

Article

The Enigmatic Weevil Genus *Philetaerobius* from Southern Africa: Definition, Affinities and Description of Three New Species (Coleoptera: Curculionidae: Entiminae)

Roman Borovec ^{1,*}, Rolf G. Oberprieler ² and Massimo Meregalli ³

¹ Department of Forest Protection and Entomology, Faculty of Forestry and Wood Sciences, Czech University of Life Sciences Prague, Kamýcká 1176, CZ-165 21 Praha 6-Suchbát, Czech Republic

² CSIRO Australian National Insect Collection, G.P.O. Box 1700, Canberra, A.C.T. 2601, Australia; rolf.oberprieler@csiro.au

³ Department of Life Sciences and Systems Biology, University of Torino, Via Accademia Albertina 13, 10123 Torino, Italy; massimo.meregalli@unito.it

* Correspondence: romanborovec@mybox.cz

Received: 7 March 2018; Accepted: 21 April 2018; Published: 1 May 2018



Abstract: The small entimine genus *Philetaerobius* Marshall, 1923 is revised, entailing a redescription of the genus and the only hitherto described species, *P. nidicola* Marshall, as well as the description of three new species, *P. endroedyi* sp. n., *P. garibebi* sp. n. and *P. louwi* sp. n. A lectotype is designated for *P. nidicola* Marshall. The habitus and taxonomically important structures of all species are illustrated, including the previously unrecorded male and female genitalia. A key to the four species is provided, as well as a map of their known distributions in southern Namibia and the Northern and Western Cape provinces of South Africa. The habits of the genus, as known, are summarized, and its taxonomic position and indicated relationship with the taxonomically equally isolated genus *Spartecerus* are discussed. The habitus and genitalia of some *Spartecerus* species are also illustrated, and the available information on the life-history of the genus is summarized.

Keywords: taxonomy; South Africa; Namibia; weevils; new taxa; spermatheca; *Mimaulus*; *Spartecerus*

1. Introduction

Philetaerobius Marshall, 1923 is a very unusual genus of Entiminae, as its flat body and rostrum distinguish it from all other Entiminae in southern Africa. It was described by Marshall [1] for a single species, *P. nidicola* Marshall, which was found in a communal nest of the Sociable Weaver, *Philetairus socius* (Latham, 1790), in South Africa. In the literature, *Philetaerobius* remained known from only the five type specimens of *P. nidicola* for more than 60 years, until Louw [2] recorded collecting 150 specimens during a 1976 ecological study in southern Namibia. Oberprieler [3] later reported finding an undescribed species on grasses in central Namibia in 1987. However, substantial additional material of the genus was also collected in the 1970s and 1980s by the late Sebastian Endrödy-Younga, a coleopterist at the former Transvaal Museum in Pretoria, and some more specimens had accumulated in other collections in South Africa. Field work in 2011, 2013 and 2016 by two of the authors of the present paper (R.B., M.M.) in the Namaqualand and Richtersveld regions of the Northern Cape province of South Africa yielded a large number of further specimens and localities, which prompted us to revise the genus and describe the new species represented among the material collected after Marshall's description of *P. nidicola*.

Marshall [1] assigned *Philetaerobius* to the then subfamily Rhythirrininae as a “very aberrant form allied to *Gronops*”, and it was also listed in this group by Schenkling & Marshall [4] and by

Louw [5] (classified as Brachycerinae: Rhythirrinini), whereas Alonso-Zarazaga & Lyal [6] placed it as *incertae sedis* in the subfamily Cyclominae, which includes Rhythirrinini as a tribe. Oberprieler [3] noted that *Philetaerobius* has adelognathous mouthparts and the scars of deciduous mandibular cusps, and he consequently transferred the genus to the subfamily Entiminae, suggesting an affinity with the South African genera *Mimaulus* Schoenherr, 1847 and *Protostrophus* Jekel, 1875, which are currently classified in the tribe Cneorhinini. However, the taxonomic affinities of the genus have never been properly investigated. With much more material in hand now, we discuss its significant characters and taxonomic position in more detail, as far as is possible in the context of the present (unsatisfactory) tribal classification of the Entiminae, globally and specifically in southern Africa.

2. Materials and Methods

Body length was measured in profile, from the anterior border of the eyes to the apex of the elytra. Ratios of the width and length of the rostrum, pronotum and elytra are between the maximum width and length of the respective parts in dorsal view. Dissected genitalia are preserved in glycerol in microvials pinned with the specimens or embedded in Solakryl BMX mounted on the same card as the respective specimen. The photographs were taken using a Leica DFC500 digital camera mounted on a Leica M205C microscope, combining (“montaging”) image stacks in Leica Application Suite 4.4.0., and using a Nikon P 6000 digital camera mounted on a Wild MDG17 microscope, combining image stacks with the software program Zerene Stacker. All images were slightly enhanced for contrast and brightness, as necessary, in Adobe Photoshop CS3.

Sequences of the mitochondrial gene *COX1* were obtained for *P. nidicola* using the method described by Meregalli et al. [7] but using the primers of Folmer et al. [8] as modified by Astrin & Stüben [9].

Label data were generally recorded *verbatim*, with a slash (/) indicating separate lines on a label and a double slash (//) indicating different labels on a pin, except for those wrong coordinates of localities that were corrected where needed. This applied in particular to labels of specimens collected by Endrödy-Younga, which use a decimal-degree format but actually indicate minutes (and seconds). We checked and verified all given coordinates during compilation of the distribution map. Additional data were inserted where relevant and placed in square brackets.

The material examined (175 specimens) is housed in the following collections, identified by the following codens:

ANIC	Australian National Insect Collection, Canberra, Australia
BMNH	The Natural History Museum, London, United Kingdom
MMTI	Collection Massimo Meregalli, Torino, Italy
RBSC	Collection Roman Borovec, Sloupno, Czech Republic
SAMC	Iziko Museums of South Africa (formerly South African Museum), Cape Town, South Africa
SANC	South African National Insect Collection, Pretoria, South Africa
TMSA	Ditsong National Museum of Natural History (formerly Transvaal Museum), Pretoria, South Africa

3. Descriptions

Genus *Philetaerobius* Marshall, 1923

Philetaerobius Marshall, 1923: 546 [1]; Schenkling & Marshall, 1929: 20 [4]; Louw, 1998: 24 [5]; Alonso-Zarazaga & Lyal, 1999: 144 [6]; Oberprieler, 2010: 11 [3].

Type species: *Philetaerobius nidicola* Marshall, 1923, by original designation.

Diagnosis. Small Entiminae, with rostrum distinctly enlarged apicad, at apex broader than at base; frons large, indistinctly triangular, apically tectate, with 6–8 pairs of long setae; mandibles with spoon-shaped, vertical deciduous cusps; antennal scrobes narrow, straight, usually confluent on venter of rostrum; eyes in lateral view subtriangular to flatly reniform; antennal scapes significantly shorter than funicles; procoxal cavities nearer to posterior than anterior border of prothorax; metatibiae

without corbels; tarsal claws single or inner one (outer one on protibiae) reduced to minute tooth at the base of other; tergite VII in both sexes with sclerotised margin, deeply V-shaped concave with straight sides and a row of coarse punctures; ventrite 1 in middle about as long as ventrite 2, ventrite 2 slightly shorter than 3–5 combined; gonocoxites small, flat, placed at angle to each other, without styli; sternite VIII of female with basal plate broadly triangular, its basal margin sclerotised, apodeme with apex transformed into a long transverse bar; spermatheca with collum longer than cornu, irregularly distorted, apically usually bulbous and curled over.

Redescription. Body length 2.7–4.2 mm. Integument of body black, legs and antennae blackish or reddish brown with apical parts of femora, basal parts of tibiae and clubs blackish, claws black, apical tibial spines yellowish brown. Vestiture of body consisting of very dense, tessellate, appressed scales, completely hiding integument; scales on elytra large and flat, 3 across one elytral interstria, irregularly angular, leaving only very slender spaces between them, sometimes concave and with irregular puncture in centre; scales on pronotum, head and rostrum, legs, antennae except clubs and underside slightly smaller than elytral ones, imbricate, with a distinct puncture in centre. Raised setae on whole body inconspicuous, very sparse and very short, pale to dark brownish, hardly visible in lateral view, shorter than diameter of one adherent scale; pronotum dorsally with anterior fringe of short semi-erect setae; antennal funicle, tibiae and tarsi with short, suberect to recumbent, subspatulate greyish setae. Color pattern of body various, in fresh specimens basic colour of pronotum and elytra brown, often with small irregular blackish spots on dorsal part of elytra and greyish on outer interstriae and two slender blackish longitudinal stripes on pronotum; in some specimens predominant color of pronotum and elytra dark brown to blackish, with irregular small spots of pale brownish and whitish scales, in others creamy with few scattered white scales; head and rostrum blackish, frons greyish, sometimes with pearly sheen; antennae and legs greyish; only vestiture of *P. garibebi* paler, grey with admixed blackish and greenish or bronze scales; underside white greyish, legs and underside in some specimens opalescent.

Rostrum 1.13× broader than long to 1.14× longer than broad, ventral part in dorsal view not visible below epifrons, in apical half to two-thirds distinctly widened apicad, at apex broader than at base and slightly narrower than head including eyes; in lateral view flat, at same level as head, anteriorly more or less abruptly declivous beyond antennal insertions. Epifrons broad, flat or longitudinally depressed, tapering anteriorly with straight or weakly concave sides, at base as wide as interocular space, with slender median longitudinal stria along the whole length. Frons (Figures 1d, 2d, 4d, 6d, 8d) large, vaguely triangular to trapezoidal but not raised, reaching antennal insertions, squamose, border with epifrons indicated by lines between 2–4 pairs of long, stout setae; epistome distinctly tectate, squamose, border with frons indicated by 2–3 pairs of setae, one anteriorly and more widely spaced and the others further back. Mandibles very small, not projecting, base squamose; deciduous mandibular processes (Figure 4e,f) vertical, flatly, bluntly asymmetrically spoon-shaped, with concavity on the outside and base, there thickened and strongly protruding, situated just inside of squamose base of mandible and leaving a narrow, vertical, subtriangular scar when broken off. Prementum with two setae. Antennal scrobes (Figures 1e, 2e, 4e, 6e, 8e) in dorsal view invisible; in lateral view slender, sharp, curved obliquely downwards in front of eyes, mostly (except in *P. garibebi*) shallowly to deeply confluent at back of venter of rostrum, creating a small flat median projection of venter (Figure 6e). Head broad, flat to slightly concave, with slender longitudinal stria continuing into median stria on epifrons; laterally with prominent, rounded projection partly covering eyes in dorsal view. Eyes moderately large, kidney-shaped to subtriangular in outline, flat to slightly convex, placed in about middle of head height in lateral view, in dorsal view hardly to distinctly prominent from outline of head. Antennal scapes short, hardly reaching anterior border of eyes when folded back, at apex distinctly narrower than clubs, weakly curved, faintly regularly enlarged apicad. Funicles 7-segmented, 1.2–1.3× longer than scape, with segment 1 longer than broad, 2 isodiametric to transverse and 3–7 cupular to transverse, progressively shorter and broader towards club. Clubs oval with segment 1 conspicuously largest.

Pronotum flat, narrow, $1.08\times$ longer than broad to $1.10\times$ broader than long, sides strongly rounded, broadest near the midlength, strongly tapered anteriorly and more gradually posteriorly, anteriorly slightly broader than posteriorly, anteriorly constricted. Disc finely and densely punctate, flat or slightly vaulted with faint, shallow, curved depressions next to faint median longitudinal elevation, sometimes concealed below appressed scales. Base faintly to strongly arched. Anterior border in lateral view straight, without ocular lobes or setae. Procoxal cavities contiguous, round, nearer to posterior than to anterior border but not reaching it; procoxae subglobular. Scutellar shield indistinct.

Elytra very flat or slightly convex, subrectangular, together $1.48\text{--}1.71\times$ longer than wide, subparallel-sided or weakly and regularly curved, bases jointly strongly arched and embracing posterior part of pronotum, sides straight or moderately curved, at apex shortly elongated and rounded, with regularly rounded shoulders; 9-striate, striae distinctly narrowly punctate; interstriae flat to slightly convex, with single row of sparse, short, blunt, semi-erect setae but these often largely or totally absent on even interstriae, in all species except *P. garibebi* interstriae 1 and 3 raised at base and transversely connected, 5–8 also raised at base into shallow humeral callus, in *P. garibebi* all interstriae equally wide and even ones also with complete row of sparse but small, translucent setae. Mesocoxae semiglobular, mesoventral process narrow, about as wide as third of mesocoxal width, not reaching posterior margin of mesocoxae, prominently raised in *P. garibebi* but not in other species. Metacoxae semiglobular, not reaching elytra (cavities laterally closed by metaventrite), metaventral process arched, about twice as wide as metacoxa. Tergite VII short and broad, translucent, with well sclerotised narrow margins, deeply V-shaped concave with straight sides and row of coarse punctures; tergite VIII rounded, well sclerotised, coarsely punctate. Tergite VII and VIII identical in both sexes. Femora faintly swollen, unarmed. Tibiae moderately long and slender, straight, apical surface (surrounding tarsal socket) densely squamose; protibiae apically rounded, mucronate, with 6–7 short, fine, yellowish, sparse, well separate spines, with lateral margin straight and mesal margin faintly bisinuate, at apex enlarged; mesotibiae apically with 6, metatibiae with 8 subequal spines, mesotibiae also mucronate but metatibiae amucronate; metatibiae without corbels. Tarsi slender and long, underside with several sparse long setae, with segment 2 slightly broader than long, 3 faintly broader than 2, bilobed, segment 5 slightly shorter than 3; claws single or with minute remnant of second claw (on outside in protibiae, on inside in meso- and metatibiae), about $0.3\times$ as long as major claw.

Abdomen ventrally stretched subtriangular, about $1.3\text{--}1.4\times$ longer than broad; ventrite 1 in middle about as long as 2, 2 slightly longer than 3 + 4 combined, 5 short, apically rounded; suture between 1 and 2 faintly sinuate, very fine and inconspicuous, other sutures somewhat arched towards apex, fine and narrow; all ventrites regularly, finely and densely punctate but obscured by dense cover of scales; ventrites 1, 2 and 5 with irregularly scattered, semierect to recumbent, moderately long, subspatulate setae, ventrites 3 and 4 each with single transverse row of the same setae; ventrites 1 and 2 in male longitudinally shallowly concave, in female convex.

