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associated with weaver ants

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Lateral views of *Notaferum natalensis* (Pic, 1906) n. gen., n. comb.

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ABSTRACT

A new genus name *Notaferrum* n. gen. is proposed for *Ptinus natalensis* Pic, 1906. The taxon is diagnosed and described and the only known species redescribed. This taxon, well outside the concept of the genus *Ptinus* Linnaeus, 1766, is most distinctly characterized by a pair of longitudinal and vertically oriented blade-like ridges located medially on the pronotum, a previously unknown feature in the spider beetles and the more inclusive Bostrichoidea Latreille, 1802. This species is a probable symphile of the African species of weaver ant (*Oecophylla longinoda* Latreille, 1802), based on both a collection record from inside an ant nest as well as the presence of distinct trichomes on the pronotum. This taxon represents the first record of a spider beetle associated with weaver ants.

KEY WORDS
Spider Beetles,
Myrmecophily,
South Africa,
new combination,
new genus.

RÉSUMÉ

Notaferrum n. gen. (Coleoptera: Ptinidae) : le premier coléoptère araignée connu associé aux fourmis tisserandes.

Un nouveau nom de genre *Notaferrum* n. gen. est proposé pour *Ptinus natalensis* Pic, 1906. Le taxon est diagnostiqué et décrit, et la seule espèce connue redécrite. Ce taxon, bien en dehors du concept du genre *Ptinus* Linnaeus, 1766, se caractérise le plus distinctement par une paire de crêtes en forme de lames longitudinales et verticales situées en position médiane sur le pronotum, une caractéristique jusqu'alors inconnue chez les coléoptères araignées et les Bostrichoidea Latreille, 1802, plus inclusifs. Cette espèce est un symphile probable de l'espèce africaine de fourmi tisserande (*Oecophylla longinoda* Latreille, 1802), basée à la fois sur une signalisation de collecte à l'intérieur d'un nid de fourmis ainsi que sur la présence de trichomes distincts sur le pronotum. Ce taxon représente la première mention d'un coléoptère araignée associé à des fourmis tisserandes.

MOTS CLÉS
Coléoptères araignées,
Myrmécophilie,
Afrique du Sud,
combinaison nouvelle,
genre nouveau.

INTRODUCTION

Though a relatively small group containing only about 600 species, the spider beetles (Ptininae Latreille, 1803) are highly diverse both in morphology as well as life histories. South Africa is currently home to some of the greatest spider beetle diversity in the world, containing 13 endemic and three widespread genera and 59 described species, as well as a few introduced taxa (for the most recent works, see Irish 1996; Philips & Foster 2004; Borowski 2006a, b, 2009a, b, c; Bell & Philips 2008; Akotsen-Mensah & Philips 2009; Smiley & Philips 2011; Trimboli & Philips 2011; Wood & Philips 2013; Philips & Dickmann 2018; Gearner *et al.* 2019a, b).

While most spider beetles feed on dung and accumulated organic matter, many alternative lifestyles have evolved as well (Philips & Bell 2010). Myrmecophily, or an association with ants, appears to have evolved independently multiple times in the group (Philips 2001, Mynhardt 2012). The biology of these taxa is largely unknown with the exception of a laboratory observation in which an adult of *Gnostus floridanus* Blatchley, 1930, solicited and received food from a host ant (*Crematogaster ashmeadi* Mayr, 1886) via trophallaxis (Thomas *et al.* 1992).

In 1904, Péringuey described the species *Ptinus elegans* based on a specimen collected in KwaZulu-Natal, South Africa in 1899. Soon after however, this name was noted to be a junior homonym of the Chilean species *Ptinus elegans* Solier, 1849 and renamed by Pic (1906) as *Ptinus natalensis*. No additional specimens were discovered until more recent collections in 1981 and 2014 of single specimens. The former record is notable as an individual was discovered inside a weaver ant nest (*Oecophylla longinoda* Latreille, 1802). There are only two documented cases of beetles associated with weaver ants, both with the Southeast Asian and Australian species, *Oecophylla smaragdina* Fabricius, 1775. Adult *Campsiura nigripennis* Schaum, 1841 (Scarabaeidae Latreille, 1802, Cetoniinae Leach, 1815) were observed intruding nests likely to feed on ant brood, and *Habroloma myrmecophila* Bílý, Fikáček & Sípek, 2008 (Buprestidae Leach, 1815) inhabit and mine leaves from weaver ant nests in the larval stage (Bílý *et al.* 2008; Komatsu *et al.* 2014).

