

Systematic Palaeontology (Invertebrate Palaeontology) / Paléontologie systématique

The Mesozoic Laurasian family Parandrexidae (Insecta: Coleoptera), new species from the Lower Cretaceous of Spain

Carmen Soriano ^{a,*}, Alexandr G. Kirejtshuk ^b, Xavier Delclòs ^a

^a *Department estratigrafia, paleontologia i geociències marines,*

faculty geologia, universitat de Barcelona, Martí i Franquès, s/n. 08028 Barcelona, Spain

^b *Laboratory of insect systematics, zoological institute RAS, universitetskaya nab.1, Saint Petersburg 199034, Russia*

Received 2 May 2005; accepted after revision 20 March 2006

Available online 24 May 2006

Presented by Philippe Taquet

Abstract

Martynopsis laticollis gen. n., sp. n. of the Laurasian Mesozoic beetle family Parandrexidae from the Barremian (Lower Cretaceous) of Spain, is described. The diagnosis of the family is revised and emended, and a new synonymy for the generic names *Parandrexia* Martynov, 1926 and *Parandrexia* Hong, 1983 is proposed. *Martynopsis laticollis* gen. n., sp. n. enlarges the palaeogeographic distribution of the family from Asia to western Europe, and amplifies the fossil record of the family from the Middle–Upper Jurassic to the Lower Cretaceous. **To cite this article:** C. Soriano et al., C. R. Palevol 5 (2006).

© 2006 Académie des sciences. Published by Elsevier SAS. All rights reserved.

Résumé

La famille mésozoïque laurentienne Parandrexidae (Insecta : Coleoptera), nouvelle espèce du Crétacé inférieur d'Espagne. On décrit *Martynopsis laticollis* gen. n., sp. n. un coléoptère de la famille mésozoïque laurentienne Parandrexidae, du Barrémien (Crétacé inférieur) d'Espagne. La diagnose de la famille est révisée et amendée. On propose aussi une nouvelle synonymie pour les genres *Parandrexia* Martynov, 1926 et *Parandrexia* Hong, 1983. *Martynopsis laticollis* gen. n., sp. n. agrandit la distribution paléogéographique de la famille de l'Asie à l'Europe de l'Ouest, ainsi que le registre fossile de la famille, du Jurassique moyen–supérieur jusqu'au Crétacé inférieur. **Pour citer cet article :** C. Soriano et al., C. R. Palevol 5 (2006).

© 2006 Académie des sciences. Published by Elsevier SAS. All rights reserved.

Keywords: Insecta; Coleoptera; Parandrexidae; Laurasia; Barremian; Spain

Mots clés : Insecta ; Coleoptera ; Parandrexidae ; Laurasie ; Barrémien ; Espagne

* Corresponding author.

E-mail addresses: carmen.soriano@gmail.com (C. Soriano), ak3929@ak3929.spb.edu (A.G. Kirejtshuk), xdelclos@ub.edu (X. Delclòs).

1. Introduction

Up to now, the family of beetles Parandrexidae has been only known from two east localities: the Middle Jurassic of Jinlongshan (northern China) and the Upper Jurassic of Karatau (southern Kazakhstan). It was composed of two genera, *Parandrexia* Martynov, 1926, comprising three species: *P. parvula* Martynov, 1926; *P. rotundicollis* Kirejtshuk, 1994, and *P. subtilis* Kirejtshuk, 1994; and *Parandrexia* Hong 1983, with one species (*P. beipiaoensis* Hong, 1983). A more precise definition and interpretation of the placement of this extinct family within the superfamily Cucujoidea is of great interest, because it can clarify the early evolution of the group.

The collection of Las Hoyas fossil site (Lower Cretaceous, Barremian) includes two specimens of beetles that can be assigned to this family. There are some differences between these specimens and the species of the genus *Parandrexia*, in the shape and proportions of head, pronotum, elytra, and mandibles. This new material contributes with some additional data to precise the diagnosis of the family.

