



Gastrotermes spinatus gen. n. sp. n., an African soil-feeding termite described from the worker caste (Isoptera, Termitidae, Apicotermittidae)

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Abstract

Gastrotermes spinatus gen. n. sp. n. is described from workers of a single foraging group collected in Cameroon. This soil-feeding termite aligns with the *Labidotermes* subgroup (*Apicotermes* group) because of its non-protruding and symmetrical enteric valve armature, its short P1, and its globular P3a. An asymmetrical field of robust sclerotized spines at the opening of the P3a is unique among the other *Labidotermes* subgroup genera.

Key words: Cameroon, proctodeal spines, enteric valve armature

Introduction

The taxonomic significance of the termite worker gut characters, including the enteric valve armature (EVA), was first addressed by a few authors including Grassé & Noirot (1954), Noirot & Kovoov (1958), Noirot (1966), Sands (1972), Mathews (1977), and Johnson (1979). Gradually, the worker gut has become a prominent character in the descriptions of soil-associated taxa as exemplified by the monumental work of Sands (1998). Of all higher termites (Termitidae), the soil-feeding members of subfamilies Apicotermittinae, Cubitermittinae, Nasutitermittinae, Syntermittinae, and Termittinae show the most robust specialization in gut characters, especially the EVA.

The termite subfamily Apicotermittinae is divided into three groups based mainly on the soldier (if present), the worker digestive tube (gut) morphology (Noirot 2001), and, to some extent, molecular sequences (Inward et al. 2007). These include the *Apicotermes* group (Ethiopian), the *Anoplotermes* group (soldierless, Ethiopian and Neotropical) and the *Speculitermes* group (Oriental, a few soldierless species). All are soil feeders (Donovan et al. 2002). The EVA of *Apicotermes* group workers (*sensu* Sands 1998), and especially the *Apicotermes* subgroup (*sensu* Noirot 2001) are among the most complex and elaborate of all termites (Donovan 2002).

While examining material in the University of Florida Termite Collection (UFTC), I came across a sample of *Apicotermes* group workers collected in Cameroon. The morphology of the EVA and the spine arrangement in the enteric valve seating (EVS) and third proctodeal segment (P3a) separates these workers from all related genera. I herein describe *Gastrotermes spinatus* gen. n. sp. n.

Material and methods

Preserved workers, stored in 85% ethanol, were positioned in a transparent petri dish filled with Purell® hand sanitizer (70% EtOH). Body sections and dissected guts were photographed as multi-layer montages using a Leica M205C stereomicroscope with a Leica DFC 425 module run with Leica Application Suite software version 3. Mandibles and EVA within the proctodeal second segment (P2) were mounted on slides with PVA mounting medium (Bioquip Products, Inc.) and photographed with a Leica CTR 5500 compound microscope using bright field lighting and the same montage software. Terminology of the worker gut follows that of Sands (1998) and Noirot (2001).

Measurements were obtained using an Olympus SZH stereomicroscope fitted with an ocular micrometer. The following abbreviations are used for the measurements: HLP, Head length to end of postclypeus; PCL, Postclypeal length; HW, maximum head width; PW, maximum Pronotal width; HTL, Hind tibia length; FTL, Fore tibia length; FTW, Fore-tibia width; FTLW Fore-tibia width:length ratio.

***Gastrotermes* gen. nov.**

Type species. *Gastrotermes spinatus* sp. n.

Description.

Imago. Unknown.

Soldier. Unknown, but may exist.

Worker. Head, pronotum, and abdomen covered with hundreds of long or very long hairs (Fig. 1A, C, D). Antennae with 14 articles. Postclypeus strongly inflated. Fore tibia slightly inflated, about six times as long as wide. Mesenteron forming complete loop; P1 about 3 times as long as wide (Fig. 2). Junction of M and P1 is straight, circular, without mixed segment (Fig. 2D). Enteric valve contained within lumen of P2 consisting of six subequal cushions near EVS (Fig. 3A, B). Anterior to cushions is a ring consisting of rounded pleats and anterior to that is a ring ornamented with 4-9 very short thorns aligned to each cushion. Enteric valve seating trilobed, about 1.7 times wider than middle of P1 and nearly as long; lined with several hundred small erect spines. Opening of the P3a lined with about one hundred well sclerotized spines posterior to EVS constriction (Fig. 3C, D). Isthmus cuticle without ornamentation.

