New Middle Permian foraminifers (Chitralinidae) from the Karakaya Complex, in northwestern Turkey

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Abstract

One new foraminiferal genus, Rectoformata gen. nov., with two new species, has been described from a Permian limestone block in the Karakaya Complex in the South of the Balya district (Balikesir, northwestern Turkey). The type species of Rectoformata, Rectoformata tekini sp. nov., is characterized by a quadrangular transverse section having a calcareous microgranular wall with fine alveolar structures, whereas Rectoformata acari sp. nov. is recognized by a pentagonal transverse section having a calcareous microgranular wall with fine alveolar structures. The age of the described taxa is assigned as Midian (= Capitanian) based on the association with small foraminifers and fusulinids. These new taxa are included in the family Chitralinidae, which is emended herein. To cite this article: C. Okuyucu, C. R. Palevol 6 (2007).

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Résumé

Nouveaux foraminifères (Chitralinidae) du Permien moyen du complexe de Karakaya en Turquie nord-occidentale. Un nouveau genre de foraminifère, Rectoformata gen. nov., avec deux nouvelles espèces, a été décrit dans un bloc calcaire Permien du complexe de Karakaya, dans le Sud du district de Balya (Balikesir, Turquie nord-occidentale). L’espèce type de Rectoformata, Rectoformata tekini sp., est caractérisée par une section transversale quadrangulaire, qui présente un mur microgranulaire calcaire à fines structures alvéolaires, tandis que Rectoformata acari sp. nov. se reconnaît par une section transversale pentagonale, avec un mur microgranulaire calcaire à fines structures alvéolaires. L’âge des taxons décrits est attribué au Midien (= Capitanien) sur la base d’une association avec de petits foraminifères et des fusulinides. Ces nouveaux taxons font partie de la famille des Chitralinidae, ce qui est ici amendé. Pour citer cet article : C. Okuyucu, C. R. Palevol 6 (2007).

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Keywords: Foraminifera; Chitralinidae; Permian; Guadalupian; Capitanian; Karakaya Complex; Turkey

Mots clés : Foraminifères ; Chitralinidae ; Permien ; Guadalupien ; Capitanien ; Karakaya Complex ; Turquie

1. Introduction

One new Middle Permian (Guadalupian) genus and two species of foraminifers are described from a Permian limestone block in the Karakaya Complex from the southwest of the Asagicakallar village, south of the...
2. Geological setting

The Karakaya Complex is a tectonostratigraphic term for a highly deformed and partly metamorphosed clastic and volcanic series of Permian and Triassic age on the Biga Peninsula, northwestern Turkey [25]. The term ‘Karakaya’ was initially introduced by Bingol [7], as the ‘Karakaya Series’, for a slightly metamorphic succession at Karakaya Hill to the south of the Beyobasi village in the Edremit area. Later, the name ‘Karakaya Formation’ was applied by Bingol et al. [8] to include the ‘detrital unit with Permian olistoliths’ and the ‘spilites with Permian olistoliths’ [31]. The Karakaya Complex is generally subdivided into two parts, a lower and an upper one [25].

The Upper Permian rocks within the Karakaya Complex are known from previous studies, and many authors have reported the blocky nature of the Carboniferous and Permian strata present [2,4,8,19,29,30]. There are different opinions about the provenance of these blocks [2,4,20,29]. According to Altiner et al. [4], Upper Palaeozoic (Carboniferous–Permian) carbonate exposures of non-metamorphosed siliciclastic rocks of the Karakaya Orogen are olistoliths deposited during the Late Triassic. The likely provenance of the blocks is from the south and from the northern margin of a carbonate platform of Gondwanan origin. The wide range of the ages of carbonate blocks from Visean to the Latest Permian and the harmony of their chronostratigraphic order with the Carboniferous and Permian stratigraphy of the Taurus carbonate platform are proposed as evidence for their southern origin by these authors.

Previously, many rift-related models were proposed for the evolution of the Karakaya units [2,8,15,26]. Goncuoglu et al. [14] have reported synsedimentary radiolarian cherts (Changhsingian in age) within the proximal turbidites and olistrostromes of the Karakaya Complex, and they concluded that the rifting of this basin within the Sakarya Composite Terrane [13] took place between the deposition of the Midian platform carbonates (e.g., [31]), and that of the Changhsingian rift-related sediments and volcanism.

