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New beetles (Insecta: Coleoptera) from the Lower Cretaceous of Spain

A. PONOMARENKO[1] and X. MARTÍNEZ-DELCLÒS[2]

(1) Paleontological Institute, Russian Academy of Sciences, Profsoyuznaya str. 123, 117647 Moscow, Russia.

(2) Dept. Estratigrafia i Paleontologia, Fac. Geologia, Univ. Barcelona, 08071 Barcelona, Spain. E-mail: delclos@geo.ub.es

ABSTRACT

Three beetles remains from the Lower Cretaceous lithographic limestones of Spain are described. We classified them into two new genus and three new species. One specimen named *Tetraphalerus brevicapitis* n.sp. was placed in the Cupedidae, and both *Megacoptoclava longiurogomphia* n.gen., n.sp. and *Bolbonectus lithographicus* n.gen., n.sp. in Coptoclavidae.

Keywords: Coleoptera. Cupedidae. Coptoclavidae. Lower Cretaceous. New genus and new species. Spain.

INTRODUCTION

The fossil beetles are abundant in the Lower Cretaceous outcrops of Lithographic Limestones of Spain. Nevertheless even today, a few studies of these materials have been studied.

The more ancient coleopteran remains found in Spain came from the Ladinian (Middle Trias) of Alcover-Montral, but it is a poorly preserved specimen, difficult to study (Vía and Calzada, 1985). Also, an isolated elytra of cupedoid has been found in the Keuper of Novelda (Alicante) (Peñalver et al., 1999, plate 1, fig. 2).

Nevertheless, of the large number of beetles' individuals found in the Lower Cretaceous lithographic limestones of Spain, only five genera and species have been studied from the Montsec fossil-sites and two families in Las Hoyas (see synthesis in Peñalver et al., 1999). Beetles from the Montsec outcrops (La Cabrua and La Pedrera fossil sites) belong to many families but only four, possibly five families: Buprestidae, Scarabaeidae, Belidae, Eccoptarthridae and Curculionidea ? have been verified (Gómez, 1979; Whalley and Jarzembowski, 1985; Martínez-Delclòs, 1991b; Alekseev, 1993; Zherikhin and Gratshev, 1997). The fossil coleopterans from Las Hoyas, have never been studied, only cited or figured by Martínez-Delclòs (1989) and Martínez-Delclòs and Nel (1995).

Some beetles from the Cenozoic deposits of Spain were previously studied. Coleopterans was found in rocks from the Oligocene (Cervera, Campins and Sarral), Miocene (Izarra, Bellver de Cerdanya, Ribesalbes, Rubielos de Mora, Bicorp and Libros (Peñalver et al., 1999).

SYSTEMATIC PALAEONTOLOGY

Order: Coleoptera LINNÉ, 1758
Suborder: Archostemata KOLBE, 1908
Family: Cupedidae LAPORTE, 1836

GENUS **Tetraphalerus** WATERHOUSE 1901

Type species: T. oligocenicus CROWSON 1962, p. 154.

These beetle remains belong to the family and the genus because of a typical tuberculate body, elytra with rows of cells, and head with a temporal part as long as the eyes.

Tetraphalerus brevicapitis n.sp.
Figures 1.3 and 2.1

Etymology: Named after its short head in comparison with the other species of this genus.

Material: Holotype LC-037-EP, part and counter part well preserved. It is housed in the Department of Stratigraphy and Palaeontology, Faculty of Geology, University of Barcelona, Spain.

Locality: Found in the La Cabrua fossil-site, in the Montsec Range, Lleida Province, Spain.

Stratigraphic position: Berriasian-Valanginian after Brenner et al. (1974); possibly Uppermost Hauterivian-Lower Barremian in age (Martín-Closas and López-Morón, 1995).

