Aptian stage

(Ottilia Szives)

Geology and stratigraphy

Historical background

The Aptian stage was defined by d'Orbigny in 1840, the type section is located in South-east France, near Apt, Vaucluse. By radiometric data Aptian lasts from 125.0±1 Ma to 112.2±1 Ma (Gradstein et al. 2004). Base of the stage is proposed to be defined by the beginning of M0 magnetic polarity chronozone, the end is potentially markered by the lowest occurrence of a calcareous nannofossil, *Praediscosphaera columnata* (Gradstein et al. 2004).

The Aptian stage was divided into substages (Table 1) — two or three, depending on the author and the studied area (Hoedemaeker et al. 1993, Cecca et al. 1999, Hoedemaeker & Rawson 2000, Hoedemaeker & Reboulet 2003, Reboulet & Hoedemaeker 2006). In France, from the second half of the XIXth century two substages were interpreted (Toucas 1888, Kilian 1888), but the position of the Clansayesian substage was uncertain as the part of the Aptian (Jacob

Table 1. Major differences in the Aptian ammonite biostratigraphy of the Western Tethyan — Boreal and Mediterranean — area

Stage	Substage	Tethys Mula Workshop, 1992 (in Erba 1996)	Kilian Group (Reboulet, Hoedemaeker 2006)	Substage	South England (Rawson 1983, Hancock 1991)	Kennedy et al. (2000)
ALBIAN	Lower	not discussed	*Douvilleiceras mammillatum*	Lower	*Douvilleiceras mammillatum*	*Leymeriella tardefurcata*
			Leymeriella tardefurcata		*Leymeriella tardefurcata*	*Leymeriella germanica*
		Leymeriella schrammeni				*Proleymeriella schrammeni*
112 My APTIAN	Upper (Clansayesian)	*Hypacanthoplites jacobi*	*Hypacanthoplites jacobi*	Upper	*Hypacanthoplites jacobi*	*Hypacanthoplites jacobi*
		Acanthohoplites nolani	*Acanthohoplites nolani*			*Acanthohoplites nolani*
	Middle (Gargasian)	*Parahoplites melchioris*	*Parahoplites melchioris*		*Parahoplites nutfieldensis*	Not mentioned
		Cheloniceras (Epicheloniceras) subnodosocostatum	*Cheloniceras (Epicheloniceras) subnodosocostatum*		*Cheloniceras (Epicheloniceras) martinoides*	
	Lower (Bedoulian)	*Dufrenoyia furcata*	*Dufrenoyia furcata*	Lower	*Tropaeum bowerbanki*	
		Deshayesites deshayesi	*Deshayesites deshayesi*		*Deshayesites deshayesi*	
		Deshayesites weissi	*Deshayesites weissi*		*Deshayesites forbesi*	
121 My		*Deshayesites tuarkyricus*	*Deshayesites oglanensis*		*Prodeshayesites fissicostatus*	

This figure is not a correlation chart. Double horizontal line indicates Aptian/Albian boundary. Bold horizontal lines indicate substage boundaries.

1905, PERVINQUIÉRE 1907, FALLOT 1920a). Finally, according to its stratigraphic position and fauna, BREISTROFFER (1947) concluded the Clansayesian substage as the upper part of the Aptian stage.

In the Mediterranean area, so far in Hungary as well, three substaged Aptian has been used since decades (FÜLÖP 1954, 1976; SZIVES 1999b, 2002, 2007). FÜLÖP (1976) in his monograph followed Russian terminology for the zonation, which placed *Diadochoceras nodosocostatum* Zone for the whole Clansayesian substage (Lyon Colloquium 1963 in RAWSON et al. (eds) 1996, BOGDANOVA & TOVBINA 1994, BOGDANOVA 1999). The position of the Barremian/Aptian boundary and the ammonite zonal scheme for the western Tethyan Aptian is discussed by BARABOSHKIN & MIKHAILOVA (2002), ROPOLO et al. (2000), ARKADIEV et al. (2000), BOGDANOVA & PROZOROVSKY (1999), BARABOSHKIN (1998), AGUADO et al. (1997), RAWSON et al. eds (1996), ERBA (1996). ATROPS & DUTOUR (2002, 2005) proposed to move the base of the Middle Aptian to the base of the *Dufrenoyia furcata* Zone according to a major faunal turnover that corresponds to a transgression (REBOULET & HOEDEMAEKER (reporters) 2006). CONTE (1994) and ROPOLO et al. (2000) are intended to keep the *Dufrenoyia furcata* Zone in the Lower Aptian because they documented the same faunal change at the top of the *Dufrenoyia furcata* Zone.

The supposed stratigraphic position of the Hungarian Aptian/?Lower Albian deposits and their fauna makes reasonable to pay special attention to the question of the Aptian/Albian boundary. The position of the boundary is a point of disagreement since decades (Brinkmann 1937, BREISTROFFER 1947, CASEY 1961a, KEMPER 1982, OWEN 1996a, b, CASEY 1999, KENNEDY et al. 2000, HANCOCK 2001, OWEN 2002). In the ammonite record a gap appears between the *Hypacanthoplites jacobi* Zone (Aptian) and the overlying *Leymeriella (L.) tardefurcata* Zone (Albian) which gap can be documented in many sequences (CASEY 1961a, AMÉDRO 1992, HART et al. 1996, KENNEDY et al. 2000). Ammonite assemblages of the Anglo–Parisien Basin, Northern Germany, South-eastern France and Russia cannot be correlated exactly because of different faunistic picture and a presumable hiatus in many sequences. In the question of the Aptian/Albian boundary there was no suggestion at the last meeting of the Kilian Group (REBOULET & HOEDEMAEKER [reporters] 2006), the decision is still pending on the Albian Working Group of the Subcomission on Cretaceous Stratigraphy. Hungarian ammonite record from the Aptian supports the idea of KENNEDY et al. (2000), that on the base of the absence of typical Lower Albian ammonite taxa it is better to attach the *Proleymeriella schrammeni* and *Leymeriella germanica* Zones to the Upper Aptian. A major faunal turnover marks the base of the Albian at the beginning of the *Leymeriella tardefurcata* Zone as the first occurence of typical Lower Albian taxa (see on Table 1).

Problems of the zonation of the Aptian/Albian boundary are summarized by KENNEDY et al. (2000). Definition for the Aptian/Albian boundary are currently undergoing active review HANCOCK (2001) proposed the base of *Lyelliceras lyelli* subzone of *Hoplites dentatus* Zone— which currently defines the base of the Middle Albian — for the base of the Albian.

In the present work, the standard Mediterranean ammonite zones of the Lower Cretaceous Working Group "Kilian Group" (REBOULET & HOEDEMAEKER [reporters] 2006) are accepted for the Early and Middle Aptian. For the Late Aptian/Early Albian, the ammonite biozonation of KENNEDY et al. (2000) is accepted and used.

The Aptian record in Hungary

Geological setting and stratigraphy

In the present Hungary, Aptian ammonite-bearing sections exposed on the surface in the Transdanubian Range (Text-Figure 13). Borehole sequences that yielded Aptian ammonites are also shown on Text-Figure 13. Bakony Mountains located in the south-western part of the Transdanubian Range (TR), Gerecse Mountains situated in the north-western part of the TR. The first Cretaceous megacycle that can be recognized in the deposits of Hungary ended up around the Late Aptian with a continuous trangression resulted deep water aleurolite at north in one hand (Vértessomló Aleurolite Formation), on the other hand in the southern part of the Transdanubian Range terrestrial circumstances existed with intensive deposition of strata, that later form bauxites.

Aptian formations are not widespread on the surface in Hungary; ammonite bearing sections are even more rare. The most important surface localities are in Tata, additional specimens were collected from the Bakony Mountains — at the Zirc, Márvány quarry and Olaszfalu, Eperkés Hill sections. Only few continuous core sampled boreholes drilled Aptian strata, and ammonites are known just from two of them. Unfortunately all the ammonites of the Neszmély N–1 borehole are mentioned and partly figured in FÜLÖP (1964, 1975) but have been disappeared. Ammonoid assemblage of Neszmély N–4 are under revision by I. Bodrogi.

From stratigraphical point of view The Hungarian Aptian is represented by the radiolaritic Sümeg Marl, crinoidal Tata Limestone and the siliciclastic Lábatlan Sandstone Formations in the Transdanubian Range, the marine Magyaregregy Conglomerate Formation in the Mecsek Mountains and the urgonian Nagyharsány Limestone Formation in the Villány Unit. All lithostratigraphic units indicate different environments of former Cretaceous seas. Aptian ammonites are only known from the Sümeg Marl Formation and the basal beds of the Tata Limestone Formation.

The Sümeg Marl Formation is a radiolaritic, glauconitic sandy marl, about 270 metres thick in the Southern Bakony Mountains — mainly known from boreholes. In the Northern Bakony area maximum thickness of the marl is 35 metres

Text-Figure 13. Map of Hungary. Position of sections and boreholes is numbered as follows: 1 — city of Tata; 2 — Tatabánya Ta–1462 borehole, Tatabánya Ta–1436 borehole, Oroszlány O–1881 borehole; 3 — Jásd 1 quarry; 4 — Jásd J–42 borehole; 5 — Jásd J–36 borehole; 6 — Pénzesgyőr, Tilos Forest; 7 — Zirc, Márvány Quarry; 8 — Olaszfalu, Eperkés Hill, Villó Hill; 9 — Sümeg, Sintérlap Quarry; 10 — Tapolcafő; 11 — Bóly B–1 borehole

(CSÁSZÁR [ed.] 1996) and have several outcrops. The name "Sümeg Marl" was originated from KNAUER (1969) although FÜLÖP (1964) determined this unit as a distinct formation, but without giving a certain name. Ammonites are abundant in the Sümeg Marl, aged from Hauterivien to Aptian and mainly from Neszmély N–1 borehole. FÜLÖP (1964) figured some of them, but the specimens seem to be disappeared.

The Lábatlan Sandstone Formation is graded sandstone with marl, siltstone and radiolarite intercalations. HANTKEN (1868) described first the "Lábatlan sandstone and conglomerate strata", and CSÁSZÁR & HAAS (1977) actualised this name and defined a distinct formation (CSÁSZÁR [ed.] 1996). The sequence can be well observed in the Eastern Gerecse Mountains in about 150 metres of thickness (CSÁSZÁR [ed.] 1996). According to recent studies (FŐZY et al. 2002; FŐZY & JANSSEN 2005, 2006) the age of the formation is Hauterivian – Late Barremian based on ammonites and nannofossils. Presence of Aptian strata is also proved without any ammonite evidence because orbitolinids (SCHLAGINTWEIT 1990) indicate Late Aptian – Early Albian age.

The last member of the Aptian sequence is the Tata Limestone Formation. Most of the Hungarian Aptian ammonite material came from this formation. The name as a distinct formation was derived from FÜLÖP (1975), although NOSZKY JR. (1934) mentioned it as brachiopod–crinoidal limestone. Tata Limestone is known from the axis of the Transdanubian Range from Sümeg to Tata, characterized by mass of crinoid fragments and a great percentage of terrigenous material. Brachiopods and bryozoans are also abundant, but no ammonite was found in prevalent, typical part of the formation itself yet. Cephalopods are only known from the heavily condensed basal beds of the formation which is very distinctinct from the rest above (Text-Figure 14). The age of the Tata Limestone Formation was first given by SOMOGYI (1914) as Valanginian– Aptian age on the basis of ammonites and brachiopods. KOCH (1909) described in details the "crinoidal limestone" and determined some ammonites that led him to Neocomian age. The most detailed work about Tata Limestone at its type locality, Kálvária Hill of Tata city was published by FÜLÖP (1975, 1976). He dedicated a whole chapter of the lithologic and palaeontologic analysis of the crinoidal limestone and pictured two plates of ammonites from the basal pockets as *Holcophylloceras (Salfeldiella) guettardi* (RASPAIL 1831), *Tetragonites duvalianus* (D'ORBIGNY 1841), *Tetragonites heterosulcatus* (ANTHULA 1899), *Ptychoceras* sp., *Hamites* sp. (later referred to *H. praegibbosus csaszari* SZIVES & MONKS, 2002), *Valdedorsella getulina* (COQUAND 1880), *Valdedorsella* sp., *Puzosiella minuta* EGOIAN 1965 [here referred to *Silesitoides* spp), *Puzosiella* div. sp. (later referred to *Silesitoides* spp. by SZIVES, *Uhligella* sp. (here referred to *U. rebouli*

Text-Figure 14. View of the top of Kálvária Hill

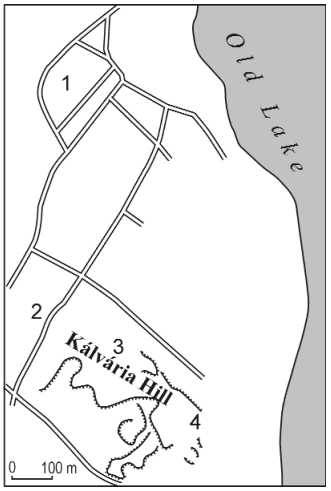
(JACOB 1908) and *U. balmensis* (JACOB 1908)], *Melchiorites* sp. [here referred to *M. melchioris* (TIETZE 1872)], *Acanthohoplites bigoureti* SEUNES 1887, *?Dufrenoyia* sp. (here referred to *Dufrenoyia katalinae* sp. nov.), *Colombiceras* sp., *Diadochoceras nodosocostatum* (D'ORBIGNY 1841), *Acanthohoplites nolani* (SEUNES 1887), *Parahoplites Uhligi* (ANTHULA 1899) (here referred to *?Parahoplites tenuicostatus* SINZOW 1907) which suggested to him Upper Aptian *Diadochoceras nodosocostatum* Zone as the age of the whole ammonite assemblage. Two decades later SZIVES (1996, 1999a, b, 2002) revised the ammonite fauna of the basal pockets and extended the age from Lower Aptian to Lower Albian. This opinion is fully discussed and corrected here.

Microfacies and microform studies led to different results. SIDÓ (1970, 1975) investigated the foraminifer assemblage of the sequence and concluded Upper Aptian age. GÖRÖG (1996) determined the age as Middle Aptian by orbitolinids while LEEREVELD (1992) dinocyst investigations suggested Albian age. LELKES (1990) studied the microfacies system of Tata Limestone and recognized three types which "mark the end of a long pelagic period in the history of the Bakony Mountains". CSÁSZÁR & ÁRGYELÁN (1994) analyzed relations and problems of Tata Limestone and the covering Vértessomló Aleurolite Formations in details.

Studied sections

Tata

The town of Tata is situated west of the Gerecse Mountains and hosts four former localities where Aptian ammonites were found (Text-Figure 15). Two of them, Kálvária Hill and Kékkő Quarry can still be visited as parts of an open-air geological museum but collecting fossils is forbidden. Other two localities of Tata, Fazekas street. and Vájáriskola were temporary outcrops and destructed since decades.