Examination of *Ptinus natalensis* led the authors to conclude that this species belongs in its own genus as it is well outside the current concept of *Ptinus* Linnaeus, 1766, or any of its subgenera and shows much closer affinity to other ptinid genera. Herein this new genus is described, the distribution documented, and relationships and probable biology discussed.

MATERIAL AND METHODS

This study was based on the examination of three specimens, including the type, from the following collections: Iziko South African Museum, Cape Town (SAM) and the National Collection of Insects, Pretoria (SANC). QGIS 3 was used to create a distribution map with ESRI Satellite and ESRI Boundaries & Places base map layers imported using the Quick Map Services plugin.

SYSTEMATICS

Order COLEOPTERA Linnaeus, 1758

Family PTINIDAE Latreille, 1802

Genus *Notaferrum* n. gen.

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TYPE SPECIES. — *Ptinus natalensis* Pic, 1906 by original designation.

ETYMOLOGY. — *Notaferrum* n. gen. is derived from the Greek nota for back and the Latin ferrum for blade in reference to the longitudinal blade-like ridges on the pronotum.

DIAGNOSIS. — This genus can be recognized by the pair of longitudinal blade-like ridges located medially on the pronotum as well as a transverse, flattened, and U-shape depression with sides diverging anteriorly at the basal 2/5 of the pronotum.

GENERIC DESCRIPTION

Body

Small, length approximately 3.4 mm, elongate.

Head

Eyes convex, ovoid, slightly projecting, visible dorsally; vertex flat at middle; antennal fossae deep and distinct medially and ventrally, antennae long, filiform, 11 antennomeres; interantennal space between antennal insertions narrow, with a longitudinal groove; clypeus triangular, concave; labrum appearing truncate, maxillary and labial palpomeres fusiform.

Pronotum

Two thin longitudinal ridges positioned on either side of midline; two lateral tubercles on either side of the pronotum, flanking a transverse groove, basally forming a large posterior flat U-shaped depression with sides diverging anteriorly; anterior margin with deep irregular punctures.

Elytra

With longitudinal rows of punctures; interpuncture rows of small setae; scattered scale-like setae.

Thoracic ventrites

Proventrite small, about as long as wide; anteriorly, ventrally expanded to partially cover mouthparts, proventral process extending beyond procoxae, expanded anteriorly, tip truncate; mesoventrite U-shaped, surrounding proventral process apex, much wider than long, metaventrite large, wider than mesoventrite.

Abdominal ventrites

First three ventrites large, each as long or longer than 4th and 5th combined, fourth very short, fifth smaller than first three but much longer than fourth. Sutures visible between all ventrites; fifth ventrite distinctly transversely concave.

Legs

Femora expanded apically, tibia similar in length to femora; first tarsomere largest; metacoxae with posterior extension lateral to the trochanter; pro-, mesocoxae conical shaped, moderately projecting, metacoxae transverse, extending laterally to elytral margin.

Sexual dimorphism

Male antennomeres 6-11 distinctly more elongate than those of the female. Eye size in both sexes approximately equal.

Notaferrum natalensis (Pic, 1906) n. comb.
(Figs 1-4)

Ptinus elegans Péringuey, 1904: 225.

Ptinus natalensis Pic, 1906: 227.

MATERIAL EXAMINED. — **Holotype. South Africa** • 1 ♀; [Natal] Isipingo beach; I.1899; SAM type Acc. No.1261.

ADDITIONAL LABEL DATA. — “Type” (red label); “natalensis”; “Lectotypus, *Ptinus elegans*, Péringuey, des J. Borowski ‘98 (SAMC)”. Abdominal ventrites on a separate card.

