Rivista Italiana di Paleontologia e Stratigrafia	volume 103	numero 3	tavole 1-3	pagine 267-292	Dicembre 1997

NEW DATA ON AMMONOIDS AND BIOSTRATIGRAPHY OF THE CLASSICAL SPATHIAN KÇIRA SECTIONS (LOWER TRIASSIC, ALBANIA)

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Key-words: Ammonoids, Biostratigraphy, Triassic, Spathian, Albania.

Riassunto. Sono presentati nuovi dati strato-per-strato su ammonoidi e loro posizione stratigrafica in tre sezioni nel Calcare di Han-Bulog del Trias Inferiore e Medio di Kçira (nord Albania). Due di queste sono verosimilmente le successioni classiche descritte da Nopcsa nel 1929. Da esse provengono le uniche due collezioni di ammonoidi del Trias Inferiore albanese non strato-per-strato note in letteratura: la collezione Arthaber, attualmente a Vienna, e la collezione Nopcsa, conservata a Londra. Su di esse è stata impostata gran parte della tassonomia dello Spatiano nella Tetide Occidentale. La porzione basale del Calcare di Han-Bulog di Kçira ha fornito i livelli ad ammonoidi più ricchi e con faune più diversificate. Nei primi 2.5 m della successione sono riconoscibili due livelli marker caratterizzati dall'acme del genere *Subcolumbites*, praticamente assente nella rimanente parte medio-alta della formazione. Queste faune basse sono ascrivibili alla zona oppeliana a *Subcolumbites-Prohungarites*, di cui viene proposta una revisione locale con l'introduzione della zona di distribuzione semplice "*Subcolumbites* beds". La porzione centrale del Calcare di Han-Bulog ha fornito solo piccoli ammonoidi a lunga distribuzione appartenenti ai generi *Procarnites, Leiophyllites* ed *Eophyllites*. Alla sommità della formazione si rinvengono faune più scarse in blocchi isolati, con forme anisiche a lunga distribuzione (*Procladiscites*, *Sturia*, *Proarcestes*, *Monophyllites*).

Abstract. New bed-by-bed data on ammonoids and their stratigraphic position within three sections from the Lower and Middle Triassic Han-Bulog Limestone of Kçira (Northern Albania) are presented. Two of the sections studied are most likely from the classical localities described by Nopcsa in 1929. They have provided the only two ammonoid collections known from the Albanian Lower Trias, which are known as Arthaber's and Nopcsa's collections, now stored in Wien and London, respectively. The ammonoids from the two collections, although sampled discontinuously (not bed-by-bed), supplied the base of a substantial part of the Spathian taxonomy in the Western Tethys. The new sampling of the basal portion of the Han-Bulog Limestone of Kçira provided the layers with the richest and most diversified faunas. Two marker levels recognized within the lowest 2.5 m of the succession are characterized by the acme of the genus *Subcolumbites*, that is practically absent in the middle-higher part of the formation. These basal faunas were assigned to the *Subcolumbites-Prohungarites* Oppel zone, whose local revision is suggested with the introduction of the taxon range zone "*Subcolumbites* beds". The middle portion of the Han-Bulog Limestone provided only small long-ranging ammonoids belonging to the genera *Procarnites, Leiophyllites* and *Eophyllites*. Scant faunas with long-ranging Anisian forms (*Procladiscites, Sturia, Proarcestes, Monophyllites*) were found at the top of the succession within isolated blocks.

Introduction.

The present paper describes the taxonomy and stratigraphic position of a continuous (bed by bed) collection of ammonoids from the Lower/Middle Triassic Han-Bulog Limestone of Kçira, northern Albania.

Kçira is a site of primary interest as it is one of the few localities in the Western Tethys, together with Chios (Greece), that is characterized by a Lower Triassic ammonoid fauna with a high degree of biodiversity (30 genera and 59 species). In contrast, the ammonoid faunas of the other Lower Triassic localities in the Western Tethys, such as Bakony (Posenato, 1992), the Werfen's localities in the Dolomites (Posenato, 1992), Muc in Dalmatia (Posenato, 1992) and Luda Kamcija in Bulgaria (Ganev, 1966; Entcheva, 1972) are typically endemic, with low diversity, and dominated by the genera *Tirolites* and *Dinarites*.

Despite its richness, the only studies of the Kçira fauna date to the beginning of the century. The pioneer of geological studies in Albania was Nopcsa (1906, 1929), whose ammonoid samples from the Han-Bulog Limestone of Kçira (not collected bed-by-bed) were studied and described by G. von Arthaber (1908, 1909, 1911). This work is of primary importance for improving the taxonomy of the Lower Triassic ammonoids, particularly since many new species were introduced. However, vertical distributions of the fossils were not reported, leaving substantial uncertainties concerning the biostratigraphy of these sequences.

The first continuous sampling of ammonoids from Kçira was obtained during the summer of 1994 by a team of Italian and Albanian geologists working on a geological project, including the magnetobiostratigraphy of the Kçira sections (see Muttoni et al., 1996).

Field work, description of the stratigraphic sections and sampling were carried out by M. Gaetani, and G. Muttoni (University of Milan) and S. Meço (University of Tirana); samples for conodonts and benthic fora-

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minifera were studied by A. Nicora (University of Milan) and R. Rettori (University of Perugia), respectively. Paleomagnetic studies were carried out by G. Muttoni and D.V. Kent (Lamont-Doherty Geological Observatory Laboratories).

The material studied is stored in the Paleontological Museum of the University of Milano.

Geological and stratigraphic frame.

Albania is included in the Dinarides s.l. and in particular, represents a sector of the range characterized by a tectonic nappes structure (Nopcsa, 1906).

Kçira is located in northern Albania and belongs to the External Mirdita Subzone (Shallo, 1992, 1994) or to the equivalent Qerret-Miliska Subzone (Godroli, 1992; Kellici, De Wever & Kodra, 1994) (Fig. 1b). The Mirdita Zone is equivalent to the Subpelagonian Zone in Greece. It overthrusts the Krasta Zone to the west (Pindos Zone in Greece), the Cukali Zone and part of the Albanian Alps to the north and in turn is overthrust by the Korabi Zone to the east (Pelagonian Zone in Greece) (Fig. 1b).

Both the External Mirdita and Qerret-Miliska Subzones consist of a volcaniclastic and terrigenous flysch unit of Late Jurassic or Early Cretaceous age (Shallo, 1992, 1994) that embeds carbonate, volcanic and radiolarite blocks. The blocks can reach considerable dimensions, ranging in size from a few meters to a few kilometers, and can also preserve a coherent stratigraphic succession from Triassic to Jurassic (the presence of Permian units has yet to be demonstrated paleontologically).

According to Muttoni et al. (1996), the flysch may represent the accretionary wedge that follows the closure of the Mirdita ocean with subduction below the Korabi microplate, while the blocks could be the remnants of the rift shoulders that bordered the Mirdita ocean.

The fossiliferous, red nodular Han-Bulog Limestone represents the Lower/Middle Triassic pelagic sedimentation on the rifted blocks with thinned crust that preceeded the opening of the oceanic basin. One block near Kçira, although disrupted tectonically, preserves the complete succession together with other Triassic and Jurassic volcanic and carbonate sediments. This block was chosen as the site for the measurements of the three stratigraphic sections described below.

Stratigraphic sections.

Three complete stratigraphic sections were measured and sampled a few meters apart in the same Han-Bulog Limestone outcrop and were named, from west to east, Kçira A (KçA), Kçira B (KçB) and Kçira G (KçG), respectively. About 250 m from this outcrop, a fossiliferous level (AK 125) was sampled at site 'E'. This level comes from the upper part of a block of Han-Bulog Limestone, but is not included in a stratigraphic section (see Fig. 1c for the location of the sections and site 'E', and Fig. 2 for lithology and thickness).

Section KçA is 42 m thick; made entirely of Han-Bulog Limestone arranged in weakly nodular layers of 2-8 cm thickness, extremely compacted and with locally amalgamated layers. The basal 5 meters of the section are intensely red, rich in clay and characterized by the presence of pervasive stylolites parallel to the bedding. The central portion is pink to pale-pink in colour, strongly recrystallized and contains, from 18 to 23 m, a set of calcite veins. In this same interval, the colour of the layers tends also to yellow-light brown. The upper part of the section is made mostly of pink packstones, rich in bioclasts and is more distinctly bedded.

Section KçB is only 4.5 m thick, made entirely of Han-Bulog Limestone, reddish in colour and corresponds lithologically to the basal part of section KçA.

The third section, KçG, was measured (9.45 m thick) and sampled for ammonoids. It is made entirely of Han-Bulog Limestone and the samples are generally yellow-light to brown on the surface and pale-pink inside.

Bedding attitudes are about 347°/34°E at KçA, 12°/45°E at KçB and vary from 340°/10°E at the bottom of KçG to 358°/40°E at the top.

KçA and KçB are most likely the localities described by Nopcsa in 1929.

Taxonomic approach.

All new material was compared directly with the only two known collections of ammonoids from the Lower Triassic of Albania, i.e. Arthaber's collection, preserved at the Paläontologische Institut of Wien (PIUW), and Nopcsa's collection, preserved at the Natural History Museum of London (NHM), both composed of material collected by Nopcsa.

Arthaber never went to Albania, but he received the ammonoids from Nopcsa (S. Meço, 1997, pers. comm.) and published three papers about them (1908, 1909, 1911). Unfortunately, Arthaber's collection is at present composed only of the types depicted in the 1908 and 1911 papers, while it is not known what happened to the other specimens. The missing portion of the collection may be preserved at NHM as part of Nopcsa's collection dated 1922, composed of material originally classified by Arthaber (see, e.g. Spath, 1934, p. 174, 182). However, the total number of specimens belonging to the same species in London and in Wien does not agree with the number of specimens reported by Arthaber in his papers. This could be due to the fact

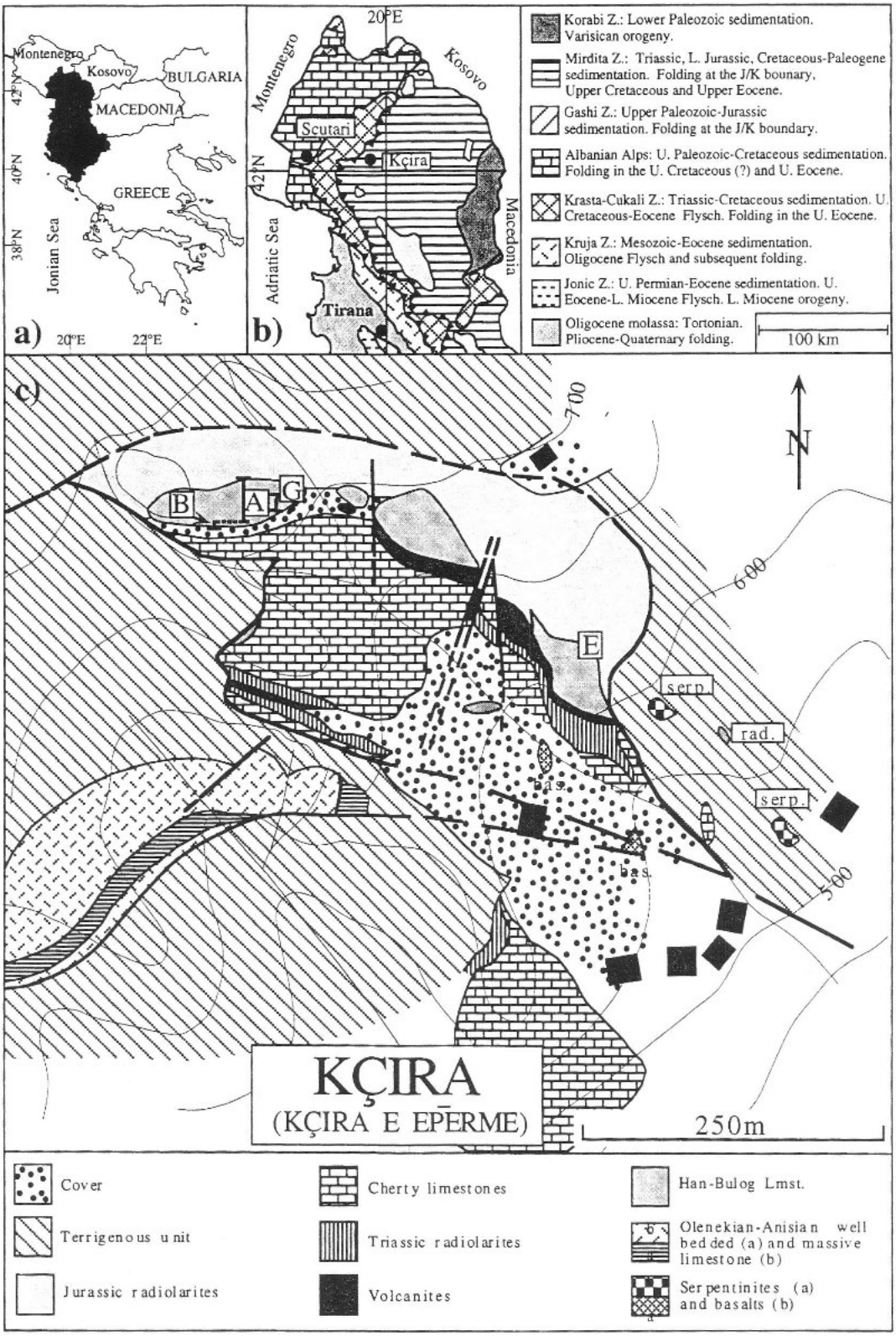


Fig. 1 - (a) Geographic location of northern Albania in the Balkan peninsula. (b) Simplified geologic map of northern Albania. The Kçira sections are located in the External Mirdita Zone. (c) Geologic map of the Kçira area. 'A', 'B' and 'G' are sections KçA, KçB, KçG; 'E' designates a site of paleontologic findings described in the text.

that Nopcsa's collection was restudied by Spath (1934), who changed the taxonomic attributions of several specimens. Unfortunately, the original labels with Arthaber's classification are lost.

An exhaustive revision of this material has yet to be produced. This may be due to the fact that the original samples were not collected bed-by-bed. The lack of stratigraphic data raises questions concerning the new species erected by Arthaber using these specimens, which should be considered only as morphospecies. Moreover, the new species were often established from only a few, or even a single, specimen which makes them artificial species.

The Albanian fauna was studied also by Spath (1934) and Kummel (1969). Spath listed and described the specimens in Nopcsa's collection, with some references to Arthaber's collection and in most cases maintained the classification originally provided by Arthaber. Sometimes he changed the taxonomic attribution of some specimens and introduced new species or *nomina nova*.

Kummel made a harder effort upon Arthaber's collection, changing the taxonomy of the Albanian fauna in a substantial way. He reduced the number of species by grouping several erected by Arthaber into few species with a high degree of intraspecific variations. However, parts of his work were criticized by Tozer (1971). When Kummel studied Arthaber's collection, it was already reduced in number of specimens. He provided new biometric measurements of the specimens and mixed them with data from other Lower Triassic collections, in order to corroborate his idea of intraspecific variability. Such a study requires the support of biostratigraphic data to distinguish normal intraspecific variability from evolutionary changes. He also redepicted some of Arthaber's specimens and their suture lines, not redrawing them, but only copying the original from Arthaber's publications (see below in 'Systematic descriptions').