Genitalia. Penis moderately short, well sclerotised, tubular, curved, apex ventrally attenuate, dorsally below ostium with a tuft of two or more long subapical setae; inside in basal half with thick, single but complex sclerite about $0.5\times$ as long as body (Figures 3a, 5a, 7a), in *P. garibebi* with tubular sclerite as long as body and protruding from base of penis (Figure 9a); temones $1.4\text{--}1.7\times$ longer than body of penis and $4\times$ longer than tegminal manubrium. Tegmen with slender ring without parameres, manubrium slightly shorter than diameter of ring. Sternite IX of male with spiculum gastrale moderately long, anteriorly curved and tapered, posteriorly with short, transverse basal plate; sternite VIII consisting of two sickle-shaped, sclerotised hemisternites. Gonocoxites lightly sclerotised, flat, short and broad, roundly subtriangular (in *P. garibebi* longer and laterally curved outwards), at about right angle to each other, apex with a row of 3–7 stout setae, stylus absent. Sternite VIII of female (Figures 3c, 5c, 7c, 9d) short and broad, basal plate broadly triangular, wider than long, in centre weakly sclerotised, often forming a round fenestra, basal margin thickened and sclerotised, apical margin thin, arcuate, medially usually with 1 pair of long stiff setae (sometimes 2 pairs, and 4 in *P. garibebi*) and some smaller setae, sometimes medially notched; apodeme about as long as basal plate,

conspicuously T-shaped, caput forming a slender transverse rod as long as or longer than stem of apodeme. Spermatheca (Figures 3d, 5d, 7d, 9c) extraordinarily large and conspicuous, well sclerotised; cornu long, variously curved or bent, apically pointed or bluntly inflated; ramus short, subglobular, faintly longer than wide, sessile or on short stem, gland stalked, globular or elongate (in *P. garibebi*); nodulus not differentiated; collum distinctly longer than cornu, variously curved and twisted, apex usually bulbous and curled so that duct arises next to collum (in *P. garibebi* not curled and duct arising apically); spermathecal duct stiff, more or less straight, about as long as or shorter than spermatheca, inserted in middle of underside of bursa.

Distribution. *Philetaerobius* as known is endemic to the southern half of Namibia (the Erongo, Hardap and Karas regions) and the north-western parts of South Africa (the Northern and Western Cape provinces) (Figure 10).

Habitat and life-history. Marshall described *P. nidicola* from specimens found in a nest of the Sociable Weaver, a bird species endemic to southern Africa and occurring from central and south-eastern Namibia southwards through south-western Botswana into the Northern, North-West and Free State provinces of South Africa [10]. Two additional short series of specimens have been collected from such nests, at least one evidently representing the same collecting event (see under *P. nidicola* below). However, all newer specimens have been collected in pitfall traps [2,11], sifted from plant debris beneath shrubs or collected from grasses [3]. Given also that the adults are wingless, it seems that the specimens collected from Sociable Weaver nests were carried into the nests with plant material collected by the birds to construct their nests. The flat body and cryptic coloration of all species except *P. garibebi* suggest a specialized lifestyle on the ground, under leaf litter or stones or in crevices in the soil, but *P. garibebi* appears to lead a more exposed way of life on plants, as other entomines generally do. The weevils have invariably been collected in xeric habitats, such as dry grassy plains adjacent to dunes [11], but little further is known about their habitats and nothing about the larvae and their hostplants and feeding sites. The deciduous mandibular cusps of teneral adults indicate that the weevils pupate in the ground and have soil-dwelling, root-feeding larvae like other entomines do. The peculiar, shovel-like shape of the deciduous cusps suggests a specialized mode of pupation, perhaps in loose sand rather than in firm soil as it occurs in other entomines, and possibly the larvae of *Philetaerobius* also lead a specialized way of life. Closer observation of the weevils in their habitats is required to properly assess their habits and life-history.

Remarks. *Philetaerobius* is a unique genus among the entomine fauna of southern Africa, differing most significantly from all other genera in the unusual shape of its spermatheca and sternite VIII of the female and, as far as known, of its deciduous mandibular cusps. Other characteristic features are the flat body shape, squamose epistome and frons, ventrally confluent or almost confluent scrobes, single or almost single tarsal claws, tubular internal sclerite of the penis, apical tuft of setae on the penis and tessellate scales arranged on the elytra in rosettes around the interstitial setae. The only entomine genus in southern Africa with a similar spermatheca is *Spartecerus* Schoenherr, 1834, to which *Philetaerobius* appears to be related on this account, although *Spartecerus* is very different in shape and other external features. A tubular internal sclerite of the penis also occurs in *Spartecerus* and, to a lesser degree, in *Mimaulus*, which furthermore has a similar rosette-like arrangement of scales on its pronotum and elytra. The likely relationships of *Philetaerobius* to these genera are explored in more detail below (see Discussion).

Philetaerobius can be regarded as a monophyletic taxon mainly on the shape of the apodeme of sternite VIII of the female, featuring a conspicuous transverse bar at its apex, and, as far as known, on the shovel-like mandibular processes, the squamose epistome and the apical tuft of setae on the penis. The structure of its spermatheca is also rather unique, differing from the similar one of *Spartecerus* in not having a nodulus differentiated at all. In *Philetaerobius*, *P. garibebi* occupies an isolated position, differing in several characters from all the other species (see description and key). Some of these characters appear to be more derived, e.g., the single claws and absence of humeri, whereas others seem more plesiomorphic, e.g., the shape of the elytra (especially at the base) and eyes, the long tubular

penis sclerite and the development and setation of the gonocoxites and sternite VIII of the female. While these numerous differences may warrant placing *P. garibebi* in a separate genus, we prefer to assign it to *Philetaerobius* as it shares all the critical genital characters of the other species and evidently belongs to the same monophyletic taxon. When or if additional species of *Philetaerobius* are discovered and perhaps accentuate these differences, the taxonomic position of *P. garibebi* may be revised.

Key to the species of *Philetaerobius*

1. Body in lateral view dorsally gently convex, elytral declivity in apical third; eyes vertically aligned on head in lateral view; scrobes not confluent on underside of rostrum; body dorsally covered with greyish-white scales, partly with a pearl to coppery sheen; tarsal claws single; penis with long, thick, straight, simple, cylindrical internal sclerite.....*P. garibebi* sp. n.
- Body in lateral view dorsally flat, elytral declivity in apical fifth; eyes obliquely to horizontally aligned on head in lateral view; scrobes confluent on underside of rostrum; body dorsally covered with mainly brown scales, admixed with some black and white scales arranged in rosettes; tarsal claws unequal, tiny remnant of second one present; penis with short, thick, dorsally open, apically double internal sclerite.....2
2. Eyes in lateral view subtriangular, regularly tapered posteriad, with ventroposterior margin straight, in dorsal view almost flat, hardly protruding from outline of head; epifrons flat; pronotum slightly longer than broad; internal sclerite of penis with dorsal apical arm as long and about as thick as ventral arm; spermatheca with cornu thickened apicad, apex globular.....*P. endroedyi* sp. n.
- Eyes in lateral view kidney-shaped, in posterior half abruptly tapered posteriad, with ventroposterior margin distinctly concave, in dorsal view faintly vaulted, protruding from outline of head; epifrons longitudinally depressed; pronotum slightly broader than long; internal sclerite of penis with dorsal apical arm shorter and thinner than ventral arm; spermatheca with cornu tapered apicad, apex acute.....3
3. Rostrum shorter, 1.1× broader than long; elytra broader, 1.45–1.55× longer than broad, laterally at apex beak-shaped elongate; odd elytral interstriae more elevated than even ones on disc; funicle segments moniliform, well separated; internal sclerite of penis broad, dorsal arm divided into two laterally projecting teeth.....*P. nidicola* Marshall
- Rostrum longer, 1.05× longer than broad; elytra slender, 1.6–1.7× longer than broad, laterally at apex regularly convex; elytral interstriae flat on disc; funicle segments cylindrical, closely approximated; internal sclerite of penis narrow, dorsal arm not divided into laterally projecting prongs.....*P. louwi* sp. n.

Philetaerobius nidicola Marshall, 1923 (Figures 1–3)

Philetaerobius nidicola Marshall, 1923: 547 [1]; Schenkling & Marshall, 1929: 20 [4]; Alonso-Zarazaga & Lyal, 1999: 144 [6]; Oberprieler, 2010: 11 [3].

Redescription. Body length 3.16–4.25 mm, lectotype 4.06 mm. Color pale brownish, elytra with only several dark brownish or blackish and whitish spots, whitish spots sometimes forming irregular lateral stripes on interstriae 6 and 7, blackish spots dominant sometimes in posterior declivity. Pronotum with two irregular dark brownish longitudinal stripes. Rostrum 1.05–1.13× broader than long, in basal half faintly tapering anteriad, in apical half distinctly enlarged anteriad, with straight sides; in lateral view short and robust. Epifrons evenly tapered anteriad along whole length, with straight to slightly convex sides, longitudinally shallowly regularly deepened along the median longitudinal stria. Scrobes shallowly confluent at back of venter of rostrum. Eyes in dorsal view vaulted, weakly prominent from outline of head; in lateral view slender, horizontal, kidney-shaped,

tapered posteriad, with ventral margin concave. Antennae with funicle with segments well separated, bead-shaped; segment 1 conical, 1.1–1.2× longer than broad and 1.1–1.2× longer than segment 2; segment 2 1.1–1.3× broader than long to isodiametric; segments 3–5 1.1–1.5× broader than long; segment 6 1.2–1.6× broader than long; segment 7 1.4–1.7× broader than long. Clubs 1.6–2.1× longer than broad. Pronotum 1.07–1.18× broader than long, broadest at midlength, in lateral view flat to slightly convex, with swollen anterior margin. Elytra 1.45–1.57× longer than broad, parallel-sided, apically broadly rounded, evenly tapered posteriad; interstriae flat, only 1, 3 and 6 behind base more elevated than others, 1 also on declivity slightly elevated. Tarsi with segment 2 isodiametric to 1.3× broader than long, segment 3 1.1–1.3× broader than long and 1.1–1.2× broader than segment 2, onychium 1.1–1.2× longer than segment 3. Genitalia. Penis parallel-sided, in apical fifth regularly tapered with slightly convex sides, with apex truncate, in lateral view regularly curved, equal in width, in apical third regularly tapered with lengthened apex; internal sclerite with dorsal arm apically divided into 2 stout short teeth directed lateroposteriad but not reaching apex of ventral part (giving the appearance of a clove), ventral part dorsoapically raised into narrow spout. Gonocoxites flat to shallowly convex, spatulate, broader in apical half; apex broadly rounded, with 1–2 stiff setae; orientated at about 90–135° to each other. Spermatheca with cornu abruptly bent at basal third of its length, apically slightly narrowed and bluntly pointed, often slightly bent; ramus globular, shortly stalked; gland ovoid, ca. 2× broader than ramus, on narrow stalk of same length; collum long, more or less straight but with slight irregular bends along the length, apex bulbous and curled over; duct stiff, straight to faintly twisted, shorter than spermatheca.

Material examined (60 exx.). Types. Lectotype (here designated), ♂: Type [printed, rounded with red margin] / *Philetaerobius nidicola*, Mshl. TYPE [handwritten] / S. Africa [printed] / In nest of Social Weaver Bird (*Philetaerus socius*) [handwritten] / Pres. by Imp. Bur. Ent. Brit. Mus. 1923-253. [printed] / LECTOTYPUS *Philetaerobius nidicola* Marshall // Borovec, Oberprieler & Meregalli desig. 2018 [printed, red] (BMNH). Paralectotypes: 1 ♀: SYNTYPE [printed, rounded with blue margin] / *Philetaerobius nidicola*, Mshl. COTYPE [handwritten] / S. Africa, fr. nest of Sociable Weaver bird [handwritten] / G.A.K. Marshall Coll. B.M. 1950-255 [printed] / PARALECTOTYPUS *Philetaerobius nidicola* Marshall // Borovec, Oberprieler & Meregalli desig. 2018 [printed, red] (BMNH); 1 ♂, 1 ♀?: from nest of / Social Weaver / bird [handwritten] // *Philetaerobius / nidicola*, Mshl. / COTYPES. [in Marshall's hand] // Type / SAM/Ent / 3706 [on green card] / PARALECTOTYPUS *Philetaerobius nidicola* Marshall // Borovec, Oberprieler & Meregalli desig. 2018 [printed, red] (SAMC). Other specimens: 1 ♂, 8 exx.: TransKei / A. L. du Toit / 1910 [handwritten] // from nest of / Social Weaver / bird [handwritten] // *Philetaerobius / nidicola* Mshl [handwritten] // SAM-COL- / A048230 (SAMC); 6 exx.: [no locality], from thorn tree / bearing nest of / social weaver / bird [handwritten] // *Philetaerobius / nidicola* Mshl [handwritten] // SAM-COL- / A048229 (SAMC); 1 ♂: Hanover [31°4.100' S 24°26.383' E] / C. C. / Cronr. Schrein. / 1901 [handwritten] // *Philetaerobius nidicola* Mshl // SAM-COL- / A048227 (SAMC); 1 ♀, 5 exx.: Kenhardt [29°22.909' S 21°11.211' E] / 1911 // *Philetaerobius / nidicola* Mshl [handwritten] // SAM-COL- / A063585 (SAMC); 1 ♂: Kakamas [28°47.339' S 20°38.214' E] / Kenhardt Div. [typed] // R. F. Lawrence / May 1934 [underside of label] // SAM-COL- / A048228 (SAMC); 1 ♀: S. Afr. [Northern Cape], Richtersveld / Buffelsriv. Valley / 29°33' S 17°27' E // 31.8.1976, E-Y: 1193 / groundtraps, 35 days / leg. Endrödy-Younga // groundtraps with / banana bait (TMSA); 1 ♂: [South Africa, Northern Cape], S.Afr., Namaqualand / Onseepkans–Kakamas / 28°52' S 19°37' E // 9.9.1976; E-Y:1244 / groundtraps, 24days / leg. Endrödy-Younga // groundtrap / with faeces bait (TMSA); 2 ♂, 5 exx.: [South Africa, Northern Cape], S.Afr., Namaqualand / Onseepkans–Kakamas / 28°52' S 19°37' E // 2.10.1976; E-Y:1280 / groundtraps, 12days / leg. Endrödy & Breyten. (TMSA, ANIC); 1 ♀: [South Africa, Northern Cape], S. Afr., Richtersveld / farm Haramoep / 29°06' S 18°40' E // 13.10.1976, E-Y: 1276 / cattle dung / Endrödy & Breytenb. (TMSA); 1 ♀: S. Afr. Cape [Northern Cape], Karroo / Struisputs farm / 30°02' S 20°55' E // 1.5.1985, E-Y: 2202 / under stones, plants / leg. M.-L. Penrith (TMSA); 1 ♀: SOUTH AFRICA, C. P. / 24 km W Springbok / 29°42' S 17°44' E / 10.ix.1986 / R. Oberprieler // collected off / *Zygophyllum / morgsana* (SANCI); 1 ♂, 1 ♀: Gannapo[o]rt farm /