OTHER MATERIAL. — **South Africa** • 1 ♂; Kwazulu-Natal, iSimangaliso Wetland Park [Previously known as Greater St. Lucia Wetland Park], Sodwana Bay campgrounds; 27.54°S, 32.67°E; c. 40 m; 21-24.X.2014; R. Stals leg.; Vegetation type: FOz Northern Coastal Forest; SANC • 1 ♀; Natal, Charters Creek, St. Lucia; 28.12°S, 32.25°E; 14-16.I.1981; R. Oberprieler leg.; from nest of *Oecophylla longinoda*; AcP. 8497; SANC.

DIAGNOSIS. — The generic diagnosis together with the white scale setal pattern on the elytra (Fig. 1) should distinguish this taxon, if other species within this genus are discovered in the future.

SPECIES REDESCRIPTION

Body

Color dark brown to black on head, pronotum, and elytra. Body small and elongate. Length 3.4 ± 0.33 mm (n = 3).

Head (Fig. 2)

Head covered in punctures, large shallow irregular and contiguous mediolaterally, medially finer, longitudinally elongate; scattered, white small appressed scales; antennae dark brown, antennomeres 1-8 with moderately dense white appressed scales, first antennomere largest, second small as long as wide, remaining antennomeres longer than wide.

Pronotum

Pronotum mostly smooth with very fine alutaceous sculpture, glabrous except anterior $\frac{1}{4}$ with round and elongate scattered punctures; pair of medial vertical ridges approximately broadly rounded from anterior to posterior dorsal edge, then declivous to base just past middle, short thin yellow setae scattered on top of ridges; three tubercles on each lateral edge, anterior tubercle rounded, middle concave triangular, somewhat ear-shaped, posterior tubercle small, pointed, recumbent clumped orange trichome setae on lateral edge in

between and around tubercles; a broadly rounded U-shaped smooth impression; posterior margin of pronotum narrow anterior of scutellum.

Elytra

Elytral surface covered in rows of round to elongate punctures separately longitudinally by half or less their length, puncture rows separated by about 1.5-2.0 times their diameters, 1st and 2nd rows slightly obliquely oriented, 3rd and 4th less so; humeral angles raised; scutellum triangular, lateral edges below elytral surface; interpuncture rows of small recumbent dull pale orange setae; white scales forming an irregular transverse band at anterior $\frac{1}{3}$, extending medially in an irregular longitudinal band from anterior transverse band to posterior $\frac{1}{3}$, lateral clump of setae on each elytron at about posterior $\frac{1}{3}$, transverse band of setae at apex and sometimes extending anteriorly along suture.

Ventrites

Ventral surface reddish to dark brown, covered in small white appressed scales mostly covering surface; proventrite smooth, mesoventrite with irregularly shaped, glabrous indentation at middle; lateral edge of fourth ventrite and apical edge of fifth ventrite with scattered fine yellowish setae.

Legs

Legs reddish to dark brown, covered in white scales as on ventral surface; 1st tarsomere longer than wide, others short in length and width, internal surface of tarsomeres covered in fine gold recumbent setae.

Sexual dimorphism

Antennomeres 6-11 in the male distinctly more elongate compared to those seen in the female. Male genitalia with elongate narrow parameres with a thick median lobe that is about the same length as the parameres.

DISCUSSION

There is little doubt that *Notaferrum* n. gen. shares close common ancestry especially with *Silisoptinus* Pic, 1917 (see Bellés 1988, 2009) and more distantly with *Eutaphrimorphus* Pic, 1898 (see Bellés 1992). All three genera are hypothesized to compose a single monophyletic lineage based on the possession of a very distinct and similarly shaped large medial smooth and flattened U-shaped shallow depression with a broadly rounded posterior border located medially at the base of the pronotum. Further similarity in these three genera is the anteriorly expanded prosternum that covers in part the ventral portion of the head, a feature that may have evolved to help protect mouthparts, most likely from ants. There are additional taxa from the Americas and southeast Asia (e.g. *Prosternoptinus* Bellés, 1985, and *Sundaptinus* Bellés, 1991) that also share this feature but based on other characteristics are not closely related (Mynhardt *et al.* unpublished).