Description: Middle sized flattened beetle with typical cupedoid appearance (see Carpenter, 1984). Length 9.3 mm, width 4.8 mm, length of elytra 6 mm, width 1.6 mm. Head weakly tapered from the temporal projection, as long as broad, 1.8 mm long. Eyes located on the sides of head, temporal part of head as long as eyes; gena is short. Neck-like constriction weak. Vertex with two flatted protuberances, the same width as their hind part. Antenna filiform, 1.5 mm long, goes up to the middle of the pronotum. Pronotum as long as broad (1.4 mm), most of its width just below the base. The base of elytra is broader than the base of the prothorax; the elytra 2.5 times as long as broad, disk of elytra with rows of small cells. Metasternum twice as broad as long, tapered anteriorly, with paracoxal suture. Metepisterns are broad, touching the meso-coxal cavities. Mesocoxae contiguous. Metacoxae some oblique, divided at the metepistern and the base of the abdomen. The last abdominal segment a third longer than the previous one. Legs are short.

Discussion: Because *T. brevicapitis* n.sp. has flattened temporal protuberances it belongs to the *T. bruchi* - line of genus. They are mostly from Cretaceous beetles of this line and near to Recent *T. bruchi* HELLER. *T. brevicapitis* n.sp. distinguished by unnarrow back temporal protuberances on a shorter head, slight neck-form constriction and prothorax narrowed forward. It differs from the Cretaceous *T. verrucosus* PONOMARENKO and *T. ochotensis* PONOMARENKO by the shape of the head and prothorax, and larger body.

Suborder: Adephaga EMERY, 1886
Family: Coptoclavidae PONOMARENKO, 1961

GENUS ***Megacoptoclava*** n.gen.

Type species. Megacoptoclava longiurogomphia n.sp.

Etymology: A big *Coptoclava*, type genus of the family. Lower Cretaceous of China.

Diagnosis: Larva flattened, stone-fly-like (Plecoptera) in appearance, with long legs and urogomphs. Head transversal with several stemmata without peritrems and mandibles with long acute apical and molar teethes. Legs very long, crawling; fore legs possibly for catching. Thoracic segments subequal. Abdomen with eight segments, the third one the widest and the last one the smallest with a pair of spiracles. Urogomphi very long with numerous transversal segmentation. There are tracheal stocks with sclerotisated walls.

Discussion: The construction of mandibles, abdomen and tracheas allows us to include this larva in the family Coptoclavidae. The constitution of legs and urogomphi distinguished this genus from all others of the family.

Remarks: All known Jurassic and Cretaceous coptoclavid larvae were nectic carnivorous animals. They swam with their paddle-like middle and hind legs and caught their victims, mainly larvae of midges, with the fore legs. *Megacoptoclava longiurogomphia* n.sp. had long crawling legs as the Plecoptera and Ephemeroptera larvae living on stones in fast flowing rivers. This new form was able to live amongst the great charophyte communities, previously found in the Las Hoyas fossil-site (Martín-Closas and Diéguez, 1998), where it hunted on

