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A fossil tiger beetle specimen from the Brazilian Mesozoic: *Oxycheilopsis cretacicus* n. gen., n. sp.

(Coleoptera, Cicindelidae)

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Abstract

A tiger beetle fossil specimen is described from the Santana Formation of Nova Olinda, Brazil (thus referable to Lower Cretaceous, ca. 120 Mio.), *Oxycheilopsis cretacicus* **n. gen., n. sp.**, based on several unique characters and its small body size. It is interpreted as probably being a member of the Oxycheilina subtribe and it is the oldest fossil tiger beetle document known to date.

Riassunto

Viene descritto un esemplare fossile di Cicindelide, proveniente dalla Formazione Santana di Nova Olinda in Brasile (dunque riferibile al Basso Cretaceo, circa 120 Mio.), *Oxycheilopsis cretacicus* **n. gen.** e **n. sp.**, che presenta alcuni caratteri peculiari e una taglia molto piccola. Esso è probabilmente da attribuire alla sottotribù Oxycheilina e costituisce il più antico cicindelide fossile finora conosciuto.

Introduction

Ancient fossil tiger beetles are extremely rare in the literature record, as it is for most insects and other invertebrates, probably also because of the fragile nature of their integuments and appendages. The few existing records have been usefully summarized (Table 1) by Nagano et al. (1982), the oldest one apparently being an insect remnant from the Eocene Green River deposit, Rocky Mountains, Colorado, which was described by Cockerell (1920) with the name of *Cicindelopsis eophilus*, but whose real ascription to the family Cicindelidae was suggested by Cockerell himself (1920, 1924) to be far from sure (see also Horn 1926, Nagano et al. 1982). Another supposed old fossil tiger beetle specimen, described by Meunier (1898) as *Cicindelites armissanti*, from the Oligocene of Armissan, was later shown to be a carabid beetle (Horn 1907b, 1926); and a supposed cicindelid mandible from the late Tertiary Beaufort Formation on Meighan Island (Matthews 1976, 1977) has later turned out to belong to a Neuropteran larva instead (Nagano et al. 1982). All the few other existing fossil records (Nagano et al. 1982), except the ones cited below, belong to Quaternary and Pleistocene deposits.

Thus, the only two older fossils which have come to light in so far, both allegedly from north European Baltic amber, are (1) a specimen originally described by Brullé (1839) in the genus *Odontocheila*, but later found by Horn (1907a, 1926) to be identical to a contemporary species, *Pogonostoma chalybaeum*, from Madagascar, thus probably being a fake in recent copal resin instead of in amber (Horn 1926, Pearson & Vogler 2001), and (2) a specimen first described as puzzingly belonging to the contemporary American species *Tetracha carolina* and considered, because of several scientifically sound reasons, to be authentical (Horn 1906, 1926). A recent check of such a specimen by Röschmann (1999) would suggest it to rather be, more understandably, a separate species, other than present-day *T. carolina*. The problem, however,

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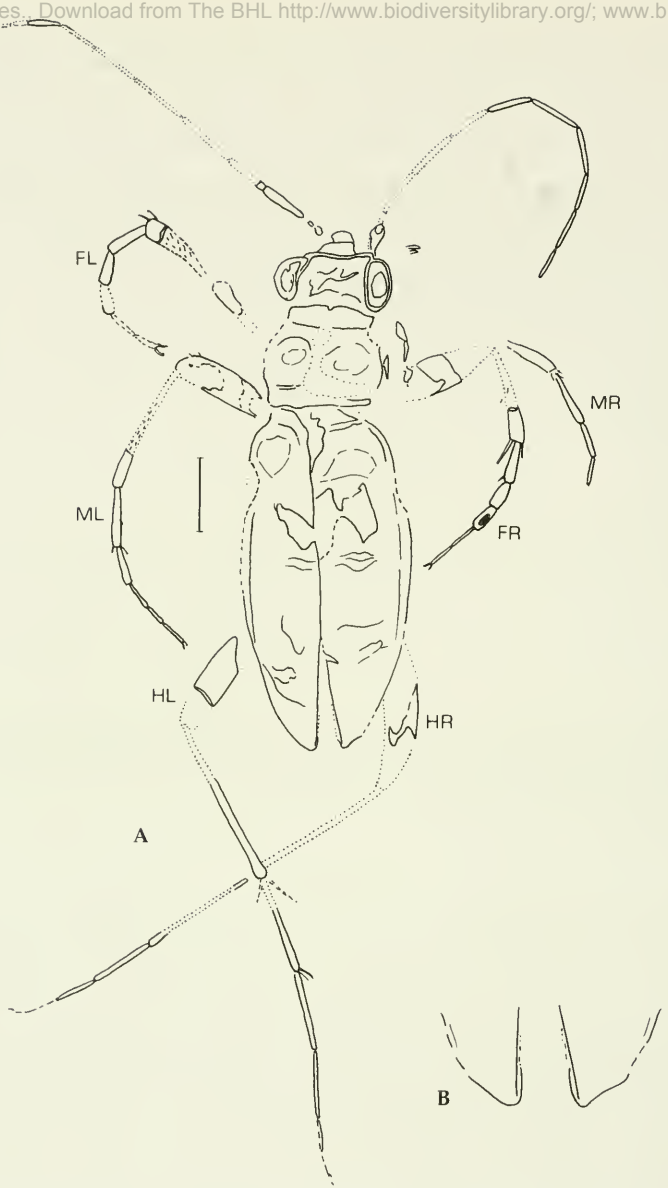