Another similarity between *Notaferrum* n. gen. and *Silisoptinus* is the greatly reduced fourth abdominal ventrite (c. $\frac{1}{4}$ the length of the third). Further is the strong declivity on the

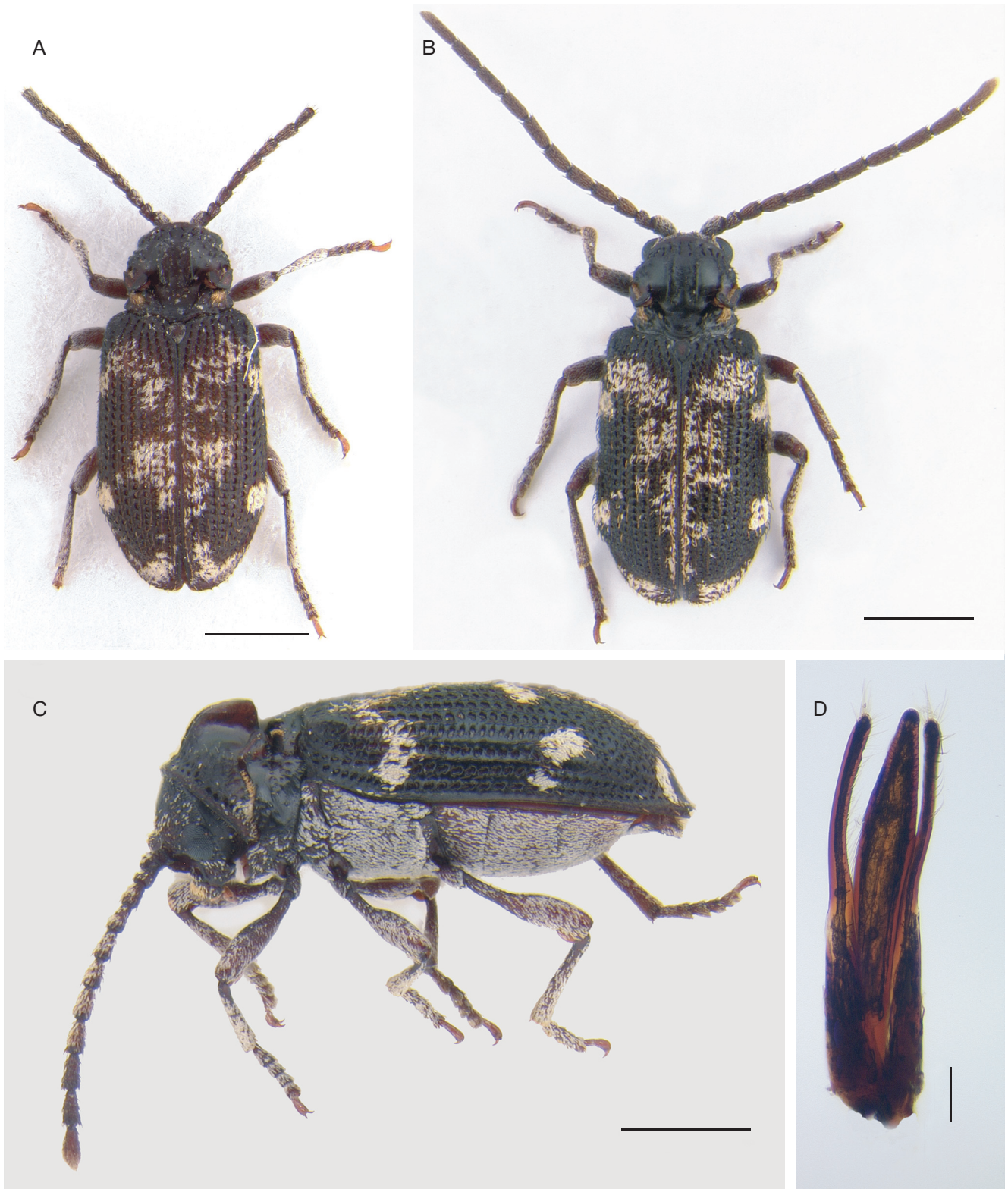


FIG. 1. — Dorsal and lateral views of *Notaferrum natalensis* (Pic, 1906) n. gen., n. comb.: **A**, type specimen of *Ptinus natalensis* Pic, 1906; **B**, specimen from Sodwana Bay Campground showing some of the variability of recumbent white setae on the elytra; **C**, specimen from Charters Creek, St. Lucia in lateral view showing the distinct blade-like structures on the pronotum; **D**, male genitalia. Scale bars: A-C, 1 mm; D, 100 μ m.

