suberect spines; external margin with dark semi-appressed setiform scales, internal margin with longer, more erect light setae; mucro concealed in a tuft of elongate curved golden-brown setae, distinctly longer and black on metatibiae in male (Figs 1A, 2A, 3A–B); metatibiae without corbel, bears comb of black spines. Tarsi with segment 1 slightly wider than 2, 2 approximately ¾ the length of 1, 3 bilobed, slightly wider than 1 and 2; claws simple, strongly curved, weakly divaricate but not mobile, equal or subequal in length.

Abdomen. Ventrite 1 with intercoxal process weakly (♀) or strongly (♂) concave in middle, ♂ 1.37–1.75 ×; ♀ 1.47–1.81 × the metacoxal width, apical edge bilobate to almost straight; in male ventrites 2+3+4 weakly concave in middle of apical ridge, concavities with integument poorly concealed by scales, apical edges slightly bilobate to almost straight in middle; ventrite 5 wide (w/l ratio: ♂ 1.49–1.78; ♀ 1.40–1.44), in female slightly convex with a very shallow apical depression, rounded apically, with a homogeneous cover of scales, apical margin with thin, brown, elongate setae forming a hook shape at apex, in males with a shallow cavity in apical ½–¾ of length, bearing a median carina, apical margin slightly to strongly bilobate, apex with two brushes of black setae.

Male terminalia. Body of penis well sclerotized, 1.58–2.44 mm in length, elongate (w/l ratio: 0.27–0.37), sides in basal ⅓–½ subparallel or slightly concave in dorsal view, widest in basal ⅓–⅔, converging abruptly or regularly in apical ½–⅓, apex acuminate; in lateral view strongly downcurved, curvature stronger near middle of length, with tip weakly or strongly downcurved; temones slightly shorter (0.91 ×) to slightly longer (1.04–1.14 ×) than body of penis. Copulatory sclerite with a left arm reflexed slightly outward or strongly inward, setose at apex. Tegmen slender, parameres distinct with fused bases divided by a median notch, manubrium more sclerotized than rest of tegmen, longer than diameter of ring. Spiculum gastrale well sclerotized, posteriorly curved and flattened to form a concave plate.

Epibrithus pustulatus Marshall, 1955
Figs 1, 4–5

Epibrithus pustulatus Marshall, 1955: 7–8 (description, distribution).
Epibrithus pustulatus – Alonso-Zarazaga & Lyal 1999: 156 (catalogue).

Diagnosis

A morphologically variable species, even within populations. Can be distinguished from *E. longicarinatus* sp. nov. and *E. boroveci* sp. nov. by the cavity in ventrite 5 of male specimens that are covered across its area by scales (Fig. 1E). The penis is shorter than in *E. longicarinatus* and *E. boroveci* (Fig. 1C) with an abrupt taper in apical ⅓ (tapering regularly in *E. longicarinatus* and *E. boroveci*). Females of this species can be distinguished from those of *E. longicarinatus* by their generally slightly smaller size and the more rounded elytra in lateral view (which reach their highest point in the middle vs elytra in *E. pustulatus*, with the highest point being situated more posteriorly vs close to the elytral declivity in *E. longicarinatus*). It is the only species of *Epibrithus* amongst material examined where some specimens have a distinct darker ovate band on the elytra, rather than a more homogeneous grey vestiture (Fig. 1A).

Etymology

The species was probably named after the callosities (‘pustules’, Marshall, 1955) present on the interstriae on the elytra of adults.

Material examined

Holotype

REPUBLIC OF SOUTH AFRICA – **Western Cape Province** • ♂; “Olifants River bet; Citrusdal & Clanwilliam C.P.” “*Epibrithus pustulatus* TYPE ♂” “HOLOTYPE” “Type SAM/Ent 4179” “IMAGED LEICA LAS 4.9 SAMC 2024”; SAMC.

Paratypes

REPUBLIC OF SOUTH AFRICA – **Western Cape Province** • 4 ♂♂, 4 ♀♀; same collection data as for holotype; type SAM/Ent 4180; SAMC • 3 ♂♂, 3 ♀♀; same collection data as for holotype; NHMUK.

Other material examined

REPUBLIC OF SOUTH AFRICA – **Western Cape Province** • 5 ♂♂, 1 ♀ (1 specimen preserved in ethanol); The Baths; 32°44′31″ S, 19°02′6″ E; 3 Nov. 2019; J. Haran coll.; beating vegetation; JHAR03020; CBGP • 1 ♀, Olifants River Mountains; O. Bokkeveld leg.; SAM-COL-A045235, SAMC.

