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First record of ants from Borneo amber (Hymenoptera, Formicidae)

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The first fossil ant from Borneo amber is described as *Cataulacus plebeius* sp. n. This species is very close to the recent South Indomalayan *C. horridus* Smith widespread in Borneo today. This discovery suggests a low rate of evolutionary change in the tropics since the Miocene.

Keywords: Formicidae, fossil, Miocene, Borneo amber, *Cataulacus*

INTRODUCTION

Amber inclusions represent virtually the sole possibility of accurate insight into insect paleontology. Besides the two relatively well-known and rich sources in the Baltic area and in the Dominican Republic, there are several other amber deposits worldwide, though quantitatively less important than the Baltic and Dominican resources (see e. g. Schlee & Glöckner 1978 and Poinar 1992). The fauna of most of these ambers remains poorly known or totally unknown so far. The causes for this are multiple, varying from the scarcity of amber itself, to the poverty of insect inclusions, or to the amber quality rendering it difficult for vision and preparation of specimens.

For this reason we were particularly curious when Mr Jörg Wunderlich, Straubenhhardt (Baden-Württemberg, Germany), offered us the possibility to study some fragments of Borneo amber, at least one of which containing two recognizable ant specimens susceptible of detailed study. Borneo amber is of Miocene age (Hillmer et al. 1992) and no previous records of ants from it are known in the literature.

MATERIAL AND METHODS

A single splinter of Borneo amber in the collection of Mr Jörg Wunderlich, brownish in color, rather opaque and crossed by several cracks in different directions. This splinter was subsequently cut into two and polished to separate from each other and to approach during examination two ant specimens embedded into two fragments called here:

Fragment A, 1.6 x 0.8 x 0.7 cm, containing an ant worker missing the left part of the gaster and the outer surface of the left tibiae;

Fragment B, 1.0 x 0.3 x 0.3 cm, containing one ant worker fissured in several parts and missing the upper part of the mesosoma. The head of this specimen is better visible than the one of the Fragment A but its position renders it totally inadequate for photography.

We first attempted to photograph the specimens by a video camera connected to a computer where the sharpest parts of different images were combined together by means of the software Montage Explorer, Version 1.01.003 (© Synoptics Ltd, 1998, 1999).

Due to the scarce visibility of the two ant specimens, we also tried to obtain a better vision by means of confocal laser scanning microscopy as suggested by Hammer-Schemann et al. (2001) and by Böcker & Brocksch (2002). Either the amber quality or the thickness of the amber layer covering the ants, or both, permitted only results far from satisfactory.

Nonetheless we were able to take either on one or on both specimens the following measurements, indicated below by their relative acronyms, as already defined by Bolton (1974) for the genus *Cataulacus*.

TL (Total length)
HL (Head length)
HW (Head width)
EL (Eye length)
PW (Pronotal width)
AL (Alitrunk length)

These measurements allowed also computation of the two following indices:

CI (Cephalic index) = HW x 100/HL

OI (Ocular index) = EL x 100/HW

RESULTS

Cataulacus plebeius sp. n. (Plate 1, Figs B, C & E)

Derivatio nominis. From the Latin *plebeius* (Cicero) = common, referred to the morphology of this species recapitulating the commonest traits that one would expect to find in a *Cataulacus* from Borneo.

Type material. Holotype and paratype workers respectively in the two Borneo amber fragments A and B described in the material chapter.

Diagnosis. A *Cataulacus* species belonging to the extant *horridus* group and differing from the sole representative of this group, *horridus*, in the worker, by the eyes smaller, by the teeth on the sides of the promesonotal junction broader, by the denticles on the posterior fourth of the head dorsum larger and denser.

Worker. Vertexal crest absent. Vertexal angles prolonged into a pair of massive, triangular, broad, acute spines. Sides of the head behind eyes and outer and inner edges of the vertexal spines strongly denticulate. Mesosoma not marginate laterally, and with a distinct, massive, broad tooth on each side at the level of the promesonotal junction. Promesonotum strongly convex in profile. Propodeum much lower than the mesonotum and with a pair of very long spines, broad at the base and tapering to an acute apex. Sides of the mesosoma denticulate except on the propodeal spines. Gaster not marginate laterally.

Head minutely punctate and reticulate-rugose, the rugae more longitudinal on the frontal lobes and on the clypeus. Posterior fourth of the head dorsum with prominent tubercles raised as peaks. Dorsum of mesosoma coarsely reticulate-foveolate. Gaster strongly punctate and with thin, slightly longitudinal, irregular rugosities.