Diagnosis. An absence of a mixed segment and the presence of both a very short P1 and a voluminous trilobite enteric valve seating places *Gastrotermes* in the *Apicotermes* group (*sensu* Noirot 2001). Furthermore, confinement of the EVA within the valve lumen (not projecting into the EVS or P3a, Fig. 4A, B) and a globular P3a (Fig. 4C) places *Gastrotermes* into the *Labidotermes* subgroup (*sensu* Noirot 2001). *Gastrotermes* workers are much smaller than other members of the *Labidotermes* group: *Acutidentitermes* (HW=1.65 mm), *Hoplognathotermes* (HW=1.4-1.7 mm), and *Labidotermes* (HW=2.0-2.3 mm). *Skatitermes* (HW=1.74-1.92 mm), if really part of the *Labidotermes* group (Noirot 2001 does, with hesitation, include *Skatitermes*), has dark head capsule coloration, and very different mandibles with short apical teeth (Coaton 1971). Unlike the other *Apicotermes* group genera, *Skatitermes* has no soldiers. Also, genera within the *Labidotermes* subgroup lack P3a spines (as in *L. celisi* Deligne and Pasteels, Fig. 4C) while in *Gastrotermes*, the EVS is lined with small erect spines and the opening of the P3a is lined with many robust spines. Members of the *Trichotermes* and *Eburnitermes* subgroups have spines lining the P3a, however, they are thinner and shorter (20-40 μ m; Noirot 2001, Fig. 7N, P).

Etymology. “*Gastro*”, from the Greek “gaster”, stomach, belly, refers to the gut which differentiates this termite from other apicotermite genera. “*Termes*” (= termite in Latin) is used as the root suffix for almost all termite genera.

***Gastrotermes spinatus* sp. nov.**

Holotype. Worker, 1DEC2011, Jan Křeček, University of Florida Termite Collection no. AFR1424.

Type repository. University of Florida Termite Collection, Fort Lauderdale, Davie, Florida.

Type-locality. Cameroon, Korup National Park (lat 5.007, long 8.865), elev. 135 m.

Paratypes. Another 30 workers, same colony sample as holotype.

Worker (Figs. 1-3). Monomorphic, intermediate size for subfamily; head, pronotum, and body rather hairy for subfamily (Fig. 1A). Head capsule yellowish, covered with a few short but mostly long (ca. 0.12 mm) to very long (ca. 0.22 mm) setae (Fig. 1C, D). Postclypeus strongly inflated; fontanelle almost indiscernible; frontal gland paler than surrounding vertex. Antennae with 14 articles, 2=3>4<5. Left mandible with apical tooth about twice as long as M1+2; anterior margins of M1+2 and M3 subequal; posterior margin of M1+2 forming ca. 110° with anterior margin of M3 (Fig. 1B). Right mandible with apical tooth about 2.5 times longer than first marginal tooth; second marginal tooth forming 90° isosceles triangle. Fore tibia slightly inflated compared to hind tibia.