The present review of Arthaber's and Nopcsa's collections consists of remeasurements of the shell dimensions, redrawing of the suture lines and study of the whorl sections by moulding and casting.

The new collection from Kçira does not allow a full revision of the fauna because the specimens, although sampled bed-by-bed, are often few, or not preserved well enough for biometric and ontogenetic studies. For this reason, the present study will follow Arthaber's original taxonomy and will maintain the species erected by him, even though they are artificial.

Ammonoid distribution in the stratigraphic sections.

Ammonoid occurrence within sections KçA, KçB and KçG is shown in Fig. 2.

Most ammonoids come from section KçA, where the fossiliferous layers are concentrated in the basal 2.5 meters of thickness (levels AK 2bis and AK 5) and in the central part from 23 to 29 meters (levels AK 31, AK 36, AK 38, AK 40). Level AK 57 comes from the top of the section but belongs to a loose block.

Section KçA provided a total of 83 ammonoids, belonging to 11 genera and 13 species listed below:

AK 2bis: *Subcolumbites perrinismithi* (Arthaber, 1908), *Subcolumbites europeus* (Arthaber, 1908), *Subcolumbites* sp., *Procarnites kokeni* (Arthaber, 1908), *Albanites* sp. aff. *A. osmanicus* (Arthaber, 1911), *Pseudosageceras drinense* (Arthaber, 1908), *Pseudosageceras* sp., *Eophyllites* sp. aff. *E. refractus* (Spath, 1934), *Eophyllites* sp. cf. *E. dieneri* (Arthaber, 1908), *Eophyllites* sp., *Leiophyllites* sp.

AK 5: *Leiophyllites* sp. cf. *L. pitamaha* (Diener, 1895), *Procarnites kokeni* (Arthaber, 1908), *Albanites arbanus* (Arthaber, 1911), *Albanites* sp., *Subcolumbites* sp., *Cordillerites* sp. aff. *C. angulatus* Hyatt & Smith, 1905, *Paleophyllites steinmanni* Welter, 1922, *Parussuria* (?) sp.

AK 31: *Eophyllites* sp., *Leiophyllites* sp. cf. *L. pitamaha* (Diener, 1895), *Leiophyllites* sp., *Procarnites* sp.

AK 36: *Leiophyllites* sp. cf. *L. pitamaha* (Diener, 1895).

AK 38: *Procarnites kokeni* (Arthaber, 1908).

AK 40: *Leiophyllites* sp.

AK 57: *Procladiscites brancoi* Mojsisovics, 1882, *Sturia* sp.

Some orthoceratids were found in levels AK 2bis, AK 5 and AK 31.

The specimens are rather poorly preserved, are hardly separable from the matrix, and in most cases one side is partly dissolved, as often occurs in red ammonitic limestones. This makes the finding of complete conchs uncommon.

In the lower part of the section the fossils are mostly reddish. The phragmocones are almost always full of calcite that often hinders the preservation of the suture lines. In the central part of the section there are only small specimens with smooth shells, generally yellow/light-brown in colour.

Section KçB provided only one fossiliferous layer, level AK 62, with a total of 18 ammonoids classified as follows:

AK 62: *Subcolumbites* sp., *Eophyllites dieneri* (Arthaber, 1908), *Sulioticeras* sp. cf. *S. sulioticum* (Arthaber, 1911). Some orthoceratids were found as well.

The preservation of the specimens is exactly the same as described above for the basal portion of section KçA.

The assemblage is very similar to that of level AK 2bis of section KçA, as the acme of the genus *Subcolumbites* is recognizable also in level AK 62. Section KçB can be correlated paleontologically and lithologically to the basal part of section KçA.

In the lower and middle part of section KçG, ammonoids belonging to four genera were found in, levels G 2609, G 2610 and G 2611.

G 2609: *Procarnites kokeni* (Arthaber, 1908), *Subcolumbites* sp.

G 2610: *Procarnites kokeni* (Arthaber, 1908), *Proptychitoides* sp.

G 2611: *Albanites* sp.

The material has a rather good preservation. It is yellow-brownish in colour and presents a slightly crushed surface in levels G 2609 and G 2610, while it is reddish in level G 2611. Not all specimens are completely preserved.

Finally, level AK 125 from the top of a block at site 'E' (see Fig. 1c) provided specimens belonging to *Sturia sansovinii* Mojsisovics, 1882, *Proarcestes* sp., *Monophyllites* sp. Some orthoceratids were recognized as well.

The new collection is composed of 128 specimens belonging to 16 genera and 15 species, with 7 genera reported from Kçira for the first time (*Paleophyllites* Welter, 1922, *Cordillerites* Hyatt & Smith, 1905, *Procladiscites* Mojsisovics, 1882, *Sturia* Mojsisovics, 1882, *Proarcestes* Mojsisovics, 1882 and *Monophyllites* Mojsisovics, 1879; *Parussuria* Spath, 1934 not surely).

The fauna from Kçira shows the highest similarity with the fauna described from Chios (Greece). Chios was firstly studied by Renz & Renz (1947, 1948), who gathered a collection of about 2000

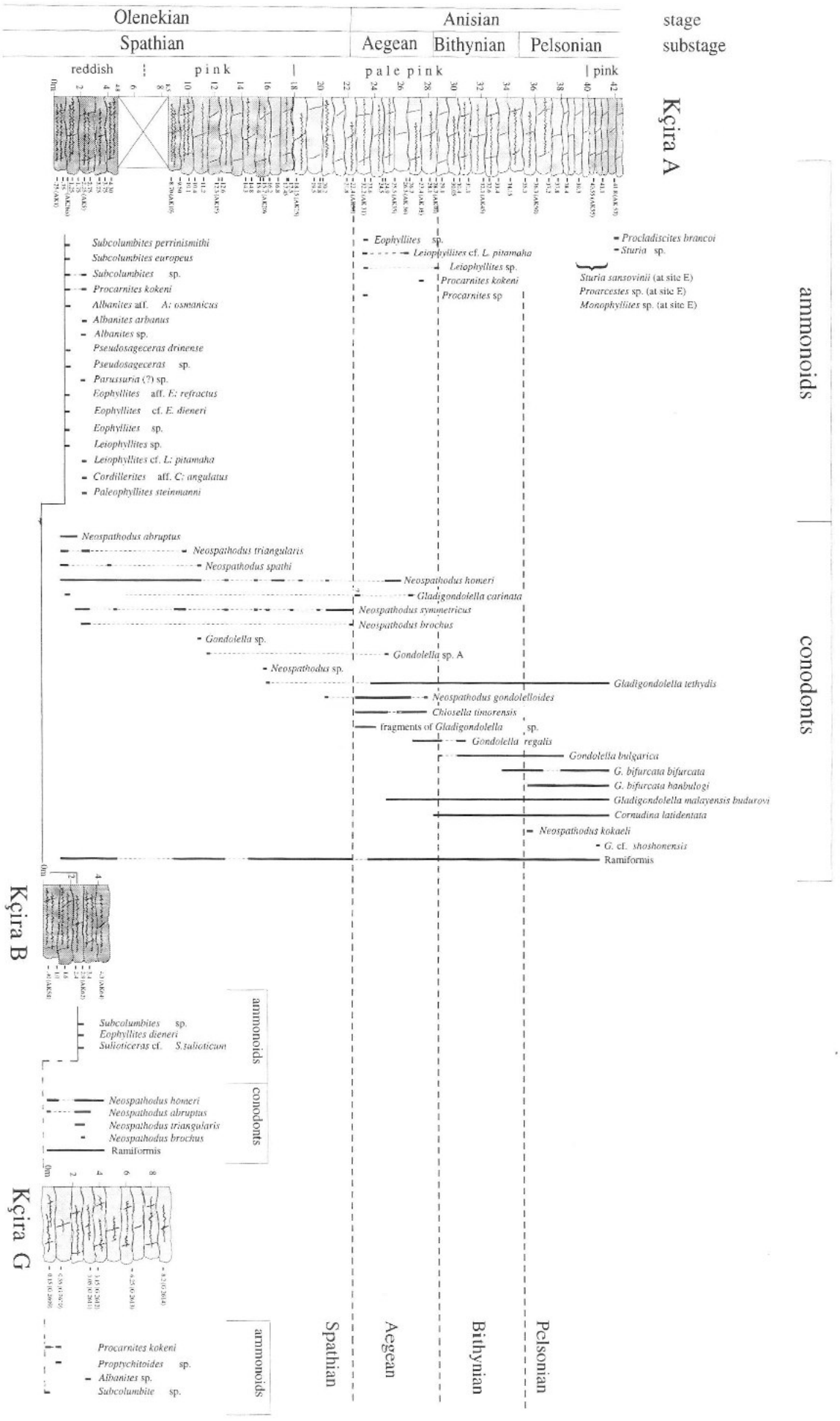


Fig. 2 - Ammonoid and conodont biostratigraphy of sections KçA, KçB and KçG. Conodonts from Muttoni et al., 1996.

specimens, currently preserved at the Natural History Museum of Basel. This collection has 20 genera and 24 species in common with the Albanian fauna described by Arthaber (1908, 1911) and 13 genera exclusive of Chios (*Anasibirites* Mojsisovics, 1896, *Chioceras* Renz & Renz, 1948, *Hellenites* Renz & Renz, 1948, *Dinarites* Mojsisovics, 1882, *Stacheites* Kittl 1903, *Inyoites* Hyatt & Smith 1905, *Ophiceras* Griensbach, 1880, *Flemingites* Waagen, 1892, *Koninckites* Waagen, 1895, *Beyrichites* Waagen, 1895, *Paranannites* Hyatt & Smith, 1905; *Cordillerites* Hyatt & Smith, 1905 and *Nannites* Mojsisovics, 1881 not surely). New studies of the fauna from Chios (Bender, 1970; Jacobshagen & Tietze, 1974; Assereto et al., 1980; Fantini, 1981; Gaetani et al., 1992; Muttoni et al., 1994) enriched the composition of the Lower Triassic fauna with some elements such as the genus *Paleophyllites*. Typical Anisian forms recognized by the same authors in Chios belong to the genera *Aegeiceras*, *Paracrochordiceras*, *Paradanubites* and *Japonites*.

Age of the assemblages.

The associations contained in the basal portion of section KçA and in sections KçB and KçG largely correspond to the fauna described by Arthaber in 1908 and 1911 from the same locality and may be referred to the *Subcolumbites-Prohungarites* zone sensu Kummel (1973a, b).

The *Subcolumbites-Prohungarites* zone was defined first by Kummel in 1973. In order to simplify the Triassic zonal schemes and to allow worldwide correlations, he designated only four major zones for the Lower Triassic, each named after two of its characteristic genera. They were, from oldest to youngest, the *Otoceras-Ophiceras* zone, the *Gyronites-Prionolobus* zone, the *Owenites-Anasiberites* zone and the *Prohungarites-Subcolumbites* zone.

Kummel's *Prohungarites-Subcolumbites* zone included all the faunas of the latest Lower Triassic under a single name, instead of the great number of local zonations. It could be recognized in the Tethys (64 genera), in the Western Pacific (15 genera), in the Eastern Pacific (30 genera) and in the circum-Artic region (22 genera). The most diversified fauna was yielded by the Tethys, with 26 genera known only from this province, 19 of which were endemic (such as *Tirolites* and *Dinarites* in the Werfen Formation, *Protropites* in Albania). Some species were extremely widespread, occurring throughout the Tethys, e.g. *Albanites triadicus* (Arthaber, 1908), *Procarnites kokeni* Arthaber, 1908, some species of *Arnautoceltites*, *Leiophyllites* and *Subcolumbites*. Kummel stated also that the *Subcolumbites-Prohungarites* zone was generally isolated in the Western Tethys, without other Lower Triassic faunas above or below.

This zone has not been discussed definitively since 1973. Kummel did not provide a clear definition of the kind of biozone it was based on, but we may assume that it was close to an Oppel zone, no longer accepted as valid by the ISG (Salvador, 1994). As a consequence, the *Subcolumbites-Prohungarites* zone should be revised.

The original meaning of the *Subcolumbites-Prohungarites* zone as a 'global' zone has been practically ignored; the name has been used occasionally for some localities in the Western Tethys such as Chios (Assereto et al., 1980; Gaetani et al., 1992; Muttoni et al., 1994) and in China (Wang, 1985) or in North America with only an informal meaning (*Prohungarites-Subcolumbites* beds of Nevada, Bucher, 1989). In the Humboldt Range, Nevada, the *Subcolumbites-Prohungarites* beds do not represent the last assemblage of the Spathian, but are overlaid by the *Haugi* zone, correlated with the Siberian Spiniplicatus Zone and the Subrobustus Zone of British Columbia (Bucher, 1989).

The *Haugi* zone is currently strongly advocated as the latest Lower Triassic (Tozer, 1967; Silberling & Tozer, 1968; Silberling & Wallace, 1969; Guex, 1978; Wang, 1985; Dagys & Tozer, 1989; Tozer, 1972; Tozer, 1994b). According to Tozer (1994b), this zone cannot be regarded as a subzone of the *Subcolumbites-Prohungarites* zone (Wang, 1985), but must rank as an independent zone.

Sequences in the Western Tethys are not really complete when compared with those from North America, because they are often condensed. For this reason, clear evidence of another assemblage overlaying the *Subcolumbites-Prohungarites* zone and its correlatives has not been found yet in the Western Tethys; nevertheless, the *Subcolumbites-Prohungarites* zone cannot be regarded as latest Spathian any longer.

As mentioned previously, the assemblages of the basal part of section KçA and of sections KçB and KçG may be referred to the *Subcolumbites-Prohungarites* zone because they include genera which are typical of this zone (Kummel, 1973b, p. 229) and are characterized by the presence of the genus *Subcolumbites*. Since the *Subcolumbites-Prohungarites* zone may be considered an Oppel zone and consequently should be revised, the possibility of interpreting the layers containing the genus *Subcolumbites* as a taxon range zone and referring them to the Albanian "*Subcolumbites* beds" is suggested.

The fauna of the middle part of section KçA is composed totally of long-ranging Spathian (*Procarnites* and *Eophyllites*) or Spathian to Anisian forms (*Leiophyllites*), while the latest Lower Triassic (correlative of the *Haugi* zone) is not clearly represented. *Procladiscites brancoi* Mojsisovics and *Sturia* sp. were found in the higher part of the same section. These species are regarded generally as Middle Triassic.

The assemblage of level AK125 (*Sturia, Proarcestes, Monophyllites*) from the upper part of a block at site 'E' is Anisian in age. The long range of these genera in the Middle Triassic does not allow a more accurate age determination.