29°16' S, 19°39' E / 17.iii.[1988] // S. Afr. Cape // W. Wittmer (SANC); 1 ♀: RSA, Western Cape, 811 m / R 358 12 km S Kliprand / 30°40.169' S, 18°42.597' E / 30.x.2011, R. Borovec lgt. // sifted detritus and dead / leaves below / *Euphorbia dregeana* shrubs (RBSC); 1 ♂: RSA, Northern Cape, 541 m / 40 km S Springbok, Die Drif / 1 km from Koringhuis, sifting / 29°59.139' S 17°51.875' E / 31.x.2011, R. Borovec legit (MMTI); 1 ♂, 2 ♀, 4 exx.: **RSA Northern Cape** 757 m / Ca 2 km NE Nigraoep / 29°27.147' S 17°37.968' E / R. Borovec lgt. 15.xi.2016 / Sifting below *Euphorbia dregeana* (TMSA, RBSC, ANIC); 1 ♀, 1 ex.: **RSA Northern Cape** 545 m / W Anenous Pass / 29°14.475' S 17°35.922' E / R. Borovec lgt. 16.xi.2016 // Sifting of detritus died / leaves and branches / below shrubby *Euphorbia dregeana* (RBSC, ANIC); 2 ♀, 7 exx.: **RSA Northern Cape** 908 m / R355 SE Springbok / 29°43.641' S 18°01.413' E / Sifting below *Euphorbia dregeana* / R. Borovec lgt. 20.xi.2016 (RBSC, ANIC).

Distribution (Figure 10). The species occurs in the Northern Cape province of South Africa, from Namaqualand eastwards into the Great Karoo, apparently as far east as Hanover (near De Aar). It does not seem to occur north of the Orange River and also not in the Richtersveld; the two localities so-labelled (Buffelsrivier Valley and Haramoep) lie further south, the former west of Springbok and the latter near Goodhouse in the Riemvasmaak Community Conservancy. The distribution range of *P. nidicola* thus apparently does not overlap with those of *P. endroedyi* and *P. louwi*. The implied type locality of the species (“Transkei”, see below) is evidently erroneous as the Sociable Weaver does not occur in this region.

Habitat and life-history. The type and two other series of specimens in the SAMC were found in the communal nest of the Sociable Weaver (*Philetairus socius*, Ploceidae), but the species also occurs outside the range of this bird and more recently collected specimens have been taken on the ground in pitfall traps, among detritus under plants and under stones. A single specimen was beaten off a *Zygophyllum* bush, but this plant is unlikely to represent a host for the species. It remains to be seen whether *P. nidicola* may occur in Sociable Weaver nests (or other bird nests) more regularly and how the flightless specimens end up in such nests.

Derivation of name. Marshall [1] did not state how he derived the name of the species, but it is obviously formed from the Latin noun *nidus*, a nest, and the verb *colere*, to live or inhabit. A *nidicola* is a nest-dweller, and the species name is a masculine noun in apposition.

Remarks. Marshall [1] based his description of *P. nidicola* on five specimens. Two are housed in the BMNH, a male labelled “TYPE” and a female labelled “COTYPE”, and another two specimens are in the SAMC, glued in the top corners of a large card and labelled “COTYPES”. The space between these two specimens, with the remains of a ring of glue there, indicates that the card originally held a third specimen between the outer two, thus accounting for Marshall’s remaining fifth syntype. Although Marshall labelled the male in the BMNH as type, he did not designate a holotype in his description of *P. nidicola*, and we therefore here designate the male in the BMNH as lectotype and the other three existing syntypes as paralectotypes.

The lectotype is glued on a triangular card and lacks the protarsi and several segments of the other tarsi. It was dissected by someone (not by Marshall or us) as its ventrites are glued on a card, and a second triangular card holds a blob of glue but without any genitalia. A search by one of us (M.M.) in the drawer in which the specimen is housed failed to find the aedeagus, which is apparently lost. The paralectotype female in the BMNH, glued on a rectangular card, is missing the entire right front leg. It has also been dissected and the ventrites, tergites VII and VIII, spermatheca and slightly damaged sternite VIII are glued on another rectangular card placed beneath it. The two paralectotypes in the SAMC were not dissected; the one on the right of the card, glued on its back, appears to be a male and the other is possibly a female. Although study of the genitalia of at least one type specimen is desirable for unequivocal assignment of other specimens to *P. nidicola*, we chose not to attempt dissection of the only two remaining intact types due to the insufficient dissecting facilities in the SAMC during our (R.G.O.) visit there, instead dissecting a male from the longer series of specimens (SAM-COL-A048230) bearing the same host label as the paralectotypes and evidently representing the same collecting event and a female from the series of six specimens from Kenhardt (SAM-COL-A048229). The internal sclerite

of the dissected male has the characteristic clove-type shape and the spermatheca of the dissected female is consistent with that of other specimens assigned to *P. nidicola* here.

Marshall (1923) provided no locality for *P. nidicola* in his description, and none of the types have such attached to their pins. However, a series of nine specimens in the SAMC (SAM-COL-A048230) with an identical host label (handwritten “from nest of Social Weaver bird”), thus apparently representing the same collecting event, is labelled as being from the Transkei, the former region in the Eastern Cape province of South Africa lying northeast of the Great Kei River. This region is far removed from the Northern Cape province as well as from the range of the Sociable Weaver and therefore cannot be regarded as representing a conceivable type locality for *P. nidicola*. The date on the label, 1910, is plausible, but it appears that a wrong locality label has been attached to this series.

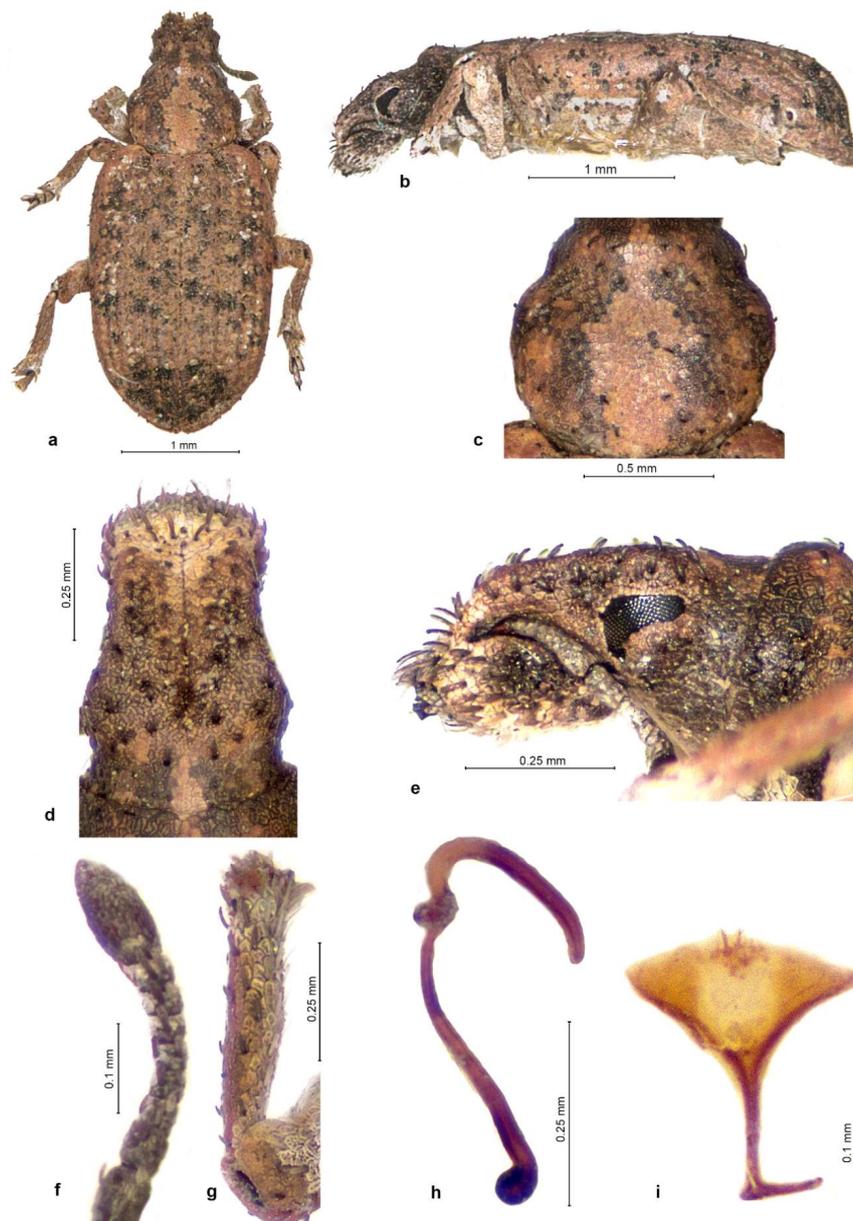


Figure 1. *Philetaerobius nidicola* Marshall. Lectotype ♂—dorsal habitus (a); left lateral habitus (b); pronotum, dorsal view (c); head, dorsal view (d); head, lateral view (e); right antenna, dorsal view (f); left protibia, dorsal view (g). Paralectotype ♀—spermatheca (h); sternite VIII (i).

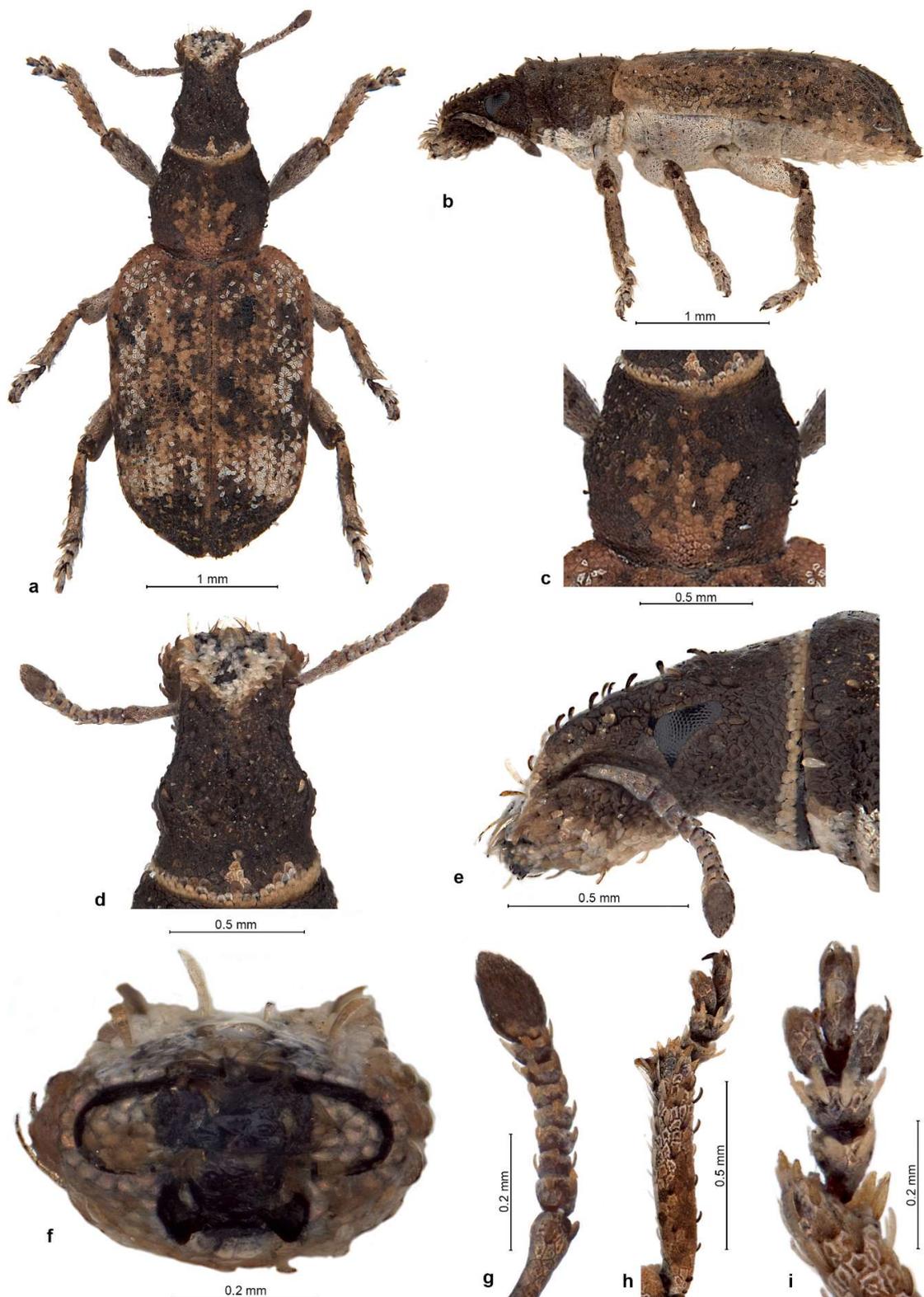


Figure 2. *Philetaerobius nidicola* Marshall (Gannapoort), ♂—dorsal habitus (a); left lateral habitus (b); pronotum, dorsal view (c); head, dorsal view (d); head, lateral view (e); rostrum, frontal view (f); right antenna, dorsal view (g); right protibia and -tarsus, dorsal view (h); right protarsus, dorsal view (i).

