Resurrection of Dryotomicus Wood and description of two new species from the Amazon River Basin (Coleoptera, Curculionidae, Scolytinae, Phloeotribini)

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Abstract

A cladistic analysis based on 20 morphological characters was conducted for 11 species representing two valid and two synonymized Phloeotribini genera. One hundred-eighty most-parsimonious trees were recovered and the Dryotomicus Wood species were monophyletic in a mostly unresolved strict-consensus tree. The unusual antennal morphology, with the length of the first two funicular segments equal to the last three segments and a scape which is twice the length of the funicle, distinguish Dryotomicus from the other Phloeotribini genera. Hence this genus is resurrected because of monophyly and diagnostic characters. Dryotomicus oenophilis sp. n. and D. woodrex sp. n. are described from Guyana and Peru, respectively. In the male specimen of D. oenophilis, the frons has one median and two large lateral carinae and in the male specimen of D. woodrex, the frons has three smaller median tubercles arranged transversely. Phloeotribus puberulus Chapuis and P. tuberculatus (Eggers) were monophyletic with the new Dryotomicus species and thus are transferred to this genus. Keys to the Phloeotribini genera and Dryotomicus species are given.

Keywords

Scolytidae, bark beetle, taxonomy, tropical biodiversity
Introduction

The most diverse and unknown scolytine fauna lies in the tropics. Although a recent monograph of the South American scolytines has been published, approximately another 2500 species remain undiscovered in the Neotropics (Wood 2007). Among these species, are lineages with previously unobserved morphologies, some of which represent undescribed genera. For example, Dole and Cognato (2007) described *Akrobothrus ecuadoriensis* because of the elytral depression around the scutellum, which is a rare character among scolytines. Similarly, we recently discovered two morphologically interesting species of the Phloeotribini collected from primary wet forests in Guyana and Peru. Although the pseudo-lamellate antennal club places these new species in *Phloeotribus* Latreille, the unusually long funicle and scape suggests the placement of these species in a different genus. Phloeotribini currently contains two genera: *Phloeotribus* which is represented by ~100 species distributed in the Holarctic, South America (with highest diversity), and Australia and *Aricerus* Blandford which is represented by three Australian-New Guinea species (Wood 1986). However, as many as nine previously recognized genera have been synonymized with *Phloeotribus* and, of these, the Neotropical genera *Eulytocerus* Blandford and *Dryotomicus* Wood resemble the recently collected specimens based on previous descriptions (Chapuis 1869; Blandford 1897; Schedl 1962; Wood 1962).

In this study, we assembled specimens of Neotropical, Nearctic, and Australian Phloeotribini and conducted a cladistic analysis, which justified the resurrection of *Dryotomicus* and the description of two new species.

Materials and methods

Specimens of one Chramesus (outgroup), one Aricerus and 11 Phloeotribus species, which included all species described as Dryotomicus and Eulytocerus (Wood and Bright 1992), from the A.J. Cook Arthropod Research Collection, East Lansing, MI [MSUC], the National Museum of Natural History at the Smithsonian Institute, Washington, D.C. [USNM], Snow Insect collection, Lawrence, KS [SMEC], The Natural History Museum, London [BMNH] and Institut Royal des Sciences Naturelles de Belgique (IRSNB) were examined and scored for 20 morphologically variable characters (Tables 1, 2).

Using this data matrix (Table 2), most parsimonious trees (mpts) were reconstructed by a branch and bound search in PAUP* 4.0 b10 PPC using default settings (Swofford 2002). Bootstrap values were determined by performing 500 pseudo-replicates in a heuristic search with simple stepwise addition replicates. Bremer support was calculated with TreeRot v.2 (Sorenson 1999).
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Results and discussion