Data on the conodont assemblages from sections KçA and KçB (already published in Muttoni et al., 1996) are also reported in Fig. 2. They provide a more

continuous record than the ammonoid's and allow the recognition of the O/A boundary. The boundary was located in the middle part of section KçA, 1 meter below the appearance of the assemblage with the long-ranging ammonoids. The first occurrence of *Chiosella timorensis* (*Gondolella timorensis* in Gaetani et al., 1992; Muttoni et al., 1995) was used to approximate the base of the Anisian stage. On the base of the conodont assemblages, the basal portion of KçA and section KçB were dated Middle Spathian.

Systematic descriptions.

Taxonomical hierarchy.

The taxonomy from order to genus level was taken from Tozer 1981, except for the genus *Sulioticeras* that was based on Tozer 1994.

Identification of specimens and repository.

All specimens are accompanied by the inventory number and the original number (in brackets, bed initials and number of the specimen).

The material is stored in the Paleontological Museum of the University of Milano; inventory numbers: 8133-8169. Acronym: MPUM.

Dimensions.

The following abbreviations were used: D (mm) = diameter; H (mm) = maximum height in D; h (mm) = minimum height in D; W (mm) = width in H; w (mm) = width in h; U (mm) = umbilical width in D; H/W = degree of compression in H; U/D = degree of involution in D; SGR = spiral growth rate = [(H-h)/h] x100.

Suture line.

Suture lines are drawn from venter to periumbilical margin, using a dotted line when parts are not well preserved. Suture elements are described from the venter towards the umbilicus and they are called in this order: ventral lobe, first lateral saddle, first lateral lobe, second lateral saddle and so on till the umbilical lobe. Auxiliary elements indicate the further subdivisions of the umbilical lobe. Adventitious lobes indicate accessory lobes between the ventral and the lateral ones. Progressive numbers increase from venter towards umbilicus.

In most cases suture lines are not complete, expecially in case of the ventral and umbilical lobes. Ontogenetic studies were not possible. Suture lines, when preserved, were always exposed by grinding.

Acronyms. PIUW = Paläontologische Institut, University of Vienna; NHM = Natural History Museum, London; GIBU = Geological Institute, Bonn University.

The following abbreviations were used in the text:

nn = *nomen nudum*; Hm = Holotype by monotypy, Hd = Holotype by designation, L = Lectotype, P = Paratype, S = Syntype.

'v' before the year in synonymy indicates specimens personally seen by the author.

Order Ceratitida Hyatt, 1884
Superfamily *Dinaritacea* Mojsisovics, 1882
Family *Columbitidae* Spath, 1934
Genus *Subcolumbites* Spath, 1930

Type species: *Columbites perrinismithi* Arthaber, 1908

Preliminary remarks. The genus *Subcolumbites* was established by Spath in 1930 based on *Columbites Perrini-Smithi* Arthaber. In 1934 Spath clearly included in this genus also the Albanian species *S. europeus* (Arthaber, 1908), *S. dusmani* (Arthaber, 1911) and *S. mirditensis* (Arthaber, 1911).

Subsequently, several species were added to the composition of the genus from Chios (as *S. europaeus-perrini-smithi* [Renz & Renz, 1948], an intermediate form between *S. europeaus* and *S. perrini-smithi*), from China (as *S. robustus* [Chao, 1950], *S. kwangianus* Chao, 1959), from the Primorye Region (as *S. multiformis* Kiparisova, 1947, *S. solitus* Kiparisova, 1961, *S. anomalus* Kiparisova, 1961) and from Nevada (as *S. americanus* Kummel, 1969). Not all of these species have been accepted unanimously as valid.

Kummel (1969, p. 427) asserts the existence of only five species that can be separated in three groups: the *S. perrinismithi* group, the *S. dusmani* group and the *S. multiformis*, *S. robustus*, *S. americanus* group. *S. perrinismithi*, the group we are interested in, should include all four Albanian species erected by Arthaber, the Chios species and *S. kwangianus* from China. Kummel states that the differences between these species outlined in the literature are limited to the degree of compression of the whorl section and the consequent presence of more or less rounded umbilical shoulders; however, he considers these characters an expression of intraspecific variation, because they are completely gradational. According to him, the pattern and strengh of the ornamentation also are not suitable for distinctions as they are extremely variable. So the Albanian *Subcolumbites* species are, as a matter of fact, only one species, *Subcolumbites perrinismithi*, characterized only by carination of the venter.

At present, no new data are available for biometric comparisons, as few *Subcolumbites* in the new collection from Kçira are preserved well enough to be classified at specific level and even fewer can be measured.

As discussed in the introduction, the original Arthaber's taxonomy is followed in this paper.

Subcolumbites perrinismithi (Arthaber, 1908)

Pl. 1, fig. 1 a-b; Fig. 3.

v1908 *Columbites Perrini-Smithi* Arthaber, p. 277, pl. 12, fig. 1 a-c.
v1911 *Columbites Perrini-Smithi* - Arthaber, p. 262, pl. 23, fig. 19, 20.
1915a *Columbites perrini-smithi* - Diener, p. 112, *nn*.
1928 *Columbites Perrini-Smithi* - Renz, p. 155, *nn*.
v1934 *Subcolumbites perrini-smithi* - Spath, p. 203, pl. 12, fig. 5 a, b.
1947 *Columbites perrini-smithi* - Renz & Renz, p. 59, *nn*.
?1948 *Columbites perrini-smithi* - Renz & Renz, p. 20, pl. 11, fig. 7, 7a.
1957 *Subcolumbites perrinismithi* - Kummel, in Arkell et al., p. L 140, fig. 172, 15 a, b.
1964a *Subcolumbites* cf. *perrini-smithi* - Bando, p. 99, pl. 3, fig. 18, 19, pl. 4, fig. 3.
1968a *Subcolumbites perrini-smithi* - Kummel, 485, *nn*.
?1968b *Subcolumbites perrini-smithi* - Kummel, p. 495, pl. 1, fig. 1, 2, 3.
v1969 *Subcolumbites perrinismithi* - Kummel, p. 427 partim, pl. 3, fig.1, 2, 3, 6, 7.

Holotype. *Columbites Perrini-Smithi* Arthaber, 1908, pl. 12, fig. 1; PIUW IV-63. Hm.

Material. 3 specimens: MPUM 8134 (AK 2bis-13), MPUM 8133 (AK 2bis-9; -12). Han-Bulog Limestone, Kçira (Albania). Section KçA; level AK 2bis.

Description. Evolute and compressed *Subcolumbites* with each whorl covering 2/3 of the previous one. The venter is rounded with a manifest keel, flattened and not separated from the flanks as it passes gradually to convex flanks. Umbilical rim rounded, passing to a relatively low and subvertical umbilical wall.

The ornamentation covers also the venter and the umbilical wall and consists of thin, projected primary ribs that strongly bend at 1/3 of the whorl height.

Suture line not preserved.

Dimensions of the types (in mm):

	D	H	h	W	w	U	U/D	H/W	SGR%
PIUW IV-64 (P)	41.25	12.6	8.95	-	9.5	19.7	0.477	-	40.782
PIUW IV-63 (Hm)	53.35	17.35	12.9	-	11.3	23.1	0.433	-	34.496

Discussion. The specimens were attributed to *S. perrinismithi* (Arthaber, 1908) because they bear exact morphological resemblance with Arthaber's type material. In the holotype it is possible to see that the keel is missing during the first stage of growth, while subsequently the venter sharpens and tends to become "roof shaped" (Fig. 3).

Compared with the other *Subcolumbites* of nearly the same dimensions in the new Albanian collection, they show a greater degree of compression of the whorl section, a greater degree of evolution, a more pronounced keel and the typical ornamentation of *S. perrinismithi* as described by Arthaber in 1908.

Fig. 3 - *Subcolumbites perrinismithi* (Arthaber). Whorl section, PIUW IV. x 63, holotype (1908, pl. 12, fig. 1), H =15.4 mm; x 1.

The morphological characters described refer to an adult specimen; small specimens could not be easily discriminated at specific level because of the change of some features during growth (see, for example, the modification of the venter of *S. perrinismithi* in the description above).

Occurrence. The species was reported first by Arthaber from Albania (1908, 1911). *S. perrinismithi* is known also from Japan (Bando, 1964a) and Afghanistan (Kummel, 1968a). Its occurrence in Timor (Kummel, 1968b) and in Chios (Renz & Renz, 1948) is not certain.

Kummel considered S. *perrinismithi* as belonging to the *Prohungarites* zone (1969) and later (1973a, b) to the *Subcolumbites-Prohungarites* zone.

Subcolumbites europaeus (Arthaber, 1908)

Pl. 1, fig. 2 a-b.

v1908 *Columbites europaeus* Arthaber, p. 278, pl. 12, fig. 2 a-d.
v1911 *Columbites europaeus* - Arthaber, p. 261, pl. 23, fig. 13-18.
1915a *Columbites europaeus* - Diener, p. 112, *nn.*
1928 *Columbites europaeus* - Renz, p. 155, *nn.*
v1934 *Subcolumbites europaeus* - Spath, p. 204, pl. 12, fig. 6 a, b, text-fig. 62 c.
1947 *Columbites europaeus* - Renz & Renz, p. 59, *nn.*
1948 *Columbites europaeus* - Renz & Renz, p. 19, pl. 11, fig. 3-3 a, 4-4 a, 5-5 a, ?6-6 a.
v1969 *Subcolumbites perrinismithi* - Kummel, p. 427 partim, pl. 1, fig. 1-9, pl. 2, fig. 5, 6, pl. 4, fig. 3, 4.
1972 *Subcolumbites perrinismithi* - Tozer, pl. 2, fig. 5 a, b; 6 a, b.

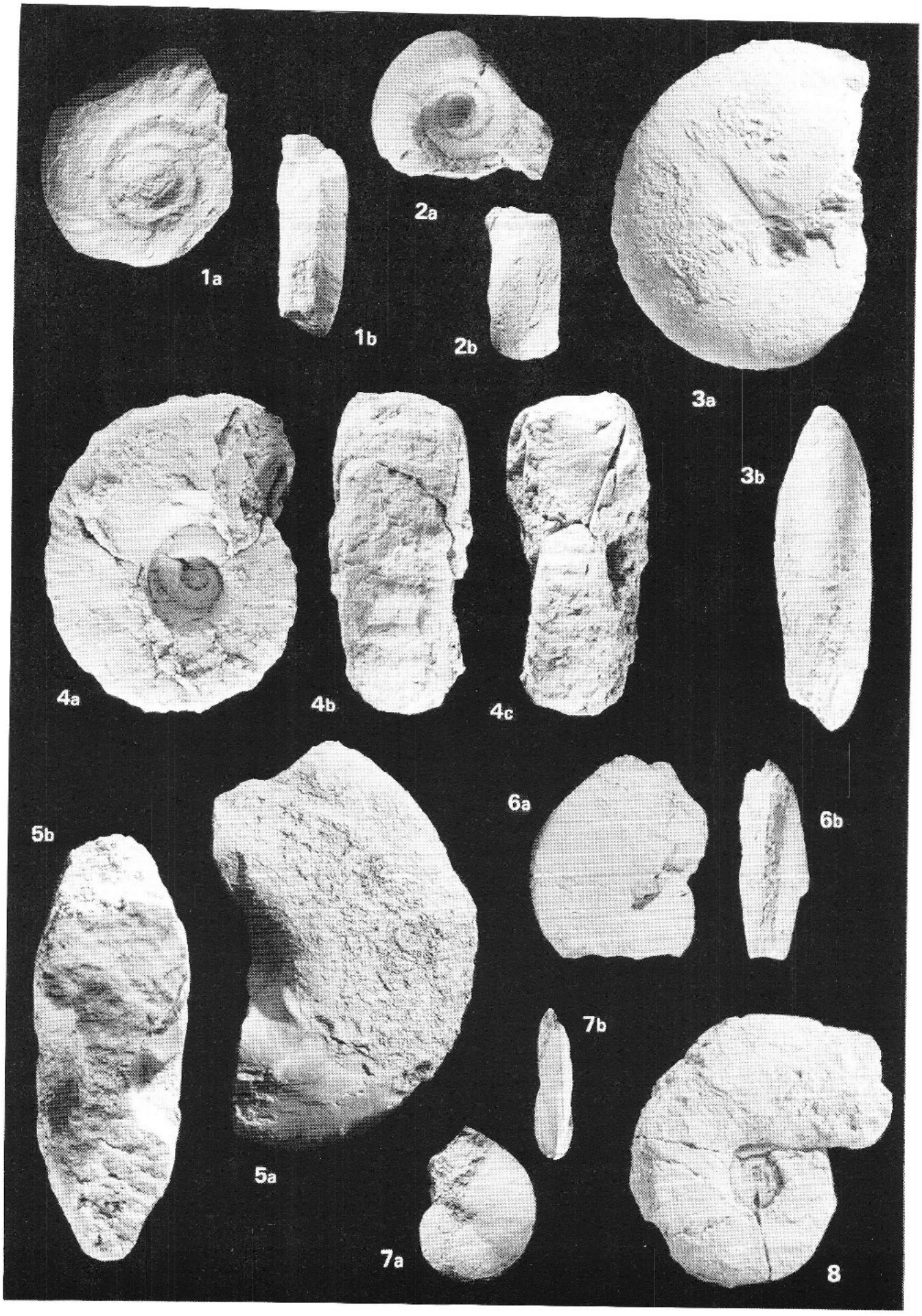
Holotype(?). *Columbites europaeus* Arthaber, 1908, pl.12, fig.2 a-d; PIUW IV-61. This specimen is reported as holotype by Spath (1934, p. 204) and by Kummel (1969, p. 433, pl. 4, fig. 3-4), but Arthaber does not clearly select it as holotype.

Material. 1 specimen: MPUM 8135 (AK 2bis-8). Han-Bulog Limestone, Kçira (Albania). Section KçA; level AK 2bis.

Description. Evolute *Subcolumbites* with a whorl section sligthly depressed and maximum width at the umbilical shoulders. The venter is rounded with a tendency to fastigation or to a low carination that gradually passes to convex flanks.

PLATE 1

Fig. 1 a, b - *Subcolumbites perrinismithi* (Arthaber). KçA, MPUM 8134 (AK 2bis-13). a) Lateral view; b) ventral view; x 1.
Fig. 2 a, b - *Subcolumbites europeus* (Arthaber). KçA, MPUM 8135 (AK 2bis-8). a) Lateral view; b) ventral view; x 1.
Fig. 3 a, b - *Procarnites kokeni* (Arthaber). KçG, MPUM 8137 (G 2610-2). a) Lateral view; b) ventral view; x 1.
Fig. 4 a-c - *Albanites* sp. aff. *A. osmanicus* (Arthaber). KçA, MPUM 8140 (AK 2bis-7). a) Lateral view; b) ventral view; c) oral view; x 1.
Fig. 5 a, b - *Proptichitoides* sp. KçG, MPUM 8143 (G 2610-1). a) Lateral view; b) section; x 1.
Fig. 6 a, b - *Cordillerites* sp. aff. *C. angulatus* Hyatt & Smith. Kçira A, MPUM 8144 (AK 5-6). a) Lateral view; b) ventral view; x 1.
Fig. 7 a, b - *Pseudosageceras* sp. KçA, MPUM 8146 (AK 2bis-22). a) Lateral view; b) ventral view; x 1.
Fig. 8 - *Eophyllites dieneri* (Arthaber). KçB, MPUM 8147 (AK 62-10). Lateral view; x 1.


