



## Catalogue of type collections of Early Cretaceous corals (Scleractinia, Anthozoa) at the National Museum of Natural History, Sofia

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## Каталог на типовата колекция раннокредни корали (Scleractinia, Anthozoa) в Националния природонаучен музей, София

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**Резюме.** Каталогът дава информация за типовия материал от раннокредни корали, съхраняван в колекциите на Националния природонаучен музей, София. Основната част от него е публикувана от Zlatarski (1966; 1967a, b; 1968a, b; 1970; 1972). Днес в музея се пазят по-голямата част от типовите образци и дюншлифи, описани от Златарски, принадлежащи към 24 вида фосилни корали с барем-ранноаптска възраст от няколко находища в Централна Северна България (Предбалкан). Също така музеят притежава и богата колекция от раннокредни корали от планина Любаша, Пернишко (Югозападна България, Средногорска зона), публикувана от Roniewicz (2008). От тази колекция в музея се съхраняват типовите образци и дюншлифи на всичките 6 нови вида корали с валанжинска възраст. Значимостта на двете колекции се увеличава от обстоятелството, че някои от новите видове, описани от Златарски и Рониевич, се явяват и типови видове на нови за науката родове. Каталогът включва информация и за един синтип, описан от Toula (1889).

**Ключови думи:** Anthozoa, Scleractinia, Долна Креда, България, каталог, типови образци.

**Abstract.** The catalogue provides information about the availability of type material of Early Cretaceous coral taxa in the invertebrate fossil collections of National Museum of Natural History, Sofia, Bulgaria. The major part of the fossil coral type material was published by Zlatarski (1966; 1967a, b; 1968a, b; 1970; 1972). At present most of Zlatarski's type specimens and thin sections are housed in the museum. They belong to 24 coral species from the Barremian–Lower Aptian of several localities in central North Bulgaria (Fore-Balkan). Second well represented part of the coral type collection contains all the type specimens and all thin sections of 6 new species of Valanginian corals collected in Lyubasha Mountain, Pernik district (Srednogorie, SW Bulgaria) and published by Roniewicz (2008). Some new species introduced by Zlatarski and Roniewicz are also type species of new genera. A syntype, described by Toula (1889) is also included in the catalogue.

**Key words:** Anthozoa, Scleractinia, Lower Cretaceous, Bulgaria, catalogue, type specimens.

### Introduction

The aim of this catalogue is to provide information about the type collections of Early Cretaceous corals deposited in the National Museum of Natural History, Sofia (NMNHS) at the Bulgarian Academy of Sciences (BAS) by 2011.

The Lower Cretaceous deposits in Bulgaria contain numerous corals, mostly colonial forms building bioconstructions both in carbonate as well as in siliciclastic deposits (for lithostratigraphy and paleogeography of Lower Cretaceous in Bulgaria see Minkovska et al., 2002 and Nikolov et al., 2007). These coral assemblages represent two time spans. Berriasian–Valanginian corals come from Lyubasha Mountain

(described material) and non published specimens from other localities of the Srednogorie (South-West Bulgaria). The NMNHS hosts mainly coral collections representing Barremian–Lower Aptian of the Lovech Urganian Group in the Central Fore-Balkan (Central North Bulgaria), and rare specimens from Moesian Platform (North Bulgaria). Most of this material is still undetermined or under study.

### Types published by Zlatarski (1966–1972)

The prevailing part of coral type material housed nowadays in the Museum was collected by Vassil Zlatarski at the end of 1950's and the early 1960's

from Lovech–Veliko Tarnovo area during his work on PhD thesis (Zlatarski, 1968c) and published in the period 1966–1972. Initially it was deposited in the Geological Institute–BAS (GI–BAS) where V. Zlatarski was research fellow at that time, thus in his papers the material is reported to be housed there.

The Museum itself during that period was a part of the Institute of Zoology, so the geological collections were not kept or exhibited there. In 1972 the mineralogist, Prof. Ivan Kostov, presented a motion to the BAS for restoration of the Museum as an independent unit (Petrussenko, 2005). As a result of this official action in 1974 the Council of Ministers of the state adopted a decision for the restoration of the Museum as an independent scientific institution within the BAS and it acquired a national statute. The new circumstances provoked an all-round development, reorganisation and modernization of the Museum. The number of exposition halls grew and rocks, minerals, fossils were also exhibited along with zoological exhibitions. The main geological collections were moved from GI–BAS to the NMNHS. The type collection of V. Zlatarski was moved to the Museum in the summer of 1980 or 1981 (Zl. Boev, pers. comm. 2009).

For many years the coral type material of Zlatarski was mixed among the huge collection of non determined Urgonian (Barremian–Lower Aptian) corals – more than 20 000 registered specimens. Perhaps one of the reasons for such mixture was that parts of the type specimens were not properly indicated on their labels. We found part of them still accompanied with the old working labels of V. Zlatarski, and it was not clear to which exactly new taxon every specific specimen belongs. The separation of the type material was a difficult and time consuming task. It was initiated by V. Zlatarski who was kind to consult us and provide data from his working notes at the time of pre-publication. He has also sent us a list of correspondence between unofficial working names and published scientific names of some taxa.

The need of compiling this catalogue become crucial after several inquires which the curators of this collection have received in recent years. Some scientists and students were interested in the Early Cretaceous coral collection of NMNHS. Dr. V. Tchechmedjieva with her student M. Tencheva and Dr. V. Idakieva (all from Sofia University) have worked with some specific taxa and have determined some of them. Recently Dr. B. Kołodziej (Jagiellonian University, Krakow) undertook extensive study on the whole Early Cretaceous coral collection in frame of Polish–Bulgarian project dealing with Urgonian corals from Bulgaria. He has helped and has continuously supervised the process of deciphering the old documentation, identifying and separating the type materials from the bulk of non identified Early Cretaceous corals.

The curators of the collection are aware that some ideas about the taxonomy of Early Cretaceous corals have developed through the years and perhaps part of

the material needs revision. However, to provide future visitors with the basic data about the availability of the material in NMNHS and to encourage researchers to select neotypes in case of lost types, this catalogue had to be compiled.

At present in NMNHS are housed 23 holotypes and 159 paratypes belonging to: 7 distinct coral species (*Enallhelia multiradiata* Zlatarski, 1966; *Hydnophora ackermanni* Zlatarski, 1972; *Dimorphocoeniopsis beauvaisorum* Zlatarski, 1967; *Clausastrea alloiteaui suhindolensis* Zlatarski, 1967; *Clausastrea julistephanovi* Zlatarski, 1967; *Paraclausastrea chevalieri* Zlatarski, 1968; *Paraclausastrea grandidentata* Zlatarski, 1968; *Cyclastraea meltensis* Zlatarski, 1970) and to the representatives of family Diplocteniopsidae, which contains 17 species. Unfortunately some of the type specimens of Zlatarski's new taxa were not found. Obscure is the situation of *Actinoseris? alloiteaui* Beauvais et Zlatarski, 1966 which is supposed to be deposited in the Museum, but it was not traced among the collection.