1.1. Locality and Stratigraphy

The Las Hoyas fossil site consists of laminated mudstones (lithographical limestones) that result from a shallow-lake sedimentation during the Upper Barremian (Lower Cretaceous). These mudstones contain a large quantity of fossil specimens with an exceptionally good preservation of soft parts, which includes Las Hoyas as one of the most famous Konservat-Lagerstätten [13].

Geologically, the Las Hoyas outcrop is located in the Las Hoyas syncline (Serranía de Cuenca, Iberian Ranges). The continental rocks from the Las Hoyas syncline were deposited in a little sedimentary basin, named Cubeta de Las Hoyas, which was integrated into a bigger one, named Iberian Basin [4]. The Cubeta de Las Hoyas was one subsident block with active sedimentation from the Iberian Basin, compartmented as a result of distensive tectonic phase of an intracontinental rifting, during the Lower Cretaceous. All the sediments deposited in the Cubeta de Las Hoyas are included in the La Huérguina Fm., Hauterivian–Barremian in age. The biostratigraphic studies with palynomorphs (pollen and spores), charophytes, and ostracods suggest that the age of the Las Hoyas fossil site is Upper Barremian (115 Myr BP) [2].

1.2. Terrestrial flora and entomofauna association

The terrestrial flora found in Las Hoyas is not diverse, but abundant. Filicales and Gymnosperms are the better represented plants, but bryophytes, and likely angiosperms are also collected. Ferns are represented by spores, pinnules and leaves of the families Schizaceae (*Ruffordia*), Dicksoniaceae (*Onychiopsis*), Cyathaceae (*Chyathidites* spore), Osmundaceae (*Cladophlebis*), and Matoniaceae (*Weichselia*). Gymnosperms are represented by Bennettitales and Coniferales. Among Bennettitales the best preserved genus is *Zamites*. At least three families of Coniferales are found: Cheirolepidiaceae (*Frenelopsis*, *Cupressinocladus*), Taxodiaceae (*Sphenolepis*), and other not-well-represented families that include the genera *Podozamites*, *Pagiophyllum*, and *Brachyphyllum*. Several pollen genera, such as *Classopollis*/*Corollina*, *Eucommiidites*, *Spheripollenites*, etc., suggest also Podocarpaceae and Pinaceae families to be present [3,5].

The terrestrial palaeontofauna assemblage recorded in Las Hoyas is wide and diverse. Fourteen orders of insects are recognized [9,12]. The majority of collected specimens are remains of beetles from families such as Cupedidae, Trachypachidae, Peltidae, Scarabaeidae, Elateridae, Buprestidae, Staphylinidae, Nemochnidae, and some others [14–16], and neuropterans (Chrysopoidea: Allopteridae, Mesochrysopidae, Limaiidae, and Kalligrammatidae); nevertheless, this material has still been poorly studied up to now [11].

2. Systematic palaeontology

Order COLEOPTERA Linné, 1758

Suborder POLYPHAGA Emery, 1886

Superfamily CUCUJOIDEA Latreille, 1802

Family PARANDREXIDAE Kirejtshuk, 1994

Type genus. *Parandrexia* Martynov, 1926

Addition to description. Body elongated and sub-flattened, with thin and apparently evenly scattered punctation. Head large and transverse, with large- to medium-sized eyes; quite long 11-segmented subfiliform antennae attached between mandibles and eyes; long and narrow mandibles; long segments of maxillary and labial palpi; wide mentum whose sides almost reach edges of eyes. Prothorax widened anteriorly (thus evidently increasing mobility of the block combined head and prothorax). Coxae narrowly separated. Procoxae transverse, with trochantin exposed and looking like narrowly closed posteriorly; all coxae flat. Prosternal process more or less projecting beyond the level of