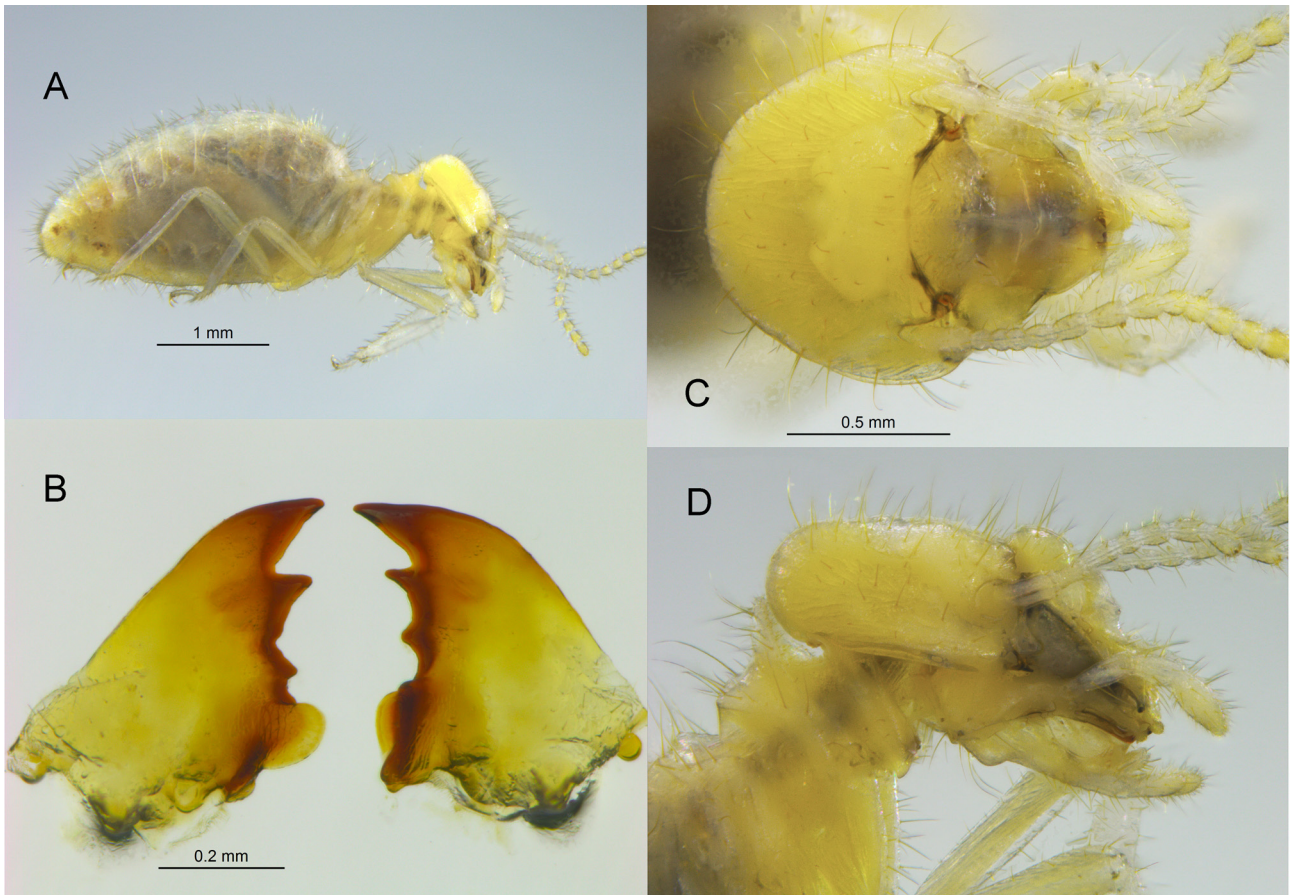


FIGURE 1. *Gastrotermes spinatus* worker. A) lateral habitus, B) mandibles, C) dorsal head capsule, and D) lateral head capsule and pronotum.