The information for each species includes data about the type locality, the holotype and information if it is available or missing, and data about the paratypes presently available in NMNHS. Original old data about the type horizon given by Zlatarski are used in the catalogue. When possible some speculations about the possible updated information concerning the horizon are given. Investigations still in progress are awaited to specify the precise stratigraphic position of the type horizons (M. Ivanov and V. Idakieva, pers. com. 2009). The catalogue also provides information about the available original thin sections. Unfortunately only few of the thin sections prepared by V. Zlatarski were found among the collection and it is often impossible to recognise which specimen they derive from.

The type specimens have 2 kinds of numeration: (1) official numeration, given when registering the specimens in NMNHS, this is the museum number (NMNHS F-xxxxx) – the so called new numeration; (2) original numeration, given by V. Zlatarski [Cr, xxxx], now preserved as old numbers and given in square brackets in this catalogue. The numeration given by Zlatarski is important for recognizing the type material, because he used it in his publications. The new numeration was assigned later, after the material was moved from GI–BAS to NMNHS. It is ink-written on the specimens or on small sheets of paper, attached to the specimens.

There were some complicated details related to the numeration, which we tried to clarify as much as possible in the catalogue: (1) the old numbers are written only on labels and in a case of lost or much damaged label it was very difficult, sometimes impossible, to recognise the type material among the huge collection, especially the not illustrated types; (2) in cases of presence of more than one specimen in a box (see *Enallhelia multiradiata*, *Hydnophora ackermanni* and *Cyclastraea meltensis*) it is not possible to decide which specimen to which old number refers; (3) during the time of their study many specimens were cut

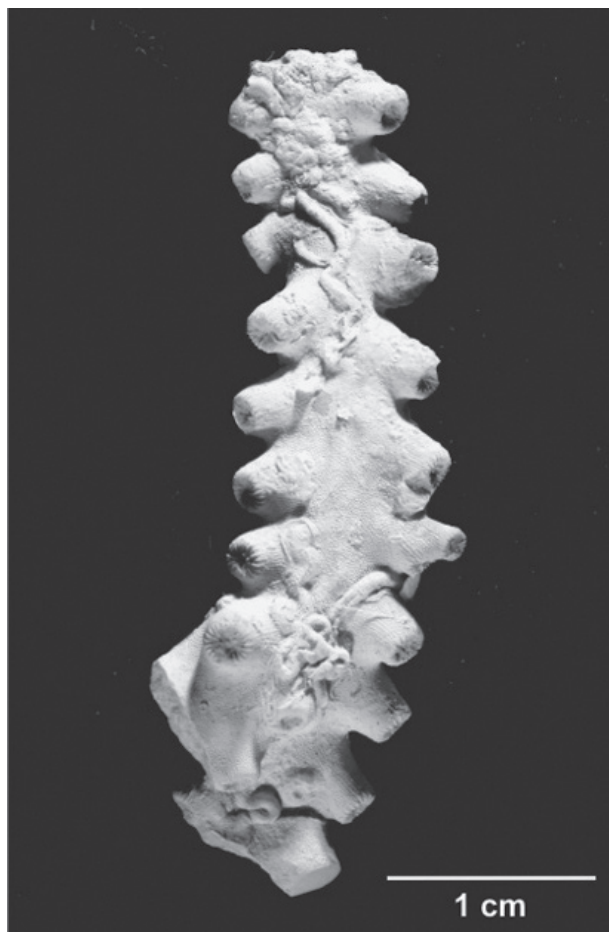
in two or more pieces for preparing thin sections. This fact was not taken into account when the new museum numeration was given. Often the pieces of original intact specimen having one old number bear now different new museum numbers, often not consecutive.

Besides the type material, NMNHS hosts also additional topotype or other material of most of the new taxa. Information about the available additional material is included only in cases of many missing types (see *Enallhelia multiradiata*, *Dimorphocoeniopsis beauvaisorum* and *Actinoseris? alloiteui*).

### Types published by Roniewicz (2008)

Recently a collection comprising about 250 specimens (in rock samples) from Lyubasha Mountain, close to the village of Lyalintsi, Pernik district was deposited in NMNHS. The material was collected in 1982 by Dr. Vassil Zlatarski and Prof. Ewa Roniewicz

(Institute of Paleobiology, Warsaw). The collection yielded ca. 400 thin sections. As a result 72 species belonging to 50 genera within 2 orders, Hexanthinaria and Scleractinia, were described (Roniewicz, 2008). The coral fauna come from continuous Late Kimmeridgian–Valanginian section. One new family, 3 new genera and 6 new species of scleractinian corals were introduced based on the Bulgarian material. In some cases the rock samples contain several different taxa, therefore they have the same collection number. They bear museum numeration NMNHS F-30057–30300. The thin sections, prepared from the rock samples, bear indexes a, b, c, etc. after the respective museum number. The whole collection and thin sections are housed at NMNHS and all specimens are available. In this catalogue we include information only about the new taxa and type material described in Roniewicz (2008). Information about the type locality, type horizon and data about the type material and the thin sections of the type material is given.



**Fig. 1.** *Enallhelia multiradiata* Zlatarski, 1966, paratype NMNHS F-22106. Batultsi village, Lovech district, Lower Cretaceous (Barremian or Aptian), Roman Fm. Photo by G. Dziewinska.

**Фиг. 1.** *Enallhelia multiradiata* Zlatarski, 1966, паратип NMNHS F-22106. Село Батулци, Ловешко, Долна Креда (Барем или Апт), Романска свита. Фотография G. Dziewinska.

### A type published by Toula (1889)

A syntype from the collection of Georgi Zlatarski from the end of 19-th century, described by Toula (1889) is also included in the catalogue (see *Stylina bulgarica*).

### Annotated catalogue and systematic position of the type specimens

Class ANTHOZOA Ehrenberg 1834  
Subclass ZOANTHARIA Blainville 1830  
Order SCLERACTINIA Bourne 1900

Suborder Stylinina Alloiteau, 1952  
Family Stylinidae d'Orbigny, 1851  
Genus *Enallhelia* Milne-Edwards et Haime, 1849  
Type species *Lithodendron compressum* Goldfuss, 1829

*Enallhelia multiradiata* Zlatarski, 1966  
Figure 1

1966. *Enallhelia multiradiata* n. sp. Zlatarski, p. 145, Pl. I, figs 1–9.

**Type locality:** Three km NW from Batultsi village, Lovech district.

**Type horizon:** Lower Cretaceous (Barremian or Aptian), Roman Fm (Zlatarski, 1966).

**Holotype:** Cr<sub>1</sub> 5053 – illustrated in Zlatarski (1966, Pl. I, fig. 4), not found.

**Paratypes:** 30 [Cr<sub>1</sub> 5054–Cr<sub>1</sub> 5083]. Available in NMNHS – 4 paratypes: NMNHS F-22103–22106 [Cr<sub>1</sub> 5080–5083]. NMNHS F-22106 is illustrated here on Fig. 1.