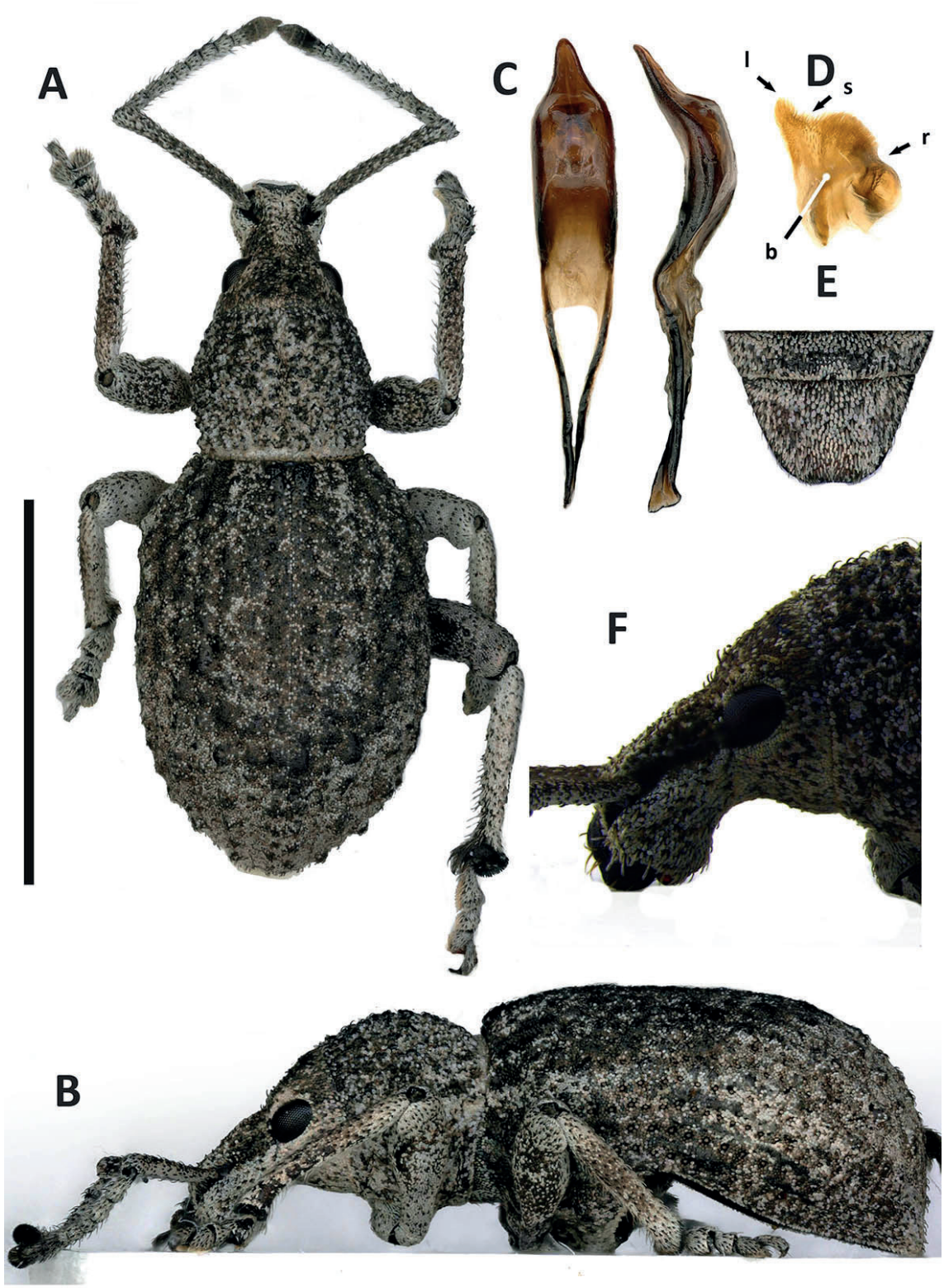

Fig. 1. *Epibrithus pustulatus* Marshall, 1955, ♂, (JHAR03020-01; CBGP). **A.** Habitus, dorsal view. **B**. Habitus, lateral view. **C**. Penis, dorsal (left) and lateral (right) views. **D**. Copulatory sclerite (b = body; l = left arm; r = right arm; s = setae at base). **E**. Abdominal ventrites. **F**. Head and rostrum, lateral view. Scale bar: A–B = 5 mm; C–F not to scale.

Redescription (♂♀)

Body length. 6.6–9.1 mm.

Colour and vestiture. Body integument dark red to black; elytral vestiture forming a dense cover of small, round to elliptical (slightly longer than wide) appressed brown-to-light grey scales, not completely covering the integument; callosities on elytra with tufts of suberect elongate scales, generally darker than surrounding vestiture; each elytron with an oblique dark band from humeral angle to apical ⅔ of suture in approximately 10–100% of specimens, depending on population; base of interstriae 1 with scale cover less dense, revealing integument.

Head. Rostrum longer than wide (w/l ratio: ♂ 0.84–0.86; ♀ 0.89), in dorsal view sides wider at antennal insertions than at the base (1.12–1.24 × ♂; 1.27 × ♀); apical to middle dorsal edges of pterygia raised abruptly above the level of frons in some specimens, causing pterygial edges to appear ridge-like; frons with scattered scales in basal part, epistome bearing 1 pair of setae (lacking setae in single specimens). Forehead with a distinct median fovea between eyes, distance between dorsal posterior margin of eyes > than width of eye; eyes moderately convex. Scape 0.73–0.82 × as long as funicle, slightly curved to nearly straight; funicle with segments 1–2 elongate, longer than wide (w/l ratio 1: 0.35–0.48; w/l ratio 2: 0.46–0.58), 1 subequal to longer (1.14–1.36 ×) than 2, segments 3–6 subequal in length, 7 subequal in length to slightly longer than 6, longer than wide (w/l ratio 3: 0.70–0.91), conical; club spindle-shaped, segment 1 longer than 2, margins slightly sinuous.

Prothorax. Slightly wider than long (w/l ratio: ♂ 1.18–1.25, ♀ 1.32) in dorsal view, apical margin 0.83–0.87 × as wide as at base, sides moderately convex, in lateral view highest point at the middle of length; median line with a groove not reaching base and apex of pronotum.

Elytra. Sides sub-parallel in the middle (w/l ratio: 0.67–0.73), apex broadly rounded; humeral angles located at 0.16–0.19 of elytral length; in lateral view, dorsal line convex, reaches highest point in basal ⅓. Size of elytral callosities differs between populations.

Legs. Tibiae nearly straight, internal margin often with row of 3–4 black, suberect spines; mucro concealed in a tuft of elongate curved golden-brown setae, distinctly longer and black on metatibiae in male.

Abdomen. Ventrites with pearly white rounded scales, contiguous but not concealing the integument; ventrite 1 intercoxal process slightly wider than the metaxocal width (♂ 1.67–1.75×; ♀ 1.81×), apical edge slightly bilobate in middle; in male ventrites 2+3+4 apical edges almost straight in middle; ventrite 5 (♂ 0.66–0.70 ×; ♀ 0.77 ×) as long as 2+3+4, ventrite 5 wide (ratio w/l: ♂ 1.64–1.78; ♀ 1.44), male with a shallow cavity in apical ⅔ of length, bearing an indistinct short apical median carina shorter than ¼ the length of cavity, margin slightly bilobate, vestiture of ventrite 5 with a homogeneous cover scales, revealing integument but covering the bottom of cavity, apex with two short brush of black setae (Fig. 1E).