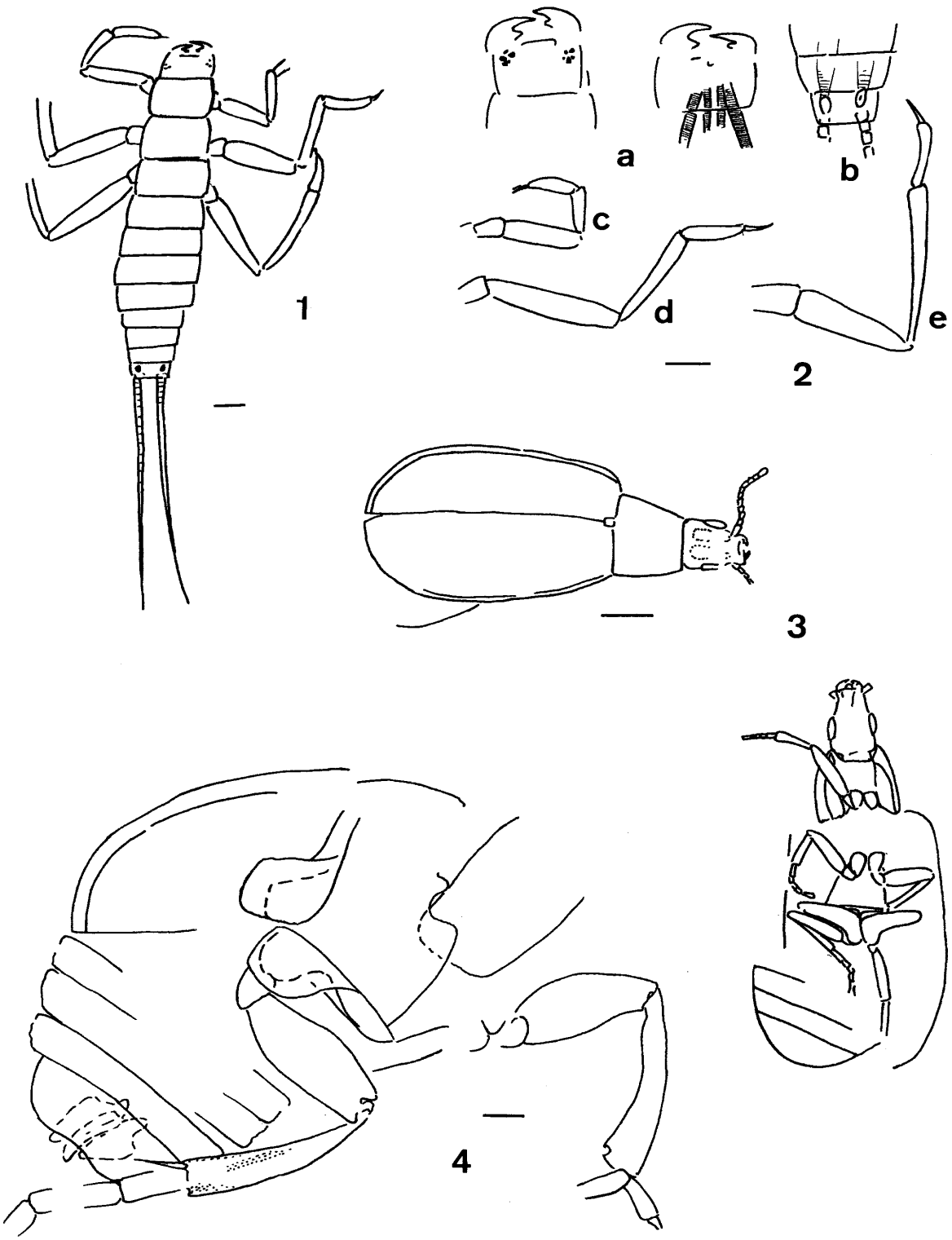

Figure 1. 1.- *Megacoptoclava longiurogomphia* n.gen., n.sp. General reconstruction of the holotype. 2.- *M. longiurogomphia* n.gen., n.sp., detail of some parts: a) mandibles, b) basal part of the urogomphi, c) fore leg, d) mid leg, e) hind leg. 3.- *Tetraphalerus brevicapitis* n.sp., holotype in ventral and dorsal view. 4.- *Bolbonectus lithographicus* n. sp. hind legs and abdomen of the holotype. Scale bar 1 and 2: 3mm; 3: 1.3 mm; 4: 1.8 mm.