**Additional material:** Eleven specimens: NMNHS F-23145–23155 from NE from Yoglav village, Lovech district, Aptian?

**Remarks:** Ten thin sections (12/V.Z.–21/V.Z.) made by Dr. Zlatarski, but not mentioned in the publication. The specimens, they were made from, are not known. Probably they were completely destroyed for preparing the thin sections.

Genus *Stylina* Lamarck, 1816  
Type species *Stylina echinulata* Lamarck, 1816

*Stylina bulgarica* (Toula, 1889)  
Figure 2

1889. *Placocoenia bulgarica* – Toula, p. 82, Pl. 6, Fig. 1c.

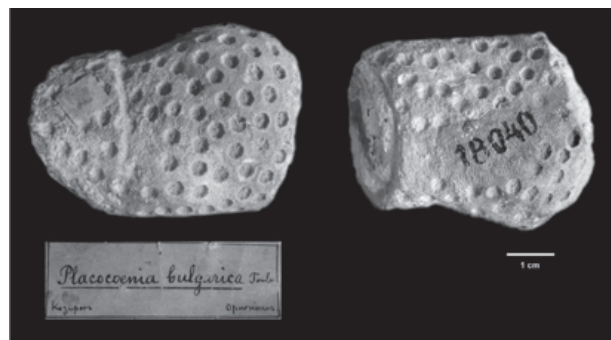
**Type locality:** Kozi rog village, Gabrovo district.

**Type horizon:** Lower Cretaceous (Barremian?).

**Syntype:** NMNHS F-18040 (illustrated here on Fig. 2).

**Remarks:** This is one of the two syntypes, described by Toula (1889). In his description Toula has mentioned 2 specimens, one collected by himself and a second one from the collection of Georgi Zlatarski. NMNHS F-18040 is the one from G. Zlatarski's collection. Although Toula (1889, Pl. 6, Fig 1c.) has figured only a portion of this specimen to show its peculiarities, it was possible to recognize the syntype because of the well described anomalous region 1 cm wide deprived of columella. This anomalous region was used by previous curators in NMNHS to put the new museum number (see Fig. 2). The first syntype is deposited in Vienna Natural History Museum under the registration number 1967/0695/0002. According to the personal communication by Dr Hannes Loeser who examined pictures of NMNHS F-18040, our syntype is conspecific with the first one and both belong to the genus *Stylina*, not to *Placocoenia*. This is visible even without a thin section because of the very prominent columella and small ear like ornamentations (auriculae) at the septal inner borders.

It is not clear why and how this specimen has been deposited in NMNHS. Historically the mate-



**Fig. 2.** *Stylina bulgarica* (Toula, 1889), syntype NMNHS F-18040 with the original label. Kozi rog village, Gabrovo district, Lower Cretaceous (Barremian?). Photo by N. Motchurova-Dekova.

**Фиг. 2.** *Stylina bulgarica* (Тюла, 1889), синтип NMNHS F-18040 с оригиналния етикет. Село Кози рог, Габровско, Долна Креда (Барем?). Фотография Н. Мочурова-Декова.

rial of G. Zlatarski is supposed to be deposited in the Palaeontological Museum of the Sofia University (M. Ivanov, pers. comm. 2009). However, this syntype bears museum number of NMNHS. Its supposed old number is worn off from the small sticker originally fixed on the specimen. Until further clarifications between both museums, we will keep the specimen and it will be available for examination. However, it is possible specimen NMNHS F-18040 to be moved to the Palaeontological Museum of the Sofia University in the future.

Suborder Faviina Vaughan & Wells, 1943  
Family Faviidae Gregory, 1900

Genus *Hydnophora* Fischer de Waldheim, 1807  
Type species *Hydnophora demodovii* Fischer de Waldheim, 1807

*Hydnophora ackermanni* Zlatarski, 1972

1972. *Hydnophora ackermanni* n. sp. Zlatarski, p. 267, Pl. I, Figs. 1–4.

**Type locality:** north of the railway station in Lovech.

**Type horizon:** Aptian, Smochan Fm (Zlatarski, 1972). According to more recent studies published by Ivanov et al. (1997) in the area of Lovech the boundary between Barremian and Aptian lies within the upper part of Smochan Fm. The distribution of the taxon continues up in the Devetaki Fm (Zlatarski, 1972). Since from the paper of Zlatarski it is not clear which exact part of Smochan Fm the holotype was collected from, we could suggest a wider stratigraphical range, namely Barremian–Aptian, within which the exact type horizon of *H. ackermanni* could be.

**Holotype:** NMNHS F-17760 [Cr<sub>1</sub> 6498] – illustrated in Zlatarski (1972, Pl. I, Figs. 1–3).

**Paratypes:** 110 [Cr<sub>1</sub> 6416–6497 and Cr<sub>1</sub> 6499–6526]. Available in NMNHS – 69 paratypes in total: 20 specimens NMNHS F-15220–15239 [Cr<sub>1</sub> 6416–6437]; ten specimens NMNHS F-20787–20796 [Cr<sub>1</sub> 6457–6472]; 19 specimens NMNHS F-17963–17982 (17967 missing) [Cr<sub>1</sub> 6478–6497]; ten specimens NMNHS F-27611–27620 [Cr<sub>1</sub> 6499–6510]; ten specimens NMNHS F-24004–24013 [Cr<sub>1</sub> 6511–6526].

**Remarks:** The ranges of the old numbers often include more specimens than the ranges of the museum numbers. NMNHS F-17963 is illustrated in Zlatarski (1972, Pl. I, Fig. 4).

Family Montlivaltiidae Dietrich, 1926

Genus *Dimorphocoeniopsis* Zlatarski, 1967  
Type species *Dimorphocoeniopsis beauvaisorum* Zlatarski, 1967

*Dimorphocoeniopsis beauvaisorum* Zlatarski, 1967  
Figure 3

1967b. *Dimorphocoeniopsis beauvaisorum* n. sp. Zlatarski, p. 1318, Pl. I, Figs. 1–5; Pl. II, Figs. 1–4.

**Type locality:** SW from fountain “Stublata”, SW from quarter Goznitsa, Lovech. The locality is already covered (V. Zlatarski and B. Kołodziej, pers. com).