Male terminalia. Body of penis short (1.58–1.65 mm), elongate (w/l ratio: 0.33–0.37), widest in basal ⅔, sides of basal ⅔ subparallel in dorsal view, converging abruptly at apical ⅓, then regularly apicad, apex acuminate, in lateral view downwards curvature strongest in middle ⅓, apex with very slight downwards curvature; temones 1.04–1.12 × as long as body of penis (Fig. 1C). Copulatory sclerite with left arm reflexed outward and curving slightly upward apicad in dorsal view, setae at base about a ⅓ as long as arm, left area of body wider than right (Fig. 1D). Spiculum gastrale posteriorly curved.

Life history

Specimens were observed in large numbers during daytime in a small patch of forest in the Citrusdal area (JHAR3020). Adults were found on the leaves of trees and on the lower branches, where vegetation was very dense (Fig. 4A–B). The absence of specimens in the fynbos surrounding this patch (intensively sampled) suggests that *E. pustulatus* has a preference for forest habitat. This species was sampled on *Galenia africana* (Aizoaceae) by R. Borovec, but no specific host could be identified by the second author while sampling. Adults were collected in November.

Distribution

This species appears to occur naturally around the Citrusdal area and north towards the Olifants River (Fig. 4D).

Remarks

The species is morphologically variable, in size, relative size of callosities, colour and morphological ratios, even within populations. Larger scale genetic analysis will be necessary to determine whether cryptic species occur within this species concept.

Epibrithus longicarinatus Haran & Hansen sp. nov.
urn:lsid:zoobank.org:act:00B4FCAE-2A33-4531-AE28-4EDB5266ADB0
Figs 2, 4C–D, 5

Diagnosis

Epibrithus longicarinatus sp. nov. can be distinguished from *E. pustulatus* and *E. boroveci* sp. nov. by the apical median carina in ventrite 5 of male being ½ the length of the ventrite (being proportionally shorter in the other two species). Unlike *E. boroveci* males, the apical median carina does not bear a brush of erect setae. From the specimens examined, this appears to be the largest species of *Epibrithus*, and has the proportionally largest eyes. The distance between the dorsal posterior margin of the eyes is less than the width of an eye in male specimens.

Etymology

This species is named for the elongated median carina in the cavity of ventrite 5 in males.

Material examined

Holotype

REPUBLIC OF SOUTH AFRICA – **Western Cape Province** • ♂; "REP. OF SOUTH AFRICA; WC. Algeria; 1 xi. 2022; J. Sudre coll." "JHAR05672-01; -32.394 19.086 [32°23′38.4″S, 19°05′09.6′″E]; Beating vegetation; SAMC" "HOLOTYPE; *Epibrithus longicarinatus*; Hansen & Haran 2025"; SAMC.

Paratype

REPUBLIC OF SOUTH AFRICA – **Western Cape Province** • 1 ♀; same collection data as for holotype; SAMC.

Description (♂♀)

Body length. 9.0–9.5 mm.

Colour and vestiture. Body integument dark red to black, elytral vestiture consists of a dense cover of small, round to elliptical (slightly longer than wide) appressed light grey scales, callosities on elytra with tufts of suberect elongate scales, generally darker than surrounding vestiture; base of interstriae 1 with scale cover less dense, revealing integument.

Head. Rostrum longer than wide (w/l ratio: 0.85), in dorsal view sides wider at antennal insertions than at the base (♂ 1.31 ×; ♀ 1.21 ×); frons with scattered scales in basal part only, and bearing 2 pairs of elongate setae; epistome bare of setae; forehead with a distinct median fovea between eyes, distance between dorsal anterior margin of eyes dorsally < than width of eye (♂), eyes large, convex. Scape 0.78–0.82 × as long as funicle, nearly straight; funicle with segments 1–2 elongate, longer than wide (w/l ratio 1: 0.32–0.38; w/l ratio 2: 0.43–0.53), 1 longer (♂ 1.45 ×; ♀1.68 ×) than 2, segments 3–6 subequal in length, longer that wide (w/l ratio 3: 0.75–0.89), conical, segment 7 slightly longer than segment 6; club spindle-shaped, segment 1 longer than 2, margins slightly sinuous.

Prothorax. Slightly wider than long (w/l ratio: ♂ 1.23, ♀ 1.30) in dorsal view, apical margin 0 × as wide as at base, sides moderately convex in male and more strongly convex in female, in lateral view highest point just before middle of length; tubercles are sparsely covered in scales at apex (revealing integument), median line with a groove not reaching base and apex of pronotum.

Elytra. Sides sub-parallel (♀) or convex and widest just beyond middle of length (♂) (w/l ratio: ♂ 0.63; ♀ 0.73) apex ovately rounded (♂), broadly rounded (♀); humeral angles located at 0.13–0.16 of elytral length; in lateral view, dorsal line convex, reaches highest point in about apical ⅓ beyond start of the declivity, callosities on apical ½ of posterior declivity with hook-shaped scales more elongate than on basal portion of elytra.

Legs. Tibiae slightly downcurved, internal margin often with row of 2–5 black, suberect spines; mucro concealed in a tuft of elongate curved golden-brown setae, distinctly longer and black on metatibiae in male.

Abdomen. Ventrites with pearly white rounded to elongate scales, contiguous but not concealing the integument; ventrite 1 intercoxal process slightly wider than the metaxocal width (♂ 1.43 ×; ♀ 1.47 ×), apical edge almost straight in middle; in male ventrites 2+3+4 apical edges almost straight in middle; ventrite 5 (♂ 0.77 ×; ♀ 0.91 ×) as long as 2+3+4, ventrite 5 wide (w/l ratio: ♂ 1.49; ♀ 1.40), male with a shallow cavity in apical ¾ of length, bearing an elongate median carina in apical ½ of length of cavity, margin strongly bilobate, vestiture of ventrite 5 with a bare patch revealing integument either side of the median carina in apical ½ of cavity, median carina with sparse scales and erect setae, apex with brushes of black setae (Fig. 2E).