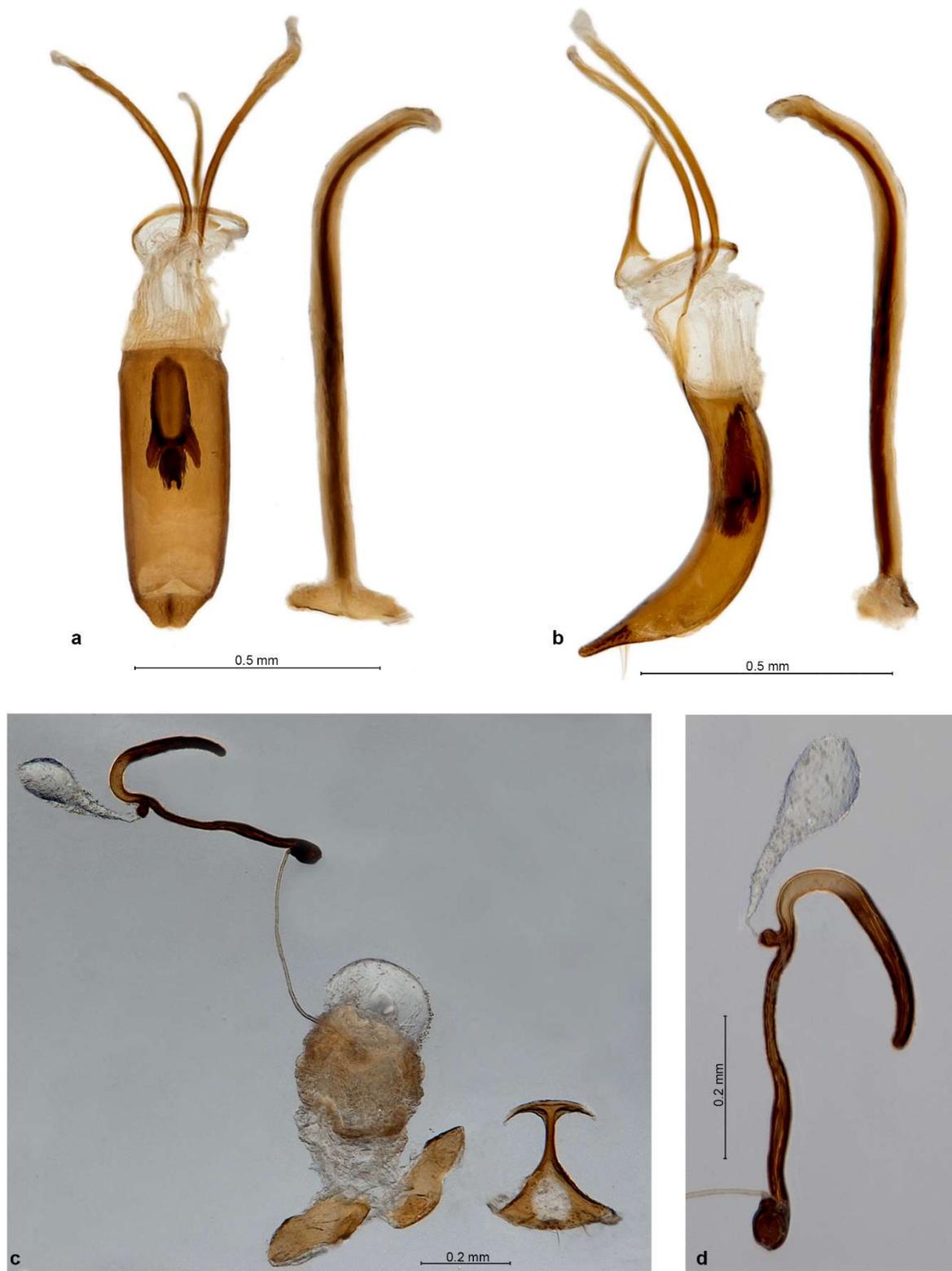


Figure 3. *Philetaerobius nidicola* Marshall, genitalia. ♂(Gannapoort), aedeagus and sternite IX, dorsal view (a); ditto, left lateral view (b); ♀(Springbok), ovipositor and sternite VIII, dorsal view (c); spermatheca, dorsal view (d).

Philetaerobius nidicola differs from the other species most conspicuously in the characteristic clove-type internal sclerite of its penis. Its spermatheca differs from that of *P. endroedyi* in having

an acute cornu and from those of *P. louwi* and *P. garibebi* in having the collum more or less straight, not widely curved. Externally *P. nidicola* differs from the former two species (the other flat ones of the genus) mainly by its shorter and more robust rostrum, which is broader than long in dorsal view. In other characters it is somewhat variable. The elytra and pronotum vary from being slender to broader and in lateral view from flat to slightly convex, and the range of the length-width ratio of the antennal clubs is larger than in the other species, the shape varying from slender and spindle-shaped to oval.

The COX1 sequence of a male from Nigramoep has been deposited on GenBank.

***Philetaerobius louwi* sp. n.** (Figures 4 and 5)

Philetaerobius nidicola: Louw, 1986: 310 [2].

Description. Body length 3.16–4.50 mm, holotype 4.05 mm. Integument black but densely covered with tessellate scales, these mostly pale orange-brown or greyish in color but on pronotum and elytra also irregularly scattered black and whitish scales, arranged in partial or complete rosettes around stria punctures on lateral and posterior parts of elytra, and white scales sometimes forming a large drop-shaped macula on pronotal disc. Rostrum 1.04–1.06× longer than broad, in basal half faintly narrowing anteriorly, in apical half distinctly widening anteriorly; in lateral view moderately short and robust, abruptly declivous in front of antennal insertions. Epifrons inflated, sides straight but slightly converging anteriorly, disc longitudinally deeply trough-shaped impressed towards a narrow median stria. Scrobes shallowly confluent at back of venter of rostrum. Eyes flat but slightly curved, in dorsal view barely visible below broad and raised forehead; in lateral view narrowly elongate, horizontal, anteroventrally extended into acute angle, ventral margin concave and raised on blunt canthus from posterior and ventral part of head. Antennae with funicle segments cupular, closely approximated; segment 1 more cylindrical, 1.1–1.2× longer than broad and 1.1–1.2× longer than segment 2, segment 2 1.1× broader than long, segments 3–5 1.2–1.3× broader than long, segment 6 1.4–1.5× broader than long, segment 7 1.6–1.7× broader than long. Clubs 1.6–1.7× longer than broad, very compact. Pronotum 1.06–1.16× broader than long, broadest at midlength, sides rounded; in lateral view flat with swollen anterior margin. Elytra long and slender, together 1.61–1.71× longer than broad, broadest at basal part and slightly, regularly tapered posteriorly, base deeply emarginate and embracing base of pronotum, broadly rounded at apex; interstriae mostly flat, 3, 5 and 7 slightly roundly raised, 1 also raised on declivity, only just behind basal margin odd interstriae more elevated than even ones. Tarsi with segment 2 1.2× broader than long, segment 3 1.2–1.3× broader than long and 1.1–1.2× broader than segment 2, onychium 1.1× longer than segment 3. Genitalia. Penis parallel-sided, posteriorly abruptly truncate with narrow, attenuated, truncate apex, in lateral view regularly curved, basally slightly thicker than apically, posteriorly sharply tapered to narrow, flat ventral apex; internal sclerite narrowly navicular in dorsal view, in lateral view cleft in apical third, with dorsal arm shorter than ventral one and only about half as thick. Gonocoxites flat to shallowly convex, sublenticular, about equally broad throughout or slightly broader in apical half; apex broadly rounded, with 2–3 stiff setae; orientated at about 90–120° to each other. Spermatheca with cornu sharply curved into right angle at basal third of its length, nearly straight, apically usually shortly bent, blunt but not inflated; ramus small, globular, sessile or shortly stalked; gland elongate, without distinct stalk; collum very long (longer than spermathecal duct), strongly variously bent and coiled, often faintly hook-shaped, apex bulbous but not curled (insertion of duct rotated at most 90°); duct stiff, straight to slightly twisted, only about half as long as spermatheca.

Material examined (54 exx.). Types. Holotype, ♂: [Namibia, Erongo], S.W.Afr., Namib / Us Pass, Park Gate / 23°04' S 15°35' E // 15.11.1974, E-Y: 468 / groundtraps 70 days / leg. Endrödy-Younga // ground traps with / ferm.banana bait (TMSA). Paratypes. 3 ♀, 13 exx.: same data as holotype (TMSA, ANIC); 1 ♂, 1 ♀: South West Africa / ??? [obtained in 1973 from old school collection in Windhoek, probably collected on the Khomas Hochland] (ANIC); 2 exx.: [Namibia, Hardap], Bullspoort S.W.A. [24°8.943' S 16°21.783' E] / R. G. Strey (TMSA); 2 exx.: [Namibia, Hardap], S.W.Afr., Naukluft / Felseneck farm / 24°21' S 16°00' E // 25.10.1974, E-Y: 417 / groundtraps, 136 day / leg.

Endrödy-Younga (TMSA); 1 ♀: [Namibia, Hardap], S.W.Afr., Nauwkluft / Nauwkluft Park / 24°16' S 16°15' E // 26.10.1974, E-Y: 425 / groundtraps, 88 day / leg. Endrödy-Younga // groundtrap with / banana bait (TMSA); 1 ex.: [Namibia, Hardap], S.W.Afr., Nauwkluft / Nauwkluft Park / 24°16' S 16°15' E // 26.10.1974, E-Y: 428 / groundtraps, 88 day / leg. Endrödy-Younga // ground traps / unbaited (TMSA); 3 exx.: [Namibia, Erongo], S.W.Afr., Namib / Ganab water / 23°06' S 15°32' E // 1.11.1974, E-Y: 437 / groundtraps, 17 day / leg. Endrödy-Younga // ground traps with / ferm. banana bait (TMSA); 1 ex.: [Namibia, Erongo], S.W.Afr., Namib / Ganab NE range / 23°08' S 15°36' E // 18.11.1974, E-Y: 483 / groundtraps, 65 day / leg. Endrödy-Younga // ground traps with / ferm. banana bait (TMSA); 1 ♂: [Namibia, Hardap], S.Afr., Kalah. Park / Farm Mara / 25°25' S 19°30' E // 19.12.1974, E-Y: 513 / ground traps, 73 d / leg. Endrödy-Younga // ground traps / with meat bait (TMSA); 3 exx.: [Namibia, Erongo], S.W.Afr., Namib / Ganab NE range / 23°08' S 15°36' E // 1.3.1975, E-Y: 711 / groundtrap: 90 day / leg. Endrödy-Younga (TMSA); 2 exx.: [Namibia, Erongo], S.W.Afr., Namib / Us Pass, 10 km Park / 23°03' S 15°40' E // 5.6.1975, E-Y: 852 / groundtraps 88 days / leg. Endrödy-Younga // ground traps / with faeces bait (TMSA); 1 ♂, 2 ♀, 1 exx.: [Namibia, Erongo], S.W.Afr., Namib / Us Pass, 10 km Park / 23°03' S 15°40' E // 1.9.1975, E-Y: 900 / groundtraps, 75 day / leg. Endrödy-Younga (TMSA); 1 ♂, 2 ♀, 8 exx.: [Namibia, Erongo], S.W.Afr. KhomasHl. / Us Pass, 10 km Park / 23°03' S 15°40' E // 7.7.1978; E-Y:1472 / groundtraps, 3years / leg. Endrödy-Younga (TMSA); 3 exx.: [Namibia, Erongo], S.W.Afr., c. Namib / Ganab, N. E. Hillgap / 23°08' S 15°35' E // 7.7.1978, E-Y: 1470 / groundtraps, 3 years / leg. Endrödy-Younga (TMSA); 1 ♀: [Namibia], Wildheim Ost 384 / SE 2619 Bc [26°28' S 19°34' E] / KEETMANSHOOP / 26–29 October 1976 / S. Louw, M.-L. Penrith // H33608 (SANC).

Distribution (Figure 10). The species as known occurs in south-central Namibia, in the west along the edge of the Namib Desert from the Khomas-Hochland west of Windhoek southwards to the Nauwkluft, but also in the east along the western edge of the Kalahari Desert. It is probably distributed throughout south-central Namibia and may also occur in south-western Botswana and the Northern Cape province along the eastern border of Namibia, but its distribution range does not seem to overlap with that of *P. endroedyi* in the south-west and with that of *P. nidicola* in the south-east.

Habitat and life-history. Most specimens examined were collected in pitfall traps, some of which had been baited with fermented bananas or faeces, but it is unlikely that the weevils were attracted by the bait. Louw [2] recorded the species (as *P. nidicola*) to be common in the Kalahari in spring, occurring in large numbers on plains dominated by grasses and *Rhigozum trichotomum* (in 1976 at Wildheim Ost) [11]. It appears that the species is associated with grasses, but its larva and life-history remain unknown.

Derivation of name. *Philetaerobius louwi* is cordially named after the late Schalk van der Merwe Louw, Professor of Zoology and Entomology at the University of the Free State in Bloemfontein, South Africa, who collected 150 specimens of this species during an ecological study of ground-living Coleoptera in the Namib and Kalahari Deserts and who also made significant contributions to the taxonomy of other taxa of terricolous weevils in southern Africa. Schalk sadly and unexpectedly passed away while this paper was in the proof stage.

Remarks. This species is distinguishable from *P. nidicola* by its slender rostrum and elytra and from *P. endroedyi* by its kidney-shaped and vaulted eyes and longitudinally depressed epifrons. Its internal penis sclerite is also distinctive, being deeply cleft and with the dorsal arm shorter and narrower than the ventral one, and its spermatheca is characteristic in having a long, curved to twisted collum. It is one of three *Philetaerobius* species known from Namibia and apparently the most widespread and common one, *P. garibebi* and *P. endroedyi* being known from only a few specimens and occurring to the north and south of it, respectively.