Text-Figure 15. Simplified map of Tata localities. Sections numbered as follows: 1 — Vájáriskola, 2 — Fazekas street 21, 3 — Kálvária Hill 4, — Kékkő

KÁLVÁRIA HILL GEOLOGICAL MUSEUM

The superbly excavated hill is a classical Mesozoic fossiliferous locality of Hungary. From the 1960's it runs as an open-air geological museum. The Kálvária Hill section starts with the Triassic Dachstein Limestone and ends with the Albian grey siltstone.

Geological investigation of the fossiliferous red Jurassic strata started in the early XIXth century (BEUDANT 1822) although TOWNSON (1797) also mentioned Tata as a city "built on red marble". In the early XXth century the best Hungarian geologists and palaeontologists worked on the Cretaceous grey crinoidal limestone, as LÓCZY Sen. (1906), LIFFA (1910), KOCH (1909), SOMOGYI (1914). KOCH (1909), in his essential work about the geological settings of the Kálvária Hill, described some ammonites as *Lytoceras (Tetragonites)* sp., *Hoplites (Parahoplites)* sp. and *Phylloceras* sp. among other fossils. After a long break FÜLÖP (1954) published a brief work on the geological settings of the area, but geological importance and curiosities of the locality led him to dedicate a monograph (FÜLÖP 1975, 1976) to the Kálvária Hill of Tata. In the 1950's, Fülöp József, the director of the Geological Institute of Hungary at that time, had the institute to start a gorgeous excavation on the Kálvária Hill of the town. Works led to one of the most spectacular and complete outcrop of the Mesozoic sequences of Hungary. During the excavation thousands of fossils were collected from different ages and strata. One of these collections is the so called "Aptian Fülöp Collection".

Ammonites known to be Aptian age were excavated in the geological museum from two sites — one on the top of the hill, named as Kálvária Hill by FÜLÖP (1975), and a second is opposite to the Fülöp Memorial House, named as Kékkő Quarry, also by FÜLÖP (1975).

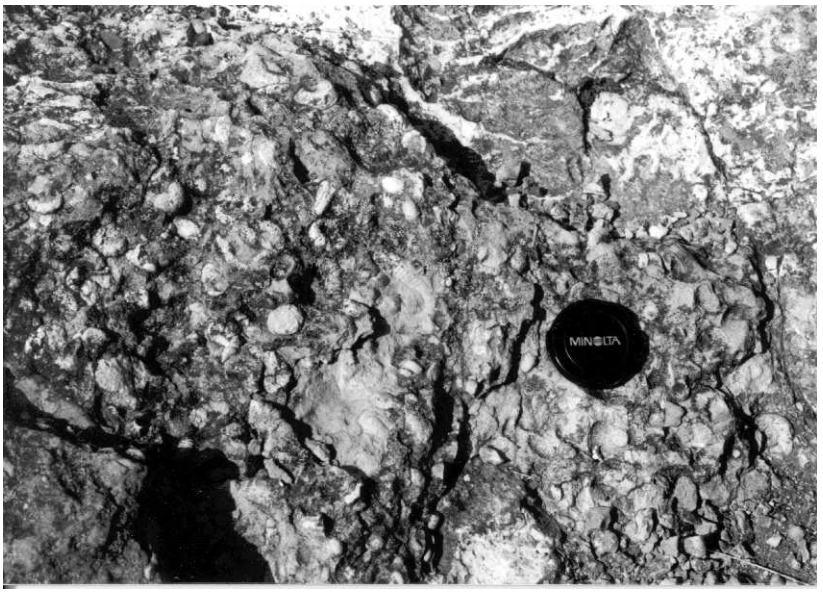
For more detailed description of the Kálvária Hill Geological Museum of Tata see FÜLÖP (1976) and HAAS & HÁMOR (2001).

All the material collected from the Kálvária Hill Geological Museum is the property of the Geological Institute of Hungary and housed in the same building at the Geological Museum of Hungary.

KÁLVÁRIA HILL SECTION

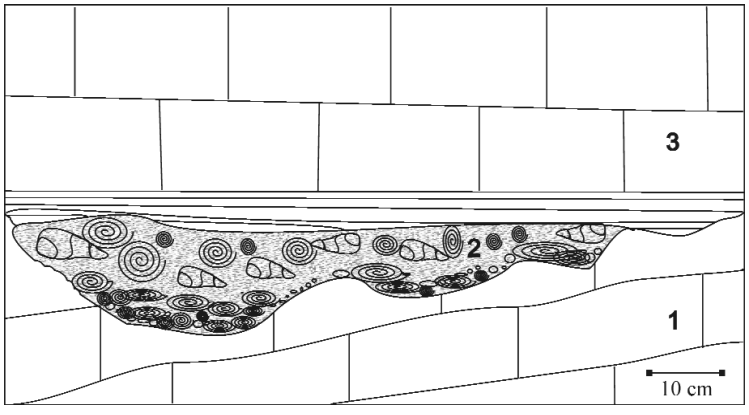
From the Kálvária Hill locality, almost a thousand ammonite internal moulds were collected by the Fülöp Team. Additional collecting was done by Szives. The full ammonite data for each locality is presented in the appendix. For the first sight it is a bit confusing that Fülöp used the same name for the exact locality and the whole site — Kálvária Hill — on his original designations of the fossils.

On the upper yard of the open-air geological museum section, the partly stromatolitized Tithonian limestone hardground is still can be observed. On the eroded, uneven surface of the Tithonian is followed by the greyish-blue, crinoidal Tata Limestone (Text-Figure 16). Between the underlying Tithonian limestone and the overlying crinoidal Tata Limestone, in some isolated, local deepenings of a hardground, a heavily condensed fossil assemblage can be found, called "Aptian fauna of Tata".



Text-Figure 16. Picture of the basal pockets of the Tata Limestone Formation at Tata, Kálvária Hill

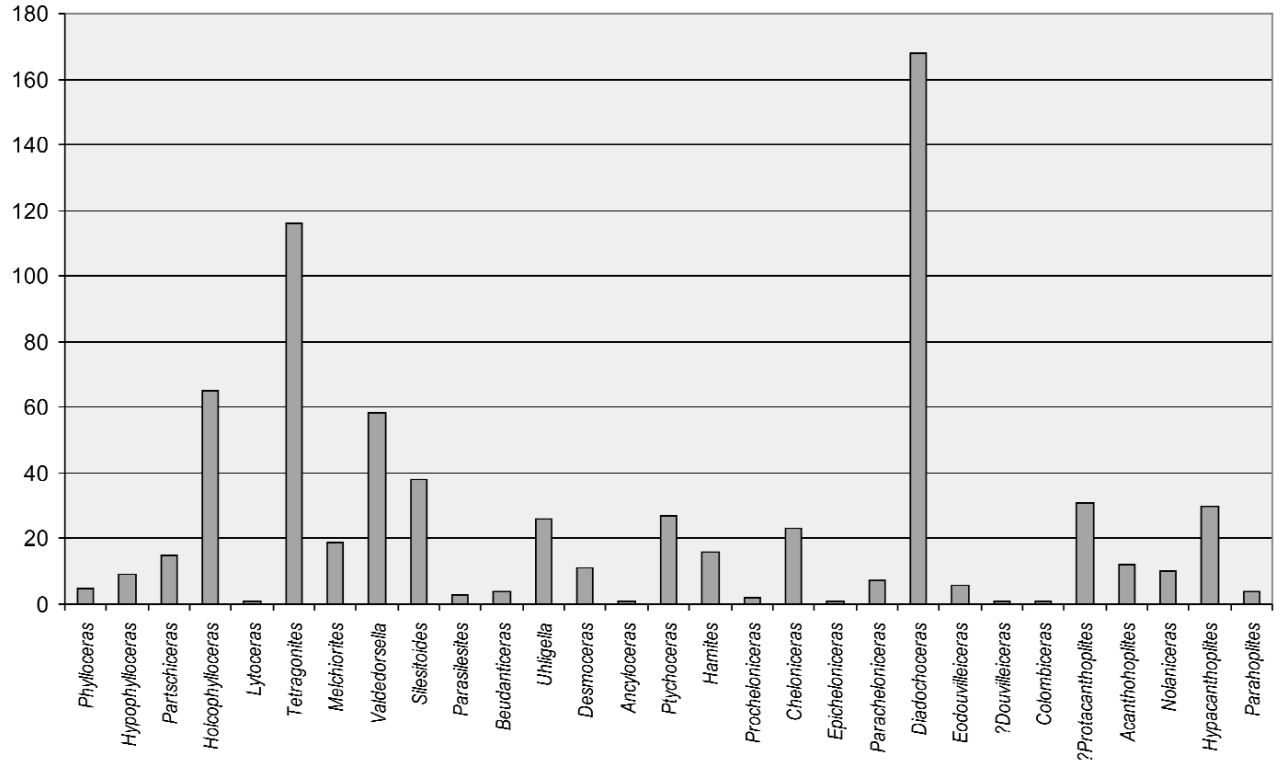
Fauna. The fauna was fossilized as a mass of internal moulds in heavily condensed srata, although "strata" is not a correct term for the situation (Text-Figure 17). All the assemblages were collected from surface outcrops — apart from Kékkő Quarry one —, are from heavily condensed fossiliferous masses which occur in isolated lenses between the overlying Tata Limestone and the underlying Tithonian limestone. Ammonites collected here show good example of sorting by size. Most of them are between 2–5 centimetres in diameter. Some bigger fragments or entire moulds also can be found as specimens belong to genus *Beudanticeras, ?Ancyloceras, Ephamulina, Eodouvilleiceras.* Internal moulds are made of a phosphatic, glauconitized marly grey limestone. Matrix between the moulds often contains a centimetre sized black pebbles and carbonized plant remains. In most cases moulds are entire, slightly eroded ones, without any sign of flattening or other marks of deformation.



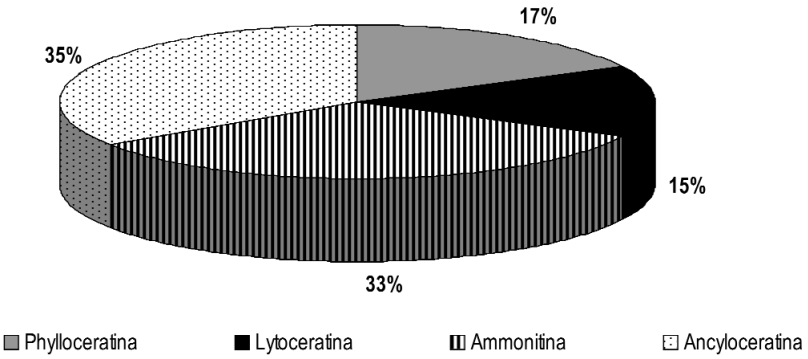
Text-Figure 17. Stratigraphic position of the basal pockets (2) which situated between the underlying Tithonian limestone (1) and the overlying crinoidal Tata Limestone Fm (3)

The accompanying fauna contains lots of echinoids, belemnites and gastropods. Bivalves are rare. A half dozen of nautilids also were found.

The ammonite assemblage of Kálvária Hill encompasses almost the entire spectrum of a Middle – Upper Aptian fauna together with its whole startigraphic range. Generic distribution of the collected specimens (Text-Figure 18) shows high dominance of the genera *Tetragonites* and *Diadochoceras*. *Holcophylloceras* and *Valdedorsella* species are also very common forms of the assemblage. *?Parahoplites* almost lacks here, in contrary *?Protacanthoplites* and *Silesitoides* are abundant. The remarkably great percentage of *Hamites* and *Ptychoceras* specimens within the



Text-Figure 18. Generic distribution of the collected specimens at Kálvária Hill section



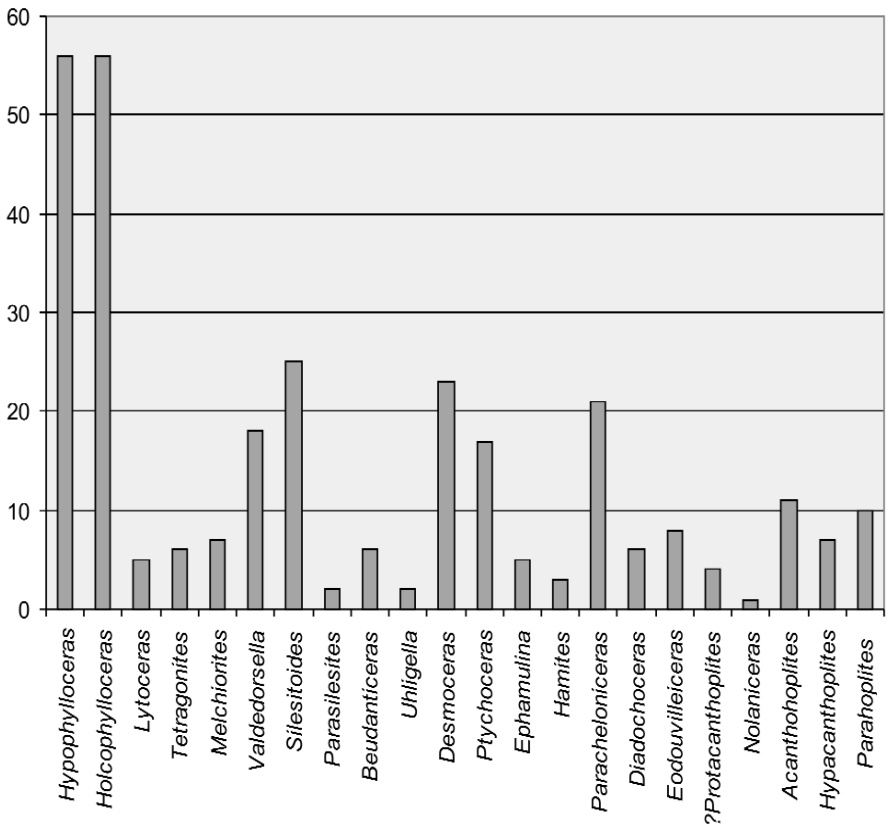
Text-Figure 19. Percentage diagram of the ammonite assemblage at Kálvária Hill by subordo level. Data chart belongs to the diagram is presented in the appendix

Ancyloceratina can be due to palaeoecological factors discussed later. Text-Figure 19 shows the percentage diagram by subordo level.

KÉKKŐ QUARRY SECTION

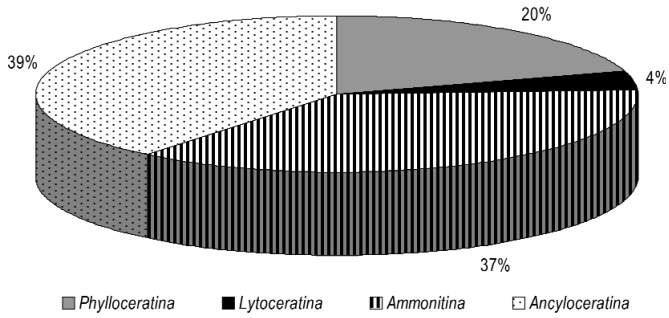
Kékkő Quarry was the original name of the entire site what was originally a quarry and now is called Kálvária Hill open-air Geological Museum. The quarry was named after the bluish-grey crinoidal Tata Limestone that was excavated here as building stone for the house constructions by the local people of Tata. The Kékkő Quarry section is also situated in the open-air geological museum of Kálvária Hill, just opposite the little Memorial House.

