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RESEARCH ARTICLE

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A new genus and subtribe of bark beetles (Coleoptera, Scolytinae), from Udzungwa Mountains, Tanzania

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Udzungwana bispinosa, gen. et sp. n. is described from Tanzania and placed in a new corthyline subtribe *Udzungwanina*, subtribus n. Although this new subtribe lacks a single diagnostic character, the combination of characters makes it unique both within Corthylini and among other tribes. The new taxon is associated with dead hanging lianas in a tropical rain forest.

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INTRODUCTION

Bark and ambrosia beetles (Coleoptera, Scolytinae) in the Afrotropical region are less well known compared to the Neotropics, Indomalaya and Australasia. Most of the taxa that are currently known were described in the previous century, mainly by Schedl (e.g. Schedl 1952; Schedl 1957; Schedl 1960; Schedl 1962a; Schedl 1962b). Most of his efforts involved inventories in the Congo Basin. Other great efforts include the West-African timber research during 1960s (e.g. Browne 1972; Browne 1973; Roberts 1961; Roberts 1964) and some scattered collection efforts in eastern and southern parts of Africa (e.g. Schedl 1969; Schedl 1972; Schedl 1977). More recent collecting efforts have nevertheless revealed a rather large proportion of undescribed species (e.g. Jordal 2021a; Jordal 2021c; Jordal 2023) and indicate how little studied bark and ambrosia beetles are in this region, despite their global status as a familiar group of beetles.

One undescribed species was collected in Tanzania and bears a combination of morphological characters of dubious affiliation to other known genera. It was tentatively placed in Corthylini (voucher name CoMim02; Jordal and Cognato 2012) with some overlap in morphological characters with genera in Trypophloeini. The pronotum is unusual having concentric rows of pronotal asperities but not reaching the anterior margin, and the lateral margins are rounded with a basal rim. Two higher-level phylogenetic studies have indicated that this species forms a separate lineage equivalent of a new genus and at least a new subtribe (Jordal and Cognato 2012; Pistone et al. 2018). None of the molecular analyses revealed an exact placement with respect to other taxa and its ambiguous status is confirmed by a unique combination of morphological characters.

Taxonomic research on bark and ambrosia beetles in the past was surprisingly often characterised by a superficial examination of only a few body features. In most cases, structures in the head, pronotum, and elytra were described, sometimes also aspects of the legs. However, a wide variety of more informative characters can be found inside the body, including mouthparts, proventriculus and the male genitalia. In addition, features of the meso- and metanotum and hindwings can also be informative. This study describes all parts of the body of the new taxon which illustrates a lack of close affinities to other bark beetle genera (Table 1).

MATERIALS AND METHODS

Beetles were collected by hand in Mang'ula, Morogoro region in Tanzania, near the Udzungwa national park headquarter [7.845° S, 36.880° E]. DNA extraction and sequencing with subsequent phylogenetic analyses were described in previous studies (Jordal and Cognato 2012; Pistone et al. 2018). Dissections of internal anatomical structures were based on specimens macerated for about 4 hours in hot 8 % KOH, thereafter washed in water and EtOH, and mounted in euparal (Carl Roth, Karlsrue, Germany) on slides.

Photographs of whole specimens were made in a Leica m205 c stereo microscope and stacked using the Zerene Stacker software (https://zerenestacker.com). Measurements of length and width was made in perpendicular view, excluding head if visible from above. Slide preparations were photographed in a Leica microscope using the LAS module (Leica). Type materials are deposited in the University Museum of Bergen (ZMUB) and the Natural History Museum, Vienna (NHMW).

RESULTS

CORTHYLINI

Udzungwanina Jordal, subtribus n.

Type genus: *Udzungwana* gen. n.