Male terminalia. Body of penis long (2.28 mm), elongate (w/l ratio: 0.33), widest in basal ½, sides of basal ½ subparallel in dorsal view, converging regularly apicad from apical ½ of length, apex acuminate, in lateral view downwards curvature strongest just before middle and again at apex, apex with strong downwards curvature, temones 1.14 × longer than body of penis. Copulatory sclerite with all structures strongly reflexed inward, giving a rounded appearance, left area of body wider than right. Parameres diverging strongly apically; spiculum gastrale posteriorly curved.

Life history

This species was collected in the daytime from vegetation in a small patch of forest during November.

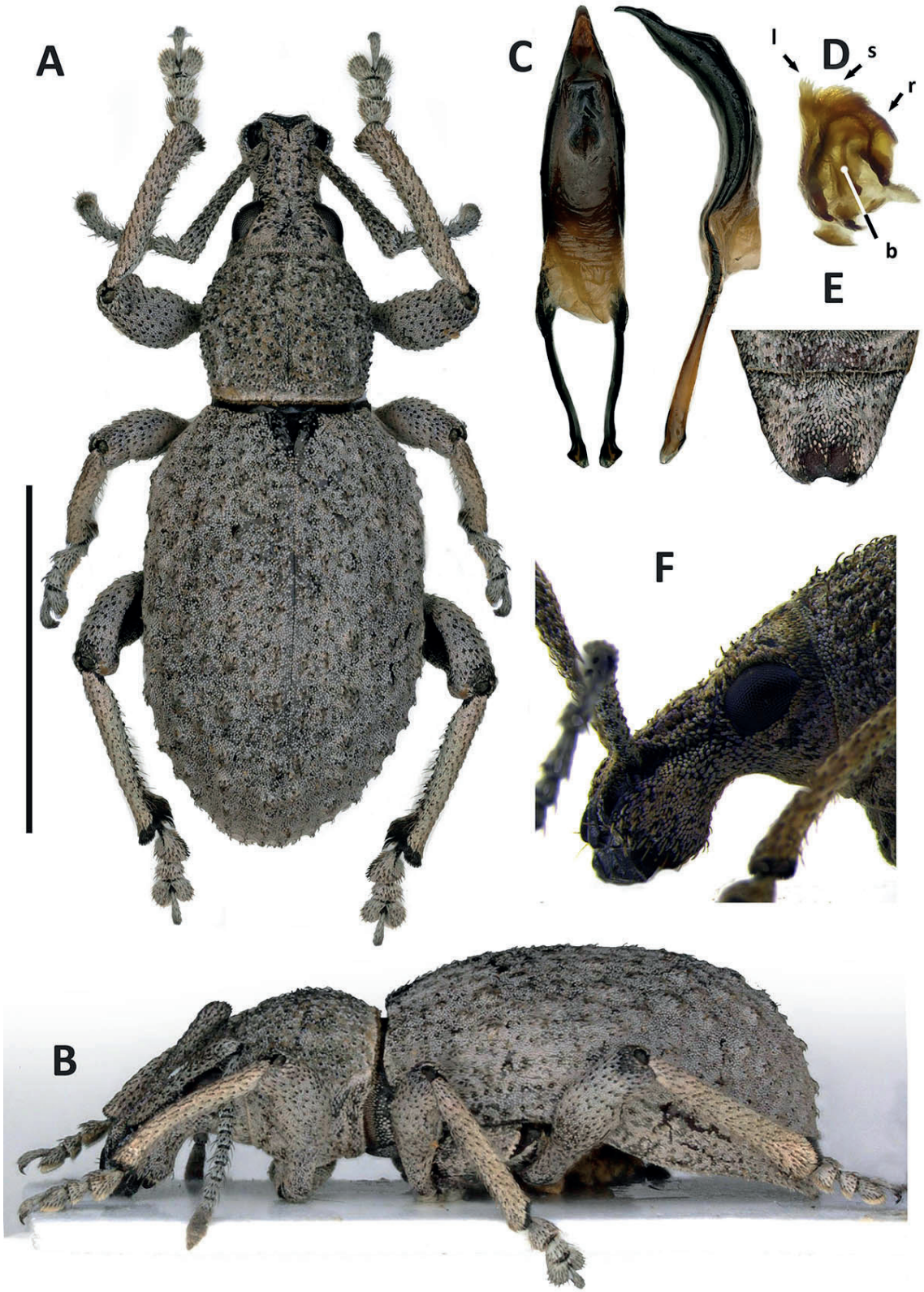

Fig. 2. *Epibrithus longicarinatus* sp. nov., holotype, ♂ (JHAR05672-01; SAMC). **A**. Habitus, dorsal view. **B**. Habitus, lateral view. **C**. Penis, dorsal (left) and lateral (right) views. **D**. Copulatory sclerite (b = body; l = left arm; r = right arm; s = setae at base). **E**. Male abdominal ventrites. **F**. Male head and rostrum, lateral view. Scale bar: A–B = 5 mm; C–F not to scale.

Distribution

Limited information available. This species is known from a limited number of specimens collected at Algeria in the Cederberg mountains (Fig. 4D).

Remarks

Only one male (the holotype) and one female (the paratype) were collected, therefore knowledge about intraspecific variability is still unknown.

Epibrithus boroveci Haran & Hansen sp. nov.
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Figs 3, 4C–D, 5

Diagnosis

Epibrithus boroveci sp. nov. appears to be somewhat intermediate morphologically between *E. pustulatus* and *E. longicarinatus* sp. nov. and can be distinguished from the latter two species by the median carina of ventrite 5 carrying a brush of setae and a penis that is longer than the temones (Fig. 3C). The median carina on ventrite 5 is relatively shorter, and the apical margin of this ventrite less strongly bilobed, than in male *E. longicarinatus* (Figs 2E, 3E).

Etymology

This species is named after our colleague and friend Roman Borovec, a weevil taxonomist who has contributed a huge body of knowledge on South African entimine weevils; and collected the paratypes for this species.