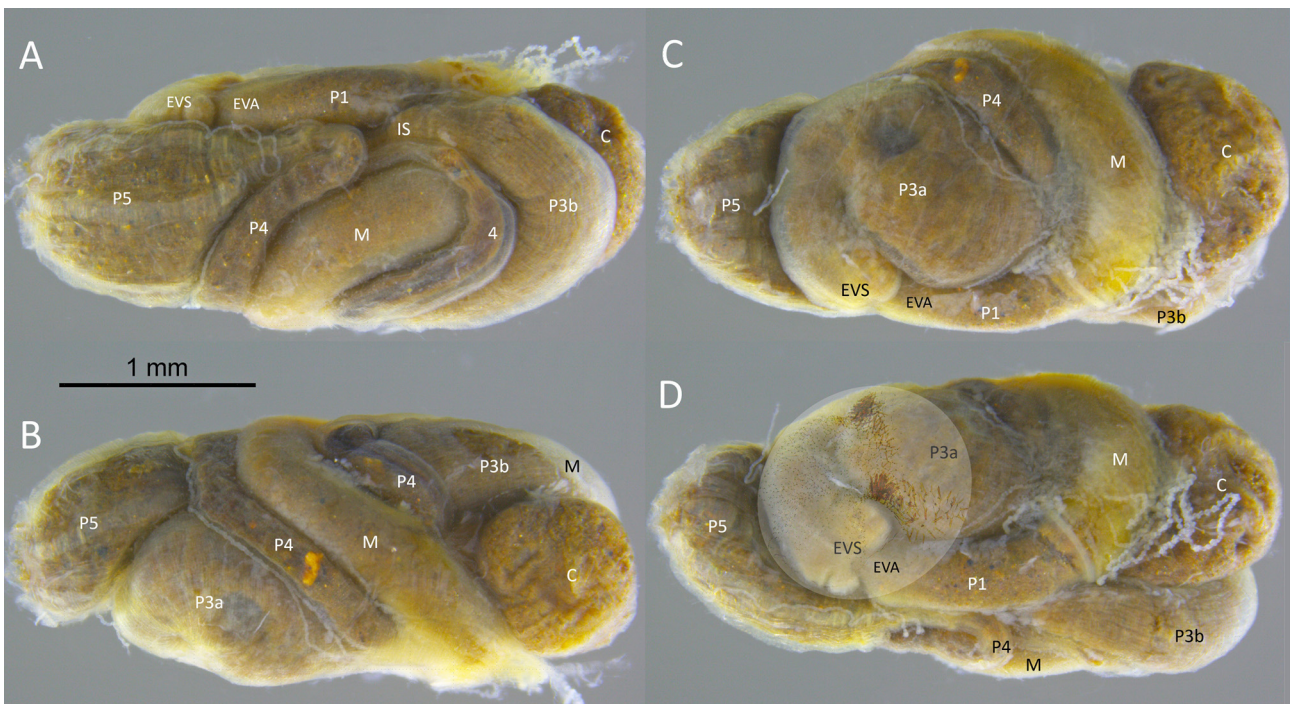


FIGURE 2. *Gastrotermes spinatus* worker whole gut. A) dorsal, B) right, C) ventral, and D) left aspects. Superimposed on D) in highlighted circle is position, to scale, of spiny section of P3a (Fig. 3C). Abbreviations: C = crop, M = mesenteron, P1 = first proctodeal segment, EVS = enteric valve seating, P3a = posterior portion of third proctodeal segment, P3b = anterior portion of third proctodeal segment, IS = isthmus, P4 = fourth proctodeal segment, P5 = fifth proctodeal segment.