Diagnosis

Eyes weakly sinuate in front; antennal club flattened, without sutures; funiculus 5-segmented; lateral margin of pronotum rounded, basal margin with a fine rim; third tarsal segment cylindrical;

Table 1: Major diagnostic characters in *Udzungwana* and similar character states found in some close relatives. Corthylini, including all genera or part of, are marked in bold.

Udzungwana	Similar Taxa
Eyes sinuate or weakly emarginate	Ipini, Dryocoetini, ***Stegomerus***
Antennal club flat with septum and no sutures	*Glostatus* (some), *Eidophelus*
Pronotal asperities not reaching ant. margin, summit with pits	*Glostatus* (males)
Pronotal margins rounded laterally, basal rim	*Glostatus, Ernoporus*
Hypomeron with split setae	*Cryphalus,* ***Stegomerus***
Elytra with scale-like ground vestiture	Trypophloeini (some), ***Stegomerus***, *Cryphalus, Ernoporus*
Legs broad with >5 lateral denticles	Trypophloeini, Xyloterini, Dryocoetini (part), Ernoporini, ***Stegomerus***, *Cryphalus*
Mesocoxae contiguous	*Cosmoderes* (Trypophloeini)
Metacoxae with deep vertical furrow	none
Scutoscutellar suture parallel	**Many tribes**, not Ernoporini
Pleural suture straight	***Stegomerus, Dendroterus***, Trypophloeini, not core Corthylini
Elytral locking spine	***Stegomerus, Dendroterus***, Trypophloeini, not core Corthylini, not Ernoporini
Hind wing, stigmal patch setae	***Stegomerus***, Micracidini, Hypoborini, *Polygraphus*
Proventriculus with open median suture	**Corthylini** (not *Dendroterus*), ***Stegomerus***, Micracidini
Aedeagus with closed tegmen and manubrium, spiculum and apohyses thin	General type in **Corthylini**, Ipini
Total of 15:	Trypophloeini 6, Corthylini 3, *Dendroterus* 3, *Stegomerus* 10

protibiae and metatibiae with >5 lateral socketed denticles; postnotum separated from metanotum by a complete membrane; scutoscutellar suture parallel to scutellar groove; pleural suture straight, elytral locking spine on metanepisternum distinct; proventriculus with large apical plate having an open median suture; male genitalia with a complete and ring-shaped tegmen, apophyses free.

Udzungwana bispinosa Jordal, gen. et sp. n.

Figures 1–13
Genus:
urn:lsid:zoobank.org:act:CFDC1B96-B761-40E4-8273-1FD1ED9427DD
Species:
urn:lsid:zoobank.org:act:BC5953DD-B0B1-40E1-9ADC-27939CD46B47

Type material

Holotype male: Tanzania, Morogoro prov., Udzungwa, GIS: 7.85° S, 36.89° E, ex thorny liana, 30.VI.2010, B. Jordal leg [ZMUB]; allotype female and 13 paratypes: same data as holotype; same data except Mang'ula, 7.VII.2010; same data except ex Fabaceae twig, 29.VI.2010 [ZMUB, 2 in NHMW].

Diagnosis

Antennal funiculus 5-segmented, club flat with one lateral transverse septum; lateral margin of pronotum rounded; males with a pair of sharp hooked spines on upper declivity; protibiae broad, with 6–8 lateral socketed denticles; tarsi cylindrical; pro- and mesocoxae contiguous; metacoxa with a deep, vertical, sclerotised furrow and dense vertical row of plumose setae along its anterior edge.