Contrary to the Kálvária Hill section, fossils from Kékkő Quarry locality were collected from exact beds, but two different names were used for the locality. Original designations by the late professor Fülöp are very confusing because he mentioned strata as "from the second faunal level on the bottom", "from the sandy level above the second faunal level", "from the strata above the first faunal level" without any numbering or stratigraphic chart. Trying to reconstruct the situation, it is supposed that during the several collecting phases in the 1950's and 60's, two different names were given to the same section as "Kékkő Quarry" and "Jewish Cemetery" by different collectors. The author of this chapter tried to find levels and strata mentioned in the original designations of the fossils but all efforts went on vain, not even a single ammonite was found. From Kékkő Quarry section the assemblage was collected, supposedly, bed-by-bed. Lack of the original documentation and the unsuccesful new collecting made the ammonite stratigraphic reconstruction impossible.



Text-Figure 20. Generic distribution of the collected specimens at Kékkő Quarry section

Fauna. Ammonites of the Kékkő Quarry section are different from others of Tata in many points of view. All the fossils, apart from belemnite rostra, are preserved as internal moulds, as in other Aptian surface localities, but here the internal moulds are made of grey, glauconitized-phosphatized marly limestone. Moulds are mostly big (5–15 cm), most cases heavily flattened and deformed. Sorting by size cannot be observed, while it is usual in other localities of the Aptian fauna. Generic distribution of the collected specimens (Text-Figure 20) shows the high dominance of the genus *Holcophylloceras* and the relative abundance of the genera *Silesitoides, Desmoceras* and *Cheloniceras (Paracheloniceras)* which are not common at other localities. From biostratigraphical point of view, this should have been the most interesting section; unfortunately the original documentation of the collecting is lost. Most ammonoid taxa, on the basis of the startigraphic distribution, are restricted to Middle to Late Aptian (sensu KENNEDY et al. 2000). Most specimens of *Silesitoides, Ephamulina, Paracheloniceras* and *Eodouvilleiceras* were collected from this section. *Cheloniceras* lacks here although the genus is very abundant in other sites at Tata. Situation is the same for *Diadochoceras* which is represented here only by a few specimens. At subordo level (Text-Figure 21) the Ancyloceratina and Ammonitina dominate the fauna.



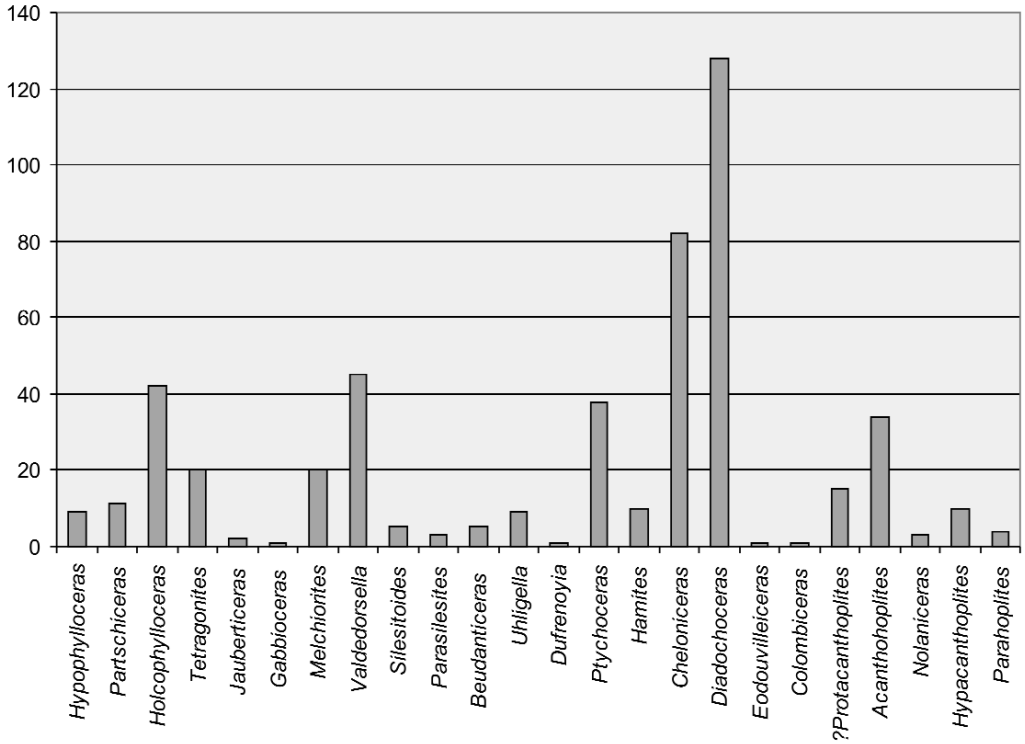
Text-Figure 21. Percentage diagram of the ammonite assemblage at Kékkő Quarry by subordo level

Accompanying fauna contains lots of echinoids, belemnites and gastropods, and some bivalves as well.

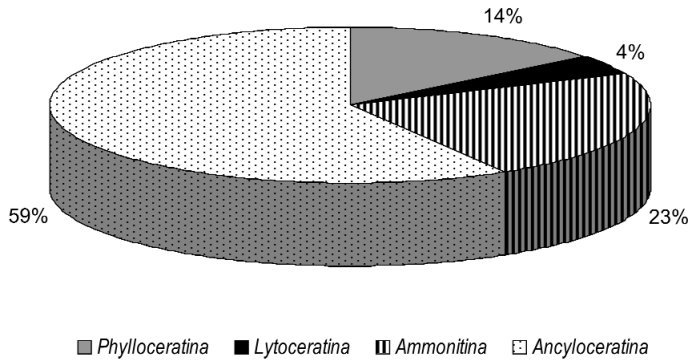
The state of preservation varies much, usually average. Suture lines were obliterated during the diagenesis. Moulds are homogenous from the inner whorls to the body chamber.

FAZEKAS STREET 21 SECTION

On the original designations of the late professor Fülöp, one of the localities was called Fazekas street. It is also in the town of Tata. In 1953, a temporary sewage system construction started in front of the No. 21. Workers found some fossils and informed the geologist working on the Kálvária Hill. Fortunately, the hole crossed a fossiliferous pocket between Tithonian and Tata Limestone. Fülöp have collected the assemblage, the sewage system has been completed and the hole has been recultivated.



Text-Figure 22. Generic distribution of the collected specimens at Fazekas street section



Text-Figure 23. Percentage diagram of the ammonite assemblage at Fazekas street by subordo level

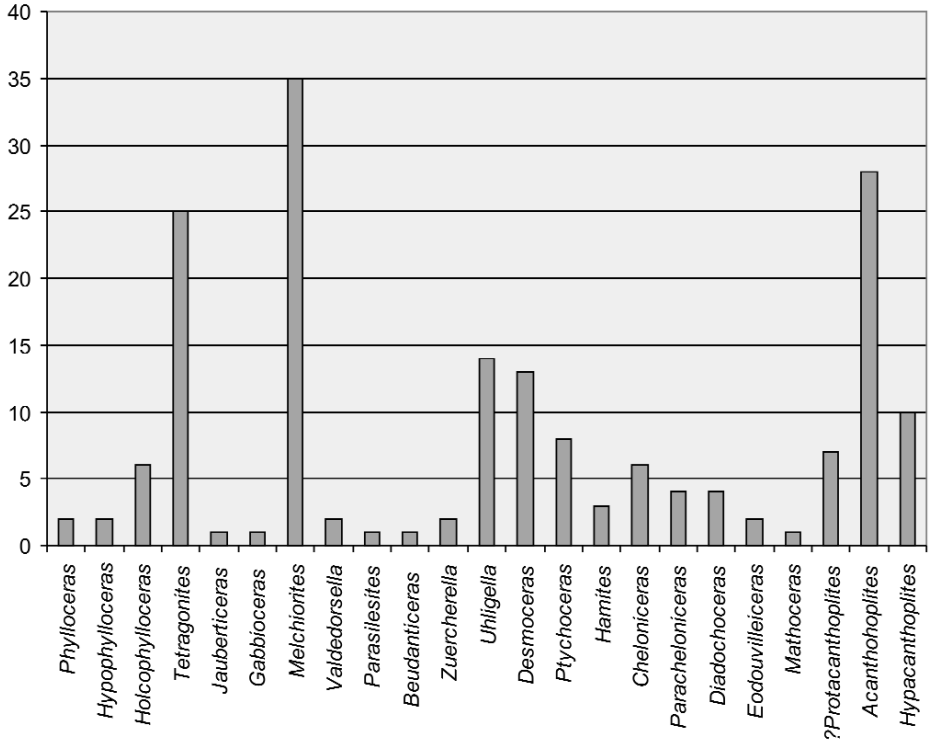
Fauna. From Fazekas street locality 504 specimens were determined, almost the total number of the collected ones. The fauna of Fazekas street is very similar to that from Kálvária Hill, not only in faunistic composition but in taphonomic features as well. Ammonites of Fazekas street locality are a good example of sorting by size. Most of the fossils are between 3 to 5 cm in diameters, bigger forms are missing. Fossils preserved as phosphatized and glauconitized internal moulds accompanied with small, black, oval pebbles and carbonated wooden material. State of preservation is good, many suture lines are visible. If we have a look on the generic distribution (Text-Figure 22), the high dominance of *Diadochoceras* and *Cheloniceras* is remarkable, *Holcophylloceras, Valdedorsella* and *Acanthohoplites* are also abundant here. The high dominance of subordo Ancyloceratina (Text-Figure 23) is also remarkable.

The accompanying fauna contains lots of echinoids, belemnites and gastropods, and some bivalves as well.

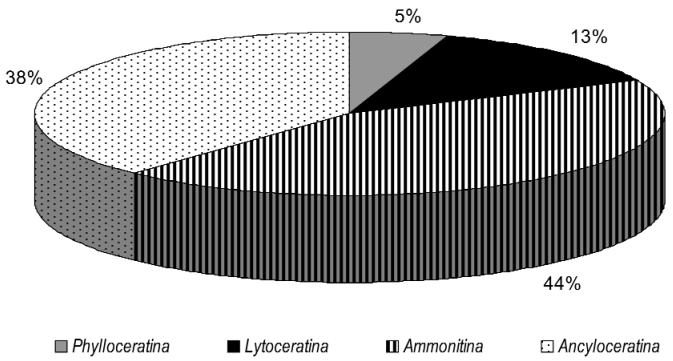
VÁJÁRISKOLA SECTION

On the original designations of the late professor Fülöp, one of the Tata localities is called Vájáriskola. Vájáriskola section was a temporary sewage constructing hole in the town of Tata, in front of a former Miners' School building. Nowadays the exact position of the hole cannot be reconstructed.

Fauna. Fossils collected from Vájáriskola locality are internal moulds as in all the Aptian sites of Tata, consist of purple red marly limestone which makes difference from fossils collected from other localities where the rocks are bluish grey. The inner material is not phosphatized and glauconitized so much as the specimens from Kálvária Hill or Fazekas street locali-



Text-Figure 24. Generic distribution of the collected specimens at Vájáriskola section



Text-Figure 25. Percentage diagram of the ammonite assemblage at Vájáriskola by subordo level

ties. The biggest Aptian ammonite specimens are from this locality, sorting by size cannot be visible. The ammonite assemblage is in poor state of preservation apart from some fortunate specimens. Analyzing the generic distribution (Text-Figure 24) of the specimens found at Vájáriskola locality, the high dominance of *Melchiorites* and *Acanthohoplites* is remarkable, besides the great number of *Tetragonites, ?Protacanthoplites, Hypacanthoplites* and *Desmoceras*. According to the percentage data (Text-Figure 25), subordo Ammonitina are more abundant in specimen number than the others.

The accompanying fauna contains lots of echinoids, belemnite rostra, gastropods and some bivalves as well.

Gerecse Mountains

Vértessomló Vs–8 borehole

There are only two *Holcophylloceras guettardi* (Raspail 1831) specimens and a *Beudanticeras* sp. specimen from unknown depth.

Tatabánya Ta–1423 borehole

The borehole drilled with continuous core sampling and penetrated the Vértessomló Aleurolite Formation. Only a single *Parasilesites* cf. *kilianiformis* (Fallot 1910) specimen was found at 292.4–295.0 m.

Table 2. Ammonite data of Tatabánya Ta–1462 borehole

Depth in metres	Ammonite record of Tatabánya Ta–1462 borehole
210.8	*Brancoceras* sp.
213.0–214.0	*Puzosia (P.) mayoriana* (D'ORBIGNY, 1841)
221,0–222.3	*Tetragonites (T.) duvalianus* (D'ORBIGNY, 1841)
223.0–223.4	*Parasilesites kilianiformis* (FALLOT, 1910)
230.0–232.0	*Holcophylloceras guettardi* (RASPAIL, 1831)
235.0–240.0	*Neosilesites nepos* (DOUVILLÉ, 1917)
253.0–255.0	*Neosilesites nepos* (DOUVILLÉ, 1917) (two specimens)
255.2–256.0	*Neosilesites nepos* (DOUVILLÉ, 1917)
260.0–261.0	*Hypacanthohoplites* sp.
264.0–266.0	*Neosilesites nepos* (DOUVILLÉ, 1917)
265.0	*Beudanticeras* sp.
268.0	*Neosilesites* sp.
277.8–278.2	*?Parahoplites* sp.
277.8–278.2	*Neosilesites nepos* (DOUVILLÉ, 1917)
277.8–278.2	*Nolaniceras nolani* (SEUNES, 1887)
300.5	*Brancoceras* sp.
303.5	*?Desmoceras* sp.
299.2–319.0	*Beudanticeras (B.) convergens* (JACOB, 1908)
326.8–327.5	*Ammonoidea*
330.5	*Parachelonicera (Ch.) rerati* COLLIGNON, 1965

TATABÁNYA TA–1462 BOREHOLE

The borehole drilled with continuous core sampling and crossed the Vértessomló Aleurolite Formation. A representative Late Aptian ammonite fauna was found in the 120 metres long core. Cephalopods of the Tatabánya Ta–1462 borehole were determined by G. SCHOLZ in a manuscript, all the ammonite fauna is revised here (Table 2).

NESZMÉLY N–1 BOREHOLE

Ammonites of the Neszmély N–1 borehole are listed and partly figured by FÜLÖP (1975). The material is housed at the Geological Museum of Hungary.

NESZMÉLY N–4 BOREHOLE

The ammonite material of the borehole is currently under revision by I. Bodrogi and was not accessible for the purpose of the present work.