posterior margin of procoxal cavities. Mesocoxal cavities transversely oval. Metathorax comparatively long, and with submesocoxal lines, but without traces of parametacoxal and medial sutures. Metacoxae subrectilinearly transverse and nearly reaching lateral edge of body. Abdomen including five ventrites, apparently not fused and of approximately equal length. Elytra complete or slightly shortened, with well-developed epipleura, forming distinct bend in plane of elytra. Prothorax, head and appendages of head (particularly antennae) with expressed sexual dimorphism. Legs moderately developed, with elongate trochanter, comparatively narrow femora and tibiae, apparently with 4-segmented tarsi and with ultimate tarsomere longest. Anal sclerite well developed and somewhat horseshoe-shaped.

Remarks. The family Parandrexidae should be regarded as a member of the superfamily Cucujoidea as was grounded by Kirejtshuk [7,8]. The strongly transverse flattened procoxae with exposed trochantin are characteristic for this family and few other Cucujoid families, such as Nitidulidae, Kateretidae, Smicripidae, Boganiidae, and Byturidae. Other characters of thorax also support the ascription of this family to the Cucujoidea. The general appearance of members of Parandrexidae has some characters similar to those of anthophilous groups of these families (particularly to some Paracucujinae from the Boganiidae as well as some Epuraeinae, Meligethinae, and Mystropinae from the Nitidulidae), including in transformation of antennae, mandibles and palpi of large, elongate and prognathous head, movable articulation between prothorax with head, on the one hand, and the rest more or less consolidated part of body, on the other one. Besides, the outline of leg segment, elongate trochanter, male anal sclerite and type of sexual dimorphism are similar to those among Cucujoidea rather than to any other superfamilies. It is possible to preliminarily admit that the Parandrexidae represents one of first offspring from ancestors of the Cucujoidea in general, and it seemed to have some phyletic connections with Nitidulidae, unless a further deeper cladistic analysis of cucujoids is needed to clarify the relationships between the different families among Cucujoidea.

Since its description, the genus *Parandrexis* has been considered as a member of the Cerambycidae and Boganiidae [1,10]; in 1994, Kirejtshuk considered that the genus should be placed in a new separately family [7]. Unfortunately, the systematic position of this new family within Cucujoidea remains uncertain, due to the lack of sufficient characters in remains available for study.

The genus *Parandrexis* is characterized by the antennae with length longer than the head, and also the head at least twice longer than the pronotum. The pronotum of the *Parandrexis* species is strongly widened anteriorly and with posterior angles obtuse and indistinct; their prosternal process is narrower than femora, slightly widened or not widened at apex and scarcely extended posteriorly from procoxae 5.5–18.0 mm. In 1983 Hong published a new species of Parandrexidae that he named '*Parandrexia beipiaoensis* g.s.n.' [6]. However, this species has a habitus quite characteristic of the other species of the genus *Parandrexis*, but differing from others known from Karatau in its much larger and somewhat more slender body. The figure of the holotype published in Hong's original description shows the male anal sclerite very similar to that in many nitidulid groups, as well as the trace of submesocoxal lines and elongated trochanter supporting the opinion on placement of this family among the superfamily Cucujoidea.

Because of the structure of the adult mouthparts (elongated mandibles and long maxillary and labial palpi), the comparatively large eyes and prognathous head, Kirejtshuk proposed an open mode of life for the members of this extinct family, which could have lived on the surface of the strobiles of Mesozoic gymnosperms [7]. The Las Hoyas fossil site contains many remnants of conifers such as Araucariaceans and Cheirolepidaceans, which, as was supposed before for members of this family from Karatau, could have been host plants for specialized species of the family Parandrexidae.

According to the actual palaeogeographical maps [17], the three fossil sites where members of Parandrexidae family have been found (Jinlongshan, Karatau and Las Hoyas) were located in the subtropical-tropical areas, with cool or warm temperate floras.

Genus *MARTYNOPSIS* gen. n.