1a
1b
2a
2b
3a
3b
4a
4b
4c
5a
5b
6a
6b
7a
7b
8

The umbilical rim is relatively high, rounded and passes to a sloped and quite high umbilical wall. Umbilicus wide and deep, with a kind of "funnel shape".

The ornamentation consists of weak, projected primary ribs that bend decidedly towards the opening at the umbilical rim, where the flanks change inclination. The radial ribs cross the venter with a convexity. Very weak spiral striae, more pronounced in the upper half of the whorl.

Suture line not preserved.

Dimensions of the types (in mm):

	D	H	h	W	w	U	U/D	H/W	SGR%
PIUW IV-60 (P)	48.65	17.0	10.0	-	-	21.65	0.445	-	70

Discussion. The medium size specimens could be close to *S. dusmani* (Arthaber, 1911), but they lack a vertical umbilical wall (the umbilicus has no "step shape"), and the spiral ornamentation is not pronounced enough to give a reticulated look to the shell. The venter shows a tendency to fastigation or carination, while in *S. dusmani* (Arthaber, 1911, p. 263, pl. 24, fig. 1a-d) it is absolutely rounded. Moreover, direct comparison with Arthaber's types shows that specimens of *S. dusmani* (Arthaber) of the same size, are more involuted.

Medium size specimens of *S. mirditensis* (Arthaber, 1911) have a more "roof-shaped" venter and a higher and more acute umbilical shoulder (1911 Arthaber, p. 263, pl. 24, fig. 2, 3, 4). Larger specimens of *S. europeus* are preserved in Arthaber's collection at PIUW. They show a more pronounced carination and a greater similarity with specimens of the same size of *S. mirditensis* (Arthaber) as they have a periumbilical margin with a "cord" shape (high and rounded) and an almost vertical umbilical wall. Moreover, the whorl section is less depressed.

Occurrence. The species is known from Albania (Arthaber, 1908, 1911) and Chios (Renz & Renz, 1928, 1947, 1948). It was placed by Kummel in the *Prohungarites* zone (1969), but later (1973) the same author considered this species as belonging to the *Subcolumbites-Prohungarites* zone. Tozer (1972) indicated the presence of some specimens classified as *S. perrinismithi* (but reported as similar to *Columbites europeus* Arthaber) from the *Albanites* beds of Iran.

Superfamily *Megaphyllitaceae* Mojsisovics, 1896

Family *Procarnitidae* Zhao, 1959

Genus *Procarnites* Arthaber, 1911

Type species: *Parapopanoceras kokeni* Arthaber, 1908

Procarnites kokeni (Arthaber, 1908)

Pl. 1, fig. 3 a-b; Fig. 4 a-e.

v1908 *Parapopanoceras kokeni* Arthaber, p. 259, pl. 11, fig. 1a-c, 2a, b.
v1911 *Procarnites kokeni* - Arthaber, p. 215, pl. 17, fig. 16, 17, pl. 18, fig. 1-5.
1915a *Procarnites kokeni* - Diener, p. 228, *nn.*
1917 *Procarnites kokeni* - Diener, p. 167, pl. 1, fig. 4, 5.
1928 *Procarnites kokeni* - Renz, p. 155, *nn.*
1933 *Procarnites kokeni* - Kutassy, p. 622, *nn.*
v1934 *Procarnites kokeni* - Spath, p. 181, pl. 3, fig. 1.
1947 *Procarnites kokeni* - Renz & Renz, p. 61, *nn.*
1948 *Procarnites kokeni* - Renz & Renz, p. 81, pl. 8, fig. 5, 6-6a, 7-7a, 8-8a, 9-9a, pl. 9, fig. 2-2a.
1966 *Procarnites kokeni* - Kummel, p. 390, pl. 2, fig. 10-13.
1968 *Procarnites* aff. *kokeni* - Nakazawa & Bando, p. 101, pl. 6, fig. 3a, b, text-fig. 7, 8.
1968a *Procarnites kokeni* - Kummel, p. 485, *nn.*
1968b *Procarnites kokeni* - Kummel, p. 493 partim, pl. 1, fig. 16.
1968 *Procarnites kokeni* - Shevyrev, p. 190 partim, pl. 15, fig. 6.
v1969 *Procarnites kokeni* - Kummel, p. 391 partim, pl. 12, fig. 1, 2, pl. 13, fig. 1-8.
?1976 *Procarnites* cf. *kokeni* - Wang & He, p. 317-318 partim, pl. 17, fig. 1, text fig. 26 c.
1978 *Procarnites kokeni* - Wang, p. 167 partim, pl. 2, fig. 15-19.
1979 *Procarnites kokeni* - Assereto et al., p. 724, 725, *nn.*
1992 *Procarnites kokeni* - Gaetani et al., p. 188, *nn.*

Lectotype. *Parapopanoceras kokeni* Arthaber, 1908, pl. 11, fig. 1a-c; PIUW IV-13. This specimen is reported as holotype by Spath (1934, p. 181) and as lectotype by Kummel (1969, p. 392, 396). Arthaber does not clearly select a holotype.

Material. 14 specimens: MPUM 8138 (G 2610-2); MPUM 8137 (G 2609-1; AK 2bis-2; -3; -11; -20; -24; -36; AK 5-5; -7; -10; -11; AK 38-1; -2). Han-Bulog Limestone, Kçira (Albania). Section KçG, levels G 2609, G 2610; section KçA, levels AK 2bis, AK 5, AK 38.

Description. Involute and compressed forms with elliptical whorl section. The degree of compression and the shape of the venter vary with the dimensions of the specimen. Small specimens are usually less compressed, with a more rounded venter while larger specimens are more compressed, with a narrowly rounded or almost acute venter (Fig. 4 d,e). The flanks are always convex, with a tendency to become flat in more compressed specimens.

Umbilicus small with subvertical umbilical wall. Shell smooth.

Because of poor preservation, the suture line is partly visible only in specimens of small dimensions.

Dimensions of the types (in mm):

	D	H	h	W	w	U	U/D	H/W	SGR%
PIUW IV-11 (P)	80.8	43.5	28.45	-	-	8.85	0.109	-	52.90

Discussion. There are no morphological differences at all between the specimens of this new collection and the three *P. kokeni* of nearly the same dimensions preserved in Arthaber's collection (PIUW). The two smaller specimens in the collection (one of them is the lectotype) are, on the contrary, more depressed, with a rounded and wider venter. The larger one is more compressed with a narrower venter.

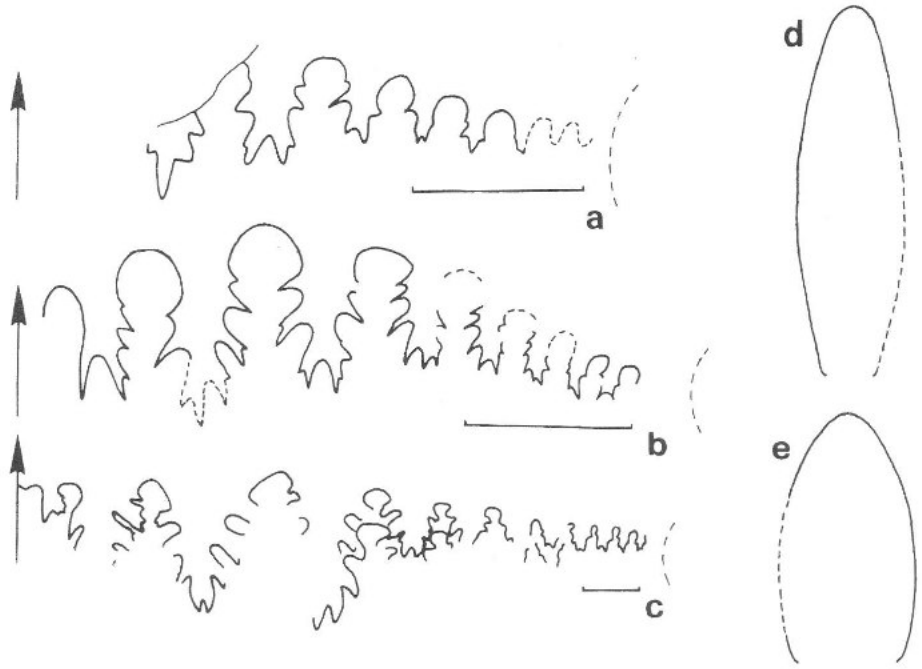


Fig. 4 - *Procarnites kokeni* (Arthaber). (a) Redrawing of the suture line, PIUW IV. 13, lectotype (Arthaber, 1908, pl. 11, fig. 1a-c). The drawing is interrupted at the broken ventral side. (b) First drawing of the suture line, C 22704, paratype (B. Nopcsa Collection, NHM). (c) First drawing of the suture line, PIUW IV. 11, paratype (Arthaber, 1911, pl. 18, fig. 5 a, b), H = 53.6 mm. Bar scale is 0.5 cm. (d) Whorl sections of specimen MPUM 8137 (AK 5-5) at H = 45.3 mm. x 1. (e) Whorl section of specimen MPUM 8138 (G 2610-2) at H = 32.8 mm. x 1.

A redrawing of the suture line of the lectotype is here provided (Fig. 4a). It is notably different from Arthaber's drawing (1908, pl. 11, fig. 1c) and from Kummel's redepiction (1969, p. 392, text-fig. 12 A). It is also incomplete as the specimen is broken, with only one side preserved.

The suture line of the bigger paralectotype (Arthaber, 1911, pl. 18, fig 5a-b) is represented here for the first time (Fig. 4c). Twenty five additional specimens of *P. kokeni* are preserved at NHM (2 of which were received from Arthaber with the name *Proptychites kraffti* Arthaber; Spath, 1934, p. 182), together with 2 specimens classified under the name of *Procarnites acutus* Spath.

This species was established by Spath in 1934 and was based on *P. kokeni* var., recognized by Arthaber in 1911 (=*Hedenstroemia* sp. in Arthaber, 1908). It was characterized by an oxinote venter and some differences in the suture line. Unfortunately, the specimen *P. kokeni* var. is no longer preserved in Arthaber's collection.

The holotype of *P. acutus* depicted by Spath (1934, pl. 5, fig. 4a-b) has a sharp venter, as personally checked at NHM, but has not been properly drawn by Spath. The whorl section he represents (1934; pl. 5, fig. 4b) is exactly the same as the one of *P. kokeni* drawn by Arthaber in 1911 (pl. 18, fig. 5b) and does not show at all an oxinote venter. In 1969 Kummel asserted that *P. kokeni* is a ficticious species because the width of the venter is a completely gradational character.

P. acutus was not considered in the synonymy of the species *P. kokeni*, because, according to the specimens in Arthaber's collection, the adult forms have a strictly narrow, but not oxinote, venter. Moreover, Arthaber himself classified the specimen with the oxinote venter as a separate variety.

P. skanderbergis Arthaber, 1911, the only specimen preserved at PIUW, is clearly more inflated than *P. kokeni*, of the same dimensions, but some reservations remain on the six specimens stored at NHM and classified as *P. skanderbergis*. They are not so different in features from *P. kokeni* and a check of the suture lines was not possible. At the moment, it is not clear whether or not they are conspecific with *P. kokeni*.

Occurrence. *P. kokeni* is a common element of the *Subcolumbites-Prohungarites* zone (sensu Kummel, 1973a, b) of Albania (Arthaber, 1908, 1909, 1911) and Chios (Renz & Renz, 1947, 1948; Assereto et al. 1979; Gaetani et al. 1992), but it is also known from the *Subcolumbites* fauna of Afghanistan (Kummel, 1968a), from Southern URSS (Shevirev, 1968), from Oman (Tozer & Calon, 1990), from the *Prohungarites* zone of Timor (Bando, 1968; Kummel, 1968) and from the *Procarnites-Leiophyllites* zone of China (Wang, 1978).

Superfamily *Noritaceae* Karpinsky, 1889
Family *Noritidae* Karpinsky, 1889
Genus *Albanites* Arthaber, 1909

Type species: *Pronorites triadicus* Arthaber, 1908

Albanites sp. aff. **A. osmanicus** (Arthaber, 1911)

Pl. 1, fig. 4 a-c; Fig. 5.

Material. 1 specimen: MPUM 8140 (AK 2bis-7). Han-Bulog Limestone, Kçira (Albania). Section KçA, level AK 2bis.

Description. Slightly involute *Albanites* with flattened sides and subquadrate whorl section. The venter is

tabulate and wide with angular lateroventral shoulders (Fig. 5).

Umbilical margin narrowly rounded; umbilical wall moderately high and vertical in the inner whorls, with a great increase in height and reduction of inclination in the outer whorl. The conch shows umbilical egression that starts at a whorl height of 14.8 mm and is extremely pronounced in the outer whorl.

The ornamentation consists of primary radial ribs that involve the venter and the upper half of the flanks. Ribs on the venter are straight, strong and relatively close in the inner whorls, then they become more spaced with two or three very weak ribs interposed. They weaken on the flanks, becoming all of the same strength and disappear in the lower half of the whorl height. They are close and rectiradiate on the flanks and form a kind of very weak knottiness on the lateroventral shoulders. This kind of ornamentation of the whorl sides could be smoothed as it probably lays on the body chamber.

Suture line not visible.

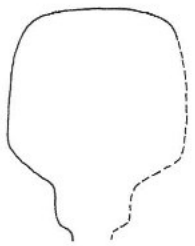


Fig. 5 - *Albanites* sp. aff. *A. osmanicus* (Arthaber). Whorl section of specimen MPUM 8140 (AK 2bis-7) at H = 23.1 mm. x 1.

Dimensions (in mm):

	D	H	h	W	w	U	U/D	H/W	SGR%
MPUM 8140 (AK 2bis-7)	59.1	25.75	16.9	-	-	16.45	0.278	-	52.367

Discussion. The attribution of the specimen to *A. osmanicus* (Arthaber) is mainly due to the shape of the whorl section. Such a depressed section is compatible only with this species and with *A. reicheli* (Renz & Renz, 1948). The attribution of MPUM 8140 (AK 2bis-7) to *A. osmanicus* is given as "*affinis*" because it is an adult specimen, while the holotype and the paratypes of *A. osmanicus* (Arthaber) are small specimens and no information is yet available on their adult morphology.

A. reicheli was depicted in the literature only by the authors in 1948 (pl. 15, fig. 1, 1a-c). This specimen is an adult of nearly the same size of MPUM 8140 (AK 2bis-7) and it shows a subquadrate whorl section, but has smooth flanks and the strong ribs on the venter are spaced also in the inner whorls.