Material examined

Holotype

REPUBLIC OF SOUTH AFRICA – **Western Cape Province** • ♂; "REP. OF SOUTH AFRICA; WC. Piketberg; 26 viii. 2023; S. Hansen coll." "JHAR06376-01; -32.820 18.665 [32°49′12.0″ S, 18°39′54.0″ E]; Beating fynbos; SAMC" "HOLOTYPE; *Epibrithus boroveci*; Hansen & Haran 2025"; SAMC.

Paratypes

REPUBLIC OF SOUTH AFRICA – **Western Cape Province** • 15 ♂♂, 4 ♀; Aurora Mts., 32°41′638″ S, 18°32′350″ E; 715 m a.s.l.; 10 Nov. 2016; R. Borovec coll.; beating trees at night and morning; CBGP (1 ♂, 1 ♀); CMNC (1 ♂); NHMUK (1 ♂); RB (9 ♂♂, 2 ♀); SAMC (1 ♂, 1 ♀); SANC (1 ♂); TMSA (1 ♂).

Description (♂♀)

Body length. 7.7 mm.

Colour and vestiture. Body integument dark red to black; elytral vestiture forming a dense cover of small, round to elliptical (slightly longer than wide) appressed light grey scales; callosities on elytra with tufts of suberect elongate scales, generally darker than surrounding vestiture, base of interstriae 1, prothorax, and head of some specimens, with scale cover less dense, revealing integument.

Head. Rostrum longer than wide (w/l ratio: ♂ 0.9), in dorsal view sides wider at antennal insertions than at the base (♂ 1.25 ×); frons with scattered scales in basal part; epistome bearing no or 1 pair of setae;

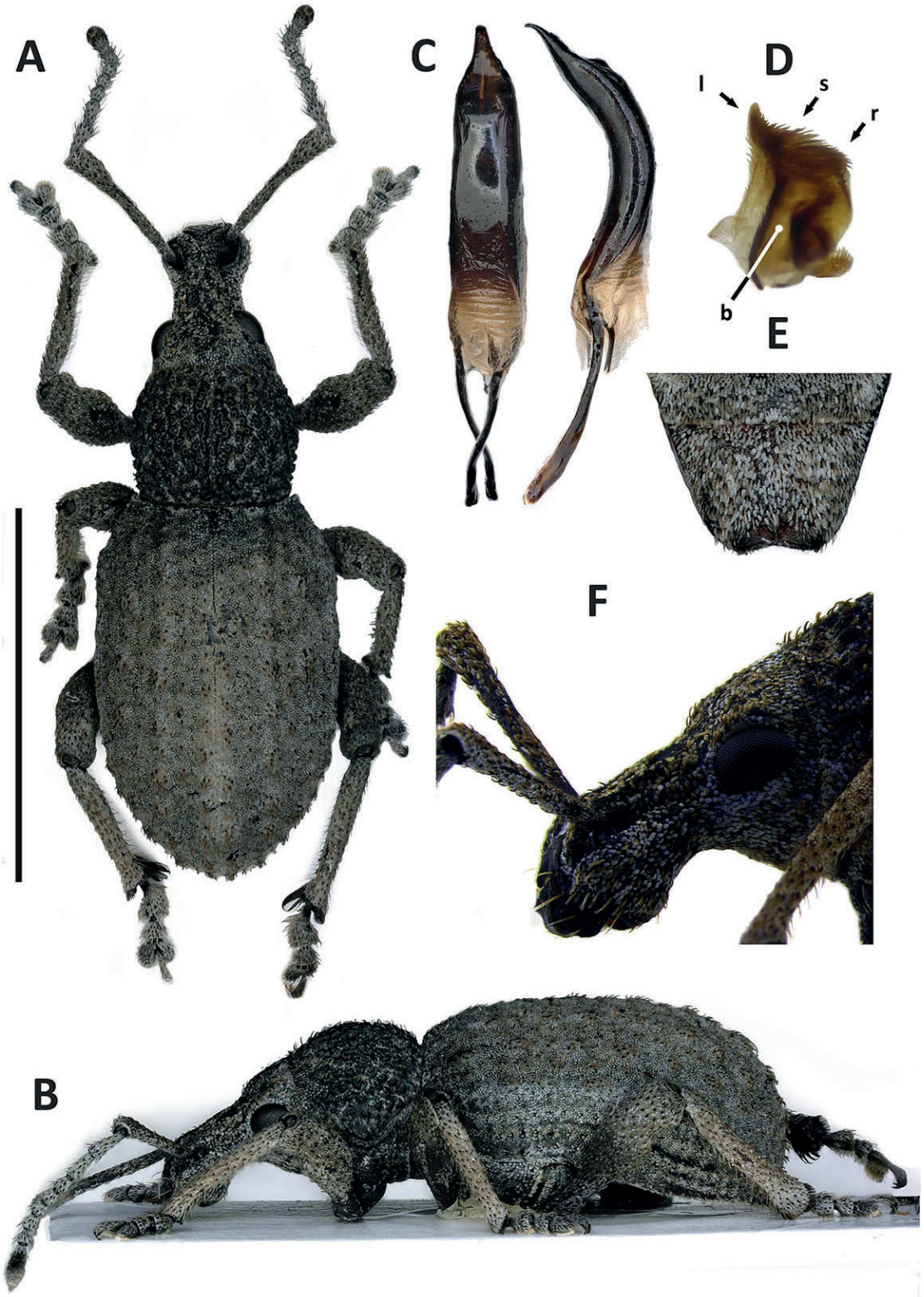

Fig. 3. *Epibrithus boroveci* sp. nov., holotype, ♂ (JHAR06376-01; SAMC). **A**. Habitus, dorsal view. **B**. Habitus, lateral view. **C**. Penis, dorsal (left) and lateral (right) views. **D**. Copulatory sclerite (b = body; l = left arm; r = right arm; s = setae at base). **E**. Abdominal ventrites. **F**. Head and rostrum, lateral view. Scale bar: A–B = 5 mm; C–F not to scale.

forehead with indistinct to distinct median fovea between eyes, distance between dorsal anterior margin of eyes dorsally > width of eye; eyes moderately convex. Scape 0.77 × as long as funicle, nearly straight; funicle with segments 1–2 elongate, longer than wide (w/l ratio 1: ♂ 0.39; w/d ratio 2: ♂ 0.46) longer (♂ 1.22 ×) than 2, segments 3–7 longer than wide (w/l ratio 3: ♂ 0.72) subequal in length, or segment 3 and 7 being slightly longer than 4–6, conical; club spindle-shaped, segment 1 longer than 2, margins slightly sinuous.