The present new taxa of small foraminifers are described from the Upper Karakaya Complex, and are known in northwestern Turkey only from the Asagickallar locality, where Permian rocks are found as olistoliths in debris flow deposits of Triassic age (Fig. 1). The basal part of the olistolith is composed of thin- to medium-bedded grey limestone. Above is grey, medium-bedded brecciated limestone with abundant fusulinids and algae. The middle part of the section consists of grey, fusulinid, and hemigordiopsid-bearing limestone. The upper part of the olistolith is represented by yellow–light grey, thin- to medium-bedded clayey limestone. The total thickness of the olistolith is 59 m (Fig. 2).

3. Systematic palaeontology

The author follows the systematic classification of Loeblich and Tappan [22]. All holotypes and paratypes
are stored in the collection of the Natural History Museum of MTA (General Directorate of Mineral Research and Exploration of Turkey), Ankara, Turkey, under No. MTA2002/CO3.

Order Foraminifera d’Eichwald [11]
Suborder Fusulinina Wedekind [33]
Superfamily Earlandiacea Cummings [10]

Family Chitralinidae Angiolini and Rettori [5] emend. herein

Emended diagnosis. Test-free, globular proloculus followed by a long undivided tubular chamber. Central cavity of tube circular or slightly quadrangular in transverse section. Marked longitudinal rounded or acute costae on the test surface. Wall is calcareous microgran-
ular, sometimes with fine alveolar structures and very finely agglutinated particles. Aperture simple terminal opening.

**Included genera.** *Chitralina* Angiolini and Rettori [5], *Giraliarella* Crespin [9] and *Rectoformata* gen. nov.

**Discussion.** The Chitraliniidae distinguish themselves from the original diagnosis of Angiolini and Rettori [5] by having a circular central cavity, longitudinal acute costae and a very finely agglutinated wall. The new emended family differs from the other families included in the superfamily *Earlandiacea* Cummings [10] by having rounded or acute longitudinal costae on the test surface.

**Stratigraphic and geographic range.** Middle Permian (= Guadalupian), Midian (= Capitanian) of northwestern Anatolia (Turkey).

*Rectoformata tekini* sp. nov. (Figs. 3.1–3.7)

**Derivation of the name.** This species is named after Associate Professor Dr. U. Kagan Tekin (Hacettepe University), in honour of his contributions to the knowledge of Mesozoic Radiolarian biostratigraphy.

**Holotype.** Sample MTA2002/CO3–02 CO 1–1–3 (Fig. 3.1).


**Type locality.** Southwest of Asagicakallar village, south of Balya district, Balikesir, NW Turkey.

**Type level.** Median (= Capitanian).

**Material.** Eight specimens (only seven specimens illustrated herein).

**Diagnosis.** *Rectoformata* with quadrangular transverse section and calcareous microgranular wall with fine alveolar structure.

**Description.** Test-free, elongate, globular proloculus followed by a long undivided tubular chamber with circular central cavity, increasing in width during the growth. Quadrangular test, characterized by the presence of four longitudinal acute costae on the test surface. Septation or pseudoseptation not seen in longitudinal

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sections. Calcareous microgranular wall with fine alveolar structures. Aperture simple terminal opening.

3.1. Dimensions

Diameter of the central cavity: 0.03–0.06 mm, thickness of the wall: 0.01–0.02 mm, becoming thicker at the corners of the tube where it may bulge outwardly to produce longitudinal acute costae.

Comparisons. *Rectoformata tekini* differs from the *Rectoformata acari* by having quadrangular shape (Figs. 3.1–3.7). It is also distinguished from *Chitralina undulata* Angiolini and Rettori [5] by having fine alveolar microgranular wall structure, four longitudinal acute costae on the test surface and circular central cavity. *Rectoformata tekini* is however similar to *Giraliarella angulata* Crespin [9] in the shape of the test; the present new species differs from *Giraliarella angulata* Crespin [9] by its calcareous microgranular wall with fine alveolar structures.