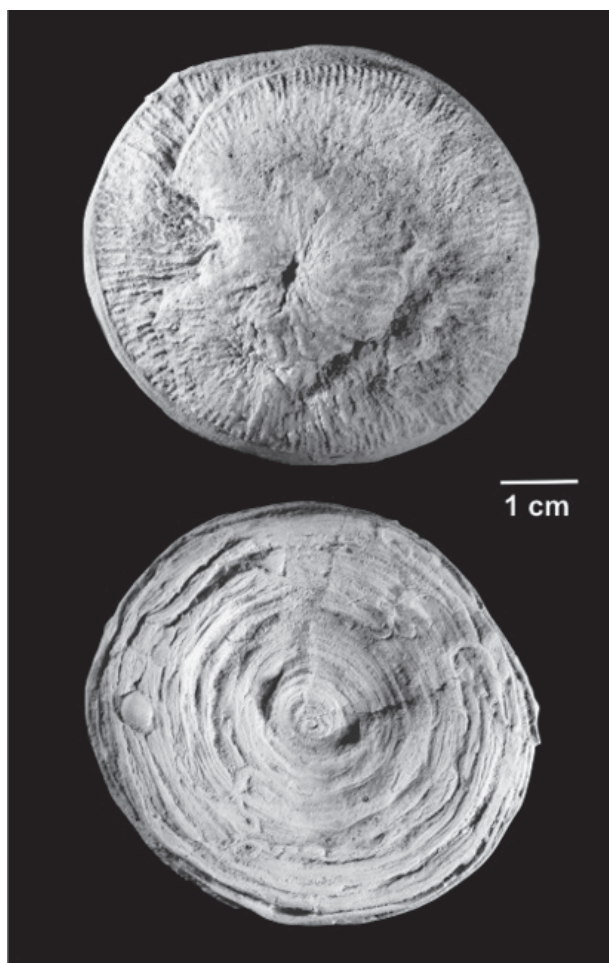
**Type horizon:** Lower part of Smochan Fm. Zlatarski (1967b) gives probable Aptian type horizon. Idakieva and Ivanov (2002) comment several coral buildups occurring also in the basal part of Smochan Fm in the surroundings of Lovech. Based also on earlier works by Ivanov and Nikolov (1995) and Ivanov et al. (1997) these authors suggest formation of the buildups from the lower parts of Smochan Fm during the middle of the Late Barremian. Thus, it is quite probable the type horizon of *Dimorphocoeniopsis beauvaisorum* to be within the Upper Barremian.

**Holotype:** NMNHS F-20024 [Cr<sub>1</sub> 5085] – illustrated in Zlatarski (1967b, Pl. I, Figs. 1, 3, 4).

**Paratypes:** 875 [Cr<sub>1</sub> 5086–5094]; [Cr<sub>1</sub> 5522–6362] and Cr<sub>1</sub> [6376–6380]. Available in NMNHS – 43 paratypes, all with the prefix NMNHS F-: 24058 [Cr<sub>1</sub> 5086]; 23627

[Cr<sub>1</sub> 5087]; 24060 [Cr<sub>1</sub> 5088]; 23815 [Cr<sub>1</sub> 5089]; 23063 [Cr<sub>1</sub> 5090]; 19559 [Cr<sub>1</sub> 5091]; 18084 [Cr<sub>1</sub> 5092]; 23816 [Cr<sub>1</sub> 5093]; 19560 [Cr<sub>1</sub> 5094]; 19558 [Cr<sub>1</sub> 5522]; 23059 [Cr<sub>1</sub> 5523]; 23067 [Cr<sub>1</sub> 5524]; 22067 [Cr<sub>1</sub> 5525]; 23820 [Cr<sub>1</sub> 5526]; 23070 [Cr<sub>1</sub> 5527]; 23071 [Cr<sub>1</sub> 5528]; 23819 [Cr<sub>1</sub> 5529]; 24063 [Cr<sub>1</sub> 5530]; 23818 [Cr<sub>1</sub> 5531]; 23062 [Cr<sub>1</sub> 5532]; 23446–23447 [Cr<sub>1</sub> 5533]; 21848 [Cr<sub>1</sub> 5534]; 23065 [Cr<sub>1</sub> 5535]; 23813 [Cr<sub>1</sub> 5536]; 23629 [Cr<sub>1</sub> 5537]; 24064 [Cr<sub>1</sub> 5538]; 23814 [Cr<sub>1</sub> 5539]; 23326 [Cr<sub>1</sub> 5540]; 21846 [Cr<sub>1</sub> 5541]; 23628 [Cr<sub>1</sub> 5542]; 23064 [Cr<sub>1</sub> 5543]; 23336–23337 [Cr<sub>1</sub> 5544]; 23060 [Cr<sub>1</sub> 5545]; 23066 [Cr<sub>1</sub> 5546]; 21845 [Cr<sub>1</sub> 5547]; 23817 [Cr<sub>1</sub> 5548]; 23068–23069 [Cr<sub>1</sub> 5549]; 23072 [Cr<sub>1</sub> 5550]; 23061 [Cr<sub>1</sub> 5551].

**Additional material:** Enormous collection of about 920 specimens from the type locality is preserved in NMNHS. Probably the missing paratypes are among them, but they could not be recognised because labels with old numbers were not found. The topotype NMNHS F-26460 is illustrated here on Fig. 3.



**Fig. 3.** *Dimorphocoeniopsis beauvaisorum* Zlatarski, 1967, topotype NMNHS F-26460. South–West from Goznitsa village, Lovech district, Upper Barremian. Photo by G. Dziewinska.

**Фиг. 3.** *Dimorphocoeniopsis beauvaisorum* Zlatarski, 1967, топотип NMNHS F-26460. Югозападно от с. Гозница, Ловешко, Горен Барем. Фотография G. Dziewinska.

Family Clausastraeidae Alloiteau, 1952 emend.

Alloiteau, 1960

Genus *Clausastrea* d’Orbigny, 1849

Type species *Clausastrea tessellata* d’Orbigny, 1850

*Clausastrea alloiteaui suhindolensis* Zlatarski, 1967

1967a. *Clausastrea alloiteaui suhindolensis* n. subsp. Zlatarski, p. 25, Pl. I, Figs. 1–3; Pl. II, Figs. 1–6.

**Type locality:** On the east slope of the hill “Varha”, 1.5 km N from Suhindol town, Veliko Tarnovo district.

**Type horizon:** About 60 m above the boundary of Devetaki Fm, Aptian (Zlatarski, 1967a). Probably Lower Aptian (see Ivanov and Nikolov, 1995).

**Holotype:** Cr<sub>1</sub> 5095 – illustrated in Zlatarski (1967a, Pl. I, Figs. 1–3) – not found.

**Paratypes:** 13 [Cr<sub>1</sub> 5096–5108]. Available in NMNHS – 4 paratypes: NMNHS F-23320 [Cr<sub>1</sub> 5098], NMNHS F-23822 [Cr<sub>1</sub> 5099], NMNHS F-23748 [Cr<sub>1</sub> 5103], NMNHS F-20026 [Cr<sub>1</sub> 5105].

**Remarks:** Illustrations in Zlatarski (1967a): NMNHS F-23320 (Pl. II, Fig. 5); NMNHS F-23822 (Pl. II, Fig. 4).

*Clausastrea julistephanovi* Zlatarski, 1967

1967a. *Clausastrea julistephanovi* n. sp. Zlatarski, p. 27, Pl. III, Fig. 1; Pl. IV, Fig. 1; Pl. V, Figs. 1–7; Pl. VI, Figs. 1–3; Pl. VII, Figs. 1–3.