Albanites arbanus (Arthaber, 1911)

v1911 *Pronorites arbanus* Arthaber, p. 205, pl. 17, fig. 11, 12.
1915a *Pronorites arbanus* - Diener, p. 230, *nn.*
1922 *Pronorites arbanus* - Welter, p. 94, pl. 155, fig. 10-14.
1922 *Pronorites* spec. ind. ex aff. *arbani* - Welter, p. 95, pl. 155, fig. 9.
1928 *Pronorites arbanus* - Renz, p. 155, *nn.*
1933 *Pronorites arbanus* - Kutassy, p. 624, *nn.*
1934 *Albanites arbanus* - Spath, p. 277.
1934 *Albanites welteri* Spath, p. 278.
1945 *Pronorites arbanus* - Renz, p. 301, *nn.*
1947 *Pronorites arbanus* - Renz & Renz, p. 61, *nn.*
1947 *Pronorites shaubi* Renz & Renz, p. 62, 78, *nn.*
1947 *Pronorites shaubi* var. *kephalovunensis* Renz & Renz, p. 62, 78, *nn.*
1948 *Pronorites arbanus* - Renz & Renz, p. 85, pl. 14, fig. 15-15b.
1948 *Pronorites arbanus* var.- Renz & Renz, p. 85, pl. 14, fig. 13-13b, pl. 15, fig. 5-5c.
1948 *Pronorites arbanus* var. *sundaica* Renz & Renz, p. 85.
1948 *Pronorites shaubi* - Renz & Renz, p. 87, pl. 15, fig. 4-4a.
1948 *Pronorites shaubi* var. *kephalovunensis* - Renz & Renz, p. 87, pl. 15, fig. 3-3a.
1948 *Pronorites arbanus* var. *timorensis* - Renz & Renz, p. 87.
1948 *Pronorites orientalis* Renz & Renz, p. 86, pl. 15, fig. 2, 2b.
?1960a *Albanites danispanensis* - Astakhova, p. 143, pl. 34, fig. 4, 5.
?1960b *Albanites danispanensis* - Astakhova, p. 150.
1968 *Albanites arbanus* - Shevyrev, p. 118 partim, pl. 6, fig. 5, 6.
v1969 *Albanites triadicus* - Kummel, p. 477 partim, pl. 17, fig. 1, 2.

Lectotype. *Pronorites arbanus* Arthaber, 1911, pl. 17, fig. 11a-d; PIUW IV-7; selected by Spath, 1934, p. 278.

Material. 1 specimen: MPUM 8141 (AK 5-3). Han-Bulog Limestone, Kçira (Albania). Section KçA, level AK 5.

Description. Involute and compressed *Albanites* with a subrectangular whorl section. The venter and the flanks are almost flat and linked by subangular ventral shoulders.

The ornamentation consists of primary ribs that cross the venter, where they are straight, prominent and relativly close. Very weak falcoid growth lines cover the flanks.

Suture line not visible.

Dimensions of the types (in mm):

	D	H	h	W	w	U	U/D	H/W	SGR%
PIUW IV-7 (L)	23.1	11.45	7.8	7.5	5.0	3.85	0.167	1.527	46.795
PIUW IV-7 (P)	34.95	14.8	10.95	-	-	9.2	0.263	-	35.160

Discussion. The preservation of the specimen is not good. Because of the incompleteness of the material, only a few characters can be observed. Nevertheless, the outline of the whorl section and the pattern of the ornamentation fit with the morphology of *A. arbanus* (Arthaber).

A. arbanus was established on two specimens and the very small lectotype is surely a juvenile form. It shows smooth flanks and a venter with strong ribs, while the other specimen (1911, Arthaber, pl. 17, fig. 12) shows falcoid primary ribs on the lateral sides.

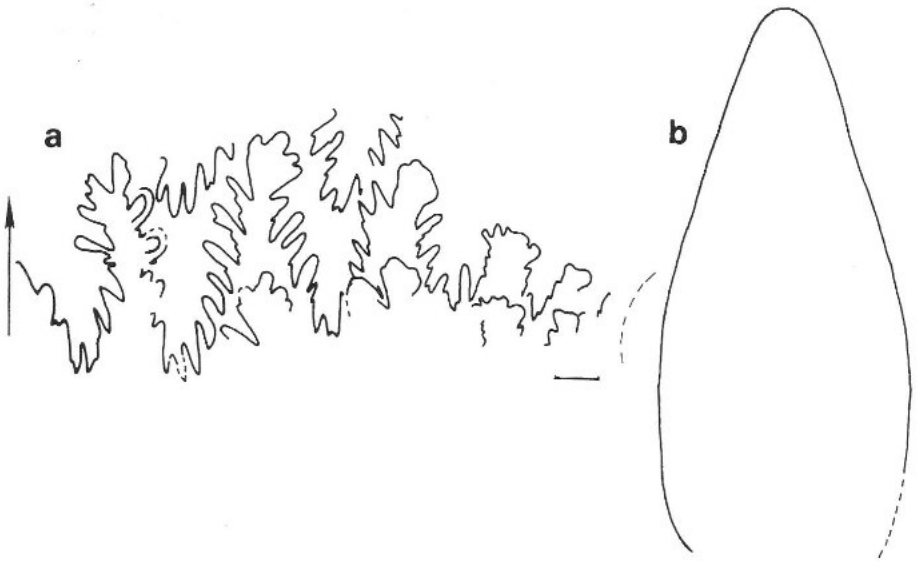


Fig. 6 - *Parussuria* (?) sp. Specimen MPUM 8163 (AK 5-15): (a) Suture line at H = 65.6 mm. (b) Whorl section at H = 68.9 mm. x 1. (b) Bar scale is 0.5 cm.

The difference was noted by Renz & Renz (1948, p. 87) who separated the lectotype as a new species (sic!) (*Pronorites shaubi* Renz & Renz, 1948) characterized by a smooth shell.

Occurrence. The species is known from the *Subcolumbites-Prohungarites* zone (sensu Kummel, 1973) of Albania (Arthaber, 1908, 1911) and Chios (Renz & Renz, 1947, 1948) and from southern URSS (Shevyrev, 1968). The occurrence of *A. arbanus* in Mangyshlak is not certain (Astakhova, 1960a, b).

Family *Ussuriidae* Spath, 1930

Genus *Parussuria* Spath, 1934

Type species: *Ussuria compressa* Hyatt & Smith, 1905

Parussuria (?) sp.

Pl. 3, fig. 1 a-b; Fig. 6 a-b.

Material. 1 specimen: MPUM 8163 (AK 5-15). Han-Bulog Limestone, Kçira (Albania). Section KçA, level AK 5.

Description. The specimen is only a phragmocone with shell of a compressed involute form, with narrow rounded venter and a subtriangular whorl section (Fig. 6b). The flanks are convex, keeping the same maximal width from the middle of the hight to the umbilical margin. The upper half of the height regularly narrows towards the venter. The umbilicus and the umbilical wall are not easily assessable. Nevertheless, the umbilicus seems to be small, but it is not possible to see if it is also closed. Shell smooth.

Suture line subammonitic with at least five saddles. Lobes and saddles irregularly digitated with a triangular shape. The ventral and the first and second lateral lobes are deep and frilled by several deep and long digitations; the first and second lateral saddles have a more acute top (with a subdivision in two of the first ones), while the other saddles tend to have a flattened top (Fig. 6a).

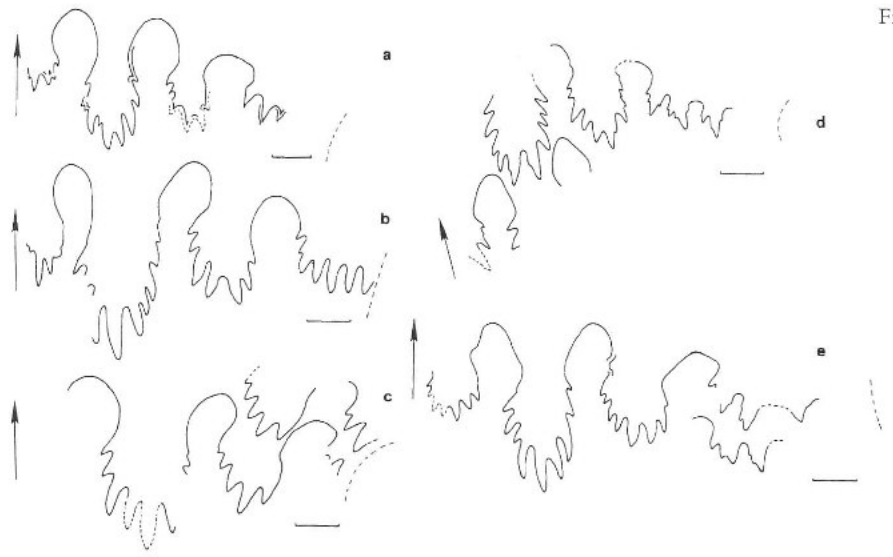


Fig. 7 - Suture lines of species of *Proptychitoides*. (a) *Proptychitoides* sp. Specimen MPUM 8143 (G 2610-1) at H = 31.2 mm. (b) *Proptychitoides bertisci* (Arthaber); redrawing of the suture line of PIUW IV. 19, holotype (1911: pl. 19, fig. 4a-c) at H = 30.7 mm. (c) *Proptychitoides trigonalis* (Arthaber); redrawing of the suture line of PIUW IV. 18, holotype (1911: pl. 19, fig. 4 c) at H = 33.7 mm. (d) *Proptychitoides krafti* (Arthaber); redrawing of the suture line of PIUW IV. 17, syntype (1911: pl. 19, fig. 3 c) at H = 36.5 mm. (e) *Proptychitoides decipiens* Spath; redrawing of the suture line of PIUW IV. 16, holotype (= *Proptychitoides latifimbriatus* non De Koninck, (Arthaber, 1911: pl. 19, fig. 2 c) at H = 40.9 mm. Bar scale is 0.5 cm.

Discussion. This kind of suture line makes it difficult to place the specimen into a genus with a similar external feature. The closest genus is *Parussuria* Spath, 1934, mostly for the lobes deeply frilled and with a triangular shape; however, *Parussuria* has a more irregular suture line characterized by fewer elements.

Family *Meekoceratidae* Waagen, 1895
Subfamily *Proptychitinae* Waagen, 1895
Genus *Proptychitoides* Spath, 1930

Type species: *Proptychitoides decipiens* Spath (=*Proptychites latifimbriatus* Arthaber, 1911-non De Koninck).

Proptychitoides sp.

Pl. 1, fig. 5a-b; Fig. 7 a-e.

Material. 1 specimen: MPUM 8143 (G 2610-1). Han-Bulog Limestone, Kçira (Albania). Section KçG, level G 2610.

Description. Only half of the outer whorl is preserved, partly distorted. Involute, deep embracing, compressed shell with a subtrigonal whorl section. Maximum width at the umbilical margin as a kind of swelling. The venter is rounded and rather wide, gradually passing to convex flanks. Rounded umbilical shoulders that pass to vertical umbilical wall. The umbilicus is deep and rather wide. Shell smooth.

Suture line subammonitic with monophyllic saddles; at least three lateral saddles are visible (Fig. 7a). The first lateral saddle is the highest, followed by the second only slightly lower. They both have a rounded top. The third saddle is characterized by a more "squared" shape, with a still rounded top which tends to flatten. First lateral lobe deep and highly digitated. The digitations of the lobes start more or less at the same hight on both sides of the saddles.

Discussion. Making a direct comparison with the specimens in Arthaber's and Nopcsa's collections, MPUM 8143 (G 2610-1) shows the greatest morphologic similarity with *P. bertisci* (Arthaber, 1911), but there is a remarkable difference in the suture line because in *P. bertisci* the saddles are more slender and thinner (Fig. 7b, holotype, Arthaber, 1911, pl. 19, fig. 4c; redrawing). Nevertheless, the poor preservation of MPUM 8143 (G 2610-1) does not allow a specific attribution.

No comparison were possible with *Meekoceras hakki* Arthaber, 1911. Its suture line fits with genus *Proptychitoides*, but only one big specimen is preserved and the relationship between this specimen and the species of *Proptychitoides* with smaller individuals is not clear. It is possible that one of the species with smaller specimens represents the internal whorls of the larger.

A redrawing of the suture lines of the holotypes and of a drawn sintype of four species belonging to the genus *Proptychitoides* erected by Arthaber is here provided (Fig. 7b-e). They were not carefully drawn by the author and they were only copied by Kummel (1969, p. 386, text-fig. 11 A, B, I, J). Moreover, I found the specimens with the ink that Arthaber used to point out the sutures still preserved.

Superfamily *Sageceratacea* Hyatt, 1884
Family *Hedenstroemiidae* Waagen, 1895
Genus *Cordillerites* Hyatt & Smith, 1905

Type species: *Cordillerites angulatus* Hyatt & Smith, 1905

Cordillerites sp. aff **C. angulatus** Hyatt & Smith, 1905

Pl. 1, fig. 6 a-b; Fig. 8 a-b.

Material. 1 specimen: MPUM 8144 (AK 5-6). Han-Bulog Limestone, Kçira (Albania). Section KçA, level AK 5.

Description. Compressed involute conch, deeply embracing the lateral sides, slightly convex with maximum width at the umbilical shoulders. The venter is tabulate and relatively wide (Fig. 8b) with angular ventral shoulders. On the first third of the outer whorl there are very weak keels on the ventral shoulders, which disappear on the body chamber. Umbilicus very narrow. Shell smooth.

Suture line with an external lobe subdivided in two adventitious bifid lobes; the second already shows a further subdivision of both denticulations. The first lateral lobe is very deep and wide, with four subdivisions.

Fig. 8 - Cordillerites sp. aff. *C. angulatus* Hyatt & Smith. Specimen MPUM 8144 (AK 5-6): (a) Suture line at H = 22.5 mm. Bar scale is 0.5 cm. (b) Whorl section at H = 27.3 mm. x 1.

Its width corresponds approximatively to the sum of the widths of the previous saddle and lobe. The second lateral lobe is about half the width and length of the first and is trifid. Four auxiliary elements are preserved. The saddles are slender, narrower at the base and with a rounded top (Fig. 8a).

Dimensions (in mm):

	D	H	h	W	w	U	U/D	H/W	SGR%
MPUM 8144 (AK 5-6)	29.7	18.1	9.2	10.35	7.5	2.4	0.081	1.749	96.739

Discussion. The suture line of the specimen is generally simpler and with fewer elements than the one of *Pseudosageceras* Diener, 1895.

Compared with the suture lines of *Cordillerites angulatus* drawn by Hyatt & Smith, there is the unusual subdivision of the first lateral lobe in four parts instead of the three present in the type-species and in the other species belonging to the genus. Nevertheless, the suture line of specimen MPUM 8144 (AK 5-6) is closer to that of the genus *Cordillerites* rather than to *Pseudosageceras*, because of the fewer elements and the width of the deepest lateral lobe. The attribution to the genus *Cordillerites* is also justified by the venter, which is wider than in *Pseudosageceras*.

In Nopcsa's collection some specimens with an unusual wide venter are classified as *Pseudosageceras*. A check on their suture lines is necessary to be sure about their taxonomic attribution.

Specimen MPUM 8144 (AK 5-6) is considered only "*affinis*" to the species *C. angulatus* Hyatt & Smith, 1905, because it has a slightly keeled venter in the first third of the outer whorl, a character not included by Hyatt & Smith in the definition of the species. According to the evolution of the sutural lines in *Cordillerites angulatus* reported by Hyatt & Smith (1905, p. 109-110), the specimen MPUM 8144 (AK 5-6) should be an adult.