One hundred-eighty mpts where reconstructed for the 13 taxa. The strict consensus tree of the mpts was mostly unresolved except for the monophyly of *Dryotomicus* species (Fig. 1). This clade has a high bootstrap value (100), is supported by a relatively high Bremer value (4) and has several diagnostic characters (Fig. 1). The antennal funicle, in which the length of the first two funicular segments equals the last three segments, and the scape, which is twice the length of the funicle, are the most striking features. Antennal morphological variation is taxonomically important because these features diagnose *Aricerus* as well as species of *Phloeotribus* (Wood 1982, Wood 1986). Hence, given monophyly and the diagnostic characters, *Dryotomicus* is removed from synonymy with *Phloeotribus* and includes four species *D. puberulus* (Chapuis, 1869), *D. tuberculatus* (Eggers, 1943), *D. oenophilis* sp. n., and *D. woodrex* sp. n. Exclusion of *P. ovatus* (Egg-
Table 2. Character states used for the reconstruction of the Phloeotribini phylogeny (Fig. 1). Characters and states are in Table 1.

| Characters | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|------------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|
| Aricerus sp. | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Phloeotribus championi | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 1 | 1 | 1 |
| Phloeotribus sp. Costa Rica | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 1 | 1 |
| Phloeotribus sp. Ecuador | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 1 | 1 |
| Phloeotribus frontalis | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| Phloeotribus liminaris | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 1 | 0 | 0 | 1 |
| Phloeotribus ovatus | 1 | 1 | 0 | 0 | 0 | ? | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | ? |
| Phloeotribus sp. Panama | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 2 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| Dryotomicus oenophilis sp. n. | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Dryotomicus woodrex sp. n. | 1 | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Phloeotribus puberulus | 1 | 2 | 1 | 1 | 1 | ? | ? | ? | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Phloeotribus tuberculatus | ? | ? | ? | ? | ? | ? | ? | ? | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | ? | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Chramesus sp. | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 4 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

ers, 1943) and *P. championi* (Blandford, 1897) from this clade confirms their synonymy with *Phloeotribus* (Wood and Bright 1992). Although the relationship of the *Phloeotribus* spp. is unresolved, many of the mpts suggest that this genus is potentially paraphyletic. The inclusion of more *Phloeotribus* spp. and data, especially DNA sequences, in future phylogenetic analyses would help to solidify the relationships among the genera.

The relationship of the four *Dryotomicus* species is mostly unresolved (Fig. 1). Low support values indicate a potential sister-relationship between *D. oenophilis* and *D. tuberculatus*. However this is a likely spurious result caused by missing character data for
*D. tuberculatus*; the only known specimen representing this species is missing its head. However, the distinct morphology of the male frons and elytral declivity distinguish the new species from *D. tuberculatus* (Fig. 1).

**Systematics**

*Dryotomicus* Wood, genus bona

*Dryotomus* Chapuis 1869: 46. Type species: *Dryotomus puberulus* Chapuis, monobasic, preoccupied by Swainson 1831: 301. Synonymy: Schedl 1962: 487. (References in Wood and Bright 1992: 216)

*Dryotomicus* Wood 1962: 76. *Dryotomus puberulus* Chapuis, automatic. Synonymy: Wood 1982: 256. (References in Wood and Bright 1992: 217)

**Diagnosis.** The asymmetrical first segment of antennal club, socketed teeth on the protibae, and rounded lateral margins of the pronotum distinguish this genus from *Aricerus*. The usual median tubercle(s) on the male frons, the longer second antennal funicular segment, declivitous anterior edge of the pronotum, the shallowly impressed elytral striae, and elytral declivity with scales and long setae distinguishes *Dryotomicus* from *Phloeotribus*.

*Dryotomicus oenophilis*, sp. n.

urn:lsid:zoobank.org:act:A2174B38-3EBD-4463-AB45-718C449F858D

Figs 2–5

**Diagnosis.** *Dryotomicus oenophilis* is distinguished from the other *Dryotomicus* species by a large medial tubercle and lateral carina with acute proximal tips on the male frons, interstriae 2 without long uniserial setae, and by raised interstriae of the elytral declivity having tubercles on interstriae 3, 5, and 7 (Fig. 3B).

**Description.** Holotype, male, total length 4.5 mm (3.8–4.5 mm, n=7), 2× longer than wide, color reddish-black (Fig. 2).

