CONTRIBUTION TO THE KNOWLEDGE OF THE AQUATIC PALEOENTOMOFUA FROM SANTANA FORMATION (ARARIPE BASIN, LOWER CRETACEOUS, NORTHEAST BRAZIL) WITH DESCRIPTION OF NEW TAXA.

Zamboni, J.C. 1,2

1Laboratorio de Palentologia da FFCLRP-USP
2Bolsista CAPES
zamboni@ccinet.com.br

ABSTRACT: Although a hundred of known insect species from Santana Formation (Lower Cretaceous, Northeast Brazil) rather terrestrial, some groups remain undescribed or little known as is the case of relatives of the orders Coleoptera, Heteroptera, Phasmatoptera, Mecoptera and Megaloptera. The knowledge of the aquatic paleoentomofauina, so restrict when comparable with terrestrial specimens, is enlarged here with the description of a new genus and two new species of Ephemeroptera and a new taxa of Heteroptera (Belostomatidae) recently collected. Additionally the taxon Conan barbarica Martins-Neto, 1998, is reviewed and it is removed from Coleoptera, as firstly interpreted, to Odonata, and this peculiar giant nymph is compared with the other published ones of the same deposits.

Key Words: Santana Formation, Lower Cretaceous, Ephemeroptera, Odonata, Heteroptera.

Introduction

During the last two decades the fossil insects of the Santana Formation comes special attention of the international paleontologist community due the excellent state of preservation and great diversity, however unfortunately this also contributes to an increase in the interest of the private collectors. In this contribution are described new genus and species of recently collected material, all of which came from the yellowish laminated limestone of the Crato Member (lowest unit of Santana Formation)
outcrop at Nova Olinda City, Ceará State, Northeast Brazil (Araripe Basin). According with both stratigraphical and paleopalynological data, the age of this member is rather considered as Upper Aptian/Lower Albian, about 112 to 108 million years.


SISTEMATIC PALEONTOLOGY

HEMIPTERA
NEPOMORPHA Popov, 1968
BELOSTOMATIDAE Leach, 1815
BELOSTOMATINAEO Leach, 1815

Neponymphes n. gen

Type species: Neponymphes godoi n. sp., designated here.

Etymology: From Nepomorpha Suborder.

Diagnosis
Nymph: compound eyes very large, occupying nearly the entire sides of the head in dorsal view, around 2/3 of head. Pronotum 3 mm in length and 1 mm in wide; scutellum 4 mm in length and 3 mm in wide.

Discussion
The known members of this family characteristically have are mid-sized. Neponymphes n. gen. differs from the genera of others subfamilies by having the abdominal projections of the respiratory tube not forming an air trap. In this exemplar have not air trap. There are not notice in the fossil record of genera exhibiting pronotum and scutellum as large as in this specimen, in this nymphal fase. The eyes stand out occupying a great part of the head, showing great importance for the survival of the nymph. Neponymphes godoi n. sp

(Plate 1, Fig. A and B)

Etymology: In honor to the paleontologist Vinicius Moreno Godoi (FFCL:RP-USP).

Holotype: RGMT- T094 Martins-Neto Collection, housed in the Laboratório de Paleontologia of the Faculdade de Filosofia Ciências e Letras de Ribeirão Preto-USP.

Type locality: outcrop at Km 4 of the road Santana do Cariri-Nova Olinda, Ceará State. Northeast Brazil.

Type stratum: laminated limestone level, uppermost part of the Crato Member, lowest unit of the Santana Formation, Araripe Basin.

Age: Upper Aptian/Lower Albian, Lower Cretaceous.

Diagnosis
As for the genus. Body 12 mm in length, ovoid-like.

Description
Young individual preserved in dorsal view. Body ovoid-like. Eyes in spheric shape with 1 mm in diameter. Metepisterna extending back to cover the proximal abdomen sterna. Scutellum with 2 mm in length; pronotum with 1 mm long and 3 mm wide. Abdomen 8-segmented, the large one having 1 mm in width and 6 mm length. Left foreleg partially preserved with raptorial-like shape. Hind legs flattened and fringed; tarsi 2-segmented with one distal claw preserved; tibiae 5 mm long, femur at least 3 mm as preserved; tarsi 2 mm long and tarsal claw very narrow with 1 mm long.

Discussion
The first known record of this family came from West Europe, Lower Jurassic, Poland (Popov, 1996). The first true Belostomatinae was found in the Upper Jurassic sediments of west Germany, namely Mesonepa Handirslich (1906). From
cretaceous sediments as Mongolia and Spain also was recorded. The Belostomatidae is a worldwide family, distributed mainly at tropics.