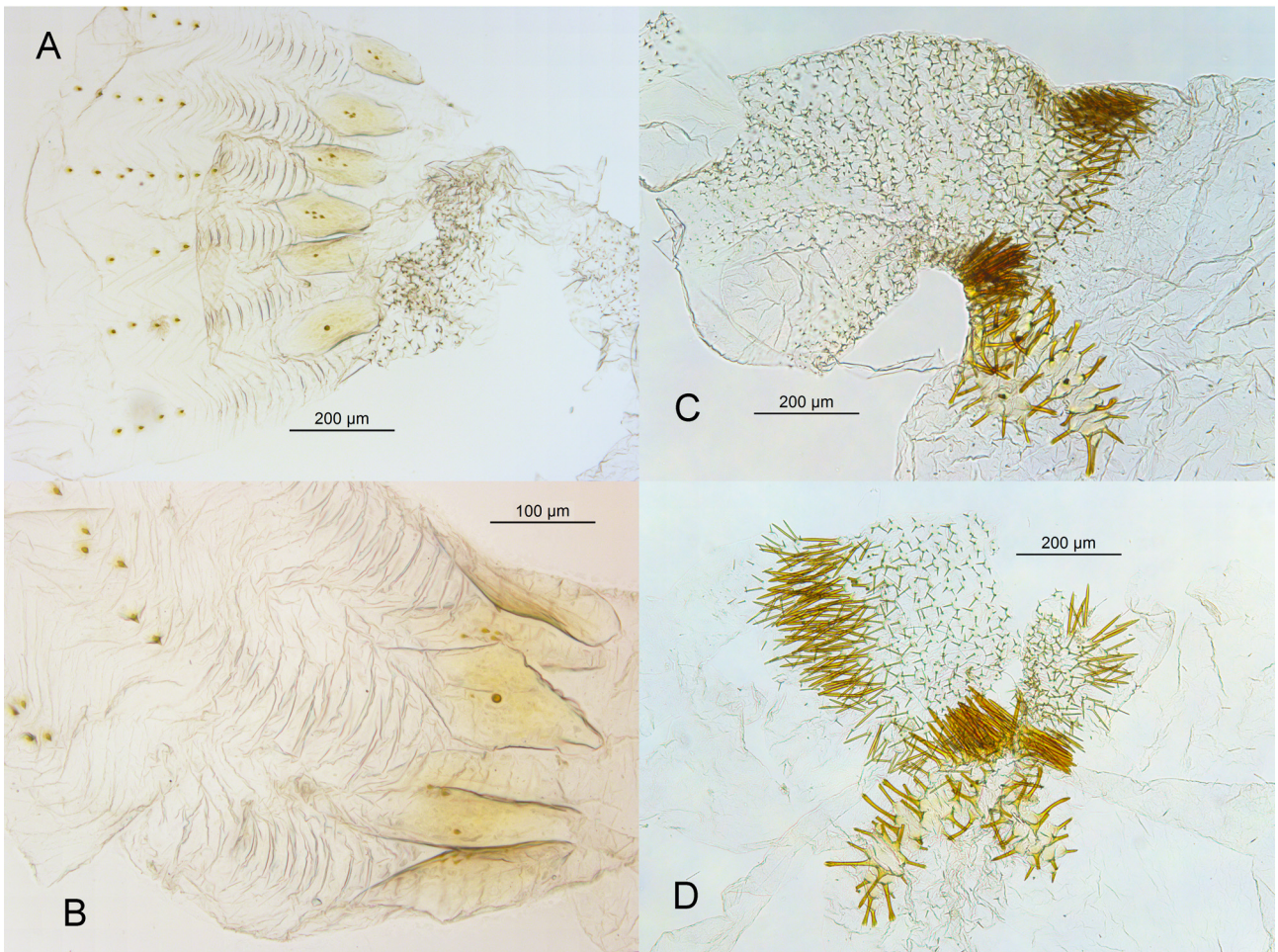


FIGURE 3. *Gastrotermes spinatus* worker gut. A) cuticle of enteric valve armature and portion of EVS, B) EVS, whole mount, C) EVS and adjoining portion of P3a viewed from left aspect (Fig. 2D), D) adjoining portion of P3a viewed from ventral aspect. See Fig. 2 for abbreviations.