**Head.** Frons shagreen with setae as long as or longer than the large median tubercle, longest setae close to epistoma and frontal margins; a large median tubercle between antennal insertions and dorsal margin of eye; lateral carinae from epistoma to dorsal end of eye thicker at antennal insertion and ending acutely (Fig. 3A). Vertex, shagreen with setae approximately as long as or longer than large median tubercle; slightly concave with distinct slightly carinate lateral margins; obtuse median carina from median frontal tubercle to epistoma. Antennae, scape expanded distally and curved proximally beyond the anterior edge of pronotum, funicle five segmented, segments 1 and 2 about equal length and each as long as the combination of segments 3,
4, 5, club pseudo-lamellate, asymmetric, basal segment 1 expanded at base (j-shaped). Eyes oval, ventrally acute (Fig. 3A).

Pronotal width 2.2 mm (1.7–2.2 mm, n=7), 0.64× longer than wide; quadrate flat summit not apparent, densely punctured with appressed minute pubescence and scattered longer setae approximately as long as the funicle concentrated anteriorly and laterally.

Elytra 1.2× longer than wide, 2× longer than pronotum, striae on disk impressed, punctures only evident near declivity; striae 4–9 marked by shallow, uniserial punctures;
interstriae on disk 2–3× width of striae, confused scales from base to apex on interstriae 1 and 2, interstriae 1 and 3–9 with long uniserial setae approximately as long as the funicle; interstriae 3–9 minutely punctured. (Figs 2, 3B). Elytral declivity with densely placed scales and scattered long setae; striae impressed; interstriae 3, 5, 7 each with 3 tubercles (Fig. 3B).

**Male genitalia.** Aedeagal body (median lobe) conical, apex acute, lateral margins heavily sclerotized medially on apical half, apophyses (struts) as long as body, attached ventrally; internal sac central area lightly sclerotized, lateral margins heavily sclerotized appearing as ventral apophyses (struts) directed apically, seminal trough at proximal end comprised of two lobes that curve medially (Fig. 4). Tegmen circular, weakly scler-
rotised on dorsal side. Spiculum gastrale nearly as long as adeagus, crescent-shaped with small knob near the apical end.

*Female* similar to male in most features, except frons flat to slightly convex, densely punctured, without median tubercles and carinae (Fig. 5A). Strial punctures on elytra more distinct, interstitial tubercles smaller (Fig. 5B).

**Type material.** Holotype and 6 paratypes (3 males and 3 females) bear two collection data labels, First: “GUYANA: Iwokrama Forest, GPS N 04.40.486’, W 58.41.028’, 4–9 March 2007, Cognato, Hulcr, Smith, Dole, McCall Colls”; Second: “Collected with ethanol trap”. The holotype is deposited in the Biodiversity Center at the University of Guyana and 4 paratypes are deposited in the A. J. Cook Arthropod Research Collection, Michigan State University, East Lansing; 2 paratypes are in the U.S. National Museum of Natural History, Washington D.C.

**Notes.** In Guyana, we collected all specimens from 20 plastic cups filled with 100 ml of 90% ethanol and nailed to trees 1.5 meters above ground.

**Etymology.** *oen* (G) = wine, *philis* (G) = lover. The name “wine-lover” signifies the collection of all specimens from ethanol traps.
Dryotomicus woodrex, sp. n.
urn:lsid:zoobank.org:act:C0901E0A-AC6D-4501-B4F4-1E5E975DC0B6
Figs 6–8

Diagnosis. *Dryotomicus woodrex* is distinguished from the other *Dryotomicus* species by three medial tubercles arranged transversely on a tumescence on the male frons; the interstriae flush with striae on the elytral declivity.

Description. *Holotype*, male, total length 4.6 mm, 2x longer than wide, antennae reddish-black, head, legs, thorax, and elytra tannish (perhaps teneral). Pronotum tannish with dark diamond pattern (Fig. 6).
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Head. Frons shagreen with setae approximately as long as or longer than funicle; three medial tubercles arranged transversely on a tumescence between antennal insertion and dorsal margin of eye; lateral carinae from epistoma to dorsal end of eye thicker at antennal insertions (Fig. 7A). Vertex shagreen with setae approximately as long or longer than funicle; slightly concave. Antennae, scape expanded distally and curved proximally beyond the anterior edge of pronotum, funicle 5-segmented, segments 1 and 2 about equal length and each as long as segments 3–5 combined, club pseudo-lamellate, asymmetric, segment 1 expanded at base (j-shaped). Eyes oval, ventrally acute (Fig. 3A).