**Type locality:** The valley Solu dere (Solou dere), 4.8 km SE from Doyrentsi (Doirentzi) village, Lovech District.

**Type horizon:** Upper parts of Smochan Fm, about 25 m below the boundary with Devetaki Fm, Aptian (Zlatarski, 1967a). Since Ivanov and Nikolov (1995) place the boundary between Barremian and Aptian in

the middle part of Smochan Fm (see also Ivanov et al., 1997, Fig. 2, the scheme about the Lovech sector), we are not sure if the type horizon of *Clausastrea julistephanovi* is below or above this boundary. The same remark applies also to the following taxa collected from the same type horizon and locality (see below): *Paraclausastrea chevalieri*, *Paraclausastrea grandidentata*, *Cyclastraea meltensis* and all the taxa from family Diplocteniopsidae.

**Holotype:** NMNHS F-29654 [Cr<sub>1</sub> 5109] – illustrated in Zlatarski (1967a, Pl. III, Fig. 1; Pl. IV, Fig. 1; Pl. V, Figs. 1–7).

**Paratypes:** The two paratypes are available: NMNHS F-23824 [Cr<sub>1</sub> 5110], NMNHS F-23632, 23633 [Cr<sub>1</sub> 5111a–b].

**Remarks:** Illustrations in Zlatarski, 1967a: NMNHS F-23824 (Pl. VI, Figs. 1–3); NMNHS F-23632; 23633 (Pl. VII, Figs. 1–3). A thin section 23632–23633a is available.

Genus *Paraclausastrea* Zlatarski, 1968

Type species *Paraclausastrea chevalieri* Zlatarski, 1968

*Paraclausastrea chevalieri* Zlatarski, 1968

Figure 4

1968b. *Paraclausastrea chevalieri* n. sp. Zlatarski, p. 160, Pl. I, Fig. 1; Pl. II, Figs. 1–2; Pl. III, fig. 1.

**Type locality:** The valley Solu dere (Solou dere), 4.8 km SE from Doyrentsi (Doïrentzi) village, Lovech District.

**Type horizon:** Upper parts of Smochan Fm, about 25 m below the boundary with Devetaki Fm, Aptian stage (Zlatarski, 1968b). Concerning the type horizon, see the remark above for *Clausastrea julistephanovi*, collected from the same type horizon and locality.

**Holotype:** NMNHS F-29854 [Cr<sub>1</sub> 6363–Cr<sub>1</sub> 6363 a, b, c] Cr<sub>1</sub> 6363a (dimensions 59x55x15.5 cm) – illustrated in Zlatarski (1968b, Pl. I, Fig. 1) and here in Fig. 4.

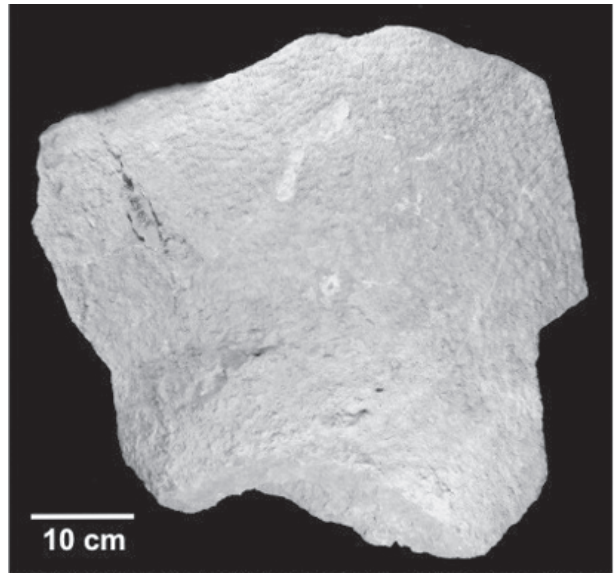
**Paratypes:** Ten [Cr<sub>1</sub> 6364–6373]. Available in NMNHS – 9 paratypes, all with the prefix NMNHS F-: 28999–29000 [Cr<sub>1</sub> 6364 a, b], 29001 [Cr<sub>1</sub> 6365], 26115–26116 [Cr<sub>1</sub> 6366], 28998 [Cr<sub>1</sub> 6367], 29860–29861 [Cr<sub>1</sub> 6368], 27732–27733 [Cr<sub>1</sub> 6370], 27713–27715 [Cr<sub>1</sub> 6371], 29691 [Cr<sub>1</sub> 6372], 26138 [? Cr<sub>1</sub> 6373].

**Remarks:** Illustrations in Zlatarski (1968b): NMNHS F-28999–29000 (Pl. II, Fig. 2 [only Cr<sub>1</sub> 6364 a]), NMNHS F-29001 (Pl. II, Fig. 1; Pl. III, Fig. 1). Two thin section are available – 27713–27715 a, b.

NMNHS F-28999–29000 was recently redetermined by V. Tchechmedjieva and M. Tencheva as *Paraclausastrea* cf. *grandidentata* and NMNHS F-28998 was redetermined as *Paraclausastrea* cf. *chevalieri*.

*Paraclausastrea grandidentata* Zlatarski, 1968

1968b. *Paraclausastrea grandidentata* n. sp. Zlatarski, p. 161, Pl. 4, Figs. 1–2.



**Fig. 4.** *Paraclausastrea chevalieri* Zlatarski, 1968, holotype NMNHS F-29854. Solu dere (Solou dere), 4.8 km SE from Doyrentsi (Doïrentzi) village, Lovech district. Upper part of Smochan Fm, Uppermost Barremian?–Lower Aptian? Photo by T. Lezy.

**Фиг. 4.** *Paraclausastrea chevalieri* Zlatarski, 1968, холотип NMNHS F-29854. Солу дере, 4,8 km североизточно от с. Дойренци, Ловешко. Горни части на Смочанска свита, Горен Барем?–Долен Апт? Фотография Т. Леzy.

**Type locality:** The valley Solu dere (Solou dere), 4.8 km SE from Doyrentsi (Doïrentzi) village, Lovech district.

**Type horizon:** Upper parts of Smochan Fm, about 25 m below the boundary with Devetaki Fm, Aptian (Zlatarski, 1968b). Concerning the type horizon, see the remark above for *Clausastrea julistephanovi*, collected from the same type horizon and locality.

**Holotype:** NMNHS F-29695–29696 [Cr<sub>1</sub> 6374 a, b] – illustrated in Zlatarski (1968b, Pl. IV, Figs. 1–2.)

**Paratype:** One paratype available NMNHS F-28996–28997 [Cr<sub>1</sub> 6375 a, b].

Family Diplocteniopsidae Zlatarski, 1968

**Remarks:** According to Baron-Szabo (2002) the genera of this family *Diplocteniopsis* Zlatarski, 1968, *Paradiplocteniopsis* Zlatarski, 1968 and *Plesiodiplocteniopsis* Zlatarski, 1968 might be synonymous with the genus *Tortoflabellum* Squires, 1958 from the family Meandrinidae Gray, 1857. However, *Tortoflabellum* is known only from Maastrichtian to Miocene.