Description

Male. Body length 1.4–1.6 mm, 2.4–2.7 × as long as wide; colour yellowish brown. **Frons** slightly concave, shiny and impunctate in middle, with thick, spatulate, erect setae from eye to eye to vertex. Eyes slightly sinuate-emarginate. Antennal scapus elongated, as long as width of eyes, funiculus 5-segmented, club large and flattened, with a partial lateral septum at basal one-third. **Labium** narrow, with distinct dorsal ligula reaching labial palp segment 2; labial segment 3 half the width of segment 2, about as long as segment 1+2 combined; maxillary lacinia with coarse denticle-like setae along its inner edge. **Pronotum** humpbacked, with coarse asperities on anterior two-thirds, placed in approximate concentric rows over a triangular area, not reaching anterior margin, on summit with dense contiguous asperities and pits in a small circular area; lateral margins rounded, hypomeron with fine split setae, on notum with mixed coarse spatulate and fine hair-like setae. **Scutellar shield** flat, flush with elytra. **Elytral** base straight, with a very fine basal rim; mesal locking groove smooth, without nodules; elytral striae not impressed, declivity almost vertical, flattened, near top on interstriae 2 with a pair of sharp, hooked spines; vestiture consisting of fine minute setae in strial punctures, and irregular rows of erect, broad, scale-like setae on interstriae, becoming longer on declivity, especially near the spines, setae intermixed with short scale-like ground vestiture which along the elytral suture forms regular rows. **Protibiae** broad, lateral margin gently curved with 6–8 socketed denticles on distal half, inner mucro short, slightly curved; meso- and metatibiae only slightly narrower than protibiae, with 5–7 lateral denticles on distal third. Procoxae and mesocoxae contiguous; metacoxae with a distinct vertical furrow, along its anterior margin with dense vertical row of plumose setae. **Metanepisternum** largely covered by elytra, pleural suture straight, elytral locking spine near anterior margin short; vestiture on metanepisternum, mesepimeron and mesocoxae plumose, on upper metaventrite bifid and gradually longer and unifid below. **Hind wings** with two long setae on a tubercle in stigmal patch, costa+subcosta with more than a dozen long setae, costa near base with two close setae, posterior margin with setae as long as width of C+Sc. **Metanotum** separated from postnotum by a complete membrane; scutoscutellar suture nearly parallel to scutellar groove for most of its length. **Proventriculus** with apical plate longer than posterior plate, median suture wide open, V-shaped, plate with transverse rows of sharp teeth. **Aedeagus** simple, apophyses free, about as long as the aedeagal body, end plates thin but distinct; tegmen a complete ring, manubrium present, narrowly tapered; spiculum gastrale a simple curved rod shorter than aedeagus, with faint fork near its attachment.

Females externally similar to males, except frons less shiny in middle, and declivity less steep, without spines, but with single rows of fine granules on declivital interstriae 1–4.

Figures 1–8: Habitus of *Udzungwana bispinosa*, sp. nov. 1, 3, 5: male. 2, 4, 6: female. 7: protibia. 8: mesotibia.

Etymology

Genus named after the type locality, at the foothills of the Udzungwa mountains, with the addition of the Latin suffix *-ana*, which means 'belonging to'. Gender feminine. The species epithet *bispinosa* is a Latin nominative adjective, meaning two spines, referring to the sharp declivital spines in the males.