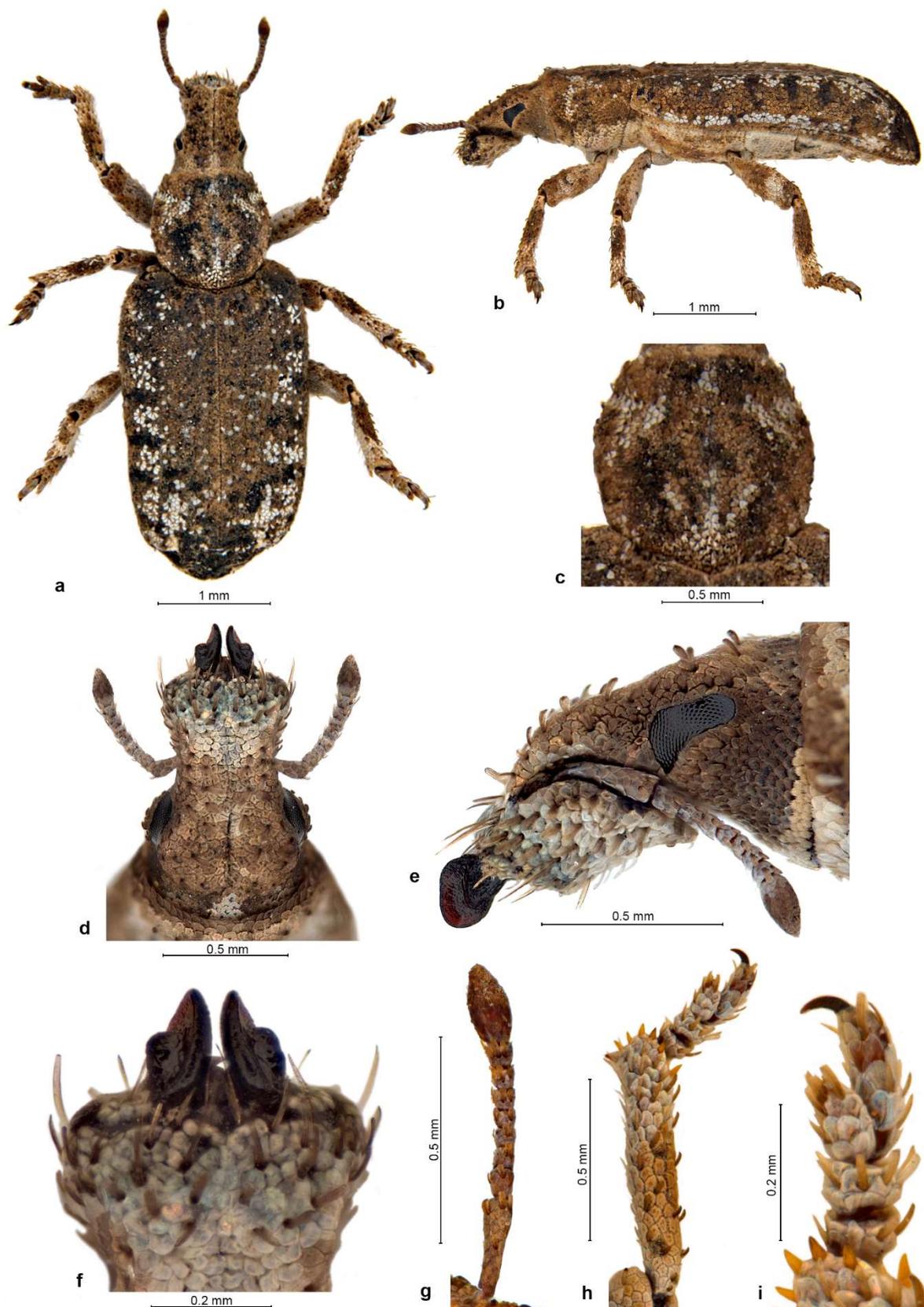


Figure 4. *Philetaerobius louwi* sp. n. (Us Pass), ♂—dorsal habitus (a); left lateral habitus (b); pronotum, dorsal view (c); head, dorsal view (d); head, lateral view (e); rostrum and mandibular cusps, dorsal view (f); right antenna, dorsal view (g); right protibia and -tarsus, dorsal view (h); right protarsus, lateral view (i).



Figure 5. *Philetaerobius louwi* sp. n., genitalia. ♂(SWA [Namibia]), aedeagus and sternite IX, dorsal view (a); ditto, left lateral view (b); ♀(Us Pass), ovipositor and sternite VIII, dorsal view (c); ♀(Us Pass), spermatheca, dorsal view (d).

***Philetaerobius endroedyi* sp. n.** (Figures 6 and 7)

Description. Body length 2.66–4.38 mm, holotype 4.38 mm. Integument black on body, dark testaceous on antennae and tarsi, densely covered with tessellate variegated golden brown and black scales, laterally and posteriorly on elytra admixed with a few white scales arranged in complete

or partial rosettes around strial punctures. Rostrum 1.09–1.14× longer than broad, in basal third slightly tapering anteriorly, in apical two-thirds widening anteriorly; in lateral view moderately long and slender, abruptly declivous in front of antennal insertions. Epifrons dorsally tapering anteriorly, sides almost straight, at declivity widening again, with faintly concave sides; disc flat, not impressed but with thin median stria along whole length. Scrobes deeply confluent at back of venter of rostrum. Eyes flat, in dorsal view narrowly visible below broad and raised forehead; in lateral view obliquely subtriangular, with ventroposterior margin straight, slightly raised on weak canthus from posterior and ventral part of head. Antennae with funicle segments subcylindrical to frustocone-shaped, closely approximated; segment 1 almost parallel-sided, 1.2× longer than broad and 1.5–1.6× longer than segment 2; segment 2 isodiametric to 1.1× longer than broad; segments 3–5 1.1–1.2× broader than long; segment 6 1.3–1.4× broader than long; segment 7 1.5× broader than long. Clubs oval, 1.4–1.6× longer than broad. Pronotum 1.03–1.08× longer than broad, broadest before midlength to anterior third, distinctly constricted behind anterior margin, in dorso-lateral view flat or faintly depressed on disc. Elytra together 1.56–1.67× longer than wide, parallel-sided, base deeply emarginate and embracing base of pronotum, broadly rounded at apex; interstriae flat to faintly convex, odd ones only in very short basal part somewhat more elevated than even ones and sutural ones elevated on declivity. Tarsi with segment 2 1.1× broader than long, segment 3 1.3–1.4× broader than long and 1.3–1.4× broader than previous segment, onychium 0.9× as long as segment 3. Genitalia. Penis subparallel-sided, posteriorly weakly attenuate, apex truncate, in lateral view regularly curved, equal in width, in apical third regularly tapered to ventrally placed apex; internal sclerite narrowly to broadly navicular in dorsal view, in lateral view cleft in apical quarter, with dorsal arm as long as ventral one and almost as thick. Gonocoxites flat to shallowly convex, subspatulate, broader in apical half; apex subrectangular, with 1–2 stiff setae; orientated at about 90–135° to each other. Spermatheca with cornu abruptly curved at basal third of its length, then evenly weakly C-shaped, apically inflated (twice thicker than at base) and broadly globular; ramus globular, broadly sessile to shortly stalked; gland elongate, medially constricted, not stalked; collum long but shorter than spermathecal duct, more or less straight but with slight irregular bends along the length, apex bulbous and tightly curled over (insertion of duct rotated 180°); duct stiff, straight to slightly twisted, shorter than spermatheca.

Material examined (59 exx.). Types. Holotype, ♂: **RSA Northern Cape** / Richtersveld 19.ix.2013 / rd to Akkedis pass 450 m / 28°09.880' S 17°01.497' E // Sifting of detritus, died / leaves and branches / below shrubby *Euphorbia* sp. / R. Borovec, M. Meregalli lgt. (TMSA). Paratypes: 1 ♂, 1 ♀, 7 exx.: same data as holotype (RBSC, MMTI, ANIC); 1 ♂, 1 ♀, 6 exx.: S. Afr. Richtersveld / Rooiberg Valley / 28°12' S 17°07' E // 4. 9. 1976; E-Y: 1217 / groundtraps, 30day / leg. Endrödy-Younga // ground traps with banana bait (TMSA); 3 ♀, 7 exx.: S. Afr., Richtersveld / Ganakom Riv. Valley / 28°15' S 17°07' E // 5.9.1976; E-Y: 1223 / groundtraps, 35 days / leg. Endrödy-Younga // groundtrap / with banana bait (TMSA); 1 ♂, 8 exx.: **RSA Northern Cape** / Richtersveld 465 m / Koeroegab 19.ix.2013 / 28°17.298' S 17°02.606' E // Sifting of detritus, died / leaves and branches / below shrubby *Euphorbia* sp. / R. Borovec, M. Meregalli lgt. (RBSC, MMTI, ANIC); 1 ♀, **RSA, Northern Cape** / NE Eksteenfontein, 640 m // Pass E Jenkinskopf, 17.ix.2013 // 28°41.612' S 17°16.559' E (RBSC); 1 ♀, 3 exx., **RSA, Northern Cape** / S Eksteenfontein, 612 m / dir. Vioolsdrift, 23.ix.2013 / 28°51.957' S 17°21.503' E // Sifting of detritus, died / leaves and branches / below shrubby *Euphorbia* / R. Borovec, M. Meregalli lgt. (RBSC, MMTI); 1 ♂: **RSA Northern Cape** 463 m / Richtersveld NP 18.xi.2016 / Pass 2km S X RT 14 / 28°17.309' S, 17°02.657' E [R. Borovec lgt.] (ANIC); 1 ♂, 2 exx.: **RSA Northern Cape** 359 m / Richtersveld NP 19.xi.2016 / Gannakouriep / 28°23.558' S 17°09.285' E / R. Borovec lgt. sifting *Euphorbia* sp. (RBSC, ANIC); 1 ♀, 11 exx.: **South Namibia Karas** / 7 km N Rosh Pinah / 22.ix.2013 470 m / 27°53.711' S 16°42.627' E // Sifting of detritus, died / leaves and branches / below shrubby *Euphorbia dregeana* / R. Borovec, M. Meregalli lgt. (RBSC, MMTI, ANIC).

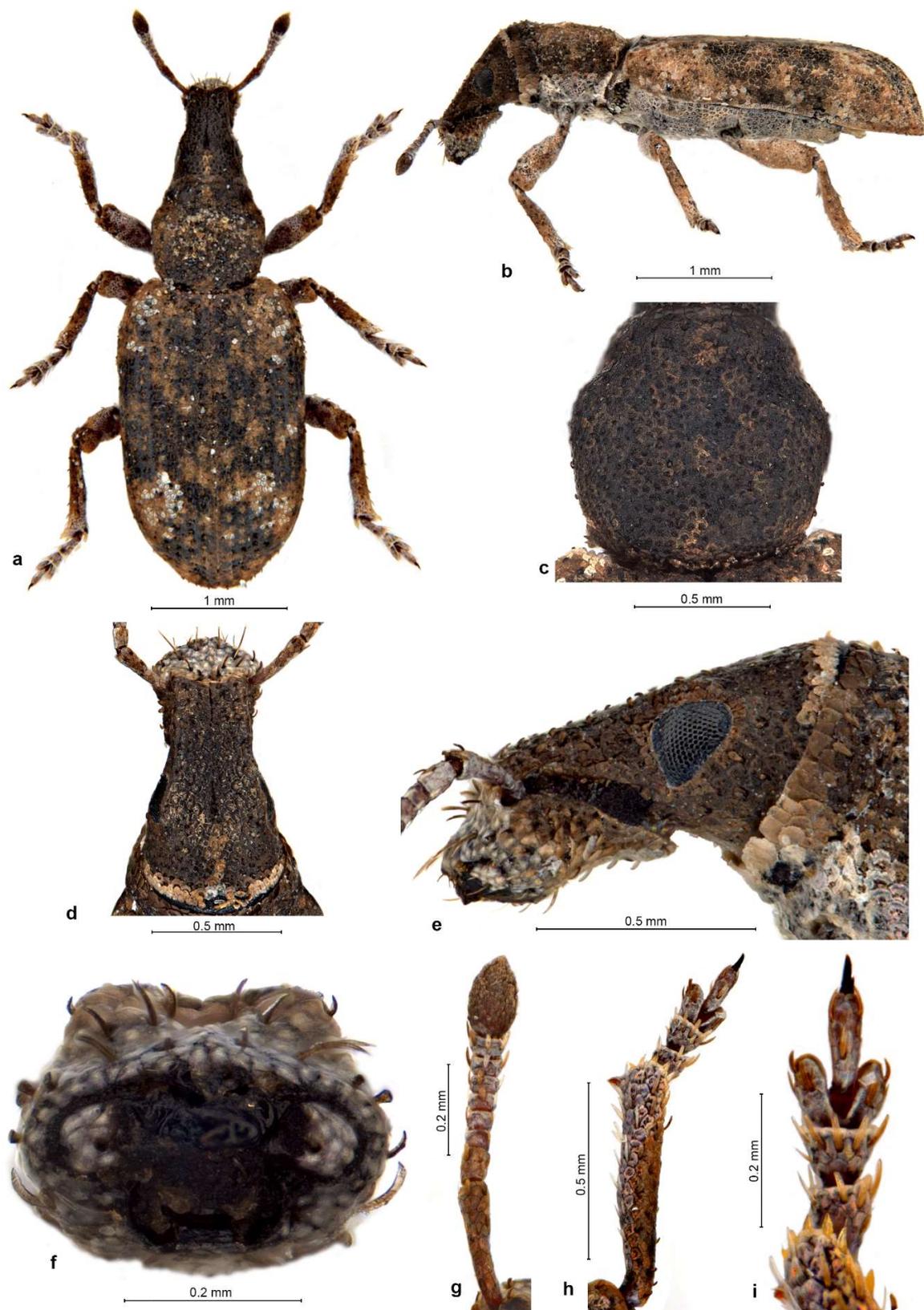


Figure 6. *Philetaerobius endroedyi* sp. n. (Koeroegap), ♂—dorsal habitus (a); left lateral habitus (b); pronotum, dorsal view (c); head, dorsal view (d); head, lateral view (e); rostrum and mandibles, frontal view (f); right antenna, dorsal view (g); right protibia and -tarsus, dorsal view (h); right protarsus, lateral view (i).