Prothorax. Slightly wider than long (w/l ratio: ♂ 1.21) in dorsal view, apical margin 0.85 × as wide as at base, sides moderately convex, in lateral view highest point just before middle of length; tubercles have sparse to contiguous scales at base and are largely bare at the apex, revealing integument; median line with a groove not reaching base and apex of pronotum.

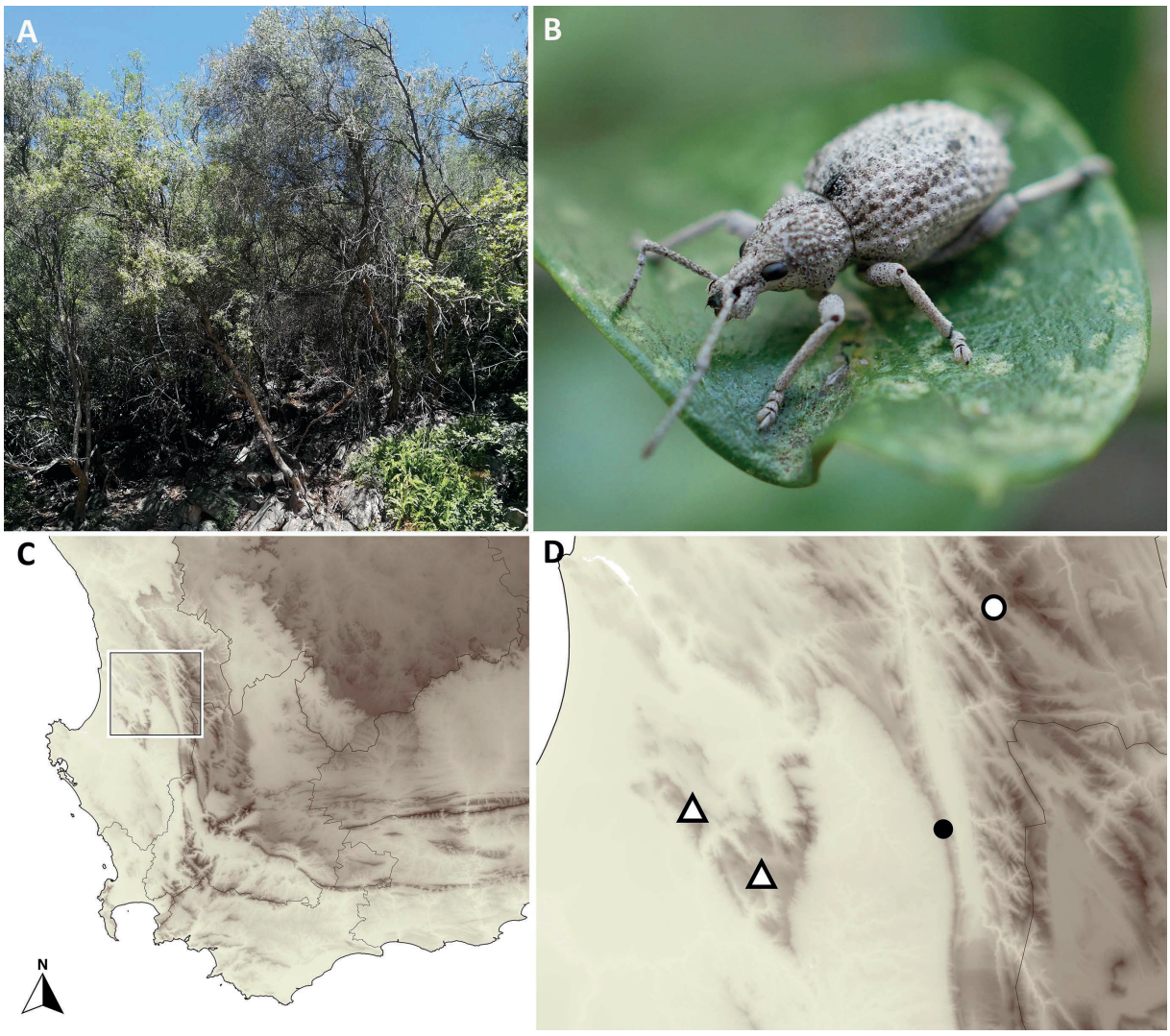

Fig. 4. Distribution and habitat of *Epibrithus* spp. **A**. Forest patch in the Citrusdal area, biotope for *E. pustulatus*. **B**. *E. pustulatus* in natura, The Baths, Citrusdal. **C–D**. Distribution maps of *Epibrithus* spp. in the Western inland region of the Cape Floristic Region: black circle: *E. pustulatus*; white circle: *E. longicarinatus* Haran & Hansen sp. nov.; triangles: *E. boroveci* Haran & Hansen sp. nov. Imprecise localities from museum specimens are not shown.

Elytra. Widest anterior to middle of length (w/l ratio: ♂ 0.63), apex ovately rounded (♂), broadly rounded (♀); humeral angles located at 0.12 of elytral length; in lateral view, dorsal line convex, reaches highest point just beyond middle of length to about apical ⅓ beyond the start of the declivity.

Legs. Tibiae nearly straight, internal margin of some legs with row of 1–3 black, semi erect spines; apical mucro concealed in a tuft of elongate curved golden-brown setae, distinctly longer and black on metatibiae in male.