Cordillerites bicarinatus (Tozer, 1965a) has a different kind of venter; the outer whorl is characterized by rounded ventral shoulders in the first third and a tabulate venter with distinctly raised keels in the last third.

Cordillerites concinnus (Kiparisova, 1961) shows a different suture line without a very deep and wide ventral lobe, with fewer adventitious lobes and a different shape of the saddles. The depicted specimen (Kiparisova, 1961, pl. 7, fig. 1a-b) has conspicuous dimensions for a *Cordillerites*.

Genus *Pseudosageceras* Diener, 1895

Type species: *Pseudosageceras* sp. indet. Diener, 1895 (= *Pseudosageceras multilobatum* Noetling, 1905)

Pseudosageceras drinense (Arthaber, 1911)

v1908 *Pseudosageceras multilobatum* Arthaber, p. 279, pl. 12, fig. 3a-c.
v1911 *Pseudosageceras drinense* - Arthaber, p. 201, pl. 17, fig. 6, 7.
1915a *Pseudosageceras drinense* - Diener, p. 236, *nn.*
1928 *Pseudosageceras drinense* - Renz, p. 155, *nn.*
1933 *Pseudosageceras drinense* - Kutassy, p. 639, *nn.*
1934 *Pseudosageceras drinense* - Spath, p. 55, fig. 6 c.
1947 *Pseudosageceras drinense* - Renz & Renz, p. 62, *nn.*
1948 *Pseudosageceras drinense* - Renz & Renz, p. 92, pl. 16, fig. 6-6a.
?1948 *Pseudosageceras drinense* var. *incentrolata* Renz & Renz, p. 92, pl. 16, fig. 11-11a.

Holotype. "*Pseudosageceras multulobatum*" Arthaber, 1908, p. 279, pl. 12, fig. 3a-b; PIUW IV-3. IIm.

Material. 1 specimen: MPUM 8145 (AK 2bis-25). Han-Bulog Limestone, Kçira (Albania). Section KçA, level AK 2bis.

Description. The specimen is a phragmocone and probably part of the body chamber. The conch is compressed and involute, with an extremely narrow sulcated venter. Lateral sides slightly convex and smooth, passing to an umbilicus reduced to a point.

The suture line is only partly exposed and very poorly preserved. Three saddles and four incomplete lobes are visible, but it is possible to recognize the shape of the deepest lateral lobe which is trifid, while the others are bifid. The saddles are elongated and get narrower at the top.

Discussion. The attribution of specimen MPUM 8145 to *P. drinense* (Arthaber) is due to the pattern of the suture line.

P. albanicum (Arthaber, 1908) is extremely similar in morphologic features, but has a different suture line. First, the deepest lateral lobe is bifid with a small subdivision; secondly, the saddles have a uniform width at the base and at the top, instead of a "lanceolate"shape.

P. multilobatum Noetling, 1905 has a different morphology of the venter, that is tabulate. The suture line is quite similar to that of *P. drinense* (Arthaber).

Occurrence. The species is known from the *Subcolumbites-Prohungarites* zone (sensu Kummel, 1973) of Albania (Arthaber, 1908, 1911) and Chios (Renz & Renz, 1947, 1948).

Pseudosageceras sp.

Pl. 1, fig. 7a-b.

Material. 1 specimen: MPUM 8146 (AK 2bis-22). Han-Bulog Limestone, Kçira (Albania). Section KçA, level AK 2bis.

Description. This specimen is faulted and distorted. The conch is entirely filled with calcite that compromises the preservation of the suture line.

The external shape is identical to that of *P. drinense* (Arthaber, 1911), but the specific attribution is not possible because the suture line is lacking.

Order Phylloceratida Arkell, 1950
Superfamily *Phylloceratac eae* Zittel, 1884
Family *Ussuritidae* Hyatt, 1900
Genus *Eophyllites* Spath, 1930

Type species: *Monophyllites dieneri* Arthaber, 1908

Preliminary remarks. The genus *Eophyllites* was established by Spath in 1930, but was not accepted unanimously. Renz & Renz (1948) considered it only a subgenus of *Monophyllites*, Mojsisovics, 1879, such as *Leiophyllites* Diener, 1915. Some species originally belonging to *Monophyllites* were distributed within these two genera, but they changed their generic position several times.

In 1968 Shevyrev defined the composition of the genus to include the following species: *E. dieneri* (Arthaber, 1908), *E. nopcsai* (Arthaber, 1908), *E. refractus* Spath, 1934, *E. variabilis* Spath, 1934, *E. orientalis* Spath, 1934, *E. rosae* (Renz & Renz, 1948), *E. preconfucii* (Renz & Renz, 1948), *E. thalmanni* (Renz & Renz, 1948), *E. georgalasi* (Renz & Renz, 1948), *E. paleotriadicus* (Renz & Renz, 1948), *E. praekieperti* (Renz & Renz, 1948) and *E. amurensis* Kiparisova, 1961.

According to Kummel (1969) *E. refractus* Spath, 1934, *E. nopcsai* (Arthaber, 1908) and *E. rosae* (Renz & Renz, 1948) should be considered synonyms of E. dieneri (Arthaber), because the main difference between these species is the degree of evolution or involution of the shell and this is nothing more than intraspecific variability.

In 1986 Shevyrev confirmed the composition of the genus *Eophyllites* given in 1968 and considered the genera *Monophyllites* (*Schizophyllites*) Renz & Renz, 1948, and *Ussuriphyllites* Zacharov, 1967, synonyms of *Eophyllites* Spath, 1930.

Eophyllites dieneri (Arthaber, 1908)

Pl. 1, fig. 8.

1908 *Monophyllites dieneri* Arthaber, p. 288, pl. 13, fig. 3a-c.
v1908 *Monophyllites dieneri* var. Arthaber, p. 288, pl. 13, fig. 4a-c.
v1911 *Monophyllites dieneri* - Arthaber, p. 234, pl. 20, fig. 5-8.
1915a *Monophyllites dieneri* - Diener, p. 203, *nn.*
1930 *Eophyllites dieneri* - Spath, p. 89, *nn.*
1934 *Eophyllites dieneri* - Spath, p. 294.
1948 *Monophyllites (Eophyllites) dieneri* var. *involuta* Renz & Renz, p. 75, pl. 5, fig. 1-1b.
1948 *Monophyllites (Schizophyllites) betilloni* Renz & Renz, p.76, pl. 4, fig. 8-8b.
1948 *Monophyllites (Schizophyllites) betilloni*, var. *evoluta* Renz & Renz, p. 76, pl. 4, fig. 6-6a; pl. 5, fig. 2-2a, 4-4a, 6-6a.
1957 *Eophyllites dieneri* - Arkell et al., p. L 186, *nn.*
v1969 *Eophyllites dieneri* - Kummel, p. 524 partim, pl. 23, fig. 1-5.
?1976 *Eophyllites dieneri* - Wang & He, p. 426 partim, pl. 47, fig. 3-4.
1980 *Eophyllites dieneri* - Assereto et al., p. 725, *nn.*
1992 *Eophyllites dieneri* - Gaetani et al., p. 188, *nn.*

Lectotype. *Monophyllites dieneri* Arthaber, 1908, p. 288, pl.13, fig.3 a-c; selected by Spath, 1930, p. 294, the lectotype is lost.

Material. 1 specimen: MPUM 8147 (AK 62-10). Han-Bulog Limestone, Kçira (Albania). Section KçB, level AK 62.

Description. The specimen consists of a phragmocone (full of calcite) and body chamber (full of sediments), and is slightly deformed. The conch is involute and compressed with an oval whorl section, a narrowly rounded venter and weakly convex sides. Rounded umbilical shoulders that pass to a low and subvertical umbilical wall.

Shell smooth except for weak growth lines. Suture line not visible.

Dimensions (in mm):

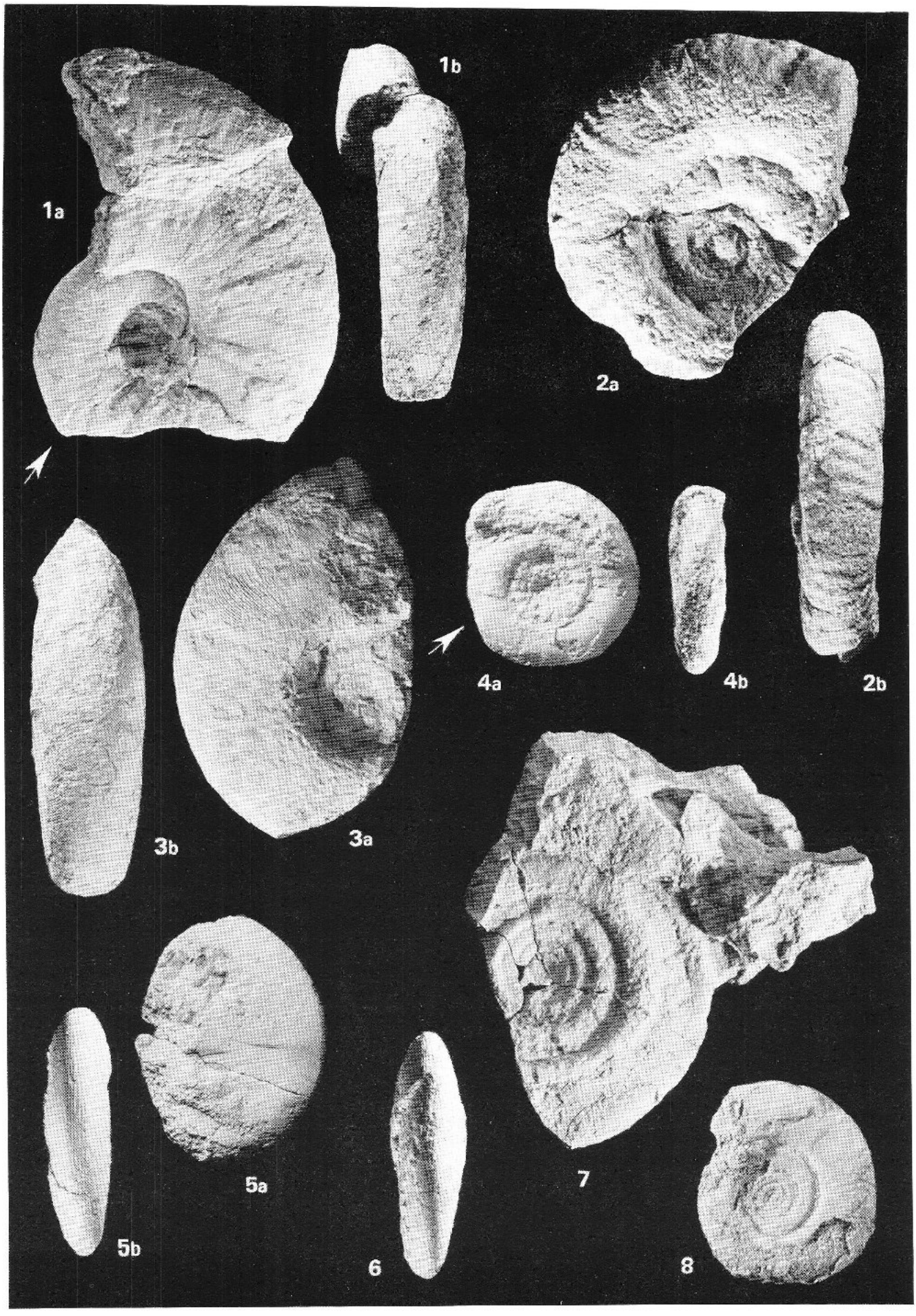
	D	H	h	W	w	U	U/D	H/W	SGR%
MPUM 8147 (AK 62-10)	52.15	25.15	13.3	-	-	13.7	0.263	-	89.098

Discussion. The attribution to the species *E. dieneri* is justified by the strict resemblance with the drawing of the lectotype. Unfortunately, the lectotype is not available in the collection of PIUW, but three paralectotypes are still preserved there and eleven types are in Nopcsa's collection at NHM. One of the paralectotypes in Wien is a variety recognized by Arthaber (1908 Arthaber, pl. 13, fig. 4a-c) with more flattened flanks, higher umbilical wall and some differences in the suture line.

Eophyllites refractus Spath, 1934 (*nomen novum* for *Monophyllites hara*, Arthaber, 1908, 1911, non Diener, 1895) is a species very close to *E. dieneri*. Young specimens of the two species are extremely alike, while adult

PLATE 2

Fig. 1 a, b - *Eophyllites* sp. aff. *E. refractus* (Spath). KçA, MPUM 8148 (AK 2bis-1). a) Lateral view; b) ventral view; x 1.
Fig. 2 a, b - *Paleophyllites steinmanni* Welter. KçA, MPUM 8150 (AK 5-20). a) Lateral view; b) ventral view; x 1.
Fig. 3 a, b - *Monophyllites* sp. Kçira, site 'E', MPUM 8151 (AK 125-5). a) Lateral view; b) ventral view; x 1.
Fig. 4 a, b - *Sulioticeras* sp. cf. *S. sulioticum* (Arthaber). KçB, MPUM 8156 (AK 62-18). a) Lateral view; b) ventral view; x 1.
Fig. 5 a, b - *Sturia sansovinii* (Mojsisovics). Kçira, site 'E', MPUM 8159 (AK 125-1). a) Lateral view; b) ventral view; x 1.
Fig. 6 - *Sturia* sp. - KçA, MPUM 8160 (AK 57-2). Ventral view; x 1.
Fig. 7 - *Leiophyllites* sp. cf. *L. pitamaha* (Diener). KçA, MPUM 8152 (AK 5-1). Lateral view; x 1.
Fig. 8 - *Leiophyllites* sp. cf. *L. pitamaha* (Diener). KçA, MPUM 8153 (AK 36-1). Lateral view; x 1. Arrow indicates the beginning of the body chamber.


1a
1b
2a
2b
3a
3b
4a
4b
5a
5b
6
7
8

individuals of *Eophyllites refractus* have a wider ventral area and a suture line with less slender saddles.

Eophyllites nopcsai (Arthaber, 1908) is clearly more involute while, given the same dimensions, *Ussurites* (?) *decipiens* Spath, 1934 (=*Monophyllites kingi* Arthaber, 1911, non Diener, 1895) is more evolute. Its ventral shoulders are rounded with the umbilical wall low and sloped.

Occurrence. *E. dieneri* (Arthaber) is known from the *Subcolumbites-Prohungarites* zone (sensu Kummel, 1973) of Albania (Arthaber, 1908, 1911) and Chios (Renz & Renz, 1947, 1948; Assereto et al., 1980; Gaetani et al., 1992). The occurrence in China is not certain (Wang & He, 1976).

Eophyllites sp. aff. **E. refractus** (Spath, 1934)

Pl. 2, fig. 1a-b; Fig. 9a.

Material. 1 specimen: MPUM 8148 (AK 2bis-1). Han-Bulog Limestone, Kçira (Albania). Section KçA, level AK 2bis.