Bakony Mountains

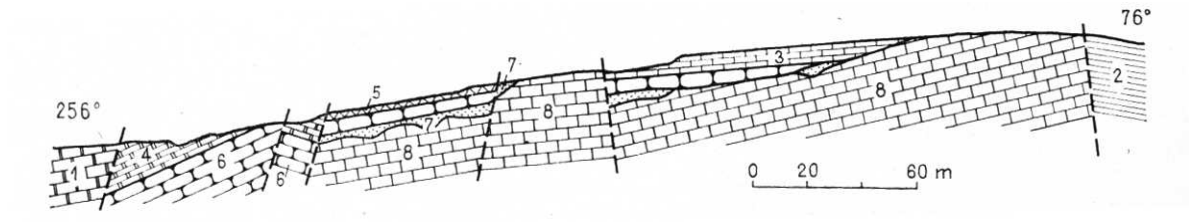
In the axis of the Transdanubian Range syncline, Tata Limestone Formation is present where it escaped the later erosion. Heading to the south-west from the Gerecse Mountains, Aptian crinoidal limestone sequence reaches 200 metres in thickness (in Pénzesgyőr Pgy–3 borehole).

EPERKÉS (EPERJES) HILL SECTION

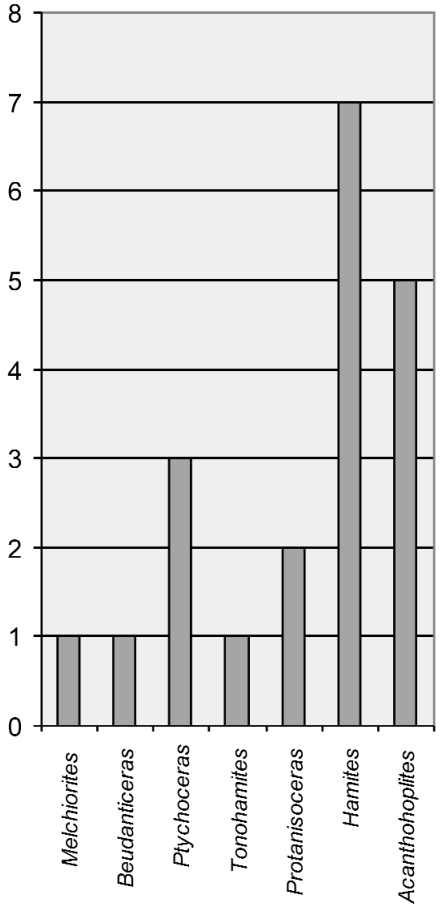
The section, named Eperkés Hill is nearby the village of Olaszfalu in the Northern Bakony Mts. Eperkés Hill is an important key-section (Text-Figure 26) of Jurassic and Lower Cretaceous sedimentary sequences of Hungary. Strata range from Lower Jurassic accross the Albian Tés Marl to Neogene (FÜLÖP 1964) (Text-Figure 27). In contrary to other localities, at Eperkés Hill no systematic ammonite collecting was done in the Aptian section, all the 18 specimens found here are fortunate findings. Most of the specimens were collected by A. Galácz, I. Főzy and I. Szente in 1995, some are from the collection of the Hungarian Natural History Museum and collection of Ágnes Somodi.

Both TAEGER (1909) and WEIN (1934) concluded the Tithonian to Neocomian age of the sequence. NOSZKY Jr. (1934) reported light red limestone "from the lower Early Cretaceous", p. 106). The Aptian crinoidal limestone at the Eperjes Hill is light orange-red coloured and discordantly deposited on the Upper Jurassic Szentiványhegy Limestone Formation. The

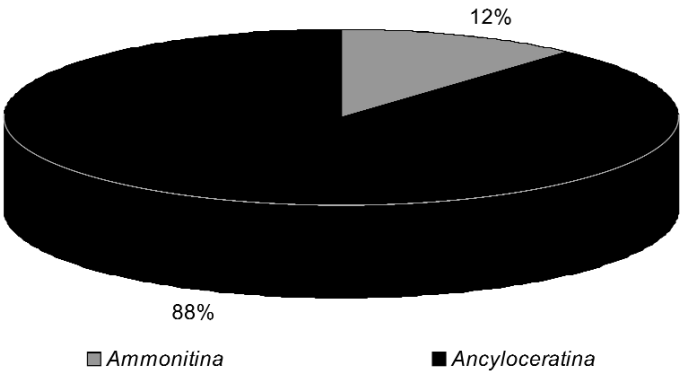
Text-Figure 26. The Aptian section of Eperkés Hill. The hammer indicates the lower boundary of the Tata Limestone Formation



Text-Figure 27. Stratigraphic section of Eperkés Hill, after FÜLÖP (1964). 1 — Albian limestone, 2 — Aptian marl, 3 — Aptian crinoidal limestone, 4 — Tithonian limestone with calpionellids, 5 — Tithon Hierlatz Limestone, 6 — Kimmeridgeian limestone, 7 — Liassic Hierlatz Limestone, 8 — Liassic Kardosrét Limestone



Text-Figure 28. Generic distribution of the collected specimens at Eperkés Hill section



Text-Figure 29. Percentage diagram of the ammonite assemblage at Eperkés Hill by subordo level

most complete scientific work of the section was done by FÜLÖP (1964), revised recently by CSÁSZÁR [ed.] 2002). Both works contain detailed drawings of the section. SOMODI (1987) studied brachiopods of Aptian strata of the locality and she concluded that the sedimentary environment of the Aptian crinoidal limestone was connected to the top of a seamount characterized by heavy water movements.

Fauna. Fourteen specimens were determined. Half of them are heteromorphs which fact can be caused partly by palaeoecological reasons and partly by collecting bias. Generic distribution of the collected specimens at Eperkés Hill (Text-Figure 28) shows the dominance of *Acanthohoplites* and heteromorphs. Five species are represented with one specimen. No Phylloceratina and Lytoceratina were found. A new *Tonohamites* species is also found here (SZIVES & MONKS 2002). The subordo-level percentage distribution shows (Text-Figure 29) the high dominance of the Ancyloceratina but it is surely due to the limited specimen number.

The age of the ammonite fauna is determined as Uppermost Aptian (sensu KENNEDY et al. 2000) because of the appearance of *Hamites, Tonohamites* and *Protanisoceras*.

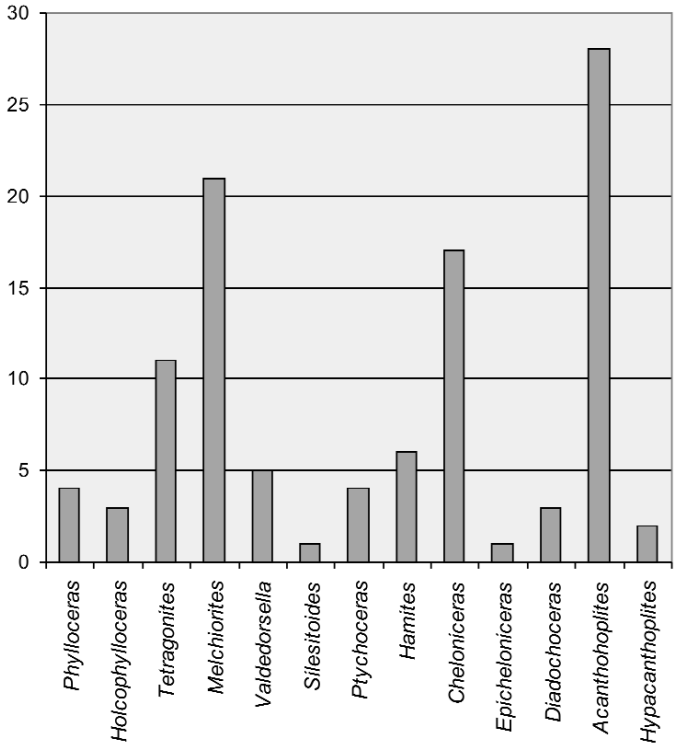
The state of preservation is excellent; most of the specimens are internal moulds with fragments of the original, calcitized shell. Suture lines are also well preserved. Internal moulds are not phosphatized or glauconitized as at other locaities. Accompanying fauna contains many brachiopods and some belemnite rostra.

ZIRC, MÁRVÁNY QUARRY SECTION

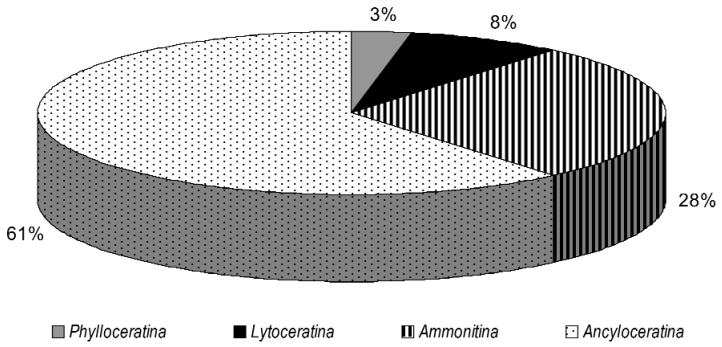
The Márvány Quarry locatity (Text-Figure 30) is situated in the northern Bakony Mountains, west from the town of Zirc, in the "Pintér-hegy" abbey forest. Its name was originated from the red limestone that was quarried here.

In the Márvány Quarry, the sequence (Text-Figure 31) starts with Tithonian white limestone, then discordantly follows an Upper Hauterivian cephalopod limestone. After a hiatus the Aptian crinoidal limestone rests on the top. For more detailed description of the locality see FŐZY & JANSSEN (2006). FÜLÖP (1964) was the first who recognized Aptian crinoidal limestone on the top of Márvány Quarry sequence. He wrote "…The Márvány Quarry section is a key section for better understanding of the Aptian crinoidal limestone. Besides Tata, this is the only locality where a fossil assemblage came out fom the

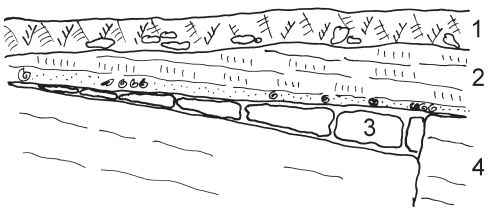
Text-Figure 30. View of Márvány Quarry section



Text-Figure 32. Generic distribution of the collected specimens at Márvány Quarry section



Text-Figure 33. Percentage diagram of the ammonite assemblage at Márvány Quarry by subordo level



Text-Figure 31. Sequence of Márvány Quarry, after FÜLÖP (1964). 1 — soil, 2 — Aptian crinoidal limestone, 3 — Barremian limestone, 4 — Tithonian limestone

base of the crinoidal limestone …., which has main importance to find out its stratigraphic position.". (By that time the 18 ammonite specimens of Eperkés Hill were not found yet.) Fülöp J. (loc. cit) ranged ammonites into 14 taxa and concluded that the age of the fauna was similar to that of Tata, is Aptian. Since his work no scientific studies held on the Aptian ammonite assemblage of Márvány Quarry except of SZIVES (2002).

Fauna. The Márvány Quarry assemblage is very similar to Kálvária Hill or Fazekas street already at the first glance. Ammonites are preserved as phosphatized and glauconitized internal moulds and show good example of sorting by size. Ammonites are mainly between 2–3 centimetres in diameter although bigger ones are also found in less numbers. Generic distribution of the collected specimens at Márvány Quarry (Text-Figure 32) shows the dominance of *Acanthohoplites*, *Cheloniceras* and *Melchiorites*. Low percentage of Phylloceratina is remarkable at subordo-level distribution (Text-Figure 33). The age of the fauna is determined as Late Aptian (sensu KENNEDY et al. 2000) because of the occurence of *Hamites praegibbosus* SPATH 1941. This is the oldest documented specimen of *Hamites* (SZIVES & MONKS 2002).

The state of preservation is average. Accompanying fauna includes echinoids, gastropods and belemnite rostra. Some brachiopods were also found.

Faunistic and biostratigraphic evaluation of Hungarian Aptian ammonites

The age of the basal ammonite fauna of the basal pockets and the overlying crinoidal Tata Limestone Formation was always a problematic question of the Hungarian palaeontology. The fossil-bearing pockets lay on a Tithonian hardground. The overlying Tata Limestone does not contain any ammonite evidence in spite of its great thickness; therefore its age can be approached only with the age of the basal fauna and the overlying Vértessomló Aleurolite Formation. Due to heavy condensation and the state of the preservation, the age of the fauna cannot be determined exactly.

FÜLÖP (1976) determined the age of the basal assemblage on the basis some well identifyable species in the Late Aptian *Cheloniceras (Epicheloniceras) subnodosocostatum* Zone (in the use of Lyon Colloquium 1963 in ERBA 1996), and "according to the more exact ammonite zonal scheme of Russian geologists…" (FÜLÖP 1975, p. 104 in Hungarian). Most of the fauna remained undetermined and out of focus. He was right at the point of the age but hundreds of older and younger specimens suggested a more complicated picture. His idea was that in the earlier Cretaceous the area was emerged, became

a positive land area and sediments were eroded under subaerial circumstances then transgression flooded the territory in the Middle Aptian. This idea relies on the fact that no older forms could be found in the basal sediment (FÜLÖP 1976) but ignores for instance the stromatolite cover of the hardground that indicates submarine environment at least for a period of time. SZIVES (1996, 1999a, 2002) concluded that the Tithonian hardground was flooded in the late Early Aptian. During Aptian – Early Albian times the sedimentation was very slow but continuous, sometimes intermittent for short periods, that resulted in a heavily condensed assemblage of ammonoids of a various state of preservation. Microflora- and fauna is completely missing from the basal beds because they were swept away by the currents. Different preservational states are remarkable. It was also problematic that a condensed level of 10 centimetres contains ammonites of million years of the Late Aptian with continuous sedimentation. Of course, it might occur — as it is known at the Jurassic ammonitico rosso for example — but sedimentary features have to reflect that, which features are completely lack in this case. Because of the heavy condensation, there are no bedding in the basal sediment that can help us to define stratigraphic levels. Similar condensed glauconitic sequences are known from the Late Aptian of the Swiss Jura Mts (RENZ & JUNG 1978). Typical Early Albian ammonites as genera *Proleymeriella, Brancocears, Hysteroceras, Cleoniceras, Sonneratia* are missing (*Brancoceras* sp. is only known from Ta–1462 borehole) from the assemblages. Representatives of *Silesitoides, Beudanticeras, Uhligella, Puzosia, Hamites, Hypacanthoplites* are reported. This could be caused by ecological and palaeobiogeographical factors besides the significant age difference.

In the present work, following the thoughts of OWEN (1996b), the author proposed a different picture for the sedimentation of the Tata fauna. Thought-to-be Early Aptian forms as *?Ancyloceras matheroni* (D'ORBIGNY 1842) and *Prochelo-niceras albrechti austriae* (UHLIG 1883) are in the worst state of preservation that suggest heavy reworking. Most of the ammonites of surface localities are from the Late Aptian *Acanthohoplites nolani* and *Hypacanthoplites jacobi* Zones. OWEN (1996b, p. 471) writes the following: "In shallow seas, subject to tidal flow or of a depth in which storm waves can remobilise sea-floor sediment relatively frequent intervals, a bare rock surface stripped of all but mobile sediments normally exists. In the geological column, such as erosion surface might be deemed emergent, when in fact a seaway existed. …. pockets of sediment are preserved in cobble-scoured pot-holes in a hard rock surface." This is exactly the situation which can be outlined for the accumulation of the Tata fauna. Considering the fossil material and the state of preservation, it can be concluded that during the Early and Early – Middle Aptian continuous currents stripped the sea-floor leaving no fossil evidence behind. From the late Middle Aptian the sea-level emerged — as it is described and documented (LELKES 1990, CSÁSZÁR & ÁRGYELÁN 1994) —, sedimentation continued and the sediments were not swept away from time-to-time. Besides, several or at least two sediment-remobilizing events took place that left the consolidated sediment in the pockets. Bigger fragments did not reach the pockets, as well as microgranules and microfossils were swept away and the size-sorted material remained and accumulated in the pockets of the hardground.