Abdomen. Ventrites with pearly white rounded to elongate scales, contiguous but not concealing the integument; ventrite 1 intercoxal process 1.37 × metacoxal width (♂), in some male specimens bearing a weak median carina visible through scales in apical ½, apical edge bilobate (♂) or straight (♀) in middle; in male ventrites 2+3+4 apical edges almost straight to slightly bilobate in middle; ventrite 5 0.77 × as long as 2+3+4 (♂); ventrite 5 wide (ratio w/l: ♂ 1.62) with a shallow cavity in apical ½ of length, bearing a short median carina approximately ¼ to ½ of length of cavity with a brush of erect grey setae, margin strongly bilobate, vestiture of male ventrite 5 with a bare patch revealing integument either side of the median carina in apical ⅓ of cavity, apex with brushes of black setae (Fig. 3E).

Male terminalia. Body of penis long (2.44 mm), elongate (w/l ratio: 0.27), widest at base, sides of middle ⅓ slightly concave in dorsal view, converging regularly apicad from apical ⅓ of length, in lateral view downwards curvature strongest just before middle and again at apex, apex with strong downwards curvature, temones 0.91 × as long as body of penis (Fig. 3C). Copulatory sclerite with left arm reflexed outward, curving slightly downward apicad in dorsal view, setae at base approximately ¾ as long as arm, right and left area of body of approximately equal width (Fig. 3D). Parameres diverging weakly apically; spiculum gastrale posteriorly curved strongly dorsally.

Life history

Collected from fynbos shrub during daytime in August, and from trees during night and morning in November.

Distribution

Mountains around Piketberg and Aurora (Fig. 4D).

Remarks

In the two populations examined, the depth of the median fovea on forehead, the presence or absence of a median carina on ventrite 1 of males, the proportional length of the cavity and apical median carina of ventrite 5 of males, and proportional length vs width of elytra differ. These differences between populations may represent cryptic speciation. Morphological ratio measurements are based on the holotype.

Other species

Material examined

REPUBLIC OF SOUTH AFRICA – **Western Cape Province** • 1 ♂; Lemoens Hoek, Heidelberg, C.P.; Nov 1927; K.H. Barnard coll.; *Epibrithus* sp. n. det. R. Oberprieler, 198*; SAM-COL-A051991; SAMC.

This specimen does not match with the genus description above, with fewer and more elongate elytral callosities; truly free claws, a raised dorsal process on pronotum and no elongate metatibial setae in male. The specimen was also collected considerably to the east of other known *Epibrithus* spp. in CFR. The specimen represents a different and possibly novel genus that can be placed in Oosomini (open corbels, trisetose mandibles, dorsally placed antennal scrobes, and lack of ocular lobes, vibrissae and a humeral callus).

Key to species of *Epibrithus* Marshall, 1955

1. Cavity of ventrite 5 of male covered in scales across its surface, with an indistinct median carina shorter than ¼ the length of cavity in apical margin; apical margin of ventrite 5 in males weakly bilobed (Fig. 1E). Penis short (<2 mm), converging abruptly apicad at apical ⅓, with slightly downward curved apex in lateral view (Fig. 1C) ..... ***Epibrithus pustulatus*** (Marshall, 1955)
– Cavity of ventrite 5 of male largely bare of scales in apically, with a distinct apical median carina extending ¼ to ½ the length of cavity; apical margin of male ventrite 5 strongly bilobed. Penis long (> 2 mm), converging regularly apicad, with strongly downward curved apex in lateral view (Figs 2C, 3C) 2

2. Apical median carina in cavity of ventrite 5 of male bears distinct brush of erect setae (Fig. 3E). Body of penis longer than temones. Distance between dorsal anterior margin of eye > width of eye (♂) (Fig. 3C)..... ***Epibrithus boroveci*** Haran & Hansen sp. nov.
– Apical median carina in cavity of ventrite 5 of male lacks distinct brush of erect setae (Fig. 2E). Body of penis shorter than temones (Fig. 2C). Distance between dorsal anterior margin of eye < width of eye (♂) ..... ***Epibrithus longicarinatus*** Haran & Hansen sp. nov.

Genetic analysis

Interspecific variation in the 658 region of the COI gene supports morphological species divisions. Uncorrected *p*-distances of genetic variation in this region are 7.4% and 13.2% between *E. pustulatus* and *E. longicarinatus* sp. nov. and *E. boroveci* sp. nov. respectively, and 14.4% between *E. longicarinatus* and *E. boroveci*. The preliminary maximum likelihood tree of the COI region suggests that *E. boroveci* is a sister clade to *E. pustulatus* and *E. longicarinatus* (Fig. 5). This pattern possibly refers to the isolation of the Piketberg mountain range from the Cederberg range (Fig. 4C–D).

Discussion

Tribal placement of the genus *Epibrithus* Marshall, 1955

Epibrithus is listed under the tribe Embrithini Marshall, 1942 by Alonso-Zarazaga & Lyal (1999). It was removed from Embrithini by Borovec & Oberprieler (2013) due to the lack of metatibial corbels and the rostrum not being dorsally separated from the head by a transversal sulcus. Marshall (1955) described the claws as connate. Upon examination of specimens under high magnification, we found this feature

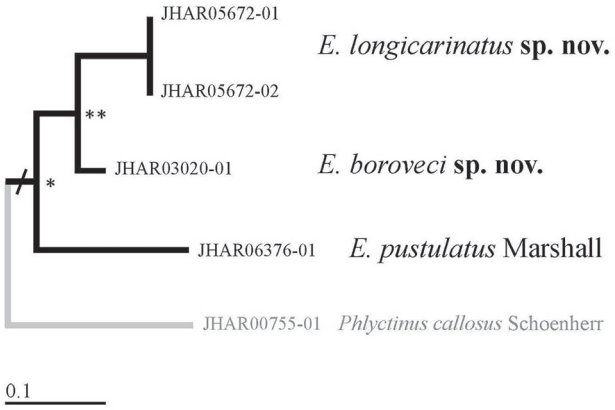

Fig. 5. PhyML phylogram of species of *Epibrithus* Marshall, 1955 inferred from the 658 bp region of the mitochondrial Cytochrome oxidase I (COI) gene fragment, utilizing *Phlyctinus callosus* Schoenherr, 1826 as an outgroup. Bootstrap support values from 1000 repeats are shown: * = 64, ** = 100.

difficult to interpret, with claws clearly divergent but not moving freely (therefore following definition of connate as per Lyal (2024). In all other features (trisetose mandibles, dorsally placed antennal scrobes, and lack of ocular lobes, vibrissae and a humeral callus) *Epibrithus* fits well with the tribe Oosomini. The tribes Oosomini and Embrithini are probably not naturally monophyletic and in need of larger scale morphological, and particularly phylogenetic, revision to better define these tribes and the genera belonging to them (Borovec & Oberprieler 2013; Borovec 2019a). We propose to include *Epibrithus* in Oosomini to facilitate the tribal placement and further handling of these taxa, until such a study can be undertaken.