Type and only species. *Martynopsis laticollis* sp. n.

Etymology. The name of the new species is devoted to the Russian palaeoentomologist, A.V. Martynov, who proposed the name for the type genus of the family, and '*opsis*' (= appearance).

Diagnosis. The type species of this new genus from the Lower Cretaceous of Spain shows similarities in the body outline and other characters to the species of *Parandrexis*. *Martynopsis* gen. n. differs from *Parandrexis* species in the antennae subequal in length to head (taken without mandibles), each of these organs sub-equal in length to the pronotum; pronotum subtrapezoidal, with the anterior and posterior edges comparable in width and with the posterior angles more dis-

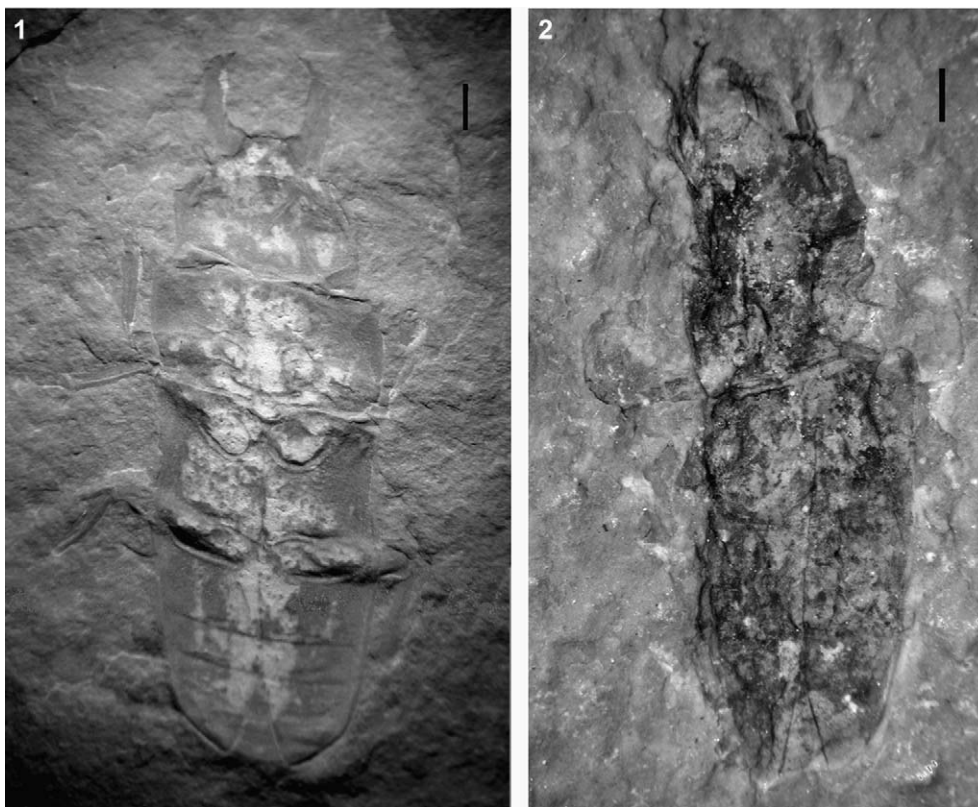


Fig. 1. *Martynopsis laticollis* gen. n., sp. n. from the Las Hoyas outcrop, La Huérguina Fm. (1) Holotype LH21091, part, general view. (2) Paratype LH24513, general view. Scale bars: 1 mm.

Fig. 1. *Martynopsis laticollis* gen. n., sp. n. du gisement de Las Hoyas, formation de La Huérguina (1) Holotype LH-21091, empreinte, vision générale. (2) Paratype LH-24513, vision générale. Échelle : 1 mm.

tinct; prosternal process about as wide as femora, very widened at apex and somewhat extended posteriorly from procoxae. Length 13.4–15.0 mm, instead 11.0–18.0 mm in *Parandrexis*.