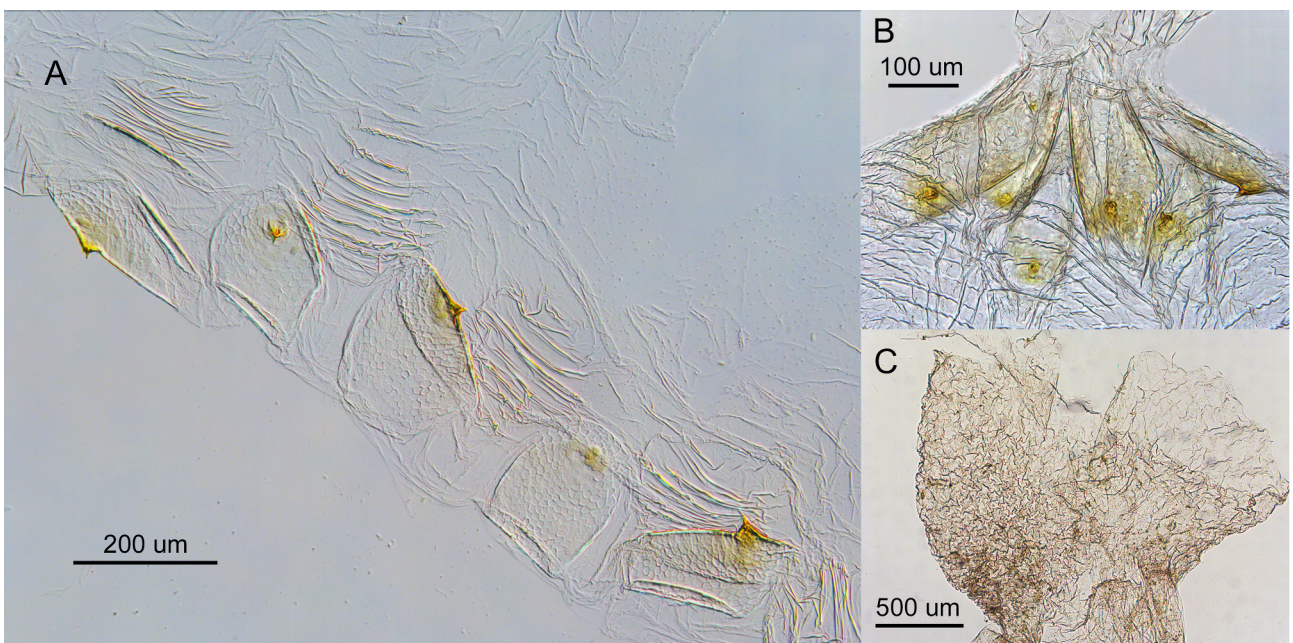


FIGURE 4. *Labidotermes celisi* worker. A) enteric valve splayed open, B) enteric valve intact, and C) anterior region of the proctodeal section P3a.

Mesenteron forms complete circle, integument in the half nearest P1 with yellow pigmentation. Malpighian knot against the terminal part of midgut. Mixed segment absent, P1 about 3 times as long as wide. Enteric valve seating trilobed, wider than P1; P3a globular; P3b terminus elongate, with longitudinal striations (Fig. 2A). Isthmus (P3a-P4) cuticle without ornamentation; P5 about same volume as P3a. Enteric valve contained within lumen of P2. Valve with six subequal ovoid cushions. Each cushion with one to four small thorns near middle. At and below the cushion ring is a ring consisting of about a dozen rounded pleats followed by a more transparent ring ornamented with 4-9 very short spines in line with each cushion. Enteric valve seating trilobed, about 1.7 times wider than middle of P1 and nearly as long; lined with several hundred 6-14 µm-long erect spines. Opening of the P3a lined with about one hundred 51-107 µm-long sclerotized spines at and beyond the EVS constriction. Long spines take two forms; those nearest EVA are simple with sharp points bunched at P3a opening into two groups, one group near interior lobe of EVS and one on opposite (left) side. Spines of the second group with wide, multifurcated termini that form two spiny arms lining the EVS side of the P3a.

Measurements. Workers (mean, range, mm, n=20): HLP 0.65, 0.58-0.70; PCL 0.21, 0.19-0.23; HW 1.01, 0.98-1.05; PW 0.65, 0.61-0.68; HTL 1.13, 1.05-1.18; FTL 0.82, 0.77-0.86; FTW 0.14, 0.12-0.14; FTLW 0.17, 0.15-0.18.

Diagnosis. Both the EVS and P3a junction, as noted above, and the EVA cuticle of *G. spinatus* are unique among the *Apicotermes* group.

Etymology. The specific epithet “*spinatus*” (Latin for spine) refers to the large spines at the juncture of the EVS and P3a.

Discussion. Soldiers are relatively rare in colonies of the *Apicotermes* group genera so it is possible that *G. spinatus* possesses a soldier. Except for its subterranean soil-feeding behavior, the biology of *G. spinatus* is unknown. The only known locality for *G. spinatus* is in lowland central African rainforest with precipitation exceeding 3 m per annum. Noirot (2001) places the *Labidotermes* subgroup as basal within the *Apicotermes* group because, unlike the *Eburnitermes*, *Trichotermes*, and *Apicotermes* subgroups, the EVA is situated on the inner face of P2 and does not project into the EVS or P3a lumen.

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