Species richness and ecology

Two new species of the previously monotypic genus *Epibrithus*, *E. longicarinatus* sp. nov. and *E. boroveci* sp. nov., are described, and *E. pustulatus* Marshall, 1995 is redescribed. Descriptions were based on robust morphological differences (mainly on ventrite 5 and aedeagus in male specimens) and supported by COI data. All collection data for this genus originates in an approximately 120 000 km^2 area in the inland mountainous regions of the western part of CFR. Between and even within populations of a species (as currently defined), there is considerable morphological variation, and further molecular investigation may yield cryptic species. Given the flightless nature of *Epibrithus*, the heterogeneous landscape, and a seeming preference for moist, dense vegetation in a typically dry surrounding matrix, this diversity is not surprising. A similar pattern is observed in the largely coastal flightless genus *Phlyctinus* Schoenherr, 1826 (Entiminae: Oosomini) also native to the CFR, where populations being temporally trapped in patches of suitable moist habitat led to allopatric speciation (Hévin *et al.* 2022).

Epibrithus adults were always found on plants (seeming to prefer shrubs and trees), and their strongly curved tarsal claws suggest an adaptation to this habitat. Very little is known of the host range, feeding habits and life history of this genus. The entire CFR (including much of the known distribution range of *Epibrithus*) is under threat from anthropogenic influence and invasive species (Mittermeier *et al.* 2004). Given the small range in which these species occur, and their apparent very patchy distribution, all three species should probably at least be considered vulnerable, and enjoy some attention for conservation of their habitat.

Acknowledgements

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Printed versions of all papers are deposited in the libraries of four of the institutes that are members of the *EJT* consortium: Muséum national d'Histoire naturelle, Paris, France; Meise Botanic Garden, Belgium; Royal Museum for Central Africa, Tervuren, Belgium; Royal Belgian Institute of Natural Sciences, Brussels, Belgium. The other members of the consortium are: Natural History Museum of Denmark, Copenhagen, Denmark; Naturalis Biodiversity Center, Leiden, the Netherlands; Museo Nacional de Ciencias Naturales-CSIC, Madrid, Spain; Leibniz Institute for the Analysis of Biodiversity Change, Bonn – Hamburg, Germany; National Museum of the Czech Republic, Prague, Czech Republic; The Steinhardt Museum of Natural History, Tel Aviv, Israël.

Appendix 1. PCR primers sequences and references. Illumina linkers for 2-step strategy are in italics.

Gene	Primer	Primer sequence	Reference
BB	BF3	*TCGTCGGCAGCGTCAGATGTGTATAAGAGACAG*CCHGAYATRGCHTTYCCHCG	Elbrecht & Leese 2017
CR	BR2	*GTCTCGTGGGCTCGGAGATGTGTATAAGAGACA*GTCDGGRTGNCCRAARAAYCA	Elbrecht *et al.* 2019
	MG2-LCO1490	*TCGTCGGCAGCGTCAGATGTGTATAAGAGACAGT*CHACHAAYCAYAARGAYATYGG	Tournayre *et al.* 2020
	Ill_C_R	*GTCTCGTGGGCTCGGAGATGTGTATAAGAGACA*GGGXGGRTAXACXGTTCAXCC	Shokralla *et al.* 2015

Appendix 2. COI sequences of *Epibrithus* spp.

>JHAR03020-01_Epibrithus_pustulatus

AACTTTATATTTTATTTTTGGAGCATGATCTGGAATAATTGGAACTTCTTTAAGAATATTA-
ATCCGAGCAGAATTAGGCAACCCAGGATCCTTGATTGGTGATGATCAAATCTACAATGTA-
ATTGTTACAGCCCATGCTTTTATTATAATTTTTTTCATAGTTATACCTATAATAATCGGAG-
GATTCGGAAATTGATTAATCCCATTAATACTTGGAGCTCCTGATATAGCATTCCCACGATTA-
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GATAAAGGAGCTGGTACCGGTTGAACAGTTTATCCCCCCCTTTCAACTAATATTGCCCAC-
GAAGGCTCTTCCGTAGACTTAGCTATTTTTAGACTTCATATAGCCGGAGTTTCATCAATCT-
TAGGGGCTATTAATTTCATTTCAACTGTAATTAATATACGATCTAGAGGAATAACTATAGAC-
CGAATATCTTTATTTATTTGAGCAGTAAAAATTACTGCTGTTCTTCTACTACTTTCCCTC-
CCAGTTTTAGCCGGAGCTATTACTATACTTCTCACAGATCGAAATATTAATACATCATTTTTT-
GATCCTGCAGGCGGAGGGGACCCCATTCTCTACCAACACTTATTC

>JHAR05672-01_Epibrithus_longicarinatus

AACTTTATATTTTATTTTCGGAGCATGATCTGGGATAATTGGAACTTCTTTAAGAATACTA-
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>JHAR05672-02_Epibrithus_longicarinatus

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>JHAR06376-01_Epibrithus_boroveci

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CGAATATCTTTATTTATTTGAGCAGTAAAGATTACTGCCGTCCTTTTACTACTCTCCCTAC-
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GACCCTGCTGGTGGAGGAGACCCAATTCTTTACCAACACTTATTT