Martynopsis laticollis sp. n. (Figs. 1,2)

Material. Holotype LH-21091 part and counterpart, and paratype LH-24513, only the part, from personal collection of Armando Díaz-Romeral. All the material is housed in the Museo de las Ciencias de Castilla La Mancha, Cuenca, Spain.

Etymology. From the Latin words ‘*latus*’ (wide) and ‘*collis*’ (pronotum).

Stratum typicum. Second lithosome of finely laminated limestones of La Huérguina Formation, Lower Cretaceous, Barremian [4].

Locus typicus. Las Hoyas fossil site, La Cierva, Serranía de Cuenca, Cuenca Province, Spain.

Diagnosis. As for genus.

Description. Length without mandibles 13.2 mm, length with mandibles 15.0 mm, body width 4.8 mm, antennae length 3.0 mm, elytra length 7.3 mm. Body

elongate and subflattened. Head comparatively short, about as long as pronotum, widened behind eyes and with small notches at apex. Mandibles narrow and long, rather curved in distal fourth, slightly shorter than head. Antennae with 11 antennomeres and somewhat longer than head, without mandibles. Pronotum transverse, almost trapezoid, slightly widened anteriorly, anterior angles with a distinct top, anterior margin subtruncate; posterior angles obtuse, their top not distinctly visible. Prosternum apparently subflattened, with comparatively wide intercoxal process rather extended behind procoxae, strongly widened before apex that has widely rounded posterior edge, notosternal sutures distinct along entire length. Procoxae comparatively widely separated, transverse, apparently open posteriorly and with exposed trochantin. Mesosternum moderately short, medially with transverse isolated stripe at posterior edge. Mesocoxae moderately separated, moderately large and oval, closed externally. Metasternum moderately long; somewhat longer than prosternum with process, with well-expressed submesocoxal lines following

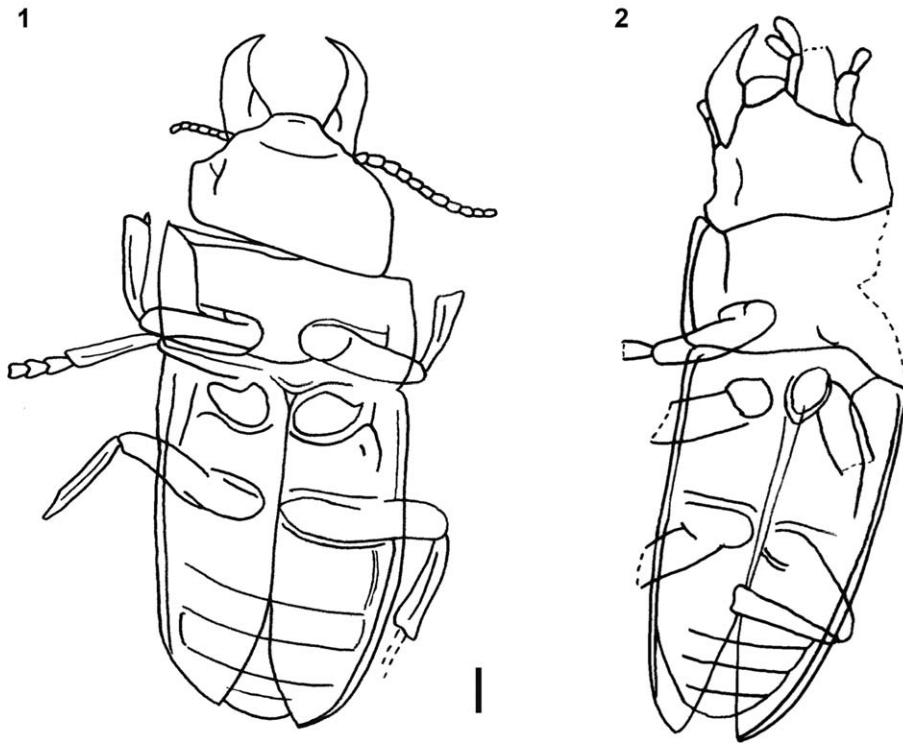


Fig. 2. Camera lucida drawings of *Martynopsis laticollis* gen. n., sp. n. from the Las Hoyas outcrop, La Huérguina Fm. (1) Holotype LH21091, part, (2) Paratype LH24513. Scale bars : 1 mm.