Fig. 1. *Oxycheilopsis cretacicus* **n. sp.**, holotype male: **A**, silhouette (FL: fore left leg; FR: fore right leg; ML: middle left leg; MR: middle right leg; HL: hind left leg; HR: hind right leg); scale segment: 1 mm. **B**, Elytral apexes.

remains to properly explain why a Neotropical *Tetracha* specimen could be found in the Baltic amber, thus in the Oligocene of northern Europe (BASILEWSKY 1966), when the present understanding of the origins of *Tetracha* and the other Megacephaline genera would strongly indicate their Gondwanian origin instead (HORN 1908 & 1915, CASSOLA 1990 & 2001, PEARSON & VOGLER 2001). A similar problem would apparently be raised by an additional old fossil specimen from the Oligocene Baltic amber, recorded by LARSSON (1978) as resembling a Collyrine species (NAGANO et al. 1982), thus supposedly belonging to an extant, speciose, tree-dwelling tiger beetle group of the Oriental tropics only (NAVIAUX 1995).

However, such problems do not represent the topic of our present paper, which only aims to describe one further fossil specimen, allegedly coming from the lower chalk ("Untere Kreide") of the Santana

Formation (ca. 125 Ma) of Nova Olinda, Brazil (WACHTEL 2003). If correctly dated, this fossil specimen is from the Lower Cretaceous age, thus establishing it as the oldest fossil tiger beetle known to date. The specimen is presently deposited in the Zoologische Staatssammlung München, Germany and it was kindly submitted to us for study and examination by Mr. Franz WACHTEL (Öhnböck/Egling, Germany), who discovered and acquired the fossil on the occasion of a sales exhibition of minerals and fossils in Munich, and whom we thank herein very much.

This tiny male specimen (total length: 6.5 mm) appears to be almost completely embedded in a yellowish-roseate limestone rock, from which the elytra, pronotum, head, as well as the appendages (although partly crushed or missing) partially protrude. Upon close examination, it appears to be a cicindelid specimen, somewhat reminiscent of a present-day Oxycheiline species but representing a previously undescribed genus and species based on its small size, general body shape and unique tarsal characters.

Description of new fossil taxon

Oxycheilopsis gen. n.

Type-species: *Oxycheilopsis cretacicus* **n. sp.**

Description. Body size small, legs and antennae rather long in proportion.

Head: Rufescent-brown, small, not wider (with eyes) than pronotum, transversely crossed in front by a narrow, rounded, slightly concave carina which connects the fore corners of eyes to each other; clypeus separated from the labrum by an appreciable suture, labrum not visible in the type specimen.

Antennae: Rufous-brown with some metallic hue, scape rather thick, a bit club-shaped, segments 2-4 probably stronger than the outer ones, antennomeres 5-11 reddish-rufous, slender, narrow.

Pronotum: Rufous-brown with some metallic hue, wider than long, with a distinct knobby prominence on both sides of disc.

Elytra: Oval shaped, wider and much longer than pronotum with head, their maximum width about the middle, evenly rufous-brown with some metallic hue.

Legs: Rather long in proportion to body size, thin, of the usual cicindelid shape and relative proportions. First three tarsomeres of front legs of male widened and thick, first two tarsomeres of middle legs also slightly widened in male.

The general facies, body proportions and shape of pronotum (with distinct protuberances on both sides of disc) suggest that the beetle most probably is a member of the Oxycheilina subtribe (CASSOLA 1997). However, the beetle differs from any extant tiger beetle genus because of the small body size, the transversal carina between the front side of eyes (a rather unusual character), and the dilated first two joints of male middle tarsi (a unique character in the whole of the family).

Oxycheilopsis cretacicus n. sp.
(fig. 1, 2)

Holotype: Male, lower chalk of Santana Formation (ca. 125 Ma), Nova Olinda, Brazil. Deposited in the Zoological State Collection, Munich, Germany.

Description. Total length small (6.5 mm), legs and antennae long in proportion.