Description. The specimen is made of a phragmocone and body chamber filled with sediments, with shell, broken and faulted. The conch is compressed and involute, with subparallel flanks, venter wide and rounded; the whorl section is subrectangular with rounded lateroventral shoulders (Fig. 9a). Great increase of the whorl height in the outer whorl. The umbilical shoulders are rounded and pass to a subvertical and smooth umbilical wall. The outer whorl shows an umbilical egression with great increase in umbilical width in the last half.

Ornamentation consisting only of weak growth lines. The suture line is only partly visible, showing a portion of the ventral lobe and the first and second lateral ones. They are entirely frilled, with many denticulations going up the flanks of the saddles. Lobes deep and u-shaped.

Discussion. The species *E. refractus* was erected by Spath in 1934 as *nomen novum* for *Monophyllites hara* Arthaber, 1908, 1911 (non Diener, 1895). Spath stated that the specimen in Arthaber's collection with the name *M. hara* (1908 Arthaber, p. 216, pl. 12, fig. 4) did not have the morphologic patterns and the suture line of Diener's species. *E. refractus* is characterized by a wide rounded venter and growth lines bent back on the ventral shoulders. The suture line has less slender saddles than *E. dieneri* (Arthaber, 1908). This species was considered conspecific with *E. dieneri* (Arthaber) by Kummel (1969) as he thought that the width of the venter could be variable within a species.

Monophyllites hara Arthaber (non Diener, 1895) (1908, p. 216, pl. 12, fig. 4) is still preserved at PIUW and several paratypes are in Nopcsa's collection at NHM. A satisfactory distinction is not possible because the specimens are small and several *Eophyllites* species look alike at small size.

The specimen MPUM 8148 (AK 2bis-1) is a phragmocone and body chamber of a big *Eophyllites*. It is close to *E. refractus* in the width of the venter, the shape of the whorl section and the suture line. Moreover, it shows umbilical egression in the last whorl, it is more involute and the flanks are parallel. It is also bigger than the specimens in Arthaber's and Nopcsa's collections, so a morphologic comparison is extremely difficult.

The attribution to *E. dieneri* (Arthaber) was not taken into consideration because *E. dieneri* has an oval whorl section with a narrower venter. Moreover the only specimen in Arthaber's collection of nearly the same size does not show umbilical egression, while the whorl section and the venter cannot be evaluated because of the incompleteness of the shell.

Eophyllites sp.

Material. 2 specimens: MPUM 8149 (AK 2bis-23, AK 31-2). Han-Bulog Limestone, Kçira (Albania). Section KçA, levels AK 2bis and AK 31.

Description. Specimen MPUM 8149 (AK 2bis-23) consists of half of the phragmocone with only a small part of the last whorl. The venter is broken and not assessable, except for the last whorl where it is wide and rounded. The ventral shoulders are rounded and the flanks are slightly convex with tendency to become parallel. The specimen is compressed and slightly evolute, with a wide umbilicus and low, vertical umbilical wall.

On the outer whorl the suture line is partly exposed. The second and third lateral saddles and the top of the first lateral one are visible. They are monophyllic (entire, not frilled). A lateral lobe between the second and third saddle is relatively wide and entirely indented.

Discussion. The suture line of specimen MPUM 8149 (AK 2bis-23) is incomplete and it is very difficult to give a specific attribution on the base of the visible parts. Nevertheless, the exposed lateral lobe is closer to those of the genus *Eophyllites* Spath, 1930, than to those of *Leiophyllites* Diener, 1895. Specimens belonging to *Eophyllites* have deeper and wider lobes, with more digitations involving the lateral sides of the saddles as well. Generally, the genus *Leiophyllites* has wider, more shallow lobes, with fewer digitations and a flat bottom.

The specimen appears close to *Ussurites* (?) *decipiens* Spath, 1934 (=*Monophyllites kingi* Arthaber, 1911) for the degree of evolution of the shell. Nevertheless, this species has no vertical umbilical wall. The most similar species is *E. dieneri* (Arthaber, 1908), but it is clearly more involute. Because of the poor preservation of the specimen, a specific determination was not possible.

Specimen MPUM 8149 (AK 31-2) is a representative of level AK 31, that is characterized by a fauna of small specimens. Its attribution to the genus *Eophyllites* is justified by the kind of coiling, that tends towards involution. Specimens belonging to the genus *Leiophyllites* are already more evolute at small size.

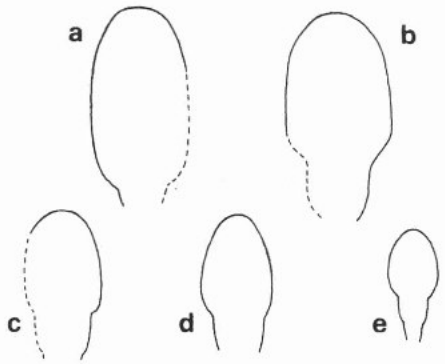


Fig. 9 - Family *Ussuritidae*: (a) *Eophyllites* sp. aff. *E. refractus* (Spath). Whorl section of specimen MPUM 8148 (AK 2bis-1) at H = 23.7 mm. x 1. (b) *Paleophyllites steinmanni* Welter. Whorl section of specimen MPUM 8150 (AK 5-20) at H = 19.4 mm. x 1. (c-e) *Leiophyllites* sp. cf. *L. pitamaha* (Diener). Whorl sections (c) Specimen MPUM 8152 (AK 5-1) at H = 13.3 mm; (d) Specimen MPUM 8154 (AK 5-2) at H = 13.1 mm; (e) Specimen MPUM 8153 (AK 36-1) at H = 8.7 mm. All x 1.

Genus *Paleophyllites* Welter, 1922

Type species: *Paleophyllites steinmanni* Welter, 1922

Paleophyllites steinmanni Welter, 1922

Pl. 2, fig. 2 a-b; Fig. 9b.

1922 *Paleophyllites steinmanni* Welter, p. 119, pl. 162, fig. 5-7; pl. 163, fig. 3-6.
1933 *Paleophyllites steinmanni* - Kutassy, p. 606, *nn.*
1934 *Paleophyllites steinmanni* - Spath, p. 297, fig. 103.
1947 *Monophyllites (Paleophyllites) thalmanni* Renz & Renz, p. 61, 78, *nn.*
?1947 *Monophyllites (Paleophyllites) praekieperti* Renz & Renz, p. 61, 78, *nn.*
1948 *Monophyllites (Paleophyllites) thalmanni* - Renz & Renz, p. 79, pl. 3, fig. 10-10b.
?1948 *Monophyllites (Paleophyllites) praekieperti* - Renz & Renz, p. 80, pl. 4, fig. 5-5b.
1968b *Paleophyllites steinmanni* - Kummel, p. 527, *nn.*
?1980 *Paleophyllites* cf. *steinmanni* - Assereto et al., p. 725, *nn.*

Lectotype. *Paleophyllites steinmanni* Welter, 1922, p. 119, pl. 162, fig. 5-7; GIBU, W216a; selected by Spath, 1934, p. 298.

Material. 1 specimen: MPUM 8150 (AK 5-20). Han-Bulog Limestone, Kçira (Albania). Section KçA, level AK 5.

Description. The specimen is a phragmocone and probably part of the body chamber, partly filled with cement and partly with sediments. The conch is compressed and slightly evolute. Whorl section subrectangular with rounded ventral shoulders and flanks tending to be parallell (text-fig 9b). The venter is relativly wide and rounded. Umbilicus wide with rounded shoulders that pass to a low subvertical umbilical wall.

The ornamentation apparently covers only the outer whorl and consists of concave primary ribs, relatively close and strong, that cross the venter and weaken on the lower half of the whorl's height. Some of them are stronger but at irregular intervals.

Suture line not preserved.

Remark. In spite of the poor preservation, the specimen closely resembles in general shape the types of Welter, though it is of slightly larger dimensions.

Occurrence. *P. steinmanni* Welter is known from the *Subcolumbites-Prohungarites* zone (sensu Kummel, 1973) of Chios (Renz & Renz, 1947, 1948) and from the *Prohungarites* zone of Timor (Welter, 1922; Kummel, 1968b).

Genus *Monophyllites* Mojsisovics, 1879

Type species: *Ammonites spherophyllus* Hauer, 1850

Monophyllites sp.

Pl. 2, fig. 3a-b.

Material. 1 specimen: MPUM 8151 (AK 125-5). Han-Bulog Limestone, Kçira (Albania). From the level AK 125 at the top of the block at site 'E'.

Description. The specimen consists of more or less half of the conch. Involute and compressed form with subrectangular whorl section. Venter wide and slightly arched, with rounded lateroventral shoulders. Sides flattened with whorl's height rapidly increasing. Umbilicus wide and deep with subvertical wall and umbilical shoulders rounded.

The shell is covered by thick growth lines that bend towards the opening at 2/3 of the whorl's height and cross the venter with a convexity.

Suture line only partly preserved. A lateral saddle (probably the second lateral) is visible; it shows the typical asymmetrical shape of the genus *Monophyllites*, with rounded top and the internal side deeply indented.

Remark. The specimen is poorly preserved. The generic attribution is based both on the morphologic shape and the suture line.

Superfamily *Ussuritacea* Hyatt, 1900
Family *Paleophyllitidae* Popov, 1958
Genus *Leiophyllites* Diener, 1915

Type species: *Monophyllites suessi* Mojsisovics, 1882

Leiophyllites sp. cf. **L. pitamaha** (Diener, 1895)

Pl. 2, fig. 7, 8; Fig. 9c-e.

Material. 4 specimens: MPUM 8152 (AK 5-1); MPUM 8153 (AK 36-1); MPUM 8154 (AK 5-2, AK 31-1). Han-Bulog Limestone, Kçira (Albania). Section KçA, levels AK 5, AK 31, AK 36.

Description. The specimens are only partly preserved and sometimes crushed on one side. The phragmocones are filled with calcite that hinders the preservation of the suture line. Evolute and compressed *Leiophyllites*, with a regular and slow growth. Outer whorl covers slightly less than half of the previous one. Whorl section is oval with a ventral area rounded and moderately wide, gradually passing to convex lateral sides (Fig. 9c-e). Umbilical shoulders are rounded and pass to a low and sloped umbilical wall.

Shell smooth. Suture line not preserved.

Discussion. The species *L. pitamaha* was erected by Diener (1895) on material from the Himalayas; Arthaber in 1911 classified some specimens from Kçira (Albania) as *M. pitamaha*. Subsequently, in 1934 Spath stated that Arthaber's material was different from Diener's types, so he chose a new name for them, i.e. *Eophyllites variabilis*. He considered the specimens closer to *Eophyllites* because of the suture line with a deep and frilled first lateral lobe. Nevertheless, the general appearance of the forms was closer to the genus *Leiophyllites*. The specimen depicted by Arthaber (1911, pl. 20, fig. 11) was selected as lectotype (Spath, 1934) of *Eophyllites variabilis*, but unfortunately it is now lost.

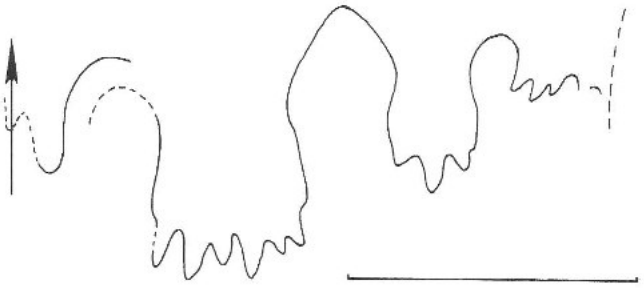


Fig. 10 - *Leiophyllites* sp. Suture line of specimen MPUM 8155 (AK 2bis-14) at H = 8.6 mm. Bar scale is 0.5 cm.

The new species differs from *L. pitamaha* mainly in the whorl section, that is almost subrectangular, with a wide rounded venter and lateral sides almost flat. The whorl section of *L. pitamaha* is more compressed, with a narrowly rounded venter, and maximal width at half of the whorl height. Nevertheless, the main problem in distinguishing these two species is that the lectotypes are extremely similar at small size; a satisfactory distinction between them could be possible only if the suture line were preserved.

The new specimens from Kçira show an oval whorl section, without a subrectangular shape and flat flanks. Moreover, a direct comparison of this material with some large specimens of *L. pitamaha* from Chios (Fantini, 1981), allowed the recognition of a mophologic similarity between the new specimens from Kçira and Diener's species.

Leiophyllites sp.

Fig. 10

Material. 5 specimens: MPUM 8155 (AK 2bis-14; AK 31-3, -8, -11; AK 40-1). Han-Bulog Limestone, Kçira (Albania). Section KçA, levels AK 2bis, AK 31, AK 40.

Description. Evolute and compressed juvenile specimens, consisting of a phragmocone and part of the body chamber. In the outer whorl the whorl section outline changes from subcircular to oval. Venter widely rounded that passes gradually to convex flanks. Umbilical margin rounded; umbilical wall. low.

The suture line is ceratitic with three lateral saddles; the second is the highest, asymmetrical, with a subangular top, while the third is very small. The first lateral lobe is the deepest and widest, with several small denticulations; the second is more or less half of the first in height and width and it is trifid (Fig. 10).

Discussion. The suture line and the general features of the specimen make it closer to the genus *Leiophyllites*, but it is clearly a juvenile form. Several species belonging to this genus are extremely similar during the juvenile stage, and neither the whorl section nor the suture line are definitively significant at that stage.

Superfamily *Xenodiscaceae* Frech, 1902
Family *Xenoceltitidae* Spath, 1930
Genus *Sulioticeras* Tozer, 1994

Type species: *Xenodiscus sulioticus* Arthaber, 1911

Sulioticeras sp. cf. **S. sulioticum** (Arthaber, 1911)

Pl. 2, fig. 4a-b.

Material. 1 specimen: MPUM 8156 (AK 62-18). Han-Bulog Limestone, Kçira (Albania). Section KçB, level AK 62.

Description. The specimen is a complete phragmocone with body chamber, evolute and slightly compressed, with rounded venter. Whorl section with subcircular outline. Umbilicus wide with umbilical wall low and umbilical shoulders rounded.

Characteristic sculpture consisting of primary radial ribs that cover only the lower third of the whorl height, very weak at the beginning of the outer whorl, then absent on the body chamber.