Biostratigraphical problems of the Aptian/Albian boundary (KENNEDY et al. 2000) suggest that in most thought-to-be continuous boundary sections there is a gap between Upper Aptian and Lower Albian deposits therefore biostratigraphical ranges of many taxa may vary a little. The Hungarian Middle Aptian – Late Aptian reworked fauna is definately not suitable for boundary biostratigraphic studies. Youngest ammonites — *Hamites praegibbosus csaszari* SZIVES & MONKS (2002) and *Hamites* sp.— are both reported from the *Leymeriella (L.) tardefurcata* Zone of the Earliest Albian deposits of Europe (KEMPER 1964, 1971, 1982), Mangyshlak (SAVELIEV 1973) and Iran (SEYED-EMAMI 1980a, b). Considering that in every case when basal lenses are found below the Tata Limestone Formation, crinoidal Tata Limestone should be at the same age or younger than the basal assemblage. Therefore the age of Tata Limestone Formation both in the Bakony and Gerecse Mts is Late Aptian and younger. This doesn't mean automatically that other Tata Formation sections without the basal assemblage are at the same age.

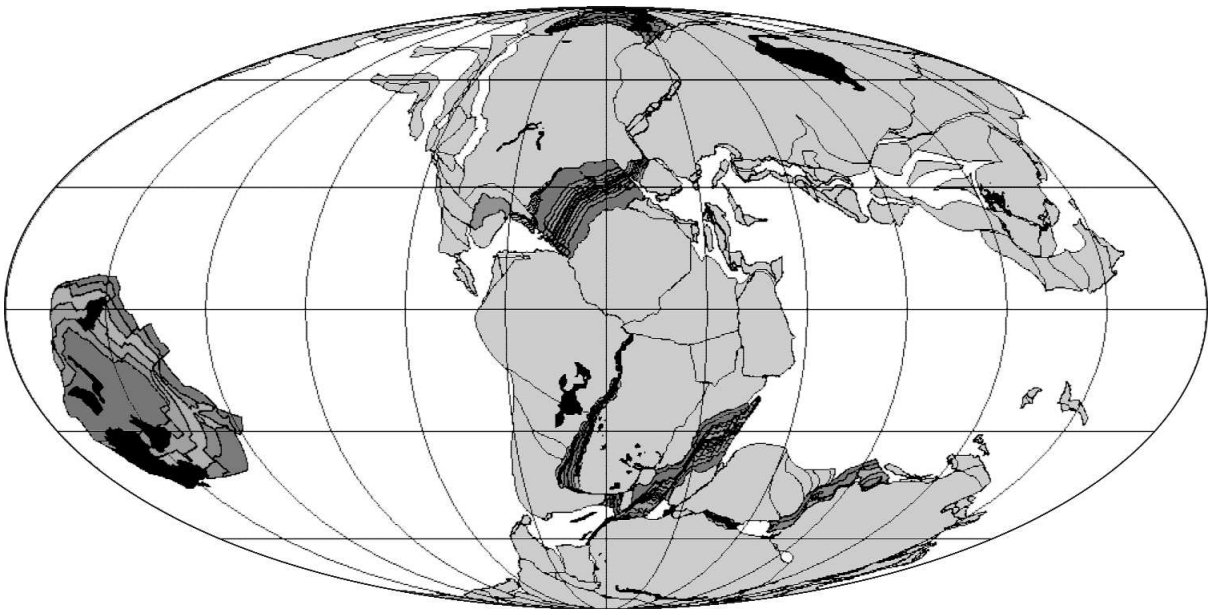
Summarizing the stratigraphical results of the Aptian chapter, we can point out that all sections from Gerecse Mts and Bakony Mts contain isochronous ammonite assemblages, namely of Middle to Late Aptian age.

35 taxa are described for the first time from Hungary.

Palaeobiogeography of Hungarian Aptian ammonites

According to the fossil record, there were several main biogeographic units — provinces — in the Aptian which are divided and named in different ways by different authors (KAUFMANN 1973; MUTTERLOSE 1992; OWEN 1988, 1996a, b; RAWSON 1994; KAKABADZE et al. 2004). These are the Arctic, Tethyan — including the Mediterranean-Himalayan (RAWSON 1981) or Indo-Mediterranean (KAUFMANN 1973) and Boreal subprovinces —, North American, Carribbean, South Atlantic, East Pacific, East Asiatic and Australian provinces.

During Aptian times the climate was well balanced (MUTTERLOSE 1992). Mesozoic palaeogeographical pattern was quite complicated in the Western Tethyan area, especially in the Carpathian region (CSONTOS & VÖRÖS 2004). Orogenic movements of future Alps and Carpathians started in the Aptian (Text-Figure 34) and caused transgression and faunistical boom later in the Albian. The Tethyan palaeobiogeographical unit "stretched from the western coastal region of northern South America and southern North America in the west to Australia in the east. It occupied much of the marine regions of



Text-Figure 34. Global palaeogeographical reconstruction of Early Aptian (120 My). Map is from the "Plate Tectonics On-Line Reconstruction Tool" website http://www.itis-molinari.mi.it/Intro-Reconstr.html, model after SCHETTINO & SCOTESE 2000. Continental crusts are light grey, opening oceanic trenches are coloured to dark grey, hotspot tracks are black

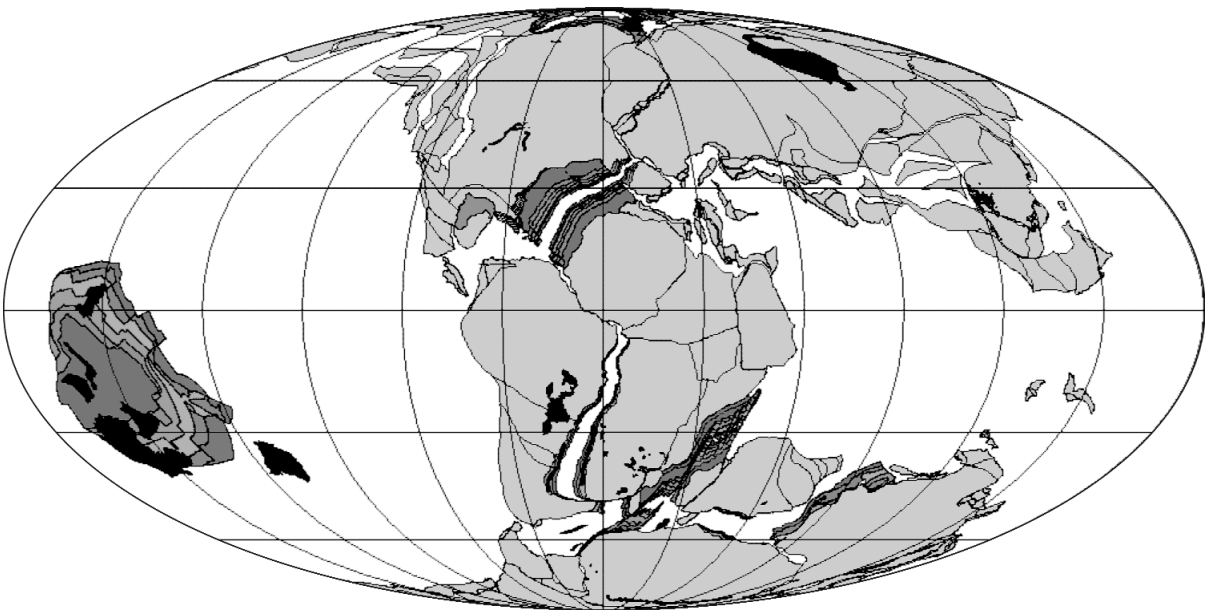
Gondwanaland..." (OWEN 1996b). This global connection of main marine environments caused that ammonite faunas, at least in generic level were more or less cosmopolitan from the westernmost end of the former Tethys to the shores of Eastern Africa, of course with additional occurences of endemic taxa. This is unique during the Cretaceous period which can be characterized with extreme faunal provincialism.

In the marine environments of the western Tethys two main palaeobiogeographic subprovinces can be recognized (MUTTERLOSE 1992, OWEN 1988, 1996b) during the Aptian: Boreal (North Temperate) and Mediterranean, but distinction between their ammonite record is not so clear than later in the Albian. Temperature conditions were equalized and a global eustatic rise resulted less differentiated provincialism between Boreal and Mediterranean realms (RAWSON 1994, BENGTSON & KAKABADZE 1999) during the Aptian. Boreal ammonite forms — as *Tropaeum* or *Hypacanthoplites* — dominated the high latidude seas, while "mediterranean" ammonites as *Diadochoceras, Cheloniceras, Colombiceras* and *Acanthohoplites* can be found in warmer, low latitude oceans. Faunal interchange was intensive between the two subprovinces which can be clearly demonstrated by the qualitative and quantitative comparison of ammonite assemblages. Connection between the two subprovinces was cut off later in the Albian which can be clearly demonstrated by the differences of Arctic, Boreal and Mediterranean ammonite assemblages.

Aptian ammonite assemblages of Ethiopia (ZEISS 1975), Mozambique (HENNIG 1939, HAUGHTON & BOSHOFF 1956, DA SILVA 1962), Madagascar (COLLIGNON 1962), Somalia (TAVANI 1949), South-East Africa (KRENKEL 1910), the Crimea and Caucasia (SINZOW 1907, 1909, 1913; KAZANSKY 1914; ROUCHADZE 1933, 1938a, 1938b; LUPPOV 1952; GLAZUNOVA 1953; DRUSCHICH & KUDRYAVTSEV 1960; EGOIAN 1965, 1969), Southern France (JACOB 1905, 1908; JACOB & TOBLER 1906; KILIAN 1913; KILIAN & REBOUL 1915) and Hungary (SZIVES 1999a, 2002) contain many Tethyan taxa, as *Cheloniceras, Parachelonicera*s, *Diadochoceras, Colombiceras, Acanthohoplites* and *Parahoplites* besides cosmopolitan phylloceratid, lytoceratid and desmoceratid genera.

At the easternmost shores of the Tethys, at least according to the ammonite data (BRUNNSCHWEILER 1959, WHITEHOUSE 1926, 1927, 1928) of Australia, endemic species dominated the region. Opening seaways between the African landmass and Madagascar, India and Australia produced small, partly separated marine environments, where probably palaeoecological factors controlled the faunal dispersal and made endemism stronger (BENGTSON & KAKABADZE 1999).

Opening of the Northern Atlantic during the Aptian (Text-Figure 35) let the communication active between the westernmost Tethyan Realm and the Carribean Subprovince. In Mexico, besides the dominance of genus *Dufrenoyia,* in the Lower to Middle Aptian, there were several endemic taxa in the Late Aptian (*Juandurhamiceras*, *Rhytidoplites*, *Riedelites*, *Burckhardtites*) which have clear regional biostratigraphic significance (BURCKHARDT 1925, HUMPHREY 1949, YOUNG 1974, BARRAGÁN-MANZO & MÉNDEZ-FRANCO 2005, BARRAGÁN-MANZO & SZIVES 2007) in the region. The Aptian ammonite assemblages of Venezuela, Colombia and Peru (SOMMERMEIER 1910, RIEDEL 1938, RENZ 1982, HOEDEMAEKER ed. 2004) also show good resemblance to the Tethyan ones in species level, with the dominated occurrence of endemic species in the region. More than half of the reported species from Colombia (KAKABADZE et al. 2004) are endemic, but naturally, it may vary genera by genera. Kakabadze (loc. cit.) concluded that „From the the middle



Text-Figure 35. Global palaeogeographical reconstruction of Late Aptian (112 My). Map is from the "Plate Tectonics On-Line Reconstruction Tool" website http://www.itis-molinari.mi.it/Intro-Reconstr.html, model after SCHETTINO & SCOTESE 2000. Continental crusts are light grey, opening oceanic trenches are coloured to dark grey, hotspot tracks are black

Aptian onward this area, together with the other areas of the Caribbean Subprovince, became an independent Province of the Tethyan Realm".

In the South Atlantic Province, strong endemism occured in the Aptian-Albian times (LEANZA 1970, FÖRSTER & SCHOLZ 1979; AGUIRRE-URRETA 1986; MEDINA & RICCARDI 2005), most of the ammonite species did not dispersed in great discances and not reported from Europe or the western Tethyan Realm.

Systematic descriptions

The systematics of Ancyloceratacеae and Turrilitaceae superfamilies of Ancyloceratina subordo follow MONKS's (1999) system.

Ordo Ammonoidea ZITTEL, 1884
Subordo Phylloceratina ARKELL, 1950
Superfamily Phylloceratacеae ZITTEL, 1884
Family Phylloceratidae ZITTEL, 1884
Subfamily Phylloceratinae ZITTEL, 1884
Genus *Phylloceras* SUESS, 1865
Type species: *Ammonites heterophyllus* J. SOWERBY, 1820

Phylloceras sp.

Material. Six fragments in bad state of preservation.
Description. Eroded fragments with a typical phylloceratid sculpture, involute umbilicus and high whorl section.
Discussion. Fragments are too eroded for specific identification.
Occurrence. The genus occurs in the condensed Late Aptian basal pockets of Tata Limestone Formation, otherwise the genus *Phylloceras* is known from the Berriasian to Maastrichtian with worldwide distribution.

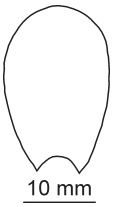
Subgenus *Hypophylloceras* SALFELD, 1924
Type species: *Phylloceras onoense* STANTON, 1895

Phylloceras (Hypophylloceras) subseresitense WIEDMANN, 1963

Pl. I, Figure 1

*1963 *Phylloceras (Hypophylloceras) subseresitense* WIEDMANN, Pl. 14, Figure 9; Pl. 15, Figure 6; Text-Figures 41, 42, 43

Material. Well preserved internal moulds from three Tata localities, 14 specimens in total.
Description. Small and medium sized highly involute forms with paralell flattened lateral region. On the ventrolateral part slight striae can be observed. Whorl section is ellipticone (Text-Figure 36), suture cannot be observed.
Remarks. According to the diphylloid morphology of main saddles, WIEDMANN (1963) put the species into the *Phylloceras thetys* group.
Occurrence. The species occurs in the condensed Upper Aptian basal pockets of Tata Limestone Formation; otherwise WIEDMANN described the species from the Aptian of Mallorca.