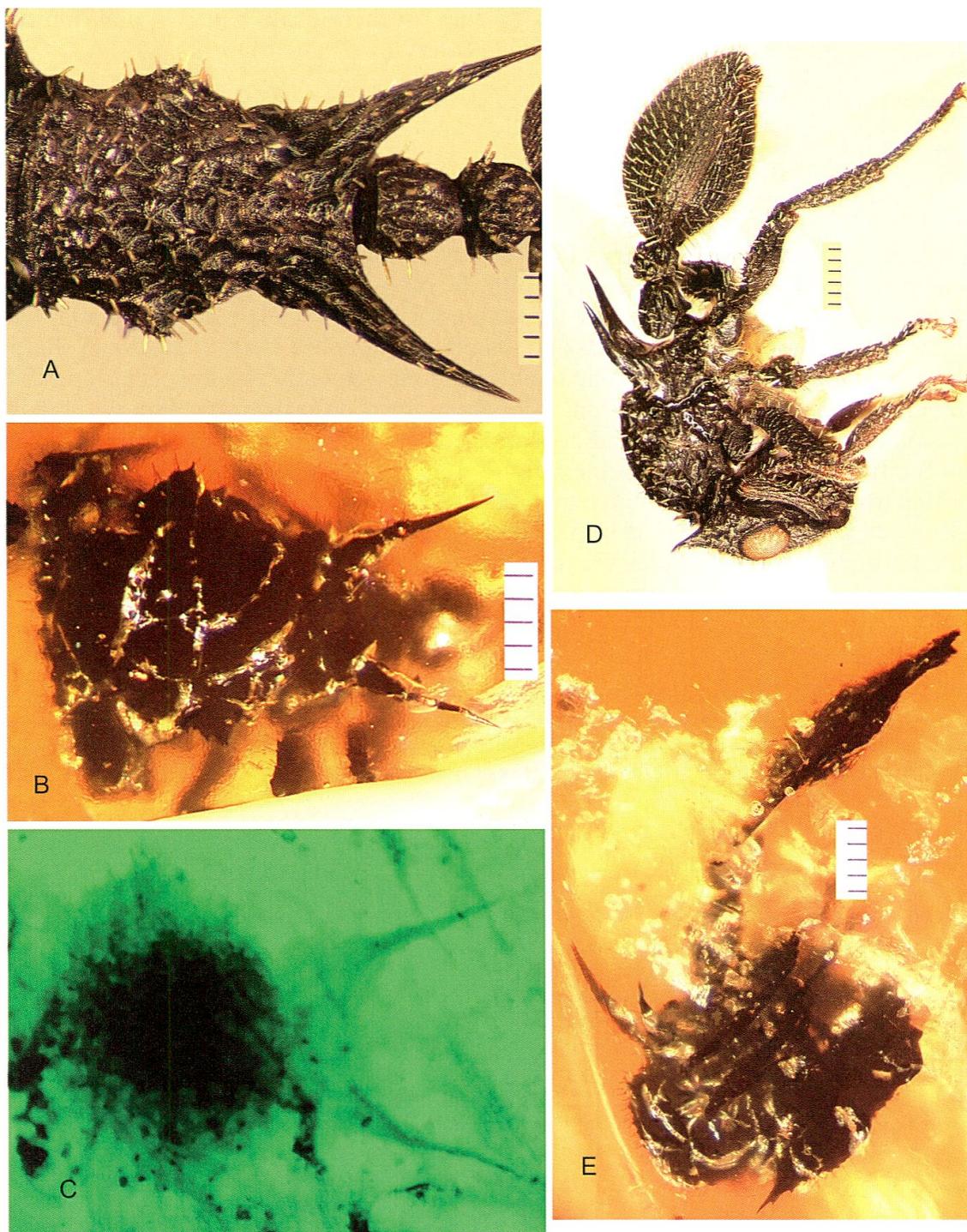


Plate 1. A) *Cataulacus horridus* Smith, from Borneo, worker mesosoma in dorsal view, image optimization by Montage Explorer 1.01. B) *Cataulacus plebeius* sp. n., from Borneo amber (Miocene), holotype worker mesosoma in dorsal view, image optimization by Montage Explorer 1.01. C) *Cataulacus plebeius* sp. n., from Borneo amber (Miocene), holotype worker mesosoma in dorsal view as resolved by confocal laser microscopy. D) *Cataulacus horridus* Smith, from Borneo, worker in profile, image optimization by Montage Explorer 1.01. E) *Cataulacus plebeius* sp. n., from Borneo amber (Miocene), holotype worker in profile, image optimization by Montage Explorer 1.01. Distance between two scale bars 0.1 mm.

Head, mesosoma, gaster and legs with erect, truncate hairs; in addition the border of the eyes and the gastric sternites with thin, longer hairs.

Measurements and indices: TL 5.16 (combined measurements of Holotype and Paratype); HL 1.16 (holotype); HW 1.34 (holotype); CI 115.5 (holotype); EL 0.38 (paratype); OI 28.3; PW 1.16 (paratype); AL 1.28 (paratype).

DISCUSSION

C. plebeius sp. n. is very close to one of the commonest extant *Cataulacus* species from Borneo, *C. horridus* Smith. If, on one hand, separation of the fossil from the recent species is relatively straightforward (see Plate 1), the similarities between the two are more impressive than the differences. This comparison sharply contrasts with the one that one could make between any recent species and two other Miocene *Cataulacus* from Sicilian amber described by Emery (1891). *Cataulacus'* evolutionary speed appears to have been much lower in Borneo than in Sicily. This was to be expected if one considers the greater climatic uniformity of the tropics as compared with temperate areas. *Cataulacus*, moreover, is presently distributed in the Old World tropics and if its presence on Borneo is likely to be uninterrupted since Miocene, the recent species geographically closest to the Sicilian fossils today inhabit Africa south of the Sahara.

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