Genus *Diplocteniopsis* Zlatarski, 1968

Type species *Diplocteniopsis curvicalix* Zlatarski, 1968

**Type locality of all species:** The valley Solu dere (Solou dere), 4.8 km SE from Doyrentsi (Doïrentzi) village, Lovech District.

**Type horizon of all species:** Upper parts of Smochan Fm, about 25 m below the boundary with Devetaki Fm, Aptian (Zlatarski, 1968a). Concerning the type horizon, see the remark above for *Clausastrea julistephanovi*, collected from the same type horizon and locality.

**Remarks:** All taxa from this genus and the other genera of the family are collected from the same locality and horizon. All holotypes and paratypes of the species, belonging to genus *Diplocteniopsis* are available in NMNHS (Table 1).

Genus *Paradiplocteniopsis* Zlatarski, 1968

Type species *Paradiplocteniopsis acutangularis* Zlatarski, 1968

**Remarks:** All taxa from the genus are collected from the same locality and horizon. See the type locality and the type horizon for the species in genus *Diplocteniopsis*. All holotypes and paratypes men-

Table 1  
*Holotypes and paratypes of species belonging to the genus Diplocteniopsis*

Таблица 1  
*Холотипове и паратипове на видовете, включени в род Diplocteniopsis*

<i>Museum number</i> NMNHS F-	<i>Old number</i>	<i>Illustrated in Zlatarski,</i> 1968a	<i>Type</i>
29880	Cr <sub>1</sub> 5001	<i>Diplocteniopsis (Diplocteniopsis) curvicalix</i> Zlatarski, 1968, p. 53 Pl. I, Figs. 4–9	Holotype
29879	Cr <sub>1</sub> 5002	<i>Diplocteniopsis (Diplocteniopsis) recticalix</i> Zlatarski, 1968, p. 56 Pl. II, Figs. 1, 3–4	Holotype
29884	Cr <sub>1</sub> 5003	Pl. II, Figs. 5–8	Paratype
29882	Cr <sub>1</sub> 5004	<i>Diplocteniopsis (Diplocteniopsis) curvilateralis</i> Zlatarski, 1968, p. 57 Pl. III, Figs. 1–7	Holotype
29885	Cr <sub>1</sub> 5005	<i>Diplocteniopsis (Diplocteniopsis) rhipidoida</i> Zlatarski, 1968, p. 57 Pl. IV, Figs. 1–4	Holotype
29920	Cr <sub>1</sub> 5006	<i>Diplocteniopsis (Diplocteniopsis) parallelacostata</i> Zlatarski, 1968, p. 58 Pl. II, Figs. 2, 9	Holotype
29883	Cr <sub>1</sub> 5007	<i>Diplocteniopsis (Diplocteniopsis) grandis</i> Zlatarski, 1968, p. 59 Pl. IV, Figs. 5–6	Holotype
29922–29923	Cr <sub>1</sub> 5008	–	Paratype
29886	Cr <sub>1</sub> 5009	<i>Diplocteniopsis (Diplocteniopsis) parallelolateralis</i> Zlatarski, 1968, p. 60 –	Holotype
29881	Cr <sub>1</sub> 5010	Pl. I, Figs. 1–3	Paratype
29890	Cr <sub>1</sub> 5012	<i>Diplocteniopsis (Ondadiplocteniopsis) altae</i> Zlatarski, 1968, p. 62 Pl. VIII, Figs. 1–4	Holotype
29891	Cr <sub>1</sub> 5013	<i>Diplocteniopsis (Ondadiplocteniopsis) rectilateralis</i> Zlatarski, 1968, p. 63 Pl. V, Figs. 3, 6–8	Holotype
29892–29893	Cr <sub>1</sub> 5014	–	Paratype
29894	Cr <sub>1</sub> 5015	–	Paratype
29895	Cr <sub>1</sub> 5016	<i>Diplocteniopsis (Ondadiplocteniopsis) dilatata</i> Zlatarski, 1968, p. 64 Pl. VI, Figs. 1, 2, 5	Holotype
29887–29889	Cr <sub>1</sub> 5017	Pl. VII, Figs. 1–7	Paratype

Table 2

Holotypes and paratypes of species belonging to the genus *Paradiplocteniopsis*

Таблица 2

Холотипове и паратипове на видовете, включени в род *Paradiplocteniopsis*

Museum number NMNHS F-	Old number	Illustrated in Zlatarski, 1968a	Type
<i>Paradiplocteniopsis acutangularis</i> Zlatarski, 1968, p. 67			
29900-29901	Cr <sub>1</sub> 5019	Pl. V, Figs. 1-2, 4-5	Holotype
29898-29899	Cr <sub>1</sub> 5018	-	Paratype
29896-29897	Cr <sub>1</sub> 5021	-	Paratype
<i>Paradiplocteniopsis obtusangularis</i> Zlatarski, 1968, p. 68			
29903	Cr <sub>1</sub> 5022	Pl. IX, Figs. 1-3	Holotype
29904	Cr <sub>1</sub> 5023	Pl. IX, Figs. 4-6	Paratype
<i>Paradiplocteniopsis? trilateralis</i> Zlatarski, 1968, p. 69			
29902	Cr <sub>1</sub> 5024	Pl. X, Figs. 1-6	Holotype

tioned in the publication are available in NMNHS (Table 2).

Genus *Plesiodiplocteniopsis* Zlatarski, 1968

Type species *Plesiodiplocteniopsis obtusangularis* Zlatarski, 1968

**Remarks:** All taxa from the genus are collected from the same locality and horizon. See the type locality and the type horizon for the species in genus *Diplocteniopsis*. All holotypes and paratypes mentioned in the publication are available in NMNHS (Table 3).

Family Misistellidae Eliášová, 1976

Genus *Lyubasha* Roniewicz, 2008

Type species *Lyubasha gracilis* Roniewicz, 2008

*Lyubasha gracilis* Roniewicz, 2008  
Figure 5

2008. *Lyubasha gracilis* Roniewicz, p. 113, Fig. 10 A-C.