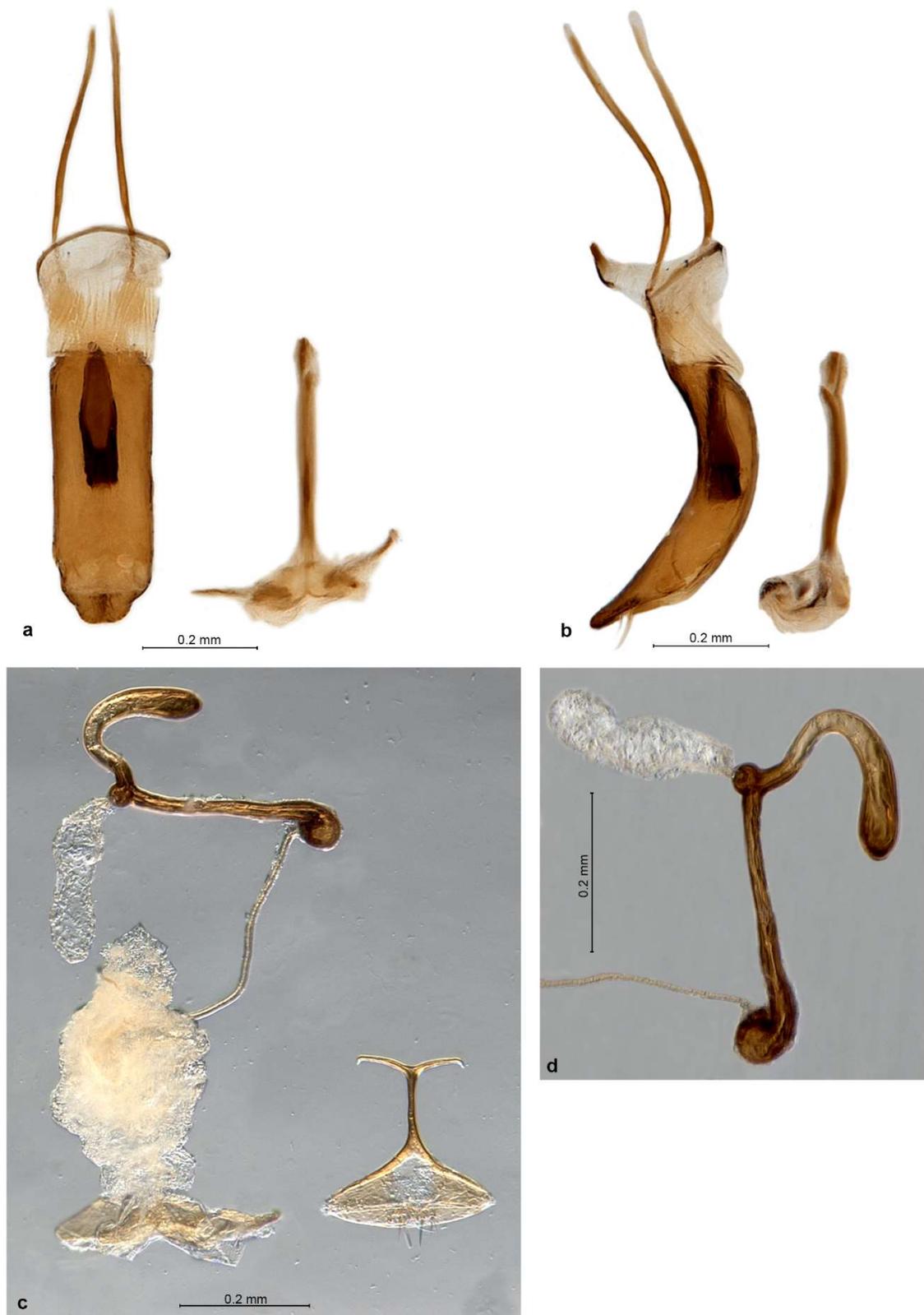


Figure 7. *Philetaerobius endroedyi* sp. n., genitalia. ♂ (Rooiberg), aedeagus and sternite IX, dorsal view (a); ditto, left lateral view (b); ♀ (Ganakom), ovipositor and sternite VIII, dorsal view (c); ♀ (Ganakom), spermatheca, dorsal view (d).

Distribution (Figure 10). The species is known only from the Richtersveld area, from Eksteenfontein in the north-western part of the Northern Cape province of South Africa northwards across the Orange River to Rosh Pinah in the south-western part of Namibia. It appears not to overlap in distribution with *P. nidicola*, which occurs in Namaqualand slightly further south, nor with *P. louwi*, which occurs further north in Namibia.

Habitat and life-history. Most of the recently collected specimens were obtained by sifting detritus and dead branches under shrubby *Euphorbia* plants, *E. dregeana* and other species of similar appearance. This suggests that the weevils live among plant debris and walk around on the ground (perhaps at night). This probably accounts for them having been collected in pitfall traps, rather than being attracted to any bait placed in these.

Derivation of name. *Philetaerobius endroedyi* is named in memory of the late Sebestyén (Sebastian) Endrödy-Younga (1934–1999), erstwhile coleopterist at the former Transvaal Museum in Pretoria (now Ditsong Museum), who extensively collected beetles throughout South Africa and Namibia, mainly terricolous taxa such as Tenebrionidae but also many weevils, including several *Philetaerobius* specimens. In the formation of the species name *endroedyi*, we adopt the spelling of his surname as he used it in South Africa both in his publications and on his specimen labels, Endrödi-Younga, and as used in the names of many other species named after him.

Remarks. This species is readily distinguishable from the other three flat species by its subtriangular, dorsally flat eyes, flat epifrons, longer pronotum and spermatheca with an apically enlarged, blunt cornu. The sclerite in the penis is also characteristic, similar to that of *P. louwi* but posteriorly only cleft in the apical quarter, and the dorsal arm as long and about as thick as the ventral one.

Philetaerobius garibebi sp. n. (Figures 8 and 9)

Philetaerobius undescribed species: Oberprieler, 2010: 11 [3].

Description. Body length 3.52–4.36 mm. Integument black on body, testaceous on antennae and tarsi, uniformly covered with tessellate scales, scales on dorsum, venter and legs pale grey with slight greenish (in males) or stronger bronze to coppery (in females) tinge, admixed with white scales and sparser black ones, these not forming distinct pattern but white scales often clustered around interstitial setae. Rostrum slightly ($1.1\times$) longer than wide at base and apex, narrower in middle of length (at antennal insertions); in lateral view dorsal outline mostly flat, continuous with that of head, but more or less abruptly but only slightly declivous in anterior third. Epifrons broadly shallowly impressed in middle, with deep broad median sulcus from base to frons but largely obscured (closed) by scales. Scrobes not confluent at back of venter of rostrum. Eyes in dorsal view flat, not raised from outline of head, barely visible; in lateral view inversely ovate, with sharp ventral point. Funicle with all 7 segments distinct, segments 1 and 5–7 obconical, 2–4 subcylindrical; segment 1 $1.4\times$ longer than broad and $1.4\times$ longer than segment 2, segment 2 $1.4\times$ longer than broad, segments 3–7 about as long as broad. Clubs $1.8\times$ longer than broad. Pronotum $1.1\times$ broader than long, broadest at midlength, in lateral view flat (males) to slightly convex (females), with swollen anterior margin. Elytra together $1.57\times$ (males)– $1.42\times$ (females) longer than broad, laterally gently rounded, widest in apical third (males) to middle (females), base straight (male) to slightly emarginate (female) but not embracing base of pronotum. All interstriae very slightly convex, none raised above others, all with single row of sparse, short, translucent, recumbent setae. Tarsi with segment 2 $1.18\times$ broader than long, segment 3 about as long but broader ($1.4\times$), onychium $1.16\times$ longer than segment 3; claws single, without remnant of second claw. Genitalia. Penis stout, cylindrical, in dorsal view broadest at base, then narrowing fairly abruptly, middle portion subparallel-sided, apical part slightly flaring out, apex ventrally shortly, roundedly attenuate; in lateral view slightly arcuate, with base curved up and apex curved down, subparallel-sided except tapering down at apex and ending in narrow tip; internal sclerite thickly tubular, straight, longer than body of penis; temones very slender, about as long as body of penis. Tegmen very slender, without parameres, apodeme about half as long as temones. Gonocoxites longer, sinuately sclerotised with proximal end curved outwards, placed at >90 angle

to each other, apex blunt, with a row of 7 stout setae. Spermatheca very long and slender, S-shaped; cornu sharply bent into acute angle just after junction with ramus, then straight before gently bent in apical third and tapering to blunt point; ramus small, globular, sessile, gland as long as cornu, with narrow stalk and elongate body; collum evenly curved, thicker near duct insertion, apex narrow, not bulbous or curled; duct stiff, straight, shorter than collum.

Material examined (2 exx.). Types. Holotype, ♂: "S.W.Africa/Namibia / 10 km E Karibib / 21°57' S 15°57' E / 10.iii.1987 / R. Oberprieler // collected / on grass" (SANC). Paratype, 1 ♀: same data as holotype (SANC).

Distribution (Figure 10). The species is thus far known from a single locality in the western part of central Namibia.

Habitat and life-history. The only known specimens were collected clinging to the stems of green grasses.

Derivation of name. This species is named after its type locality, Karibib, in central Namibia, but using the original Nama name †*garibeb*, which apparently means a place of preparing an edible plant (seemingly the fruits of the nara, *Acanthosicyos horridus*). The epithet *garibebi* is a latinized genitive singular noun derived from the Nama name.

Remarks. This species is quite different from all other *Philetaerobius* species, most obviously in its convex body, vertically aligned eyes, and predominantly greyish scales. It also differs in many additional features from the other three species (see description), but it shares the distinctive female genitalia and several other characters with these and we therefore place it in the same genus. In many of its features, such as the shape of its elytra, eyes, scrobes, spermatheca and internal sclerite of the penis, it appears to be less derived than the other species, but its single claws and total absence of humeri are evidently more apomorphic characters.

4. Discussion

Philetaerobius is a very unusual and enigmatic entimine genus. Its original placement in Rhytirrhini (as "Rhytirrhinae") as "allied to *Gronops*" [1] is evidently incorrect, not only because of its adelognathous mouthparts and deciduous mandibular cusps but also because its ovipositor does not conform with the "clawed" type (with large, curved, pointed styli) characteristic of the tribe Hipporhinini, in which *Gronops* is now placed [3]. Oberprieler [3] suggested an affinity of *Philetaerobius* with the southern African genera *Mimaulus* and *Protostrophus*, which have similarly squamose mandibles, connate tarsal claws and, at least in some species (e.g., *P. memorabilis* van Schalkwyk, 1968), also similarly flat and asymmetrical eyes. *Mimaulus* and *Protostrophus* are currently placed in the tribe Cneorhinini due to possessing metatibial corbels but no elytral humeri [12], but some *Protostrophus* species have only very faint or no corbels and this character alone is unsuitable both to determine the placement of a genus and to define a tribe in Entiminae, as it varies widely in the subfamily. The development of elytral humeri is an equally problematical character, in all weevils, as the reduction or absence of humeri is associated with the loss of wings, which has evolved many times in weevils. In *Philetaerobius* this character furthermore varies among the species, *P. garibebi* having no humeri but the other species broadly rounded ones (Figure 8a vs. Figures 1a, 2a, 4a, 6a). In van Emden's [12] key to the tribes of "Brachyderinae", *P. garibebi* therefore runs to Brachyderini but the other species run to Polydrusini. Both these tribes, however, differ in numerous other features from *Philetaerobius* and cannot feasibly accommodate it. The concepts of these and most other "brachyderine" tribes (as encapsulated in van Emden's key) are largely based on Palaearctic genera and generally compromised by the suites of characters exhibited by genera of other regions, such as southern Africa. In addition, no other "brachyderine" genus with a similar ovipositor and spermatheca is known to us. Comparison of *mt* cytochrome-oxidase-I sequences of *Philetaerobius nidicola* with those of genera from several entimine tribes from the Palaearctic region (retrieved from GenBank and BOLD) showed no supported relationships. Sequences of South African Entiminae were only available for a few as yet

undescribed species of *Oosomus*, *Cycliscus*, *Phylomerinthus* and *Nama* (Meregalli, unpublished data); also in analyses with these genera *Philetaerobius* clustered in a separate lineage.