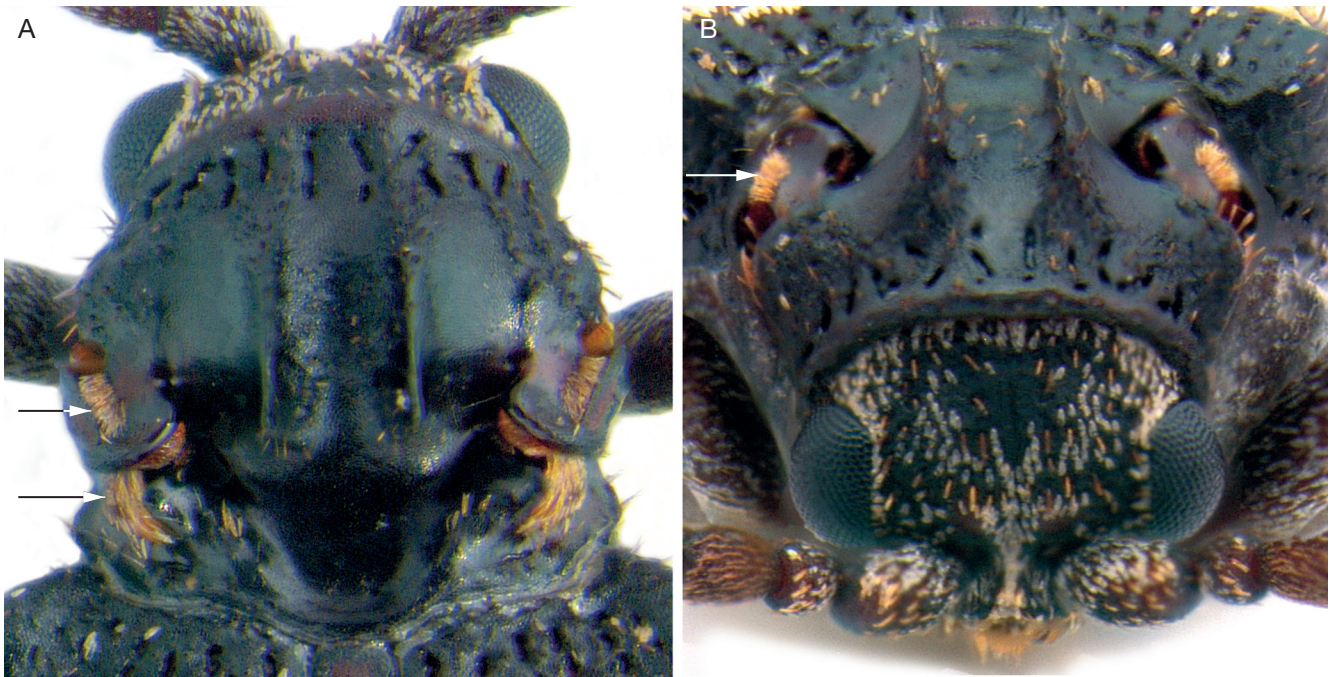


FIG. 2. — Close-up view of head and pronotum of *Notaferrum natalensis* (Pic, 1906) n. gen., n. comb.: **A**, dorsal view; **B**, frontal view. Note the distinct lateral and dorsal trichomes (see arrows).

third ventrite that slopes dramatically down to the fourth. In contrast, *Eutaphrimorphus* has a more typical spider beetle abdomen with the fourth reduced (*c.* half the length of the third) and the ventrites are all in roughly the same plane.

Notable differences of *Notaferrum* n. gen. with the other two genera is the lack of two short knobs near the pronotal base positioned laterally. They are very pronounced in *Eutaphrimorphus* while in *Silisoptinus* they are smaller and of various shapes depending upon the species. *Eutaphrimorphus* has two additional knobs positioned more centrally as well. These additional projections are also seen in at least one species of *Silisoptinus* but are much less pronounced and relatively gently rounded.