**Stratigraphic and geographic range.** Middle Permian (= Guadalupian), Midian (= Capitanian) of northwestern Anatolia (Turkey).

*Rectoformata acari* sp. nov. (Figs. 3.8–3.14)

Derivation of the name. This species is named after Dr. Sukru Acar (General Directorate of Mineral Research and Exploration, MTA), in honour of his contributions to the knowledge of Tertiary benthic foraminifersan biostratigraphy.

Holotype. Sample MTA2002/CO3-02 CO 1-1-1 (Fig. 3.12).


Type locality. Southwest of the Asagicakallar village, south of the Balya district, Balikesir, northwestern Turkey.

Type level. Midian (= Capitanian).

Material. Eight specimens (only seven specimens illustrated herein).

Diagnosis. *Rectoformata* with pentagonal shape as seen in transverse section and a calcareous microgranular wall with a fine alveolar structure.

Description. Test-free, elongate, globular proloculus followed by a long, undivided tubular chamber with a circular central cavity. Test increasing in width during the growth. Test pentagonal in transverse section and characterized by the occurrence of five longitudinal acute costae on the test surface. Septation or pseudoseptation not seen in longitudinal sections. Calcareous microgranular wall with fine alveolar structures. Aperture simple terminal opening.

Dimensions. Diameter of the central cavity: 0.045–0.070 mm; thickness of the wall: 0.012–0.020 mm, becoming thicker at the corners of the tube where it may bulge outwardly to produce longitudinal acute costae.

Comparisons. *Rectoformata acari* sp. nov. distinguishes itself from similar species *Rectoformata tekini* sp. nov. and *Chitralina undulata* Angiolini and Rettori [5] by having a pentagonal test (Figs. 3.8–3.14). It also differs from *Giraliarella angulata* Crespin [9] by its pentagonal test and different wall structure.

**Stratigraphic and geographic range.** Midian (= Capitanian), Middle Permian (= Guadalupian) of northwestern Anatolia (Turkey).

4. Phylogenetic considerations

The new genus *Rectoformata* appears for the first time in the Middle Permian (Guadalupian) and represents a descendant of *Earlandia* Plummer [27]. Angiolini and Rettori [5] discussed the phylogenetic relationships between *Chitralina* Angiolini and Rettori [5] and *Rectostipulina* Jenny-Deshusses [17], and they claimed that both were derived from *Earlandia*. The two genera can be distinguished based on the wall. The wall of *Chit-
tralina is simple and microgranular, whereas that of Rectostipulina was hyaline radial. However, the genus Rectostipulina was attributed to the Nodosariida, family Syzraniiidae by Vachard in [32]. Recently, Groves et al. [16] have also indicated to the similarity of the Rectostipulina with Syzrania Reitlinger [28] and other syzaniiids. In this case, the validity of the phylogeny of Angiolini and Rettori [5] is doubtful.

Rectoformata gen. nov., Giraliarella Crespin [9] and Chitralina are homeomorphic genera, with the main differences among them being wall structure. The wall of Rectoformata gen. nov. is calcareous microgranular, with fine alveolar structures, whereas Chitralina has a simple dark microgranular wall, and Giraliarella contains a very finely agglutinated wall with large quantities of cement. Giraliarella also differentiates itself from the other genera by a more complex morphology, due to the development of transverse growth constrictions.

Earlandia appears for the first time in the Silurian (Loeblich and Tappan [22]) and Chitralina in the Kurbegandian (= Radian) [5], in both cases earlier than the first appearance of new genus Rectoformata. It is clear that the new genus differs from the homeomorphic Guadalupian genus Chitralina mainly by its calcareous microgranular wall with fine alveolar structures. Fine alveolar structure in the wall of the new genus is possibly indicative of an evolutionary stage in this lineage. The possible lineage can be formulated as Earlandia–Chitralina–Rectoformata.

Chitralina and Rectoformata are of Middle Permian (Guadalupian) age. Chitralina undulata Angiolini and Rettori [5] is restricted to the Kurbegandian/Late Murgabian–Midian. The new species, Rectoformata tekini and Rectoformata acari, are only known from the Middle Permian (= Guadalupian), Midian (= Capitanian) deposits of northwestern Anatolia (Turkey) and are not known from older or younger strata.

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