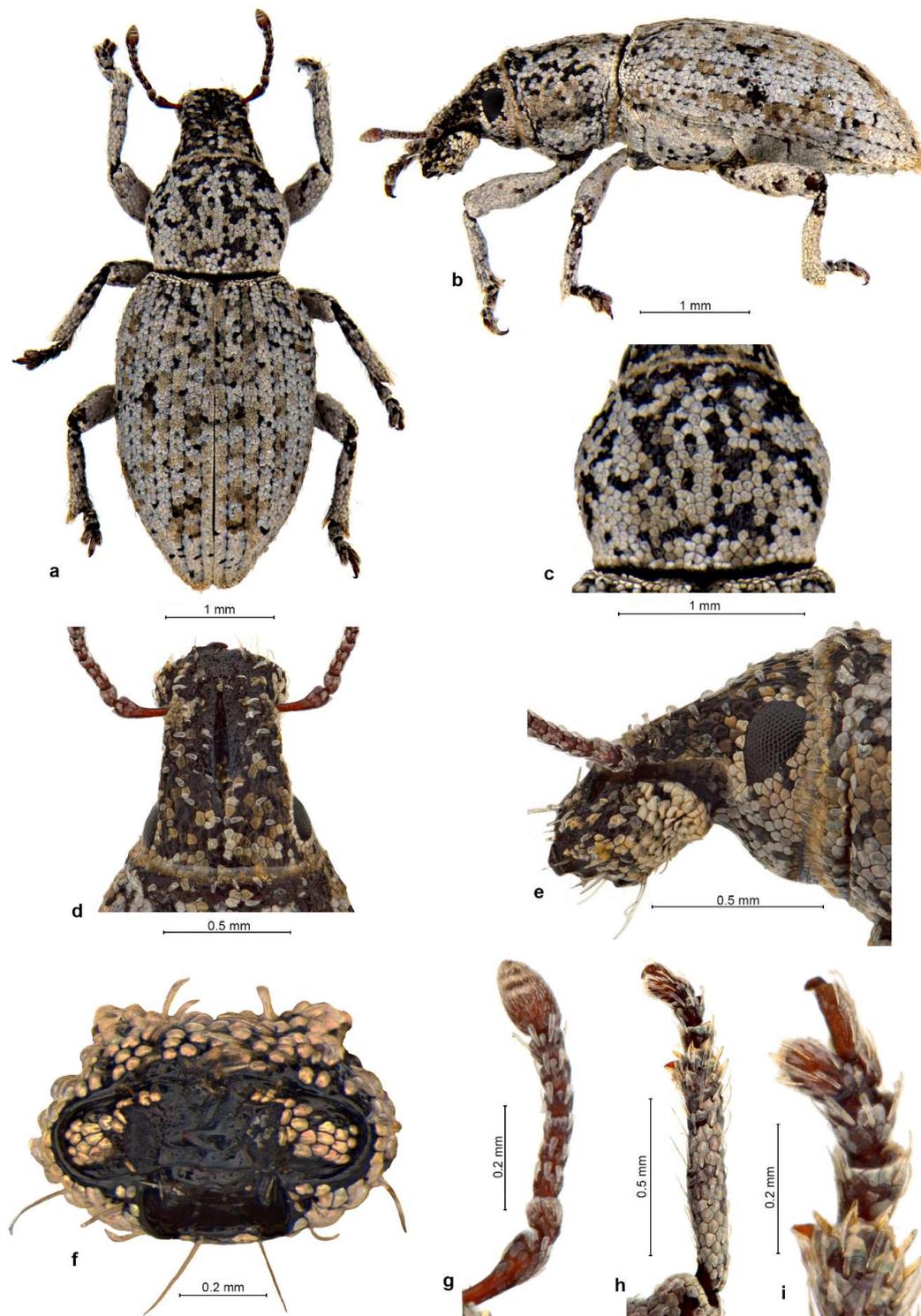


Figure 8. *Philetaerobius garibebi* sp. n. (Karibib), ♂—dorsal habitus (a); left lateral habitus (b); pronotum, dorsal view (c); head, dorsal view (d); head, lateral view (e); rostrum and mandibles, frontal view (f); right antenna, dorsal view (g); right protibia and -tarsus, dorsal view (h); right protarsus, lateral view (i).



Figure 9. *Philetaerobius garibebi* sp. n. (Karibib), genitalia. ♂, aedeagus and sternite IX, dorsal view (a); ditto, left lateral view (b); ♀, ovipositor and spermatheca, dorsal view (c); ♀, sternite VIII, dorsal view (d).

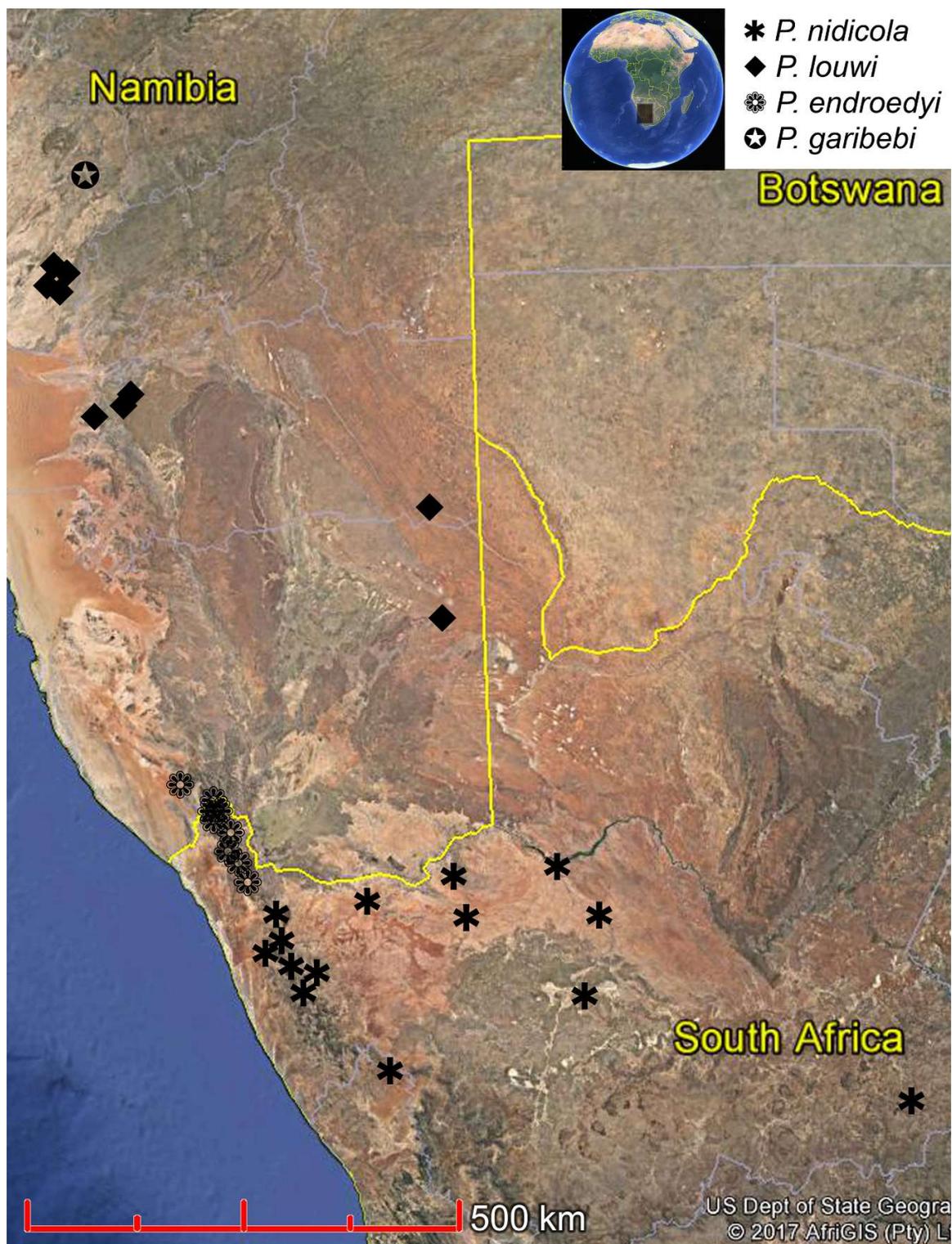


Figure 10. Recorded distribution of *Philetaerobius* in southern Namibia and north-western South Africa.

Of the southern African genera currently classified in Cneorhinini, *Mimaulus* (*M. papulosus* Fåhraeus, 1871) shares the most characters with *Philetaerobius*. It also has squamose, paucisetose mandibles, the rostrum dorsally separated from the head by a transverse sulcus, flat eyes situated under a distinct ridge (“eyebrow”) and posteriorly raised on a canthus protruding from the head, white tessellate scales arranged in rosettes around short setae (on the pronotum), the apical surface of

the tibiae (around the tarsal socket) squamose, a short thick penis with a large, strongly sclerotised, bow-shaped, tubular internal sclerite and the basal plate of sternite VIII of the female with a distinct basal margin. However, it differs from *Philetaerobius* foremost in having long, slender, pointed gonocoxites, a normal spermatheca, the basal plate of sternite VIII of the female without a central fenestra, a glabrous epistome and frons, narrow squamose metatibial corbels, basally connate claws, the penis without an apical tuft of setae and the temones short (third of penis body length), broad and flatly compressed. The similarities of the rostrum, mandibles and eyes between these two genera occur in other entimine genera too, whereas the differences in the genitalia, especially the different structures of the ovipositor and spermatheca, argue against a close relationship between *Mimaulus* and *Philetaerobius*.

To our knowledge, there is only one entimine genus in southern Africa that shares the peculiar genital structures of *Philetaerobius*, namely *Spartecerus*. This flightless, terricolous genus (Figures 11 and 12) has been classified in Leptopiinae in the past [13,14] and more recently in Tropiphorini [6], but it shares no significant characters either with the northern-hemisphere Tropiphorini (in the narrow sense; “Alophini”) or with the mainly southern-hemisphere Leptopiini (though these are currently not properly delimited and defined), and its relationships among the Entiminae remain obscure. *Spartecerus* has never been properly studied, apart from a review of the 19 described species by Marshall [13] and a later description of another species from Namibia [14].

The most important character agreements between *Spartecerus* and *Philetaerobius* occur in the female genitalia. The spermatheca of *Spartecerus* is similarly slender and elongate, the collum up to ca. $4 \times$ longer than the cornu and strongly S-shaped (Figure 12d) to doubly folded (Figure 11f) to compactly coiled (Figure 12g,i), the ramus large, broad and sessile with an elongated or bulbous gland, and a slight nodulus is differentiated. The gonocoxites (Figures 11e, 12c, 12e, 12f) are short and broad, jointly triangular, internally open, well to poorly differentiated into a proximal and a distal part and apically with a fringe of setae along the outside of the socket of the stylus (Figure 12c). The styli are large and broad, situated apically or ventro-apically, with an apical field or tuft of setae (numerous, short and dense to three long ones), and sometimes with a number of short, stout pegs laterally (Figure 12h), and their sockets are internally open. Sternite VIII of the female (Figures 11e, 12c, 12e, 12f) is short and broadly triangular, the basal plate with a large median fenestra and the short apodeme straight and symmetrical with an unmodified apex. The extremely elongate and twisted collum of the spermatheca and the fenestra of sternite VIII are clear character agreements with *Philetaerobius*, and the simpler gonocoxites of *Philetaerobius* are readily derivable from those of *Spartecerus* by a reduction of the sclerites and styli.

In the male genitalia, the penis of *Spartecerus* (Figures 11d, 12a,b) is short and thick, dorsally open (membranous) or not, apically extended into a flat ventral point without a median tuft of setae, the temones are slightly longer or shorter than the body of the penis, and inside there is a long, thick, straight, tubular sclerite. The tegmen has a pair of long, slim dorsal parameres. The character agreement with *Philetaerobius* lies foremost in the shape of the internal sclerite, which is near-identical to that of *P. garibebi*.

Agreement in external characters between *Spartecerus* and *Philetaerobius* occurs in the apically broadened rostrum (Figure 11c), squamose mandibles, dorsal sulcus separating rostrum from head, flattened eyes situated under a distinct “eyebrow”, tessellate scales, squamose tibial apices and absence of metatibial corbels, but *Spartecerus* differs from *Philetaerobius* in a more globose shape, tuberculate sculpture, the frons elevated and posteriorly sharply carinate, often glabrous, the prementum squamose, the pronotum with ocular lobes and the prosternum impressed before the procoxae, and the claws long and free. While these differences suggest that the two genera are not very closely related and/or have evolved separately for some time, the similarity in especially the spermatheca indicates that a closer relationship exists between them than with any other southern African entimine genus.

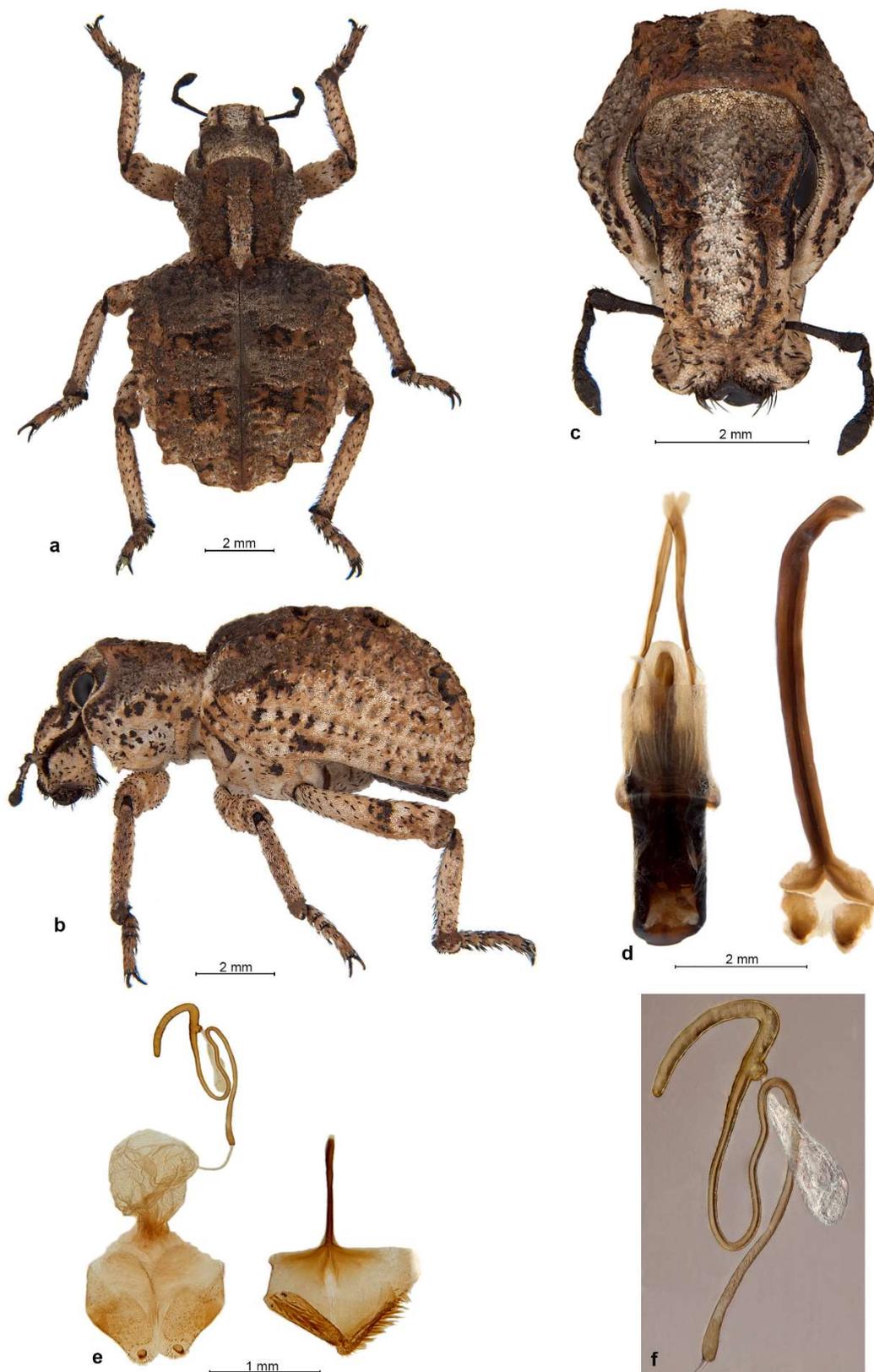


Figure 11. *Sparteceus umbrinus* Fåhraeus (South Africa, 5 km S Barkley West, 02.ii.1985, *ab larva* feeding on underground stem of *Bulbine* cf. *narcissifolia*, R. Oberprieler), habitus and genitalia. ♀, dorsal habitus (a); ♀, lateral habitus (b); ♀, head, frontal view (c); ♂, aedeagus and sternite IX, dorsal view (d); ♀, terminalia, dorsal view (e); spermatheca with gland, ventral view (f).