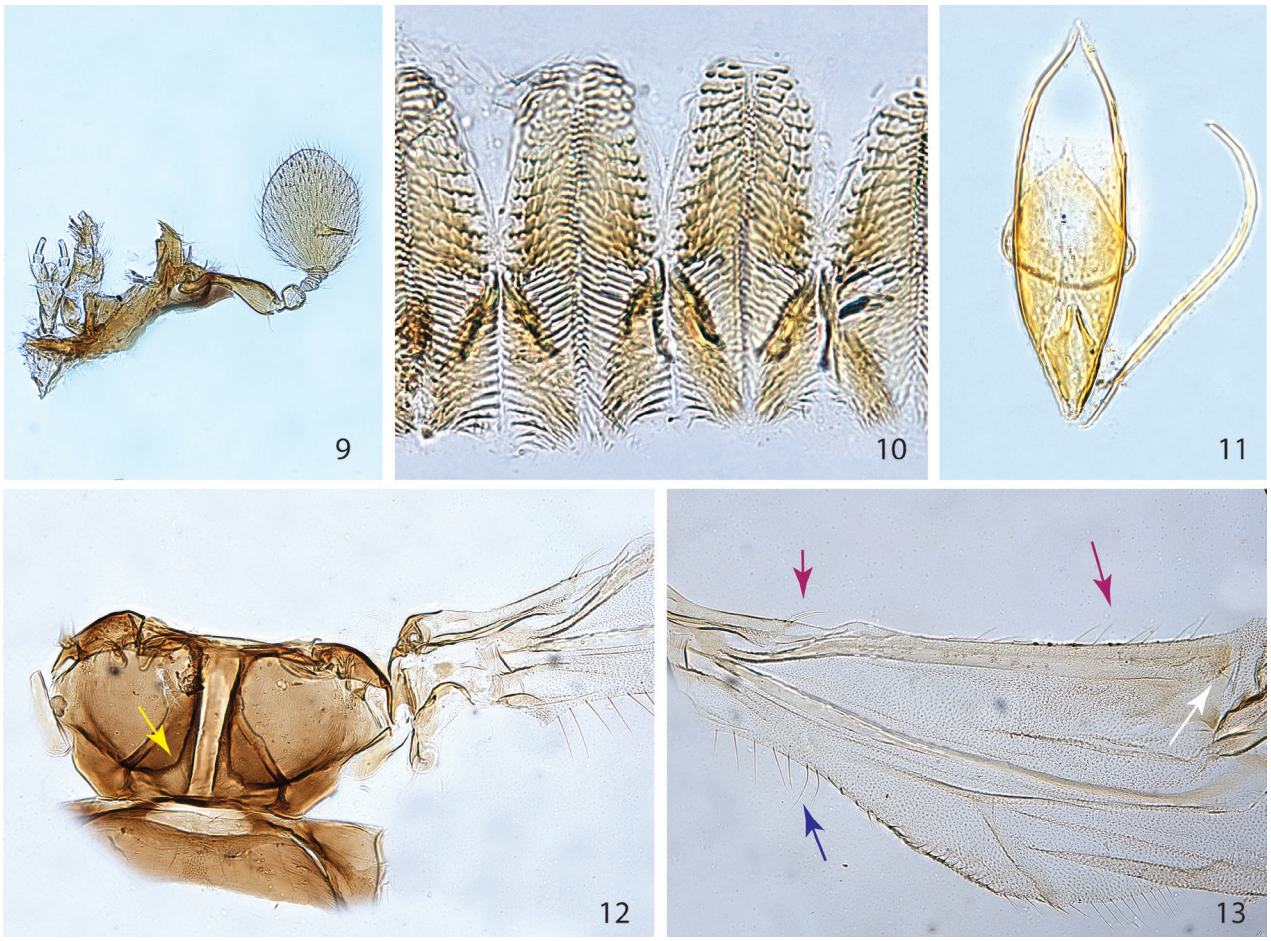
Distribution and biology

Only known from the type locality. Specimens were dissected from dead lianas hanging from big trees, in June and July, which is at the beginning of the dry season. The egg tunnels were cut both longitudinally and transversely to the grain, with the entrance hole in centre of a biramous tunnel. Eggs were deposited individually in niches, and larvae mined away in an approximately perpendicular angle to the egg tunnel. Total broods ranged between 23–30 larvae in 1 cm thick lianas (n = 5), and between 35–50 eggs and larvae in 2–3 cm thick lianas (n = 8). Fewer specimens were taken from a 0.8 cm thick legume twig, together with several species of *Hypothenemus* Westwood.