Text-Figure 36. Whorl section of *Phylloceras (H.) subseresitense* WIEDMANN, 1963

Phylloceras (Hypophylloceras) cf. *velledae* (MICHELIN, 1838)

Pl. I, Figure 2

1841 *Ammonites Velledae* MICHELIN — D'ORBIGNY, p.280, Pl. 82, Figure 1–4
1872 *Ammonites velledae* MICHELIN — TIETZE, p. 134
non 1899 *Phylloceras Velledae* MICHELIN — ANTHULA, p. 95, Pl. 5, Figure 1
1902 *Amonites Velledae* MICHELIN — VON KOENEN, p. 37
1905 *Phylloceras velledae* MICHELIN — JACOB, p. 104
non 1907 *Phylloceras Velledae* MICHELIN — PERVINQUIÉRE, p. 52
1947 *Phylloceras velledae* MICHELIN in D'ORBIGNY — BREISTROFFER, p. 55
1957 *Phylloceras velledae* MICHELIN — ERISTAVI, p. 56, Pl. 2, Figure 21
non 1960 *Euphylloceras velledae* MICHELIN — DRUSCHICH & KUDRYAVTSEV, p. 252, Pl. 2, Figure 5
1961 *Phylloceras velledae* MICHELIN — ERISTAVI, p. 42, tab. 1, Figure 1
1963 *Ph. (H.) velledae* MICHELIN — WIEDMANN, p. 197, Text-Figures 48, 49, Pl. 11, Figure 1; Pl. 13, Figures 1, 2, 4; Pl. 19, Figure 1; Pl. 21, Figure 4
1967 *Euphylloceras velledae* MICHELIN — DIMITROVA, p. 22, Pl. 8, Figure 1
1968 *Ph. (H.) velledae* MICHELIN — WIEDMANN & DIENI, p. 25, Pl. 1, Figure 5
1987 *Ph. (H.) velledae* MICHELIN — IMMEL, p. 57, Pl. 1, Figure 3
1989 *Ph. (H.) velledae velledae* MICHELIN — FÖLLMI, p. 114, Pl. 1, Figure 10, 11
1995 *Ph. (H.) velledae* MICHELIN — VASICEK & RAKÚS, Pl. 22, Figure 1

Material. Four damaged internal moulds from Kálvária Hill and two well preserved specimens from Vájáriskola.
Measurement.

	D	H	W	U	W/H
1.	22	14.5(65)	8(36)	2(9)	0.55
2.	24	15(63)	10(42)	1.5(6)	0.66

Description. Small, involute forms with high aperture and deep umbilicus. Whorl section oval. On the ventral-ventrolateral sides of the moulds fine radial striae can be visible which apperently disappear towards the dorsal part. Suture lines cannot be observed.

Discussion. WIEDMANN (1963) created a *velledae*-group within the genus *Phylloceras* according to one diphylloid main saddle beside the other tetraphylloid ones. *Ph. (H.) velledae* can be easily confused with the adult specimens of *Ph. (H) cypris* FALLOT & TERMIER 1923. The separation of the two species is based on stronger involution and more differentiated suture of *Ph. (H.) velledae*. Hitherto in present material sutures cannot be studied and the author used open nomenclature. Hungarian specimens show great similarity to the subspecies of *Ph. morelianum* (D'ORBIGNY 1841) figured by WIEDMANN (1963).

Occurrence. The species occurs in the condensed Upper Aptian basal pockets of Tata Limestone Formation, otherwise known worldwide from Lower Albian – Cenomanian sediments.

Genus *Partschiceras* FUCINI, 1923
Type species: *Ammonites partschi* HAUER, 1854

Partschiceras baborense (COQUAND, 1880)

Pl. I, Figure 5, 6, 8

1842	*Ammonites rouyanus* D'ORBIGNY p. 362, Pl. 110, Figure 3–5
1872	*Ammonites rouyanus* D'ORBIGNY — TIETZE, p. 133, Pl. 9, Figure 7, 8
*1880	*Ammonites baborensis* COQUAND — p. 26
1899	*Phylloceras rouyanum* D'ORBIGNY — ANTHULA, p. 94
1907	*Phylloceras rouyanum* D'ORBIGNY — PERVINQUIERE, p. 56
1920b	*Phylloceras baborense* COQUAND — FALLOT p. 17
1937	*Phylloceras baborense* COQUAND — COLLIGNON, Pl. 1, Figures 4, 5, 6
1962	*Phyllopachiceras baborense* COQUAND — COLLIGNON, p. 3, Figure 945
1963	*Partschiceras baborense* COQUAND — WIEDMANN, p. 243, Pl. 14, Figure 2, 4, 5; Pl. 16, Figure 1, 2; Pl. 21, Figure 5, 6; Text-Figure 59
1968	*Partschiceras baborense* COQUAND — WIEDMANN & DIENI, p. 27, Pl. 3, Figure 4; Pl. 4, Figure 11
1972	*Partschiceras baborense* COQUAND — VASICEK, Pl. 1, Figure 6
1977	*Phyllopachyceras baborense* COQUAND — KOTETISHVILI, p. 33, Pl. 7, Figure 4a, b
1979	*Partschiceras baborense* COQUAND — MARTINEZ, p. 243, Pl. 1, Figure 1a, b, c
1989	*Partschiceras baborense* COQUAND — FÖLLMI, p. 114, Pl. 1, Figure 14

Material. Well preserved internal moulds from all Tata localities, totally 26 fragments.

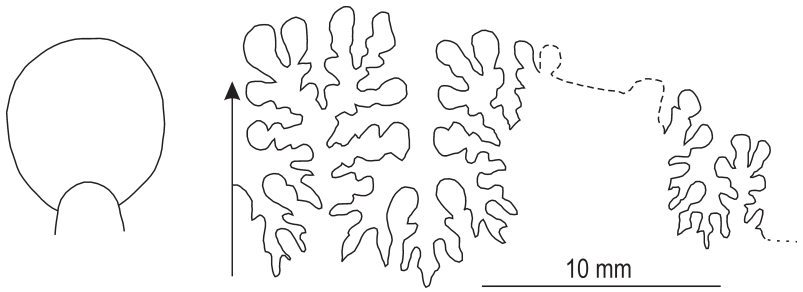
Measurement.

Kálvária Hill

	D	H	W	U	W/H
1.	30	16(53)	15(50)	–	0.94
2.	27	14(52)	13(48)	2(7)	0.93
3.	21	10(48)	10(48)	2(9)	1.00
4.	23	12(52)	12(52)	2(9)	1.00
5.	18	10(55)	10(55)	–	1.00

Description. Small, bubbled, rounded involute forms with narrow, deep umbilicus. The whorl section at adult stage is almost circular with maximun width at the mid-lateral side (Text-Figure 37). No ornamentation.

Discussion. The relation between *P. baborense* (COQUAND, 1880) and *P. rouyanum* (D'ORBIGNY, 1841) is full of confusions and misunderstandings. According to PERVINQUIÉRE (1907) and FALLOT (1910) the *baborense* and *rouyanum* are subspecies or variations of the same species, with slight differences of the whorl sections — maximum width at mid-lateral side at *baborense* and ventrolateral side at *rouyanum*. Later ERISTAVI (1957) rediscussed the question and put the two forms into two distinct species. Eristavi's separation was based on the height/width ratio of the whorl sections, which was between 0.87–0.98 at *P. baborense* but always above 1.0 at *P. rouyanum*. Later RENNGARTEN (1926) realised that the maximum width of the whorl section of the European specimens was at the dorsolateral side. This did not fit at all the distinctive parameters of the two species so instead he created a new subspecies (*baborense* var. *elliptica* RENNGARTEN 1926) for the European specimens.



Text-Figure 37. Whorl section and lobeline of *Partschiceras baborense* (COQUAND, 1880)

According to WIEDMANN (1963), the maximum height/width ratio seems to be changing during the ontogeny from the lateral part to the dorsolateral part, so the subspecies separation based on it is not correct. The specimens found in Hungary show good similarity to those described by WIEDMANN (1963).

Occurrence. The species occurs in the condensed Upper Aptian basal pockets of Tata Limestone Formation, otherwise known from the Upper Aptian deposits wordwide.

Subfamily Calliphylloceratinae SPATH, 1927b
Genus *Holcophylloceras* SPATH, 1927b
Type species: *Phylloceras mediterraneum* NEUMAYR, 1871

***Holcophylloceras guettardi* (RASPAIL, 1831)**
Pl. I, Figures 3, 4, Pl. XIII, Figure 14

1841 *Ammonites Guettardi* RASPAIL — D'ORBIGNY, p. 169, Pl. 53, Figure 1–3
1872 *Ammonites guettardi* RASPAIL — TIETZE, p. 401
1899 *Phylloceras guettardi* RASPAIL — ANTHULA, Pl. 1, Figures 1–3
1907 *Phylloceras Guettardi* RASPAIL — PERVINQUIERE, p. 60
pars 1920b *Phylloceras guettardi* RASPAIL — FALLOT, p. 18, Pl. 1, Figure 1, 2
1937 *Phylloceras guettardi* (RASPAIL) — COLLIGNON, Pl. 1, Figure 1
1962 *Phylloceras (Salfeldiella) guettardi* (RASPAIL) — COLLIGNON, Figure 947
1971 *Salfeldiella guettardi* (RASPAIL) — KVANTALIANI, p. 13, Pl. 2, Figure 4
1975 *Holcophylloceras (Salfeldiella) guettardi* (RASPAIL) — FÜLÖP, p. 104
1989 *Sowerbyceras (Holcophylloceras) guettardi* RASPAIL — FÖLLMI, p. 114, Pl. 1. Figure 15

Material. 172 internal moulds in good preservation from all surface localities and a single specimen from Tatabánya Ta–1426 borehole at 230 m.

Measurement.

		D	H	W	U	W/H
Fazekas street						
	1.	23	11(47)	9(39)	–	0.81
	2.	23	10(43)	9(39)	3(13)	0.9
	3.	29	15(51)	11(37)	4(14)	0.74
Kálvária Hill						
	1.	33	17(51)	12(36)	4(13)	0.71
	2.	24	13(54)	10(41)	3(13)	0.77
Kékkő Quarry						
	1.	24	12(50)	–	3.8(15)	–
	2.	33	16(48)	–	4.5(13.5)	–
	3.	31	15(48)	–	5(16)	–
	4.	26	13(50)	–	4(15)	–

Description. Small, bubbled, involute forms with crater-like deep umbilicus. Whorl section slightly oval, maximum whorl height is at the lateral part. Characteristic S-shaped constrictions are well observed from the dorsal part towards the venter where they become slightly shallower. Sutureline is partly visible.

Occurrence. The species occurs in the condensed Upper Aptian basal pockets of Tata Limestone Formation, also reported from the Late Aptian – Early Albian sequence of the Vértessomló Siltstone Formation (Tatabánya Ta–1426 borehole). The species is known worldwide from Barremian to Cenomanian deposits.

Subordo Lytoceratina HYATT, 1889
Superfamily Lytocerataceae NEUMAYR, 1875b
Family Lytoceratidea NEUMAYR, 1875b
Genus *Lytoceras* SUESS, 1865
Type species: *Ammonites fimbriatus* J. SOWERBY, 1817a

***Lytoceras* sp.**
Pl. I, Figure 7

Material. Six internal moulds from Kékkő Quarry and Fazekas street.

Description. Big and medium-sized specimens and fragments with characteristic evolute coiling and striae. Sutureline cannot be observed.

Occurrence. The genus occurs in the condensed Upper Aptian basal pockets of Tata Limestone Formation; otherwise *Lytoceras* was cosmopolitan from the Liassic to the Cenomanian times.

Superfamily Tetragonitaceae HYATT, 1900
Family Tetragonitidae HYATT, 1900
Genus *Tetragonites* KOSSMAT, 1895
Type species: *Ammonites timotheanus* PICTET, 1847
Subgenus *Tetragonites* KOSSMAT, 1895
Type species: *Ammonites timotheanus* PICTET, 1847

Tetragonites (Tetragonites) duvalianus (D'ORBIGNY, 1840)

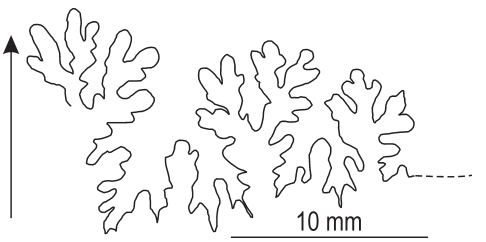
Pl. I, Figure 11, Pl. XIII, Figure 7

*1840 *Ammonites Duvalianus* — D'ORBIGNY, p. 158, Pl. 50, Figures 4, 5
1899 *Ammonites duvalianus* D'ORBIGNY — ANTHULA, p. 99, Pl. 7, Figures 3 a, b
1905 *Tetragonites duvalianus* D'ORBIGNY — JACOB, p. 401
pars 1960 *Tetragonites duvalianus* D'ORBIGNY — DRUSCHICH & KUDRYAVTSEV, p. 261, Pl. 8, Figure 4 (= *T. heterosulcatum* ANTHULA, 1899), Figure 5, P l . 9, Figure 4 (= *Kossmatella agassiziana* (PICTET, 1847))
1967 *Tetragonites duvali* D'ORBIGNY — DIMITROVA, p. 32, Pl. 11, Figures 2, 2a
1967b *Eotetragonites duvali* D'ORBIGNY — MURPHY, Pl. 1, Figures 2, 3
1975 *Eotetragonites duvalianus* D'ORBIGNY — FÜLÖP, p. 104, Pl. 49, Figures 4–8, 12–13
1988 *Eogaudryceras (Eotetragonites) duvalianum duvalianum* D'ORBIGNY — STOYKOVA & IVANOV, p. 8, Pl. 1, Figure 7

Material. One of the most abundant Aptian species in Hungary, with 121 internal moulds in various state of preservation from all localities. Also determined from Tatabánya Ta–1426 borehole at 221,3 m.

Measurement.		D	H	W	U	W/H
Fazekas street						
	1.	29	12(41)	–	11(38)	–
Vájáriskola						
	1.	27	10(37)	11(41)	11(41)	1.1
	2.	30	11(37)	13(43)	13(43)	1.18
Kálvária Hill						
	1.	46	–	24(52)	18(39)	–
	2.	40	15(37)	21(52)	-	1.4
	3.	33	13(39)	–	14(42)	–
	4.	36	–	–	14(39)	–
	5.	37	–	17(46)	15(41)	–
	6.	35	12.5(36)	–	15(43)	–

Description. Medium sized specimens with moderate involution. Ventral part wide, whorl section depressed, maximum whorl size at outer dorsolateral side, dorsal edge is almost horizontal. Strong, almost radial constrictions run from the dorsal towards the ventral part, they can be prorsiradiate on the venter. Lateral part between two constrictions could be slightly convex. The number of the constrictions on the last whorl is 9–11. Suture is well visible (Text-Figure 38).



Text-Figure 38. Part of the suture of *Tetragonites duvalianus* ANTHULA, 1899

Discussion. Specimens described in this paper are the most similar to those ones were described by ANTHULA (1899). *Tetragonites heterosulcatum* ANTHULA, 1899 has wider venter, less dense ribs and a higher angle of constrictions than of *T. duvalianus*, so the identification of fragmented specimens could be sure on the basis of these features.