**Type locality:** Lyubasha Mountain, Lyalintsi, Pernik district.

**Type horizon:** Valanginian, Slivnitsa Formation, 325 m level of the section Lyalintsi.

Table 3

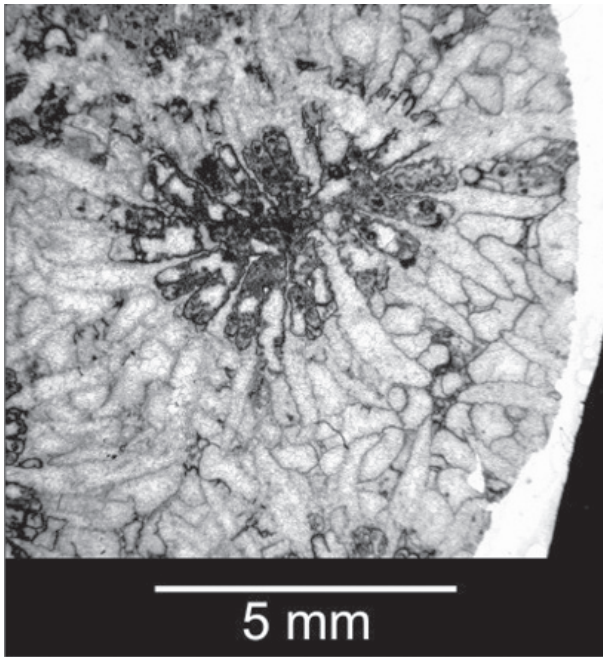
Holotypes and paratypes of species belonging to the genus *Plesiodiplocteniopsis*

Таблица 3

Холотипове и паратипове на видовете, включени в род *Plesiodiplocteniopsis*

Museum number NMNHS F-	Old number	Illustrated in Zlatarski, 1968a	Type
<i>Plesiodiplocteniopsis obtusangularis</i> Zlatarski, 1968, p. 72			
29907	Cr <sub>1</sub> 5025	Pl. XI, Figs. 5-8	Holotype
29906	Cr <sub>1</sub> 5026	Pl. VI, Figs. 6-7	Paratype
29912-29913	Cr <sub>1</sub> 5027	-	Paratype
<i>Plesiodiplocteniopsis acutangularis</i> Zlatarski, 1968, p. 73			
29910-29911	Cr <sub>1</sub> 5028	Pl. XI, Figs. 1-2	Holotype
<i>Plesiodiplocteniopsis dichotoma</i> Zlatarski, 1968, p. 74			
29909	Cr <sub>1</sub> 5029	Pl. XI, Figs. 3-4	Holotype
29908	Cr <sub>1</sub> 5030	-	Paratype
29905	Cr <sub>1</sub> 5031	-	Paratype
<i>Plesiodiplocteniopsis praeramificenta</i> Zlatarski, 1968, p. 75			
29915	Cr <sub>1</sub> 5035	Pl. XII, Figs. 1-4	Holotype





**Fig. 5.** *Lyubasha gracilis* Roniewicz, 2008, the holotype – thin section NMNHS F-30107a. Lyubasha Mountain, Lyalintsi, Pernik district, Valanginian. Photo by E. Roniewicz.

**Фиг. 5.** *Lyubasha gracilis* Roniewicz, 2008, холотип – дюншлиф NMNHS F-30107a. Планина Любаша, Лялинци, Пернишко, Валанжин. Фотография Е. Roniewicz.

**Holotype:** NMNHS F-30107-1, -2.

**Remarks:** Three thin sections, 30107a, b, c, made from the holotype are available, two of them being illustrated in Roniewicz, 2008 (30107a – on Fig. 10 A, B and 30107c – on Fig. 10 C). The holotype is reproduced here on Fig. 5.

Suborder Fungiina Verrill, 1865

Family Fugiidae Dana, 1846

Genus *Cyclastraea* Alloiteau, 1952

Type species *Cyclolites spinosa* de Fromentel, 1870

**Remark:** According to Baron-Szabo (2002) *Cyclastraea* Alloiteau, 1952 can be a synonym of the genus *Cycloseris* Milne-Edwards et Haime, 1849.

*Cyclastraea meltensis* Zlatarski, 1970

1970. *Cyclastraea meltensis* Zlatarski, p. 201, pl. I, figs 1-10.

**Type locality:** The valley Solu dere (Solou dere), 4.8 km SE from Doyrentsi (Doirentzi) village, Lovech district.

**Type horizon:** Upper parts of Smochan Fm, about 25 m below the boundary with Devetaki Fm, Aptian (Zlatarski, 1970). Since Ivanov and Nikolov (1995) place the boundary between Barremian and Aptian in the middle part of Smochan Fm (see also Ivanov et al.,

1997, Fig 2, the scheme about the Lovech sector), we are not sure if the type horizon of *Cyclastraea meltensis* will be below or above this boundary.

**Holotype:** NMNHS F-29928 [Cr<sub>1</sub> 5036] – illustrated in Zlatarski (1970, Pl. I, Figs. 1–10).

**Paratypes:** Of the 22 paratypes, 15 are available in the museum: NMNHS F-29926 [Cr<sub>1</sub> 5037], three specimens 29927-1, -2, -3 [Cr<sub>1</sub> 5038–5040], 11 specimens 13972–13982 [Cr<sub>1</sub> 5041–5051].

**Remark:** Two thin sections are available, made of NMNHS F-29927-1

Family Siderastraeidae Vaughan et Wells, 1943  
(faut de mieux)

Genus *Siderastreites* Roniewicz, 2008

Type species *Siderastreites lyalintensis* Roniewicz, 2008

*Siderastreites lyalintensis* Roniewicz, 2008

2008. *Siderastreites lyalintensis* n. sp. Roniewicz, p. 126, Fig. 15 A–D.

**Type locality:** Lyubasha Mountain, Lyalintsi, Pernik district.

**Type horizon:** Valanginian, Slivnitsa Formation, 420 m level of the Lyalintsi section.

**Holotype:** NMNHS F-30246, illustrated in Roniewicz (2008, Fig. 15 A).

**Remarks:** Four thin sections were made: NMNHS F-30246a (illustrated in Roniewicz, 2008, Fig. 15 B, C), 30246b, 30246c (illustrated in Roniewicz, 2008, Fig. 15 D) and 30246d.

Family Microbaciidae Vaughan, 1905

Genus *Actionoseris* d'Orbigny, 1849

Type species *Actinoseris cenomaniensis* d'Orbigny, 1850

**Remark:** According to Baron-Szabo (2002) *Actionoseris* d'Orbigny, 1849 can be synonym of the genus *Microbacia* Milne-Edwards et Haime, 1849.

*Actinoseris? alloiteau* Beauvais et Zlatarski, 1966

1966. *Actinoseris? alloiteau* n. sp. Beauvais & Zlatarski, p. 1171, Pl. 1, Figs. 1–10, text Fig. 1.

**Type locality:** About 1.5 km North-West from Pushevo village, Veliko Tarnovo district.

**Type horizon:** Lower Cretaceous (Barremian or Aptian) according Beauvais and Zlatarski (1966). Transition Balgarene–Emen Formations. According to Ivanov and Nikolov (1995) the exposures of the Lovech Urgonian Group around Veliko Tarnovo are of Barremian age, thus, it is quite probable that the type horizon lies within the Barremian. Tchecmedjieva (2001) describes colonial scleractinian corals from a locality North–West of Pushevo occurring at the transition between Balgarene and Emen Formations,

which could well be the same as the type locality of *Actinoseris? alloiteaui*. Based on previous stratigraphic works she assumes Early Barremian age of her locality. Idakieva (2002) mentions a close coral locality (north of Pushevo) of early Barremian age within Bulgarene Fm.

**Holotype:** Cr<sub>1</sub> 5084 – illustrated in Beauvais & Zlatarski (1966, Pl. I, Figs. 1–2) – not found.

**Paratypes:** 411 – 7 of them in the Sorbonne – coll. L. Beauvais; 404 paratypes are supposed to be in Bulgaria – Cr<sub>1</sub> 5113–5517, but none of them was found in NMNHS' collection.