DISCUSSION

Molecular phylogeny

Two comprehensive molecular phylogenetic analyses which included data on the new genus have been published (Jordal and Cognato 2012; Pistone et al. 2018). They were all consistently placing the new genus (voucher acronym CoMim02) in different areas of the tree topology, not relating strongly to any particular group of species (Figure 14). *Udzungwana* was found in the neighbourhood of the Corthylini clade in one analysis, in other analyses near Trypophloeini or Xyloterini, but never with significant node support. The large number of markers used (11 partial genes), and several DNA extractions made from sibling specimens assured DNA integrity, and leave no doubt about its separate standing in the classification. The question is if morphological characters can indicate a tentative placement in, or near, any of the existing tribes.



Figures 9–13: Macerated and slide prepared internal body parts of *Udzungwana bispinosa*. 9: ventral side of labium and left maxilla, and left antenna. 10: proventriculus, inner face. 11: male aedeagus with spiculum gastrale. 12: metanotum with yellow arrow pointing at scutoscutellar suture. 13: basal half of hind wing, with pink arrows pointing at costal setae, and blue arrow at long setae along the posterior margin.

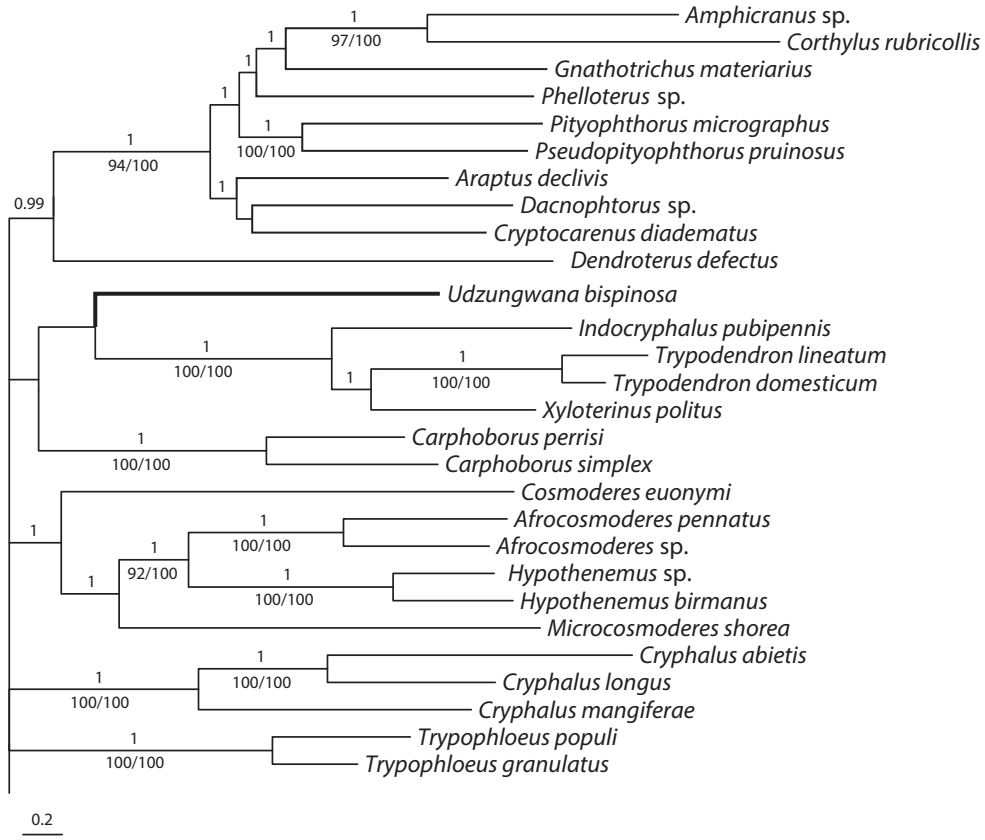


Figure 14: Phylogenetic tree modified from Pistone ***et al.*** (2018), showing the position of ***Udzungwana bispinosa***, sp. nov. (previously published under the voucher alias CoMim02).