Occurrence. The species occurs in the condensed Upper Aptian basal pockets of Tata Limestone Formation, otherwise *T. duvalianus* was abundant in Southern France, Switzerland, Georgia and the Caucasus and the Balkhan in the *Cheloniceras (Epicheloniceras) subnodosocostatum*, *Parahoplites melchioris* and *Nolaniceras nolani* Zones of Gargasian and Clansayesien.

Tetragonites (Tetragonites) heterosulcatum ANTHULA, 1899

Pl. I, Figures 9, 10

*1899	*Lytoceras (Tetragonites) heterosulcatum* ANTHULA, p. 99, Pl. 7, Figure 4a–c, 5a–b
1907	*Lytoceras (Tetragonites) heterosulcatum* ANTHULA — PERVINQUIERE, p. 73
1960	*Tetragonites heterosulcatus* ANTHULA — DRUSCHICH & KUDRYAVTSEV, Pl. 8, Figures 3a, b, 4
1967	*Tetragonites heterosulcatus* ANTHULA — DIMITROVA, p. 31, Pl. 11, Figures 1, 1a
1967b	*Tetragonites heterosulcatus* ANTHULA — MURPHY, p. 32, Figure 14
1971	*Tetragonites heterosulcatus* ANTHULA — KVANTALIANI, p. 22, Pl. 3, Figure 4
1975	*Eotetragonites heterosulcatus* ANTHULA — FÜLÖP, p. 104, Pl. 49, Figure 14, 15
1977	*Tetragonites hetrosulcatus* ANTHULA — KOTETISHVILI, p. 35, Pl. 7, Figure 7
1977a	*Tetragonites* (?) *heterosulcatus* ANTHULA — KENNEDY & KLINGER, p. 152, Figure 1 a–f

Material. 47 fragments and hollow internal moulds from Kálvária Hill, Vájáriskola and Márvány Quarry localities.

Measurements.

		D	H	W	U	W/H
Vájáriskola						
	1.	30	13(43)	14(46)	13(43)	1.08
	2.	–	–	–	12	–
Kálvária Hill						
	1.	29	11(38)	12(41)	11(38)	1.1
	2.	44	17.5(40)	23(52)	18(41)	1.35
	3.	25	9(36)	11(44)	10(40)	1.22

Description. Form and shape is similar to *T. duvalianus* (D'ORBIGNY 1840). Constrictions on *T. heterosulcatum* are steeper, straight and slightly prorsiradiate on the lateral region and very shallow on venter, if they cross it at all. The lateral part between the two constrictions is always flat. The number of the constrictions on last whorl is 7–10, juveniles can bear shallow constrictions.

Remarks. At some cases constrictions are do not cross the venter, as it could be observed on specimens figured by DRUSCHICH & KUDRYAVTSEV (1960).

Occurrence. The species occurs in the condensed Upper Aptian basal pockets of Tata Limestone Formation otherwise *T. heterosulcatum* is a characteristic fossil of the *Nolaniceras nolani* Zone distributed worldwide.

Subfamily Gabbioceratinae BREISTROFFER, 1953

Genus *Jauberticeras* JACOB, 1908

Type species: *Ammonites jaubertianus* D'ORBIGNY, 1850

Jauberticeras jaubertianum (D'ORBIGNY, 1850)

Pl. I, Figures 12, 13

1899	*Lytoceras latericarinatum* ANTHULA, p. 101, Pl. 7, Figures 2 a–c
1907	*Ammonites jaubertianus* D'ORBIGNY — PERVINQUIÉRE, p. 331.
1908	*Lytoceras (Jaubertella) Jaubertianum* D'ORBIGNY — JACOB, p. 17, Pl. 2, Figures 13, 14
non 1908	*Lytoceras (Jaubertella) Jaubertianum* D'ORBIGNY — JACOB, p. 17, Pl. 2, Figure 15 (=*Gabbioceras* sp.)
1908	*Lytoceras (Jaubertella) latericarinatum* ANTHULA — JACOB, p. 17, Pl. 2, Figure 17
1913	*Lytoceras (Jaubertella) jauberti* D'ORBIGNY — KILIAN, Pl. 12, Figure 7a, b
1920b	*Jaubertella jaubertiana* D'ORBIGNY — FALLOT, p. 25
non 1960	*Jaubertella latericarinata* (D'ORBIGNY) — DRUSCHICH & KUDRYAVTSEV, p. 261, Pl. 9, Figures 1a, b
1962a	*Jauberticeras jaubertianum* (D'ORBIGNY) — WIEDMANN, p. 25
1967a	*Jauberticeras jaubertianum* (D'ORBIGNY) — MURPHY, p. 604, Pl. 64, Figure 20–24
1975	*Gabbioceras (Jauberticeras) latericarinatum* (ANTHULA) — FÜLÖP, p. 104
1977b	*Jauberticeras jaubertianum* (D'ORBIGNY) — KENNEDY & KLINGER, p. 2, Figures 1a–g

Material. Three fragmented, but well preserved internal moulds from Fazekas street and Vájáriskola localities.

Description. Small, cadicone forms with deep, wide umbilicus and subtrapezoidal whorl section. The rounded venter and the slightly concave lateral part form sharp ventrolateral edge. On the ventral region slight striae can be visible. Suture cannot be observed.

Remarks. J. jaubertianum can be characterized with slight striae appearing mainly on the umbilical wall or on the ventral part of well preserved specimens. Hungarian specimens are well preserved but striae cannot visible. According to ANTHULA (1899), the presence of the ornamentation "is just partly depending on preservation state of the specimens", he interpreted the ornamentation as the effect of the ontogeny. During the ontogeny, the ventral part is also getting more rounded (MURPHY 1967a). Keep these two points in view, it should be pointed out the Hungarian specimens are not completely adults. The relationship of "*Ammonites jaubertianus* D'ORBIGNY 1851" and "*Lytoceras latericarinatum* ANTHULA 1899" was rather confused. WIEDMANN (1962a) accepted the separation of the two species based on the presence of ornamentation. MURPHY (1967a) rediscussed the

relation of the two species and merged them on the basis of the similar sutures, and proposed the name of *A. jaubertianum* as the senior synonym. The present work follows MURPHY's (1967a) taxonomy on the description of Gabbioceratinae subfamily.

Occurrence. The species occurs in the condensed Upper Aptian basal pockets of Tata Limestone Formation, otherwise known from the Gargasian to Lower Albian of Europe, North Africa, Caucasus, Zululand and Madagascar.

Genus *Gabbioceras* HYATT, 1900
Type species: *Ammonites batesi* GABB, 1869

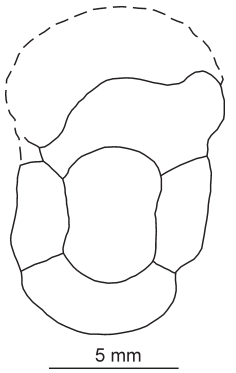
Gabbioceras michelianum (D'ORBIGNY, 1850)
Pl. I, Figure 14

1908 *Lytoceras (Jaubertella) micheliana* D'ORBIGNY — JACOB, p. 18, Pl. 2, Figure 19
1962a *Jauberticeras michelianum* D'ORBIGNY — WIEDMANN, p. 33
1967a *Gabbioceras michelianum* D'ORBIGNY — MURPHY, p. 602, Pl. 64, Figures 6, 7, 12, 13, 17, 18
1975 *Gabbioceras micheliana* D'ORBIGNY — FÜLÖP, p. 104

Material. Two internal moulds from Fazekas street and Vájáriskola localities.

Description. Small, cadicone forms with deep, wide umbilicus. The umbilicus, compared to *Jauberticeras*, is shallower and less wide. Ventral region is rounded just as the ventral edge (Text-Figure 39), which is the other well observed feature different from *Jauberticeras*. No ornamentation is visible, suture cannot be studied.

Occurrence. The species occurs in the condensed Upper Aptian basal pockets of Tata Limestone Formation. MURPHY (1967a) reported the species from the Gargasian of Texas, mentioning that exact stratigraphic position of the European specimens is unknown.



Text-Figure 39. Whorl section of *Gabbioceras michelianum* (D'ORBIGNY, 1850)

Subordo Ammonitina HYATT, 1889
Superfamily Desmoceratacea ZITTEL, 1895
Family Desmoceratidae ZITTEL, 1895
Subfamily Puzosiinae SPATH, 1922b
Genus *Valdedorsella* BREISTROFFER, 1947
Type species: *Desmoceras akuschaense* ANTHULA, 1899

Valdedorsella getulina (COQUAND, 1880)
Pl. I, Figure 15, 16, 17, Pl. III, Figure 24

*1880 *Ammonites getulinus* COQUAND, p. 18
1899 *Desmoceras akuschaense* ANTHULA, p. 104, Pl. 8, Figure 2a–c
1905 *Desmoceras akuschaense* ANTHULA — JACOB, p. 402, Pl. 12, Figure 1
1907 *Puzosia Getulina* COQUAND — PERVINQUIERE, p. 151, Pl. 6, Figure 16
1920a *Puzosia Getulina* COQUAND — FALLOT, p. 45, Pl. 2, Figure 7–10
1960 *Valdedorsella akuschaense* ANTHULA — DRUSCHICH & KUDRYAVTSEV, p. 301, Pl. 44, Figures 3a, b
1962 *Valdedorsella getulina* COQUAND — COLLIGNON, p. 33, Figure 977
1968 *Valdedorsella getulina* COQUAND — WIEDMANN & DIENI, p. 108
1975 *Valdedorsella getulina* (COQUAND) — FÜLÖP, p. 104, Pl. 49, Figure 1–5
1982 *Valdedorsella getulina* ANTHULA — RENZ, p. 22, Pl. 2, Figure 19a–c, Text-Figures 10a, b
1990 *Valdedorsella akuschaense* ANTHULA — STOYKOVA & IVANOV, p. 60, Pl. 1, Figure 7

Material. Huge amount of well preserved internal moulds from all localities, totally 128 specimens.

Measurement.	D	H	W	U	W/H
Kékkő Quarry					
1.	28	11(39)	13(46)	7(25)	1.18
2.	29	13(45)	14(48)	8(28)	1.07
3.	25	11(44)	13(52)	6(24)	1.18
Kálvária Hill					
4.	26	11(42)	14(53)	7(26)	1.27
5.	26	11(42)	14(53)	7(26)	1.27
6.	25	10(40)	13(52)	6(24)	1.30
7.	24	–	13(54)	–	–
8.	21	9(42)	13(62)	–	1.44
9.	18	8(44)	10(55)	4(22)	1.25
10.	16	7(44)	10(62)	4(25)	1.42
11.	16	–	10(62)	4(25)	–

Fazekas street					
12.	23	10(43)	14(61)	6(26)	1.40
13.	28	11(39)	15(54)	7(25)	1.36
14.	22	10(45)	14(63)	6(27)	1.40

Description. Bubbled, rounded involute forms with deep umbilicus and rounded umbilical edge. Whorl section highly depressed with maximum width at the outer part of the dorsolateral region. Venter is slighly rounded or flat, the species characterized by sinuous constrictions, numerically 5–6 on the last whorl. In between the constrictions, fine striae starts from the lateral region, these can be observed on the well preserved specimens, mainly from Kálvária Hill.

Discussion. Hungarian specimens show good similarity to those described by ANTHULA (1899), with the slight difference that on the Hungarian specimens' striae start at the lateral side. PERVINQUIERE (1907) pointed out that five constrictions per whorl are usual and the shape of constrictions is tending to be more sinuous during the ontogeny. This seem to fit the Hungarian specimens although some cases they have six constrictions per whorl.

Occurrence. The species occurs in the condensed Upper Aptian basal pockets of Tata Limestone Formation, otherwise the species was common in the Aptian sediments wordwide.

Genus *Melchiorites* SPATH, 1923
Type species: *Ammonites melchioris* TIETZE, 1872

Melchiorites sp. indet.

Material. Poorly preserved specimens in great number from all localities.

Description. Small, compressed slightly evolute specimens. Curling of the last whorl is irregular that gives ellipticoneic character to the form. Three to four sinuous constrictions per whorl can be poorly visible.

Discussion. Due to heavy reworking, the specific characters as the shape of the constrictions or other type of the ornamentation cannot be visible.

Occurrence. The genus occurs in the condensed Upper Aptian basal pockets of Tata Limestone Formation, otherwise it is known from Barremian to Albian of the Mediterranean region.

Melchiorites melchioris (TIETZE, 1872)

Pl. III, Figures 2, 3, 5, 6, Pl. XIII, Figure 3

*1872	*Ammonites melchioris* TIETZE, p. 135, Pl. 9, Figures 9, 10.
1907	*Puzosia (Latidorsella?) Melchioris* (TIETZE) — PERVINQUIERE, p. 147, Pl. 6, Figure 15
pars1913	*Desmoceras melchioris* (TIETZE) — KILIAN, p. 335, Pl. 12, fig 5, non Pl. 10, Figure 2
1920a	*Puzosia* cf. *melchioris* (TIETZE) — FALLOT, p. 49, Text-Figure 21
1920c	*Puzosia melchioris* (TIETZE) — FALLOT, p. 254, Pl. 3, Figure 5
1920c	*Puzosia melchioris* (TIETZE) var. alpina KILIAN — FALLOT, p. 256, Pl. 3, Figure 6
1962	*Melchiorites melchioris* (TIETZE) — COLLIGNON, p. 36, Figure 980
1968	*Melchiorites melchioris* (TIETZE) — WIEDMANN & DIENI, p. 109, Pl. 10, Figure 4
1975	*Melchiorites melchioris* (TIETZE) — FÜLÖP, p. 104, Pl. 49, Figure 13
pars1982	*Melchiorites melchioris* (TIETZE) — BRAGA et al., p. 697, 699; Pl. 1, Figures 9, 12
1982	*Melchiorites melchioris* (TIETZE) — RENZ, p. 23, Pl. 2, Figures 20a, b

Material. 85 internal moulds in various states of preservation from all surface locality and a single specimen from Tatabánya Ta–1426 borehole at 265 m.

Measurement.	D	H	W	U	W/H
Fazekas street					
1.	–	14	14	7	1.00
2.	34	16(47)	13(38)	–	0.81
3.	24	9(38)	7(29)	8(33)	0.78
4.	19	7(38)	6(32)	6(32)	1.00
5.	38	18(47)	–	11(30)	–
Kálvária Hill					
6.	35	16(45)	11(31)	11(31)	0.69
7.	30	14(46)	10(33)	9(30)	0.90

Description. Small elliptical forms with wide umbilicus and oval whorl section. The species is characterized by the lack of ornamentation and by well visible radial, almost straight constrictions, 3–4 per whorl. Constrictions are absent or not visible on inner whorls. Suture cannot be observed.

Discussion. Some specimens have bullae in between constrictions, which derived from the umbilical edge and getting weaker at the lateral flank. The Hungarian specimens show good resemblance to the type specimen of TIETZE (1872). On the specimens of BRAGA et al. (1982) the shape of constictions are hardly visible.