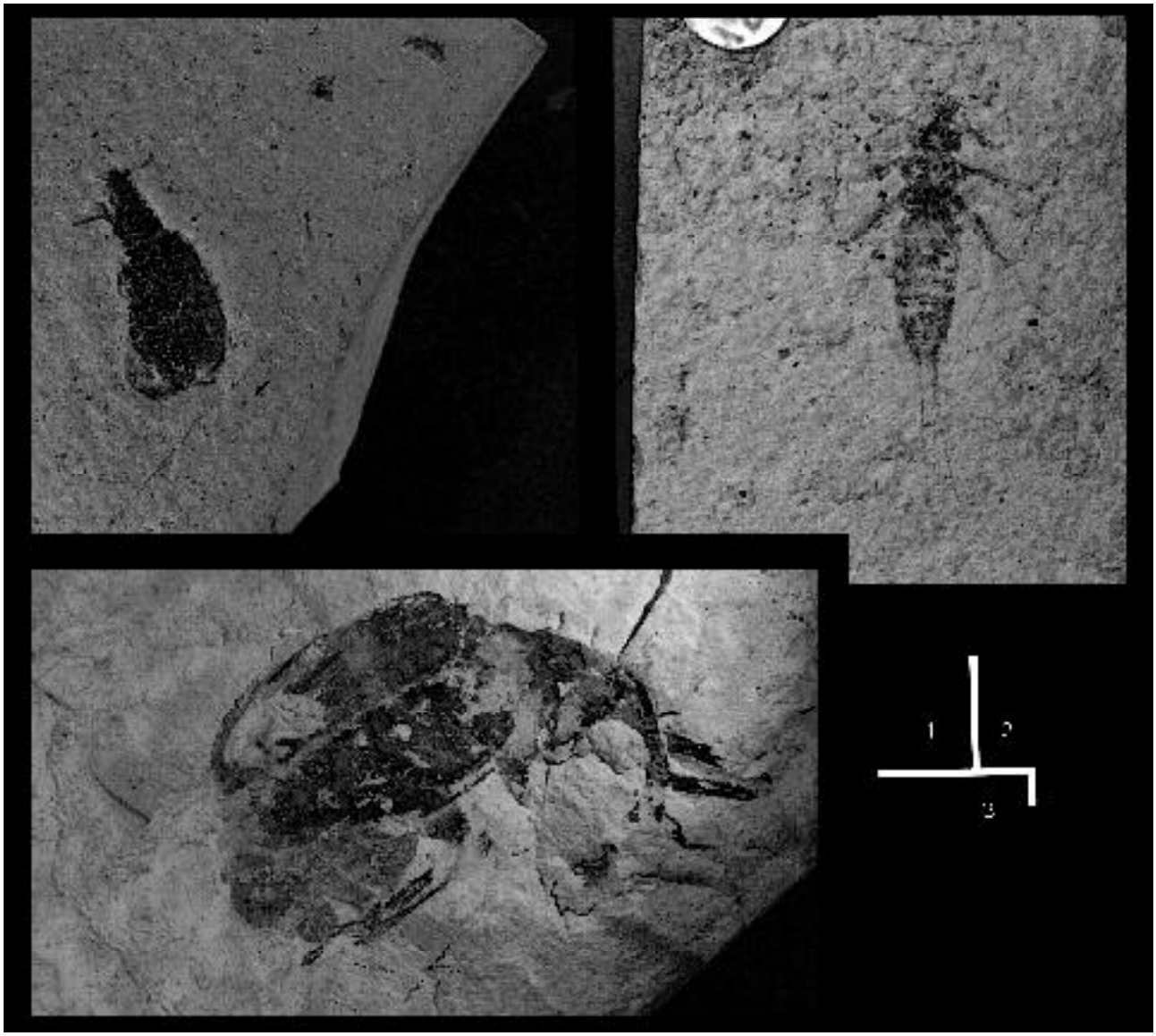

Figure 2. 1.- *Tetraphalerus brevicapitis* n.sp., holotype. 2.- *Megacoptoclava longiurogomphia* n.gen., n.sp., holotype. 3.- *Bolbonectus lithographicus* n.sp., holotype.

algal-eaters just as some insects or crustaceans also found in Las Hoyas (Martínez-Delclòs, 1991a; Rabadà, 1993; Garassino, 1997). The crawling legs could be adaptation to cope with waves in the river. The probability of buiring insects with that habitat is very low and we have thousands specimens normal coptoclavids and a single specimen of this new type.

Megacoptoclava longiurogomphia n.sp.
Figures 1.1, 1.2 and 2.2

1991a *Concaperla jucarensis*; Martínez-Delclòs, fig. 6.3.1 and Plate VI, fig. A (recent status: *nomen nudum*).

Etymology: after its long urogomphi.

Material: Only the holotype LH-1263, print and counterprint (larva), from Las Hoyas in Serranía de Cuenca (Cuenca Province, Spain). It has been deposited provisionally in the Unidad de Paleontología, Universidad Autónoma de Madrid, Spain. It's long-term home will be the Museo de Cuenca, Cuenca, Spain.

Another specimen ADR-319-I (print and counterprint of larva), from the same locality, and housed in the Mr. A. Díaz-Romeral collection, could belong to the same species.