Suture line ceratitic with three visible lateral saddles. The first lateral lobe is bifid, divided by a short saddle, then each digitation is in turn subdivided in two or three parts. The second lateral lobe is trifid and it is

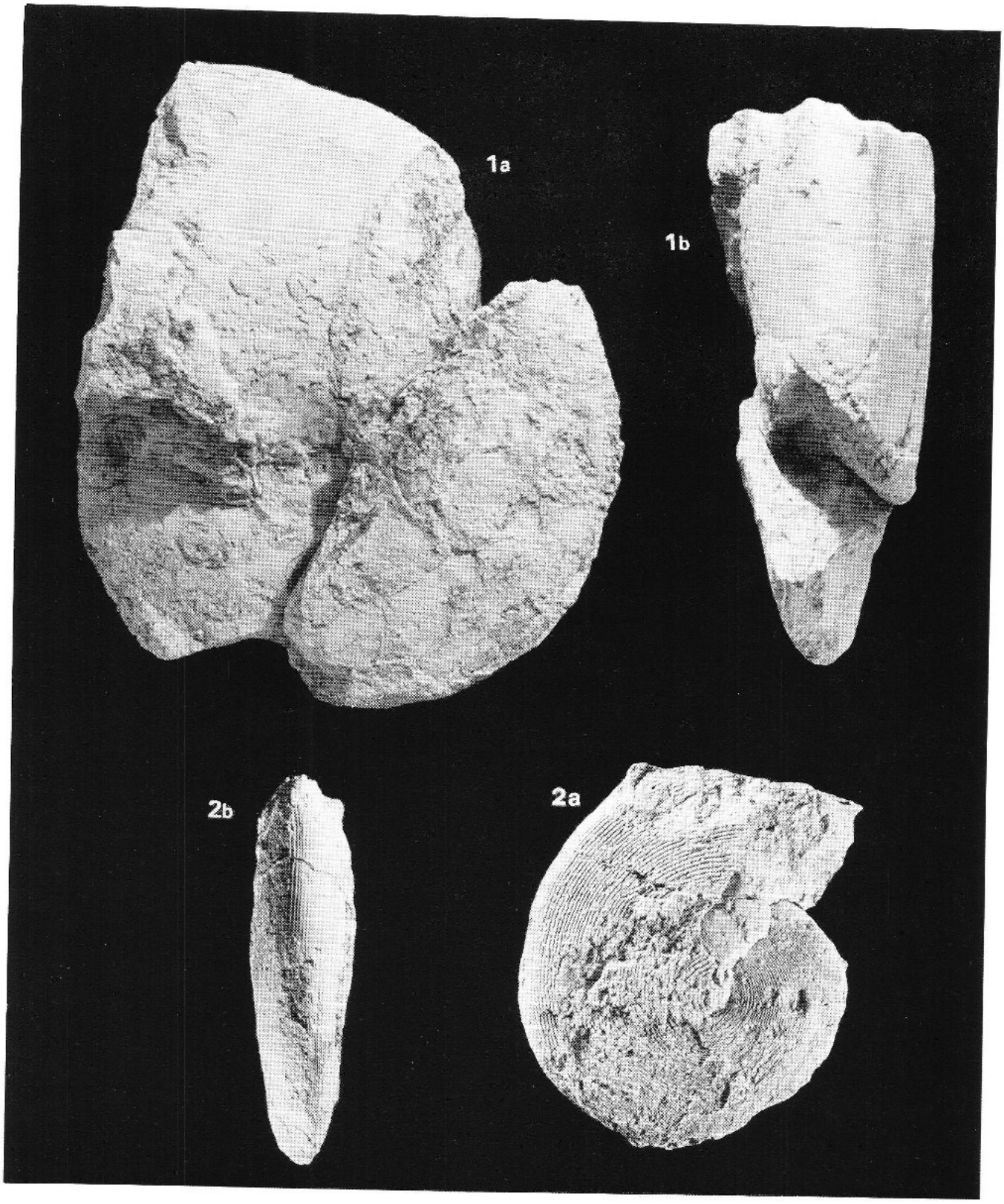


PLATE 3

Fig. 1 a, b - *Parussuria* (?) sp. KçA, MPUM 8163 (AK 5-15). a) Lateral view; b) ventral view; x 1.
Fig. 2 a, b - *Procladiscites brancoi* Mojsisovics. KçA, MPUM 8157 (AK 57-1). a) Lateral view; b) ventral view; x 1.

wide as half of the first one. The saddles are entire, with a rounded top.

Discussion. *Sulioticeras* is a new genus established by Tozer in 1994a on the basis of just two species: *Preflorianites sulioticus* (Arthaber, 1911) and *Preflorianites intermedius* Tozer, 1965. The genus is distinguished from *Preflorianites* Spath, 1930 based on a smoother body chamber.

The generic attribution of specimen MPUM 8156 (AK 62-18) is justified by the presence of a regular ribbing on the phragmocone and the smoothness of the body chamber. Although poorly preserved, it is closer to *S. sulioticum* because *S. intermedium* is less evolute.

Superfamily *Arcestaceae* Mojsisovics, 1875
Family *Cladiscitidae* Zittel, 1884
Genus *Procladiscites* Mojsisovics, 1882

Type species: *Procladiscites brancoi* Mojsisovics, 1882

Procladiscites brancoi Mojsisovics, 1882

Pl. 3, fig. 2a-b; Fig. 11.

1882 *Procladiscites brancoi* Mojsisovics, p. 171, pl. 48, fig. 1, 2a-c.
1892 *Procladiscites brancoi* - Hauer, p. 31.
1896 *Procladiscites brancoi* - Arthaber, p. 85.
1901 *Procladiscites brancoi* - Diener, p. 14.
1910 *Procladiscites brancoi* - Renz, p. 22.
1911 *Procladiscites brancoi* var. - Salopek, p. 24, pl. 2, fig. 3.
1914 *Procladiscites brancoi* - Arthaber, p. 175.

Holotype. A holotype was not selected by Mojsisovics. Syntypes are preserved at the Geologischen Bundesanstalt (Wien).

Material. 1 specimen: MPUM 8157 (AK 57-1). Han-Bulog Limestone, Kçira (Albania). Loose block from the upper part of section KçA.

Description. Involute, compressed form with oval whorl section. The venter is rounded, wide and gradually passes to convex flanks (Fig. 11). The width of the whorl is more or less the same in the lower half of the flank, but is maximum near the umbilical shoulders. Umbilicus extremely narrow, with rounded shoulders. Umbilical wall vertical and increasing in height during the growth.

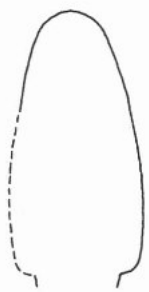


Fig. 11 - *Procladiscites brancoi* Mojsisovics. Whorl section of specimen MPUM 8157 (AK 57-1) at H = 34.7 mm. x 1.

The surface of the shell shows a regular and continuous spiral striation that covers both the umbilicus and the venter. The striae are regularly spaced and uniformly strong.

The suture line is not completely preserved. A small part of the bifid first lateral lobe and the second lateral saddle are visible. The top is not deeply subdivided, with a general rounded shape; just below the top phylloid digitations start.

Discussion. The wide rounded venter and the suture line allow the attribution of the specimen to the genus *Procladiscites*. The genus *Cladiscites* Mojsisovics, 1879 has generally a more depressed whorl section and a suture line with flattened top. The genus *Sturia* Mojsisovics, 1882 has a different whorl section, with an oval shape, but with a narrowly rounded venter and maximum width at half of the whorl height.

The greatest similarity in morphologic features and suture line is with the species *P. brancoi* Mojsisovics, 1882. *P. yasoda* Diener, 1895 has close resemblance too, but has a wider, open umbilicus that exposes the inner whorls. The same thing can be said about *P. elegans* Shevirev, 1995 (= *P.* cf. *yasoda* Welter, 1915 and *P. brancoi* He & al., 1986).

Occurrence. The species was reported first from the Trinodosus Zone of the Schreyer Alpe (Mojsisovics, 1882), then from the same Zone of Bosnia (Hauer, 1892), of Gross-Reifling, Austria (Arthaber, 1896), of Hallstatt, Austria (Diener, 1901) and from south Dalmatia (Salopek, 1911).

Family *Arcestidae* Mojsisovics, 1875
Genus *Proarcestes* Mojsisovics, 1893

Type species: *Arcestes bramantei* Mojsisovics, 1869

Proarcestes sp.

Material. 1 specimen: MPUM 8158 (AK 125-2). Han-Bulog Limestone, Kçira (Albania). From level AK 125 at the top of the block at site E.

Description. The specimen is part of the phragmocone of an involute spheroidal form, with some shell and small pieces of the suture line exposed. Smooth shell. Suture line ammonitic with lobes and saddles of triangular shape. The poor preservation does not allow a specific attribution.

Superfamily *Ptychitacea* Mojsisovics, 1879
Family *Sturiidae* Kiparisova, 1958
Genus *Sturia* Mojsisovics, 1882

Type species: *Amaltheus sansovinii* Mojsisovics, 1869

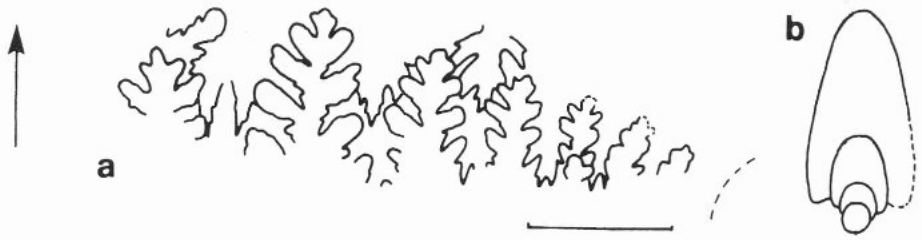


Fig. 12 - *Sturia sansovinii* Mojsisovics. Specimen MPUM 8159 (AK 125-1): (a) Suture line at H = 22.7 mm. Bar scale is 0.5 cm. (b) Whorl section at H = 24.1 mm. x 1.

Sturia sansovinii (Mojsisovics, 1869)

Pl. 2, fig. 5a-b; Fig. 12a-b.

1869 *Amaltheus sansovinii* Mojsisovics, p. 580, pl. 18, fig. 1, 2.
1882 *Sturia sansovinii* - Mojsisovics, p. 241, pl. 49, fig. 5-7; pl. 50, fig. 1.
1892 *Sturia sansovinii* - Hauer, p. 283, pl. 10, fig. 7.
1895 *Sturia sansovinii* - Salomon, p. 192, pl. 8, fig. 4.
1895 *Sturia sansovinii* - Diener, p. 61, pl. 15.
1904 *Sturia sansovinii* - Martelli, p. 102, pl. 6, fig. 5.
1905 *Sturia sansovinii* - Noetling, pl. 14, fig. 4.
1906 *Sturia sansovinii* - Arthaber, pl. 36, fig. 3.
1906 *Sturia sansovinii* - Frech, p. 273, fig. 5, 6.
1908 *Sturia sansovinii* - Kittl, p. 525.
1912 *Sturia sansovinii* - Turina, p. 678.
1913 *Sturia sansovinii* - Simionescu, p. 338, pl. 7, fig. 8, text-fig. 69.
1914 *Sturia sansovinii* - de Toni, p. 167, pl. 13, fig. 1, 2.
1915a *Sturia sansovinii* - Diener, p. 269, *nn.*
1915 *Sturia* cf. *sansovinii* - Welter, p. 99, text-fig. 7.
1925 *Sturia sansovinii* - Diener, p. 71, pl. 13, fig. 4.
1933 *Sturia sansovinii* - Kutassy, p. 666, *nn.*
1946 *Sturia* sp. - Kindle, p. 21.
1957 *Sturia sansovinii* - Kummel, p. 182, text-fig. 211-3.
1958 *Sturia sansovinii* - Kiparisova et al., p. 51, pl. 16, fig. 3, text-fig. 43.
1959 *Sturia* cf. *sansovinii* - Onuki & Bando, p. 101, pl. 8, fig. 3, 4.
1960b *Sturia sansovinii* - Kummel, p. 5, pl. 1, fig. 2.
1961 *Sturia sansovinii* - Shevyrev, p. 79, text-fig. 8, 9.
1967 *Sturia* sp. - Tozer, p. 71.
1968 *Sturia sansovinii* - Shevyrev, p. 216, pl. 18, fig. 5, text-fig. 84, 85.
1969 *Sturia* sp. - McLearn, p. 8, pl. 12, fig. 2a, b.
1970 *Sturia sansovinii* - Kullmann, Wiedmann, text-fig. 14e.
1981 *Sturia sansovinii* - Wiedmann, Kulmann, text-fig. 13 e.
1986 *Sturia sansovinii* - Tatzreiter, p. 133.
1986 *Sturia sansovinii* - Shevyrev, text-fig. 42.
1988 *Sturia sansovinii* - Fantini Sestini, p. 62.
1994 *Sturia sansovinii* - Tozer, p. 132, pl. 46, fig. 11 a, b, 33a.
1995 *Sturia sansovinii* - Shevyrev, p. 57, pl. 7, fig. 8, 9.

Lectotype. *Amaltheus sansovinii* Mojsisovics, 1869, p. 580, pl. 18, fig. 1, 2.

Material. 1 specimen: MPUM 8159 (AK 125-1). Han-Bulog Limestone, Kçira (Albania). From level AK 125 at the top of the block at site 'E'.

Description. The specimen is a phragmocone and part of the body chamber of an involute and compressed juvenile form. The inner whorls have wider rounded venter and flanks tending to be parallel. The outer whorl has a narrower venter and convex flanks with maximal width at 1/3 of the height of the whorl. Umbilicus narrow and deep. Umbilical wall vertical, except for the outer whorl where it is sloped inwards (Fig. 12b).

Ornamentation restricted to the ventral area, consisting of weak and regularly spaced spiral striae.

Suture line ammonitic, with deeply frilled lobes and saddles. The saddles have generally trifid round tops; the second lateral is the highest (Fig. 12a).

Discussion. Both whorl section and suture line are typical; the striation restricted to the venter is a juvenile character (Balini, 1997, pers. comm.). The specimen could be close to S. semiarata Mojsisovics, 1882 as well, but this species has a wider venter and subparallel flanks in specimens of the same size as MPUM 8159 (AK 125-1).

Occurrence. The type locality is in the Schreyer Alps, Austria (Trinodosus Zone), but the species is known worldwide. It ranges from Lower Anisian into younger Anisian strata.

Sturia sp.

Pl. 2, fig. 6.

Material. 1 specimen: MPUM 8160 (AK 57-2). Han-Bulog Limestone, Kçira (Albania). Level AK 57 from the upper part of section KçA.

Description. Poorly preserved, involute, compressed specimen with a rounded venter and convex flanks. The ornamentation is restricted to the ventral area with a spiral striation, while the flanks are smooth. The absence of visible suture lines and the incomplete whorl sections do not allow a specific attribution.

Acknowledgements.

I am deeply grateful to Marco Balini and Maurizio Gaetani of the University of Milano for fruitful discussions and a critical review of the manuscript; M. Gaetani also collected the samples. The manuscript also benefited by the critical review of Hugo Bucher (Lyon).

Special thanks are extended to Leopold Krystyn (Paläontologische Institut, Wien) and to Steve Baker (Natural History Museum, London), who kindly allowed the study of Arthaber's and Nopcsa's collections, respectively, and to V.A. Gavrilova (St. Petersburg), who personally saw the material and discussed the taxonomy.

I am also indebited with Alda Nicora (Milano) for the encouragement to start with this research project, carried out during a post-degree fellowship to the Wien University, Austria.

Bilateral project supported by MURST between University of Milano and Fakultety Geolojia i Miniera, Polythekniki Universiteti, Tirana, Albania.

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Received July 30, 1997; accepted october 10, 1997