Both *Notaferrum* n. gen. and *Silisoptinus* also exhibit depression(s) on the ventral surface that are lacking in *Eutaphrimorphus*; in *Notaferrum* n. gen., it is located only on the metaventrite near the middle and is similar to at least two other species of *Silisoptinus* (Bellés 1988) including one undescribed (Philips unpublished). But the two described species of *Silisoptinus* also have a single depression on the abdomen while two undescribed (Philips unpublished) have either only a single depression on the metaventrite or both very weakly developed depressions on both the metaventrite and abdomen. *Silisoptinus* species are known from the eastern side of the African continent (Zanzibar and Socotra Islands) as well as Ghana (Philips unpublished) while *Eutaphrimorphus* is known only from South Africa.

Also possibly related to *Notaferrum* n. gen. is *Dignomus* Wollaston, 1862, and the flightless *Pseudomezium* Pic, 1897, with the latter representing a flightless *Dignomus* (Philips unpublished and see Smiley & Philips 2011). These genera together with *Silisoptinus* and *Eutaphrimorphus* may form

a monophyletic clade or at least with some close common ancestry. *Dignomus* as currently defined has a diverse set of pronotal modifications (Bellés 1996; Smith & Philips unpublished) and may not form a monophyletic clade. But the overall similarity of the pronotum having an anterior and posterior lobe laterally and without much lateral projection in both *Notaferrum* n. gen. and *Dignomus* (plus *Pseudomezium*) is notable.

One other characteristic feature of the new genus is the presence of a transverse posterior pronotal groove of various degrees and shapes. Many other spider beetle taxa also possess a basal groove of various shapes including the African genera *Eutaphrimorphus* Pic, 1898, *Silisoptinus* Pic, 1917, *Eutaphroptinus* Borowski, 2009, *Dignomus* Wollaston, 1862, *Pseudomezium* Pic, 1897, *Dignomorphus* Borowski, 2009, as well as some species of the non-African *Ptinus* (e.g. *P. espanyoli* Bellés, 1997), *Tropicoptinus* Bellés, 1998, and members of *Trymolophus* Bellés, 1990.

DISTRIBUTION

Notaferrum natalensis n. gen., n. comb. is known only from KwaZulu-Natal province in South Africa (Fig. 4). The current range is a little over 300 km in length, and all records are within 30 km of the coast. This distribution is within the Maputuland-Pondoland-Albany hotspot, one of three biodiversity hotspots in South Africa. Maputuland-Pondoland-Albany is notable in particular for its high plant endemism and is the second richest floristic region in South Africa (Myers *et al.* 2000). As the distribution of the weaver ant *Oecophylla longinoda* extends from Southern Africa through Eastern and Western Africa (Bolton 1995), one might expect the distribution of *Notaferrum natalensis* n. gen., n. comb. to be much larger.



FIG. 3. — Ventral surface of *Notaferrum natalensis* (Pic, 1906) n. gen., n. comb. and host ant *Oecophylla longinoda* Latreille, 1802: **A**, ventral surface showing the apically expanded prosternal process that extends beyond the procoxae (see arrow), very reduced length of the fourth abdominal ventrite, and the small depression (devoid of setae) on the metaventrite near the posterior margin; **B**, host ant specimen, *Oecophylla longinoda* Latreille, 1802, associated with the specimen from St. Lucia, SANC. Scale bar: 2 mm.

BIOLOGY

Notaferrum natalensis n. gen., n. comb. is hypothesized to be a myrmecophile, as one individual was collected in a weaver ant nest (*Oecophylla longinoda*, Fig. 3B). There are no other spider beetles known to be associated with *Oecophylla* ants anywhere in the world. Only one other southern African genus appears to be a true symphile; *Diplocotidus* Péringuey, 1899

includes three species currently known from South Africa and Namibia (Bell & Philips 2008). Unlike this new genus, species are wingless and found in arid or semiarid regions and are associated with ground nesting ants. The food type of *Notaferrum natalensis* n. gen., n. comb. is unclear, but it may feed on nest detritus, as most species of spider beetles feed on accumulated organic matter, particularly dung and detritus.



FIG. 4. — Distribution of *Notaferrum natalensis* (Pic, 1906) n. gen., n. comb. based on three known specimens, South Africa, Kwa-Zulu Natal Province.

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