Morphological affinities

Udzungwana exhibits no obvious character that deviates from all known tribes and genera of Scolytinae, except perhaps for a vertical furrow in the metacoxae (Table 1). On the other hand, there is no combination of characters that fully support inclusion in a scolytine tribe, consistent with its solitary position in the molecular phylogenetic trees. One of the molecular phylogenies placed *Udzungwana* as sister to Xyloterini (Pistone et al. 2018); however, the lack of node support in that study is corroborated by the clearly deviant morphology in Xyloterini, especially the corneous basal part of the antennal club, divided eyes, and a compact male aedeagus with dorsally open tegmen. Instead, the new taxon is morphologically closest to some genera in Corthylini and Trypophloeini in that the pleural suture is straight, the metanepisternal spine small, the third tarsal segment is cylindrical, and the tibiae are flat with five or more lateral socketed denticles. Particularly the corthyline genus *Stegomerus* Wood shares many similarities such as sinuate eyes, broad legs with many denticles, scale-like body vestiture which also includes split setae on the hypomeron, and the wide open median suture of the proventriculus. The proventriculus is actually very similar to most genera in the corthyline subtribe Pityophthorina (Lopez-Buenfil et al. 2001), but all such corthylines have a humpbacked pleural suture, deeply emarginate eyes, and narrow tibiae with few denticles. It should also be noticed that the genus *Mimiocurus* Schedl, which currently resides in Corthylini, is very different from the other genera in that tribe, particularly the proventriculus, legs and antennae which are typical Ipini (Jordal, unpublished data).

Udzungwana has a fairly general male aedeagus, similar in some respect to *Hypothenemus* and some other trypophloeine genera (Johnson et al. 2020), but the tegmen is closed dorsally as in all Corthylini, Ipini and Dryocoetini. Species in the superficially similar Ernoporini are fundamentally different in that aedeagal apophyses are fused, the spiculum thick and forked, the postnotum is fused to metanotum, the protibiae contains a deeper tarsal groove, and the lateral edge of the pronotum is often carinate. Similarly, Micracidini and Hypoborini are very different in the shape of their tibiae, also having short and rounded eyes and, for Hypoborini, a crested elytral base (Jordal 2021a; Jordal 2021b). Micracidini and Hypoborini are on the other hand similar in the distribution of setae on the hind wings and are among the very few groups that have two setae on a tubercle in the stigmal patch (Jordal 2009). Hypoborini also have similar labial palps as in *Udzungwana*, although the latter has a distinct ligula not present in Hypoborini. The peculiar pattern of asperities forming pits at the pronotal summit and concentric rows on the anterior half not reaching the anterior margin, resemble those in certain male *Glostatus*, but the proventriculus, genitalia and tibiae are very different (Jordal 2023).

Overall there is considerable uncertainty about the classification of *Udzungwana*. However, based on the many morphological similarities with *Stegomerus*, which is placed in Corthylini based on 28S ribosomal data (Johnson et al. 2020), it seems prudent to tentatively include *Udzungwana* in this tribe. However, a new subtribe Udzungwanina is warranted due to the shape of metacoxae and pronotum, and molecular data. Several other deviant genera in Corthylini may also need similar taxonomic specifications but this is a matter for future research on the Neotropical genera in Corthylini.

With the steady increase in DNA sequenced bark beetle taxa, it is obvious that many genera should not be members of existing tribes or subtribes (Johnson et al. 2020; Johnson et al. 2018; Pistone et al. 2018). The new subtribe described here adds to the many solitary lineages already discovered (e.g. Dole and Cognato 2007; Jordal 2010; Jordal 2017; Jordal 2022; Mandelshtam and Beaver 2003). Historically, such taxa have often been forced into bins consisting of various unrelated taxa, which is indeed unfortunate. Instead, we should aim at defining each separate lineage as an evolutionary entity at the same level as its species rich sister lineage. Many new taxa of bark beetles are continuously discovered, and it seems quite likely that over time such species poor lineages will transform by the addition of new species.

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