Fig. 2. Dessin à la chambre claire de *Martynopsis laticollis* gen. n., sp. n. du gisement de La Hoyas, formation de La Huérguina. (1) Holotype LH-21091, empreinte, (2) Paratype LH-24513. Échelle : 1 mm.

along posterior edge of coxal cavities and deviating just at anterior angles of metasternum; parametacoxal lines (trace of transverse elevation at metacoxae) subparallel to anterior edges of metacoxal cavities, metepisternum moderately narrow, with shallow and indistinct punctures, about as large as half of last antennomere, interspaces between them more or less broader than punctures in diameter. Subsutural lines expressed along entire length and parallel; epipleura comparatively narrow, apparently distinctly folded laterally and do not reach apices. Legs moderately developed, with femoral apices somewhat exposed beyond lateral sides of body. Femora rather narrow, scarcely wider than prosternal process in the narrowest place, 4 to 5 times as wide as antennal flagella. Tibiae subequal in shape, slightly arcuate and with outer subapical angle somewhat projecting anteriorly, about twice narrower than femora. Exposed mesotarsus consisting at least of tarsomeres 1 to 3 moderately lobed. Elytra subparallel-sided and obliquely narrowed at apex, with most length at suture. Abdomen with visible segmentation dividing apparently ventrites (segment 1 longest), however elongate visible sutures, perhaps, belonging to borders between

laterosternites and pleurites and between pleurites and tergites respectively.

Paratype. Beetle somewhat rotated in its position along body axis, quite tectonically deformed, especially in one side of pronotum. Total length somewhat shorter than holotype, but with subequal proportions of head, pronotum, and abdomen. Mandibles looking different (probably in sequence of general deformation). This specimen has traceable apices of one labial and one maxillary palps, which are as long as mandibles: last palpomeres of both palps rather long, narrow and subparallel-sided. Elytra seeming not so subparallel. Metatibia in contrast to that in holotype longest at inner edge.

Acknowledgments

We wish to express our gratitude to our colleagues from the Palaeontological Institute of the Russian Academy of Sciences (Moscow) for a chance to study the collection of Parandrexidae, to A. Díaz-Romeral (Cuenca) for having made it possible to study the material of his personal collection, and to A.R. Sokolov,

from the Central Research Geologo-Exploring Museum (Saint-Petersburg), for the possibility to retest the type specimen of *Parandrexia parvula*. This research is supported by grants BOS2001-0173 and BOS2001-0185 from the Ministry of Science and Technology of Spain, and ‘Origin and evolution of the biosphere’ from the Presidium of the Russian Academy of Sciences.