Pronotal width 2.3 mm, 0.65× longer than wide; quadrate disk, summit not distinct, surface densely punctured with appressed pubescence and scattered longer setae approximately as long as funicle concentrated anteriorly and laterally.

Figure 6. Dryotomicus woodrex sp. n. male. Habitus, A Dorsal B Lateral.
Figure 7. Dryotomicus woodrex sp. n. male, A Frons B Elytral declivity.

Elytra 1.2× longer than wide, 2× longer than pronotum, striae on disk not impressed, punctures distinct; interstriae 3–4× width of striae, long uniserial setae approximately as long as funicle arising from granules (Fig. 6). Elytral declivity densely scaled with scattered long setae concentrated along the lateral margin (Fig. 7B).

Male genitalia. Aedeagal body (median lobe) conical, apex acute, lateral margins heavily sclerotized medially on apical half, apophyses (struts), as long as body, attached ventrally; internal sac central area lightly sclerotized, lateral margins heavily sclerotized appearing as ventral struts directed apically, seminal trough proximal end comprised of two parallel lobes (Fig. 8). Tegmentum circular, weakly sclerotised on dorsal side. Spiculum gastrale destroyed by dissection.

Female is unknown.

Type material. Holotype bears the collection data label: “PERU: Dept. Loreto, 1.5km N Teniente Lopez, 4°35.66’S, 76°06.92’W, 22 July 1993, 210–240 m, Richard Leschen #164, ex: flight interception trap”. The holotype is deposited in the Snow Museum, University of Kansas [SMEC].

Etymology. The name “woodrex” honors Dr. Stephen L. Wood’s kingly contribution to the knowledge of scolytine and platypodine taxonomy. It is used as a noun in apposition.

Dryotomicus puberulus (Chapuis), comb. n.

Dryotomicus puberulus (Chapuis) 1869: 46 (Dryotomus). Holotype: female, Cayenne; IRSNB, Brussels. (References in Wood and Bright 1992: 227)

Diagnosis. This species differs from other Dryotomicus spp. by the absence of tubercules from the third, fifth and seventh interstriae and the raised first and second interstriae of elytral declivity.

Redescription. See Wood (2007): 125.
Dryotomicus woodrex sp. n. male genitalia, A Dorsal B Lateral.

Dryotomicus tuberculatus (Eggers), comb. n.

Dryotomicus tuberculatus (Eggers) 1943: 348 (Dryotomus). Holotype: male ?, Bolivia (Cochabamba); USNM, Washington. (References in Wood & Bright 1992: 235)

Diagnosis. This species differs from other Dryotomicus spp. by the presence of tubercules on the third, fifth and seventh interstriae of the elytral declivity and rugose interstriae of elytral disk and with more than 3 tubercles (Fig. 10)

Redescription. See Wood (2007): 125–126

Key to Phloeotribini genera

1. First segment of antennal club symmetrical chevron-shaped (Fig. 9); protibia without socketed teeth; lateral margin of pronotum marked by asperites; Australia to New Guinea .......................................................... Aricerus

   – First segment of antennal club asymmetrical; protibia with socketed teeth; lateral margin of pronotum rounded, without asperites ......................... 2
Key to *Dryotomicus* species

1. Elytral declivity with tubercules on the third, fifth and seventh interstriae ............................................. 2
   – Elytral declivity without tubercules on the third, fifth and seventh interstriae ................................................................. 3

2. Interstriae of elytral disk smooth and with 3 or fewer tubercles ........................................................ D. woodrex sp. n.
   – Interstriae of elytral disk rugose and with more than 3 tubercles (Fig. 10) ................................................................. D. tuberculatus (Eggers)

3. First and second interstriae on elytral declivity flush with striae ................................................................. D. oenophilis sp.n.
   – First and second interstriae on elytral declivity raised above striae (Fig. 11) ................................................................. D. puberulus (Chapuis)
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Figure 10. *Dryotomicus tuberculatus* elytra.

Figure 11. *Dryotomicus puberulus* elytral declivity.
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