Head: Rufescent-brown, small, not wider (with eyes) than pronotum, transversely crossed in front by a distinct, rounded, cord-like, slightly concave carina which connects the fore corners of eyes to each other; clypeus separated from the labrum by an appreciable suture, the labrum being almost completely embedded in matrix and thus not visible.

Antennae: Rufous-brown, with some metallic hue on scape and articles 2-3 (4^{th} antennomere lacking in both antennae); scape relatively thick, club-shaped, segments 5-11 reddish-rufous, slender, narrow.

Pronotum: Rufous-brown, with some metallic hue, transverse, wider than long and slightly wider than head, with a distinct knobby prominence on both sides of middle disc.

Elytra: Evenly rufous-brown, with some metallic hue, oval-shaped, distinctly wider and much longer

Fig. 2. *Oxycheilopsis cretacicus* **n. sp.**: photograph of the holotype specimen.

Fig. 3. The Santana formation in Nova Olinda, Brazil, origin of the discussed specimen (Photo: M. SCHWICKERT).

than head and pronotum, their maximum width about the middle, apparently without elytral markings, immaculate; slightly domed, not fused, with the humeral angles rather effaced (the beetle probably being apterous and flightless). Elytral margins abruptly descending at sides, nearly forming a longitudinal bending of the elytral surface which runs from below the shoulder to about the four-fifths of the elytral length. Elytral apex evenly and acutely rounded to suture, unarmed, just slightly and briefly emarginate before the blunt sutural angle.

Legs: Reddish-brown with some metallic hue, rather long in proportion to body size, thin, of the usual cicindelid shape and relative proportions. First three joints of front tarsi (fully appreciable in the front right leg of holotype) distinctly widened (the specimen is obviously a male), but first two tarsomeres of middle legs (fully appreciable in the left middle leg of holotype) also slightly widened (a unique character in the whole of the family). Last tarsomeres with two small claws apically (fully visible in the left front leg).

Etymology: The name of this new species (*cretacicus*) refers to the probable age of the fossil specimen, allegedly dating back to 125 Ma in the Lower Cretaceous limestone of Ceará, Brazil.

Remarks

The Santana Formation of Brazil (fig. 3) is a well-known source of interesting fossil insects (GRIMALDI 1990), which usually document excellent and detailed preservation of external cuticles (GRIMALDI et al. 1997). Such a fortunate situation is documented by this new tiger beetle specimen too, which, although largely embedded in its limestone matrix, maintains substantial parts of elytra, pronotum, head, and appendages well-preserved and clearly visible. In particular, the elytra, despite being partly crushed, still maintain their dark brown colour and metallic hue and moreover allow an almost perfect sight, in particular, of the elytral apexes. Head and pronotum too, although partly covered by the matrix and with small parts of eyes and pronotal disc missing off, are surprisingly well visible. Labrum, palpi and the left antennal scape appear to be more or less covered by the limestone matrix, but the antennal shape and length are fully detectable

by means of the right hand scape and the actual antennomeres or their impressions. More precisely, the right antenna still holds the scape and the six outermost antennomeres (with clear impressions of 3rd, 4th and 5th ones in between), and the left antenna exhibits the apex of scape, the 2nd and 3rd joints, a proximal part of 4th antennomere, and impressions of antennomeres 4 to 11 (with just the 9th one partly visible in between). As to the legs, all six are more or less visible from the matrix, and in particular allow a clear appreciation of the dilated tarsomeres 1-3 of the front right leg (that indicate the specimen to be a male), as well as of the left middle leg with the surprising, unusual character of the first two tarsomeres also slightly widened (although longer and narrower than the dilated front tarsi of the right leg).

A more complete study of the holotype specimen will require physical cleaning and removal of matrix with some acid digestion, but for the sake of the precious specimen we have refrained from doing so. However, despite these limitations, the insect clearly is a cicindelid specimen, most probably to be referred to the *Oxycheilina* subtribe, but having some unique characters in comparison with present-day species of this tribe (Cassola 1997, Wiesner 1999). Such a specimen cannot be ascribed to any of the extant tiger beetle species of the world, thus reinforcing both the authenticity of this fossil and the concept of the tiger beetles as a very ancient beetle group, dating back to Lower Cretaceous (Evans 1982) and deserving the family status (Cassola 2001).

Zusammenfassung

Ein Sandlaufkäfer (ca. 120 Millionen Jahre alt), aus der Unterkreide der Santana Formation von Nova Olinda in Brasilien, *Oxycheilopsis cretacicus* **n. gen., n. sp.**, wird beschrieben und zeichnet sich durch einige einmalige Charaktere und die geringe Größe aus. Diese Art wird als wahrscheinliches Mitglied des Subtribus Oxycheilina interpretiert und ist bis heute der älteste fossile Nachweis eines Sandlaufkäfers.

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