References

- [1] R.A. Crowson, The biology of the Coleoptera, Academic Press, London, 1982 (802 p.)
- [2] C. Diéguez, C. Martín-Closas, N. Meléndez, J. Rodríguez-Lázaro, P. Trinçao, Biostratigraphy, in: N. Meléndez (Ed.), Las Hoyas. A lacustrine Konservat-Lagerstätte, Cuenca, Spain, Universidad Complutense de Madrid, Madrid, 1995, pp. 77–79.
- [3] C. Diéguez, P. Trinçao, C. Martín-Closas, N. Lopez-Morón, Paleobotany, in: N. Meléndez (Ed.), Las Hoyas. A lacustrine Konservat-Lagerstätte, Cuenca, Spain, Universidad Complutense de Madrid, Madrid, 1995, pp. 29–32.
- [4] M.A. Fregenal-Martínez, N. Meléndez, The lacustrine fossiliferous deposits of the Las Hoyas Subbasin (Lower Cretaceous, Serranía de Cuenca, Iberian Ranges, Spain, in: E.H. Gierlowski-Kordesch, K.R. Kelts (Eds.), Lake Basins through Space and Time, AAPG Studies in Geology, Tulsa, OK, USA, 2000, pp. 303–313.
- [5] B. Gomez, C. Martín-Closas, G. Barale, N. Solé-De Porta, F. Thévenard, G. Guignard, *Frenelopsis* (Coniferales: Cheirolepidiaceae) and related male organ genera from the Lower Cretaceous of Spain, Palaeontology 45 (2002) 997–1036.
- [6] Y.C. Hong, Middle Jurassic fossil insects in North China, Geol. Publ. House, Beijing, 1983 (223 p.)
- [7] A.G. Kirejtshuk, Parandrexidae Fam. Nov., Jurassic beetles of the Infraorder Cucujiformia (Coleoptera, Polyphaga), Palaeontol. J. 28 (1) (1994) 69–78.
- [8] A.G. Kirejtshuk, On origin and early evolution of the Superfamily Cucujoidea (Coleoptera, Polyphaga) Comments on the Family Helotidae, The Kharkov Entomological Society Gazette 8 (1) (2000) 8–38.
- [9] X. Martínez-Delclòs, A. Nel, Insects, in: N. Meléndez (Ed.), Las Hoyas. A lacustrine Konservat-Lagerstätte, Cuenca, Spain, Universidad Complutense de Madrid, Madrid, 1995, pp. 36–41.
- [10] A.V. Martynov, On the identification of fossil insects from the Jurassic shales of Turkestan. 5. Some forms of beetles, in: Yearb. Russ. Palaeontol. Soc. 5, Coleoptera, 1926, pp. 1–38.
- [11] A. Nel, X. Delclòs, A. Hutin, Revision of the Mesozoic chrysopid-like Neuroptera (Insecta, Neuroptera), Ann. Soc. Entomol. France 41 (1) (2005) 29–68.
- [12] E. Peñalver, X. Martínez-Delclòs, A. Arillo, Yacimientos con insectos fósiles en España, Rev. Esp. Paleontol. 14 (1999) 231–245.
- [13] J.L. Sanz, M.A. Fregenal-Martínez, N. Meléndez, F.J. Ortega, Las Hoyas, in: D.E.G. Briggs, P.R. Crowther (Eds.), Paleobiology II, Blackwell Science, London, 2001 (583 p.)
- [14] C. Soriano, X. Delclòs, Insectos coleópteros de Las Hoyas y El Montsec (Cretácico Inferior, España), Libro de Abstracts del XXI Congreso de la Sociedad Española de Paleontología, Morcella, 1, 2003, pp. 51–52.
- [15] C. Soriano, X. Delclòs, Coleópteros del Cretácico Inferior de Las Hoyas (Serranía de Cuenca, Cuenca). Libro de Abstracts del XXII Congreso de la Sociedad Española de Paleontología, Alcalá de Henares, 1, 2004, pp. 179–180.
- [16] V.V. Zherikhin, V.G. Gratshev, A new weevil-beetle (Insecta, Coleoptera, Nemochynidae) from the Lower Cretaceous of Spain, Palaeontol. J. 37 (2003) 407–408.
- [17] A.M. Ziegler, M. Parrish, Y. Jiping, E.D. Gyllenhaal, D.B. Rowley, J.T. Parrish, S. Nie, A. Bekker, M.L. Hulver, Early Mesozoic phytogeography and climate, in: J.R.L. Allen, B.J. Hoskins, B.W. Sellwood, R.A. Spicer, P.J. Valdes (Eds.), Palaeoclimates and their Modelling; with Special Reference to the Mesozoic Era, Chapman and Hall, London, 1994, pp. 89–97.