**ODONATOPTERA**

**ANISOPTERA** Selys & Hagen, 1854  
Family incertae sedis (Aeschinidiidae?)  

**Type specie:** *Conan barbarica* Martins-Neto, 1998, by original designation  
(Plate 1, Fig.C and D)

**Discussion**  
This specimen was originally described like a Coleoptera, Coptoclavidae, known from Cretaceous sediments from Mongolia and China. After review, was verified that the original interpretation needs to be reconsidered. Despite of the structural similarities with Coptoclavidae in this specimen is possible to see a small paracercus, typical for Odonatoptera. Additionally, *Conan barbarica* Martins-Neto (1998) is a big-sized nymph with 65 mm, quite twice larger, that the others known Coptoclavidae which have no more than 35 mm. Martins-Neto (1998) mentions that the meso and metathorax proportion, beyond of the more robust size remove your inclusion in any of the known coptoclavid genera. Bechly (1998), mentions one giant undescribed nymph, of the same deposits, possible an Anisoptera, suggesting similarities with *Nothomacromia sensibilis* Carle & Wighton (1990), of the Family Aeschinidiidae, found in the same outcrop. However, this former specimen is smaller, having lyre-like antennae, forcep-like paraprocts and spiniform epiproct. According to Bechly (1998) those characters are highly derived and unique and have been considered as synapomorphic for the group. In accordance with this, *Conan barbarica* is removed to Odonatoptera. The big size is uncommon characteristic for the most dragonflies, which largest individuals belongs to the Family Aeschinidiidae. Possibly *Conan barbarica* is a aeschinidiid, more compatible with your body size. *Conan barbarica* is maintained as a valid name by having sufficient morphological characters which distinguish it of all known described dragonflies.

**EPHEMEROPTERA**

**SIPHONURIDAE** Ulmer, 1920  
Genus *Costalimella* Martins-Neto, 1996  

**Type species:** *Costalimella nordestina* Martins-Neto, 1996 by original designation.  
(Plate 2, Fig. E and F)

**Etymology:** In honor to entomologist Dr. Ronaldo Zucchi, Faculdade de Filosofia Ciências e Letras de Ribeirão Preto-USP, Brazil.

**Holotype:** RGMT- 2053 Matins-Neto Collection housed in the Laboratório de Paleontologia of the Faculdade de Filosofia Ciências e Letras de Ribeirão Preto-USP

**Locus typicum, stratum typicum and age:** as for *Neonymphes godoii* n. sp.

**Diagnosis**  
Imago with a relatively narrow fore wing, with a triangular and fairly sharp tip, MA branching at the ¾ of wing length. Hind wing 9 mm in length and 5 mm wide.

**Description**  
Both head and thorax poorly preserved. Hind wing 9 mm in length and 5 mm wide. Fore and hind wing partially superimposed Costal area relatively broad at base, narrowing toward the tip, filled up by numerous cross veins. ScP long, reaching the apical margin. RP origin near of the wing base, five- branched. MA 8 mm long, quite straight, forking at 6 mm of the base. Cu
forks at 1/3 from the posterior margin. Anal veins superimposed.

**Discussion**

The type species has a small size, about 6mm. *C. zucchii* n. sp. differs of the *C. nordestina* Martins-Neto, 1996 by having a greater size, almost twice larger and numerous intercalate veins. Jell & Duncan (in Martins-Neto, 1996) described various Siphlonuridae from Koonwarra (Lower Cretaceous, Australia) although uncomparable with the Brazilian species.

**Uncertain Family**

*Cariiripheherma* n. gen

**Etymology:** From Cariri local municipality which the material came from of region of the outcrops.

**Type specie:** *Caririipheherma marquesi* n. sp. designated here.

**Diagnosis**

Nymph with triangular head. Thorax with the pronotum as wide as long. Body robust, without gills, as preserved.

**Description**

Head poorly preserved 3 mm wide and 1 mm long. Thorax 5 mm length and width. The legs poorly preserved. Abdomen with 8 segments, the first one is five times broader that long, the last as long as wide. Gills absent. The color of the body was very well preserved showing a brown color.

**Discussion**

This nymph have a size above the average of the nymphs current.

*Cariiripheherma marquesi*

(Plate 2, Fig. G and H)

**Etymology:** In honor of the chronobiologist Dra. Miriam David Marques.

**Holotype:** RGMT-129 Matins-Neto collection housed in the housed Laboratório de Paleontologia of the Faculdade de Filosofia Ciências e Letras de Ribeirão Preto-USP.

**Locus typicum, stratum typicum and age:** as for *Neponymphes godoi* n. sp.

**Diagnosis**

As for the genus.

**Description**

As for the genus

**Discussion**

The absence of gill merit special attention because maybe this species hasn’t. A sturdy body like this not would lose easily yours gills without to leave some signal like an insertion signal. The lack of gills could be a very important autapomorphy for this specimen virtually unknown for the Araripe paleoentomofauna. This character is present just in Baetiscidae. However, other morphological aspects are unavailable for this moment, isn’t possible a placing in any family.

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References


PLATE 1 - Aquatic paleoentomofauna from Santana Formation (Araripe basin, lower Cretaceous, northeast Brazil).
PLATE 2 - Aquatic paleontomotaina from Santana formation (Araripe basin, lower Cretaceous, northeast Brazil). E-F - Costalimella zuechii n. sp.; G-H - Caririephemera marquesi n. sp.
I Simpósio Brasileiro de Paleoartropodologia

I International Meeting on Paleoarthropodology

I Simposio Sudamericano de Paleoartropodología