Type horizon and locality: Second lithosome of finely laminated limestones of the La Huérguina Formation at Las Hoyas (Cuenca, Spain).

Description: Head is almost twice as wide as long. Distance between stemmata smaller as is length of stemma. Length of mandibles is 1.7 times smaller than width. Length of prothorax is rather more than the head with mandibles. All thoracic segments subequal. Fore legs are shorter. Tibia and tarsus subequal, femur 1.3 times longer than tibia. Femur and tibia of middle and hind legs subequal, 1.3 times longer than tarsus. Hind legs longer than middle ones. The 3rd segment of abdomen is twice as wide as the last one. Urogomphi as long as abdomen. Dimensions.- total length 60 mm, length of head 2.5 mm, thorax 6.9 mm, abdomen 20.3 mm.

Remarks: This specimen, because it structural morphology, was previously placed in the order Plecoptera, family Taeniopteryidae KLAPALEK by Martínez-Delclòs (1991), and named *Concaperla jucarensis*. Nevertheless the formal description never took place in a paper up to now. This new classification implies that the order Plecoptera never has appeared in the Lower Cretaceous from Las Hoyas, and *Concaperla jucarensis* need to be considered *nomen nudum*.

GENUS ***Bolbonectus*** PONOMARENKO 1987

Type species: Bolbonectes intermedius from Chita region, Argum district, Bolboy locality, Upper Jurassic-Lower Cretaceous.

Material: Holotype LP-1222-P from La Pedrera de Meià fossil locality, in the Montsec Range, Lleida Province (Spain).

Remarks: specimen put into the genus *Bolbonectus* PONOMARENKO 1987 according its wide hind tibia and tarsus, typical for genus. Elytra with wide epipleural edge is not known in this genus but we suppose that to describe a new genus by a single and incomplete specimen is not expedient.

The definitions of subfamilies of Coptoclavidae are unrealistic now, and a complete study of the family it is necessary. Two species of *Bolbonectus* exist, described from the Upper Jurassic and possible Lowermost Cretaceous of Transbaikalia (Ponomarenko, 1987). The species *Necronectes cyrenaicus* described by Ponomarenko in 1977 from the Hauterivian of Algeria, could really belong to the same genus.

Bolbonectus lithographicus n.sp.
Figures 1.4 and 2.3

Etymology: after lithographic limestone.

Material: Holotype LP-1222-P, housed in the Institut d'Estudis Ilerdencs (Lleida), into the Gómez-Pallerola collection.

Locality: Found in the La Pedrera de Rúbies fossil-site, in the Montsec Range, Lleida Province, Spain.

Stratigraphic position: Berriasian-Valanginian after Brenner et al. (1974); possibly Uppermost Hauterivian-Lower Barremian in age (Martín-Closas and López-Morón, 1995).

Description: The rather large beetle with oval body, widest part in the middle level with the middle coxae, from where body narrows slightly, in the terminal quarter more strong. Tip of body blunt. Metasternum transverse, rounded narrowed anteriorly, hind border angularly projects back. Hind coxae oblique, 0.7 times as long as wide, femoral plates big, subquadrate. Abdomen narrow from the base of 4th sternite, base of the last sternite is a half as big as the base of the abdomen. Tip of the posterior abdomen cut out. Fore legs are big and strong, femur wide, narrowed in apical third. Tibia is the same length as femur, slender, slightly curved, expanded in basal third and apically. Apical segment of fore tarsus is shorter than the previous one. Hind femur quite similar to fore one in size an shape. Hind tibia is 1.3 times more long as femur, 5 times as long as wide. First fore tarsomere twice as long as wide, second one shorter. Elytra is almost 3 times as long as wide, smooth, with epipleural edge. Dimensions: length of beetle about 35 mm, prothorax 5.2 mm, length of elytra 25 mm, width 6.8 mm, length of fore tibia 9 mm, length of hind tibia 10 mm.

Discussion: B. lithographicus n.sp. differs from the other species of the genus because of it's larger, wider and slightly more narrow posterior body, longer hind tibia, and wider epipleural edge.

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