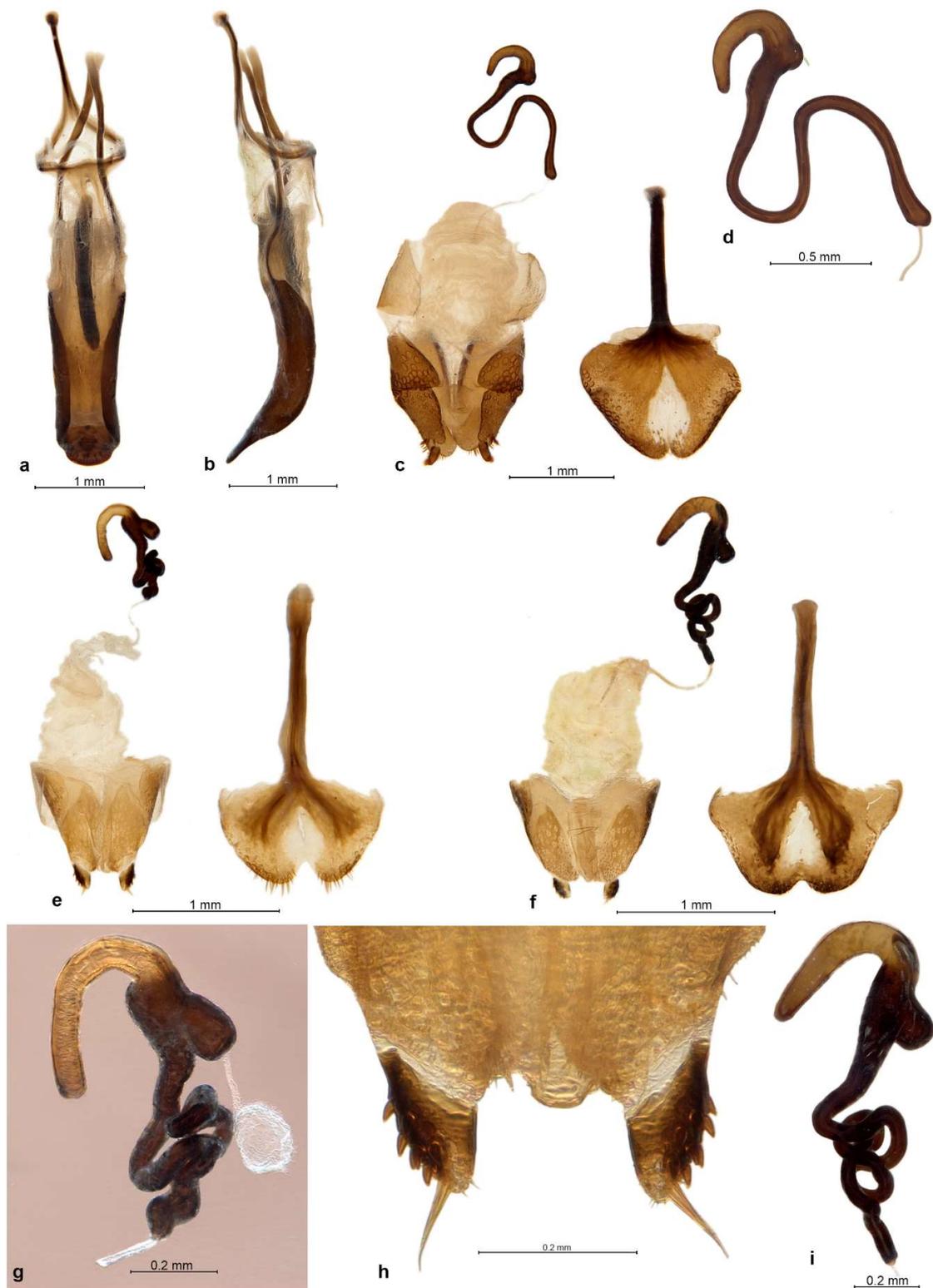


Figure 12. *Spartecerus* species, genitalia. *Spartecerus rudis* Fåhraeus (South Africa, Krugersdrift Dam, xii.1984, R. Oberprieler) (a–d). ♂, aedeagus, dorsal view (a), ditto, left lateral view (b); ♀, terminalia, dorsal view (c), spermatheca (d). *Spartecerus mendax* Péringuey (South Africa, Stanspruitfontein, 05.viii.1948, C. Koch) (e,g,h). ♀, terminalia, dorsal view (e); spermatheca (g); apex of gonocoxites with styli, dorsal view (h). *Spartecerus* sp. (Namibia, Etosha N. P., Okaukuejo, 20.xii.1977, R. Oberprieler) (f,i). ♀, terminalia, dorsal view (f); spermatheca (i).

Spartecerus is a taxonomically equally isolated genus in Africa as *Philetaerobius*. The only other somewhat similar genera (with traditional “leptopiine” characters, namely lateral scrobes and ocular lobes) are *Leptostethus* Waterhouse, 1853 and *Afroleptops* Oberprieler, 1988. The former was comprehensively revised by Thompson [15] and not regarded as particularly closely related to *Spartecerus*, differing especially in its female genitalia, and it is generally classified in its own tribe, Leptostethini [6]. *Afroleptops*, although described in the tribe Tanyrhynchini [16], differs from *Tanyrhynchus* Schoenherr and allies in numerous features, again particularly in the female genitalia, and appears more closely related to Australian leptopiines such as *Prypnum* Schoenherr, 1823 [16,17]. It shares no significant characters with *Spartecerus*. *Spartecerus* further differs from most other Entiminae in its larva having a subglobular antennal sensorium [18], not the flat, cushion-like one typical of the subfamily [19]. Neither *Spartecerus* nor *Philetaerobius* can thus be related to any other entimine genus in southern Africa or be satisfactorily accommodated in any entimine tribe as presently constituted, and we therefore treat them both as *incertae sedis* in the subfamily.

The life-history and hosts of *Spartecerus* are poorly known, but it appears that the larvae consistently feed on the underground bulbs of small geophytic monocotyledons. Voss [14] recorded *S. mendax* Péringuey, 1888 having been collected on bulbs (*an Zwiebeln*) in Namibia, and Louw [18] mentioned that the larvae feed semi-endophytically on bulbs of smaller monocotyledons. One of the authors of the present paper (R.G.O.) reared *S. umbrinus* (Fåhraeus, 1871) in 1984 from larvae found feeding on bulbs of *Bulbine* cf. *narcissifolia* (Asphodelaceae) just below the soil surface. The antenna of this larva was illustrated by Louw [18]. The adults are long-lived and overwinter under selected stones [20], but it is not known for how many years they may live. The association of *Spartecerus* with monocotyledonous hosts further supports the presumed association of *Philetaerobius* with this plant group, although it appears unlikely that the latter genus is also associated with geophytic Asparagales or similar monocotyledan orders rather than with grasses.

Author Contributions: All authors contributed equally to the design, analysis and writing of the paper.

Acknowledgments: We are very grateful to Debbie Jennings (CSIRO, Australian National Insect Collection) for her preparation of numerous superb illustrations of the weevils and their genitalia. We thank Max Barclay (BMNH), Riaan Stals (SANParks) and Ruth Müller (TMSA) for the loan of specimens in their collections and Simon van Noort and Aisha Mayekiso (SAMC) for access to the specimens in their care. For collecting permits in South Africa we gratefully acknowledge SANParks (unnumbered permit issued 7 September 2012, renewed 2013; permit CRC/2016/035–2012/V1), Cape Nature (permits AAA007-00085-0056; AAA041-00158-0056) and Northern Cape Province (permits ODB 1764 and 1794/2013; ODB 2399/2016).

Conflicts of Interest: The authors declare no conflicts of interest.

References

1. Marshall, G.A.K. On new Curculionidae from South Africa. *Ann. Mag. Nat. Hist.* **1923**, *11*, 531–552. [[CrossRef](#)]
2. Louw, S. Periodicity in and ecological equivalence between the ground-living Tenebrionidae (Coleoptera) in the southern Namib and Kalahari ecosystems with notes on phylogenetic relationships. *Navors. Nas. Mus. Bloemfontein* **1986**, *5*, 301–324.
3. Oberprieler, R.G. A reclassification of the weevil subfamily Cyclominae (Coleoptera: Curculionidae). *Zootaxa* **2010**, *2515*, 1–35.
4. Schenkling, S.; Marshall, G.A.K. Curculionidae: Byrsopinae, Rhytirrhinae, Thecesterninae, Hipporhinae, Rhyparosominae. In *Coleopterorum Catalogus, Pars 106*; Junk, W., Schenkling, S., Eds.; W. Junk: Berlin, Germany, 1929; p. 62.
5. Louw, S. Solving the riddle: Combining life-history analysis and morphological comparison in weevil systematics. In *Taxonomy, Ecology and Distribution of Curculionoidea (Coleoptera: Polyphaga), Proceedings of the XX. International Congress of Entomology, Firenze, Italy, 28 August 1996*; Colonnelli, E., Louw, S., Osella, G., Eds.; Museo Regionale de Scienze Naturali: Torino, Italy, 1998; pp. 19–26.
6. Alonso-Zarazaga, M.A.; Lyal, C.H.C. *A World Catalogue of Families and Genera of Curculionoidea (Insecta: Coleoptera) (Excepting Scolytidae and Platypodidae)*; Entomopraxis: Barcelona, Spain, 1999; p. 315.

7. Meregalli, M.; Menardo, F.; Klass, K.D.; Cervella, P. Phylogeny of the *Saxifraga*-associated species of *Dichotrachelus* (Insecta: Coleoptera: Curculionidae), with remarks on their radiation in the Alps. *Arthropod Syst. Phylogeny* **2013**, *71*, 43–68.
8. Folmer, O.; Black, M.; Hoeh, W.; Lutz, R.; Vrijenhoek, R. DNA primers for amplification of mitochondrial cytochrome c oxidase subunit I from diverse metazoan invertebrates. *Mol. Mar. Biol. Biotechnol.* **1994**, *3*, 294–299. [[PubMed](#)]
9. Astrin, J.J.; Stüben, P.E. Phylogeny in cryptic weevils: Molecules, morphology and new genera of Western Palaearctic Cryptorhynchinae (Coleoptera: Curculionidae). *Invertebr. Syst.* **2008**, *22*, 503–522. [[CrossRef](#)]
10. Sinclair, I.; Hockey, P.; Tarboton, W. *Birds of Southern Africa*; Princeton University Press: Princeton, NJ, USA, 2002; p. 448.
11. Louw, S. The diversity and daily and seasonal activity of ground-living Tenebrionidae (Coleoptera) in the southern Namib and Kalahari ecosystems. *Cimbebasia* **1983**, *7*, 35–56.
12. Van Emden, F. A key to the genera of Brachyderinae of the world. *Ann. Mag. Nat. Hist.* **1944**, *11*, 503–532, 559–586. [[CrossRef](#)]
13. Marshall, G.A.K. On the curculionid genus *Spartecerus* Schönherr (Col.). *Proc. R. Entomol. Soc. Lond.* **1948**, *17*, 137–141.
14. Voss, E. Coleoptera Curculionidae partim. In *South African Animal Life*; Hanström, B., Brinck, P., Rudebeck, G., Eds.; Results of the Lund University Expedition in 1950–1951; Almqvist and Wiksell: Stockholm, Sweden, 1974; Volume 15, Chapter VI; pp. 395–479.
15. Thompson, R.T. Revision of the weevil genus *Leptostethus* Waterhouse, 1853 (Coleoptera: Curculionidae: Entiminae). *Cimbebasia Memoir* **1988**, *7*, 80.
16. Oberprieler, R.G. Revision of the Tanyrhynchini of continental Africa (Coleoptera: Curculionidae). I. Introduction and review of the genera, revision of the genus *Brachytrachelus* Schönherr and description of *Afroleptops* gen. nov. *Entomol. Mem. Dep. Agric. Water Supply Repub. S. Afr.* **1988**, *71*, 50.
17. Oberprieler, R.G. Systematic position and composition of the tribes Tanyrhynchini and Myorhinini (Coleoptera: Curculionidae). *Mem. Entomol. Soc. Wash.* **1995**, *14*, 155–167.
18. Louw, S. Systematics and biogeography of the subfamily Microcerinae (Coleoptera: Curculionidae): A re-evaluation based on larval morphology. *Mem. Entomol. Soc. Wash.* **1995**, *14*, 169–174.
19. Marvaldi, A.E. Higher level phylogeny of Curculionidae (Coleoptera: Curculionoidea) based mainly on larval characters, with special reference to broad-nosed weevils. *Cladistics* **1997**, *13*, 285–312. [[CrossRef](#)]
20. Louw, S. Notes on adult overwintering of Microcerinae and Entiminae (Coleoptera: Curculionidae) in southern Africa. *Coleopt. Bull.* **1988**, *42*, 155–156.