**Remarks:** Some additional material of this species from the Barremian is available at NMNHS: eight specimens from South of Balvan village, Veliko Tarnovo district, NMNHS F-18188–18190, 18192–18194, 18197–18198; 15 specimens from Balvan village, Veliko Tarnovo district, 23389–23403; 15 specimens from North of railway station, Lovech, 23509–23523.

Suborder Rhipidogyrina Roniewicz, 1976  
Family Aulastreaoporidae Alloiteau, 1957  
Genus *Oedalmiopsis* Roniewicz, 2008  
Type species *Oedalmiopsis cretacea*  
Roniewicz, 2008

*Oedalmiopsis cretacea* Roniewicz, 2008

2008. *Oedalmiopsis cretacea* n. sp. Roniewicz, p. 109, Fig. 8 D–G, J, K.

**Type locality:** Lyubasha Mountain, Lyalintsi, Pernik district.

**Type horizon:** Slivnitsa Formation, interval between 421 and 427 m of the Lyalintsi section, Valanginian.

**Type material:** Two syntypes were selected: NMNHS F-30251 (illustrated by Roniewicz, 2008, Fig. 8 E) and 30252.

**Remark:** According to Roniewicz (2008) both syntypes may be fragments of one colony. The syntype 30252 was expended for preparing four thin sections: 30252a (Fig. 8 K), 30252b, 30252c (Fig. 8 F, G, J), 30252d.

Suborder Microsolenina Morycowa et  
Roniewicz, 1995  
Family Synastreaeidae Alloiteau, 1952  
Genus *Synastrea* Milne-Edwards et Haime, 1848  
Type species *Astrea agaricites* Goldfuss, 1826

*Synastrea microsolenoides* Roniewicz, 2008

2008. *Synastrea microsolenoides* n. sp. Roniewicz, p. 119, Fig. 12 L, O–R.

**Type locality:** Lyubasha Mountain, Lyalintsi, Pernik district.

**Type horizon:** Kimmeridgian/Tithonian, Slivnitsa Formation, 102 m level of the Lyalintsi section.

**Distribution:** The species is known from Kimmeridgian/Tithonian to Valanginian in Lyubasha Mountain, Lyalintsi.

**Type material:** A holotype from the type horizon, NMNHS F-30061. Three topotypes: 30060 from the type horizon and two from the Valanginian: 30188, 30258.

**Remarks:** The holotype comes from the lower part (of Kimmeridgian/Tithonian) of the section. However, specimens of this species were recognised also in Valanginian.

Five thin sections are available, four of which are illustrated in Roniewicz (2008): 30060a (Fig. 12 L), 30060b, two from the holotype, 30061a, b (Fig. 12 O, R), 30188b (Fig. 12 P).

Family Latomeandridae Alloiteau, 1952,  
emend. Roniewicz, 1976

Genus *Latomeandra* Milne-Edwards et Haime, 1848  
Type species: *Lithodendron plicatum*  
Goldfuss, 1826

*Latomeandra obliqua* Roniewicz, 2008

2008. *Latomeandra obliqua* n. sp. Roniewicz, p. 120, Fig. 13 F, I, M.

**Type locality:** Lyubasha Mountain, Lyalintsi, Pernik district.

**Type horizon:** Valanginian, Slivnitsa Formation, interval from 359 m to 377 m of the Lyalintsi section.

**Type material:** Two specimens. None of them was indicated as a holotype, both are indicated as type series: NMNHS F-30135-1, -2, -3, -4 (illustrated in Roniewicz, 2008, Fig. 13 F, M) and 30137.

**Remarks:** Four thin sections are available deriving from one of the specimens – 30135a, b, c and 30135d (Fig. 13 I) and one thin section from the second specimen – 30137a.

Genus *Microphyllia* d'Orbigny, 1849  
Type species *Meandrina soemmeringi*  
Münster, 1829

*Microphyllia elevata* Roniewicz, 2008

2008. *Microphyllia elevata* n. sp. Roniewicz, p. 121, Fig. 14 G–I.

**Type locality:** Lyubasha Mountain, Lyalintsi, Pernik district.

**Type horizon:** Valanginian, Slivnitsa Formation, interval from 359 m to 377 m of the Lyalintsi section.

**Distribution:** Tithonian-Valanginian, Lyubasha Mountain, Lyalintsi.

**Type material:** 26 specimens. No holotype was selected, a range of six specimens are indicated as type series: NMNHS F-30121, 30122, 30123, 30124, 30138, 30150 (see Table 4).

Table 4  
Type material of *Microphyllia elevata*

Таблица 4  
Типов материал от *Microphyllia elevata*

Museum number NMNHS F-	Thin section number NMNHS F-	Illustrated in Roniewicz, 2008	Type	Horizon
30069	30069c	–	Topotype	Tithonian
30072	30072b	–	Topotype	Tithonian
30088	30088a	–	Topotype	Tithonian–Berriasian border zone
30093	30093a	–	Topotype	Tithonian–Berriasian border zone
	30093c	–		
30101	30101b	–	Topotype	Berriasian
30102		–	Topotype	Berriasian
30107		–	Topotype	Berriasian–Valanginian border zone
30113	30113a	–	Topotype	Valanginian
	30113b	–		
30121	30121b	–	Type series	Valanginian
30122	30122a	–	Type series	Valanginian
30123	30123a	–	Type series	Valanginian
	30123b	–		
30124	30124a	–	Type series	Valanginian
30132	30132a	–	Topotype	Valanginian
30136	30136a	–	Topotype	Valanginian
	30136b	–		Valanginian
30138		Fig. 14 G	Type series	Valanginian
	30138a	Fig. 14 H		
	30138b	–		
30142		–	Topotype	Valanginian
30149	30149c	–	Topotype	Valanginian
30150-1, -2	30150a	Fig. 14 I	Type series	Valanginian
	30150b	–		
30185	30185a	–	Topotype	Valanginian
30186		–	Topotype	Valanginian
30191	30191c	–	Topotype	Valanginian
	30191d	–		
30200	30200a	–	Topotype	Valanginian
30208	–	–	Topotype	Valanginian
30237	30237a	–	Topotype	Valanginian
	30237b	–		
30244	30244a	–	Topotype	Valanginian
30275		–	Topotype	Valanginian

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Paleobiology, Warsaw) helped us with clarifications on her type material. Dr. Hannes Löser (Universidad Nacional Autónoma de México, Hermosillo) helped with identification of *S. bulgarica*. L. Gramenova (NMNHS) worked on this project during the initial period of deciphering the old documentation. Dr. V. Idakieva and Dr. M. Ivanov (Sofia University) helped in providing literature and advice. Prof. Z. Boev and S. Petrusenkov (NMNHS) supplied valuable information about the history of the collections. Prof. D. Synnyovskiy (University of Mining and Geology, Sofia) provided valuable comments on an earlier version of this catalogue.

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