Occurrence. The species occurs in the condensed Late Aptian basal pockets of Tata Limestone Formation, also reported from the Upper Aptian of the Vértessomló Siltstone Formation (Tatabánya Ta–1426), otherwise the species distributed worldwide in the Barremian and Aptian.

Melchiorites emerici (RASPAIL, 1831)

Pl. III, Figures 1, 4

1883 *Haploceras emerici* RASPAIL — UHLIG, p. 221, 224, 232, Pl. XVII, Figure 13
1920c *Puzosia emerici* RASPAIL — FALLOT, p. 247–251
1920c *Puzosia emerici* RASPAIL var. *strigosa* FALLOT — FALLOT, p. 251
1920c *Puzosia emerici* RASPAIL var. *alpina* KILIAN — FALLOT, p. 253

Material. 10 well preserved internal moulds from Márvány Quarry locality.

Description. Similar to *M. melchioris* (TIETZE, 1872) apart from the lateral sinuousity of the constrictions.

Occurrence. The species occurs in the condensed Upper Aptian basal pockets of Tata Limestone Formation, otherwise the species distributed worldwide in the Barremian and Aptian.

Subfamily Silesitoidinae BREISTROFFER, 1953
Genus *Silesitoides* SPATH, 1925d
Type species: *Silesites escragnollensis* JACOB, 1908

Silesitoides sp.

Material. 67 specimens and fragments from all Tata localities, mostly in poor state of preservation.

Description. Involute compressed forms, 5–6 centimetres in diameter. The ornamentation is hardly studied due to the poor preservation, but constrictions are slightly visible. No other elements or suture visible.

Remarks. The *Silesitoides* assemblage show different morphological features, but the state of preservation is poor for more exact identification.

Occurrence. The genus occurs in the condensed Upper Aptian basal pockets of Tata Limestone Formation, otherwise known from the Upper Aptian to Middle Albian deposits of Poland, England, France, the Baleares and North Africa.

Silesitoides superstes (JACOB, 1908)

Pl. II, Figures 4, 10, Pl. IV, Figure 2

*1908 *Silesites superstes* JACOB, p. 42, Pl. II, Figures 23a, b
2000 *Silesitoides superstes* (JACOB, 1908) — KENNEDY et al., p. 664, Figures 43 i, j, m (refigured holotype)

Material. Six poorly preserved internal moulds from Kékkő Quarry and Fazekas street localities.

Description. The two figured specimens are small, serpenticone, evolutee forms with shallow umbilicus and slightly compressed whorl section. Constrictions are widely separated, 4–5 per whorl. At specimen No. 10, delicate ribs start from the outer flank and cross the venter straight but the ornamentation is getting weaker during the ontogeny. On specimen No. 4, no ornamentation is visible at any stage of growth apart from the constrictions.

Remarks. KENNEDY (2000) re-illustarted the holotype of JACOB (1908) and there is no visible ornamentation apart from the constrictions.

Occurrence. The species occurs in the condensed Upper Aptian basal pockets of the Tata Limestone Formation, otherwise known from Lower – Middle Albian deposits of Poland, North Arfica, the Baleares and France.

Silesitoides escragnollensis (JACOB, 1908)

Pl. II, Figures 6, 7, 8, 9, 11, 12, 13

*1908 *Silesites escragnollensis* JACOB, p. 43, Pl. II, Figures 20a, b, 21a, b
1975 *Puzosiella* sp. — FÜLÖP, p. 104, Pl. 50, Figure 9
2000 *Silesitoides escragnollensis* (JACOB, 1908) — KENNEDY et al., p. 664, Figures 43 o, p

Material. 59 specimens from Kálvária Hill, Kékkő Quarry and Márvány Quarry localities.

Measurement.	D	H	W	U	W/H
1.	50	15(30)	10(20)	26(52)	0.38
2.	62	17(27)	14(22)	35(56)	0.4
3.	52	15(29)	12(23)	28(54)	0.42

Description. Five to six centimetres big, serpenticone, evolute forms with shallow umbilicus and rounded umbilical wall. Whorl section is slightly compressed. Presence of strong, collared constrictions is characteristic feature of the genus. Constrictions, 10–12 on the last whorl, are straight in the lateral region and tending to be prorsiradiate on the venter. In between the constrictions, there are bullae that are flat on the dorsolateral region and getting stronger on the outer lateral part without reaching the ventral region. Suture cannot be observed.

Discussion. The Hungarian specimens show greater resemblance to *S. escragnollensis* (JACOB 1908). There are other five described species (*S. sulcobifurcatus* REYNES 1876, *S. thos* PERVINQUIERE 1907, *S. superstes* JACOB 1908, *S. palmensis* FALLOT & TERMIER 1923, *S. tatricus* PASSENDORFER 1930). *S. tatricus* (PASSENDORFER 1930) differs from *escragnollensis* only in the more rounded whorl section as MARCINOWSKI & WIEDMANN (1990) emphasized it.

Occurrence. Apart from the Eperkés Hill, the species is known from each surface locality of the condensed Upper Aptian basal pockets of Tata Limestone, Hungary. Otherwise the species is known from France and England.

Genus *Parasilesites* IMLAY, 1959
Type species: *Parasilesites bullatus* IMLAY, 1959

Parasilesites kilianiformis (FALLOT, 1910)

Pl. II, Figures 2, 3, 5, Pl. XIII, Figure 6, Pl. XXV, Figure 4

*1910	*Puzosia nolani* var. *kilianiformis* — FALLOT, p. 26, Pl. 1, Figure 5
1920a	*Puzosia nolani* var. *kilianiformis* — FALLOT, p. 46, Pl. 3, Figure 3
1968	*Parasilesites kilianiformis* FALLOT — WIEDMANN & DIENI, p. 124, Pl. 10, Figure 7
1969	*Puzosiella minuta* gen. et sp. nov. — EGOIAN, p. 174, Pl. 16, Figures 8, 9, 10
1975	*Puzosiella minuta* EGOIAN — FÜLÖP, p. 104, Pl. 50, Figure 8
1982	*Parasilesites kilianiformis* (FALLOT) — RENZ, p. 37, Pl.5, Figure 10 a, b
1990	*Parasilesites kilianiformis* FALLOT — MARCINOWSKI & WIEDMANN, p. 58, Pl. 7, Figure 4

Material. 10 specimens from Tata localities and a single specimen is from Tatabánya Ta–1426 borehole at 223.3 m.

Description. Small, slightly ellipticone, evolutee forms characterized with prorsiradiate constrictions and dense, slight ventrolateral ribs, which start on the mid lateral region and crosses the venter prorsiradiately.

Discussion. According to the first description, it is difficult to separate *P. kilianiformis* FALLOT, 1910 from *Parasilesites kiliani* FALLOT, 1910. FALLOT (1920a) figured a *P. kilianiformis* (*Puzosia Nolani* var. *Kilianiformis*) which is, according to the first description, shows good morphological similarity to *Silesitoides superstes* (JACOB, 1908).

Occurrence. The species is known from each surface locality of the condensed Upper Aptian basal pockets of the Tata Limestone Formation, reported from the Upper Aptian – Lower Albian of the Vértessomló Siltstone Formation (Tatabánya Ta–1426), otherwise it is known from the Lower Albian of Mallorca and Middle Albian of the "Mediterranean" region.

Subfamily Beudanticeratinae BREISTROFFER, 1953
Genus *Beudanticeras* HITZEL, 1902
Type species: *Ammonites beudanti* BRONGNIART, 1822
Subgenus: *Beudanticeras* HITZEL, 1902
Type species: *Ammonites beudanti* BRONGNIART, 1822

Beudanticeras (Beudanticeras) beudanti (BRONGNIART, 1822)

Pl. III, Figures 9, 10, 11, 12, 13, Pl. XIV, Figure 8; Pl. XIX, Figure 1, Pl. XXI, Figure 1, Pl. XXV, Figures 2, 6

1968	*Beudanticeras beudanti* (BRONGNIART, 1822) — WIEDMANN & DIENI, p. 128, Pl. 11, Figure 10
1979	*B. beudanti* (BRONGNIART, 1822) — SCHOLZ, p. 68, Pl. 13, Figures 1, 6
1990	*Beudanticeras beudanti* (BRONGNIART, 1822) — MARCINOWSKI & WIEDMANN, p. 59, Pl. 7, Figure 1
1993	*Beudanticeras beudanti* (BRONGNIART, 1822) — KENNEDY, p. 235–238, Figure 1, 2 (refigured lectotype)

Material. A dozen of poorly preserved specimens from all surface localities of Tata. Also reported from the Upper Albian of Tilos Forest (see the Albian chapter).

Description. Rather involute, big, compressed, ellipticone specimens with narrow umbilicus and high, flattened flanks. The outer lateral whorl is plicate, with the alternation of longer and shorter ones, which both cross the venter.

Discussion. The species differs from *B. (B.) convergens* (JACOB, 1908) in the presence of ornamentation.

Occurrence. The species occurs in the condensed Upper Aptian basal pockets of the Tata Limestone Formation, also documented from the Upper Albian condensed basal beds of the Pénzeskút Marl Formation; otherwise it is reported from Europe.

Beudanticeras(Beudanticeras) convergens (JACOB, 1908)

Pl. III, Figures 7, 8, Pl. XIII, Figure 5

*1908 *Desmoceras (Uhligella) convergens* JACOB, p. 29, Pl. 2, Figure 24, 25, 26
1961 *Pseudorbulites convergens* JACOB — CASEY, p. 145, 146; Pl. 46d, g
1968 *Beudanticeras convergens* JACOB — WIEDMANN & DIENI, p. 126–127
1989 *Beudanticeras convergens* JACOB — FÖLLMI, p. 138, Pl. 9, Figures 10, 11
2000 *Beudanticeras convergens* JACOB — KENNEDY et al, p. 665, Figures 37j, 41j–l, 42w–h', 43a–h, 47p, q, 48a

Material. 11, poorly preserved internal moulds from Vájáriskola locality, and a single specimen from Tatabánya Ta–1426 borehole at 299.2 — 319.0 m.

Measurements.	D	H	W	U	W/H
Vájáriskola					
7.	25	12(48%)	10(40)	6(24)	0.83
8.	22.5	–	–	5(22)	–
16.	50	24(48)	15(30)	12(24)	0.63
17.	40	19(48)	–	18(45)	–

Description. Characteristically ellipticone very involute forms, with high compressed whorl section and flattened, subparallel flanks. The internal mould is smooth, no ornamentation is visible. No suture is visible.

Discussion. Specimens found in Hungary are show good similarity to the first description of JACOB (1908) and specimens described by FÖLLMI (1989) from Vorarlberg.

Occurrence. The species occurs in the condensed upper Late Aptian basal pockets of the Tata Limestone Formation, reported from the Upper Aptian – Lower Albian of the Vértessomló Siltstone Formation (Tatabánya Ta–1426), otherwise reported from the Upper Aptian – Lower Albian deposits of Vorarlberg, France and Poland.

Genus *Zuercherella* CASEY, 1954
Type species: *Desmoceras zuercheri* JACOB & TOBLER, 1906

Zuercherella zuercheri JACOB & TOBLER, 1906

Pl. III, Figures 21, 22, 23.

*1906 *Desmoceras zuercheri* JACOB & TOBLER, 1906, p. 9, Pl. 2, Figure 2
1920a *Uhligella zürcheri* JACOB & TOBLER — FALLOT, p. 261, Pl. 3, Figure 7
1954 *Zürcherella zürcheri* JACOB & TOBLER — CASEY, p. 112
1968 *Zürcherella zürcheri* JACOB & TOBLER — WIEDMANN & DIENI, p. 130, Pl. 12, Figure 1
1982 *Beudanticeras (Zuercherella) zuercheri* JACOB & TOBLER — RENZ, Pl. 1, Figure 20

Material. Three specimens from Tata.

Description. Discoidal, involute forms with slight, sinuous ribs running from the umbilical edge towards to the rounded venter. Some ribs tend to be wider and stronger on the outer flank and at the venter. Slight intercalated ribs also appear.

Discussion. The shape of the conch is similar to Uhligella, but *Zuercherella* has weaker ribbing with smooth intercalated ribs.

Occurrence. The species occurs in the condensed Upper Aptian basal pockets of the Tata Limestone Formation, otherwise the species known from Upper Aptian deposits worldwide.

Genus *Uhligella* JACOB, 1908
Type species: *Desmoceras clansayense* JACOB, 1905

Uhligella clansayensis (JACOB, 1905)

Pl. III, Figures 15, 19

*1905 *Desmoceras clansayense* JACOB, p. 403, Pl. XII, Figures 2a, 2b; 3a, 3b
1975 *Uhligella* sp. — FÜLÖP, p. 104, Pl. 50, Figure 12

Material. 21 poorly preserved internal moulds from all Tata localities.

Measurements.

	D	H	W	U	W/H
Fazekas street					
2.	21	9(43)	7(33)	6(29)	0.78
4.	32	16(50)	11(34)	8(25)	0.69
13.	46	22(48)	15(33)	10(22)	0.68
14.	30	14(47)	11(37)	8(27)	0.78

Description. Involute, more or less circular forms with high aperture, which has the maximum width at the dorsolateral side. Very slight, sinuous ribs start at the ventrolateral part and cross the venter continuously. On the lateral side there is no ornamentation at all.

Discussion. The species can be determined by the lack of lateral ornamentation and ellipticone coiling, although already FALLOT (1920b) remarked that apart from the different stratigraphical range, almost nothing suggests the separation of *Uhligella boussaci* FALLOT (Lower Albian) and *Uhligella clansayensis* JACOB (Upper Aptian), because their sutures are almost identical. The present author accepts FALLOT's opinion and handles *U. clansayensis* JACOB and *U. boussaci* FALLOT as the same species and for the reason of priority keeps *clansayensis* as the valid specific name. The species also resembles to *Beudanticeras (B.) beudanti* (BRONGNIART 1822) on the basis of the ornamentation, but the smaller diameter, the less ellipticone sculpture and the more involution makes difference, although WIEDMANN & DIENI (1968) proposed to include genus *Uhligella* JACOB, 1908 in *Beudanticeras* HITZEL, 1902. SCHOLZ (1979) and MARCINOWSKI & WIEDMANN (1990) also discussed the problem and concluded that the two genera are separated.

Occurrence. The species occurs in the condensed Upper Aptian basal pockets of the Tata Limestone Formation, otherwise it is known from Upper Aptian deposits of Europe and North Africa.

Uhligella balmensis JACOB, 1908

Pl. III, 14, 16, 17, 18, 20.

*1908 *Desmoceras (Uhligella) balmensis* JACOB, p. 33, Figure 20, Pl. 3, Figures 6–9
1963 *Uhligella balmensis* JACOB — COLLIGNON, p. 71, Pl. 267, Figure 1162
1963 *Uhligella balmensis* JACOB var. pingus COLLIGNON — COLLIGNON, p. 74, Pl. 268, Figure 1168
1990 *Uhligella balmensis* JACOB — MARCINOWSKI & WIEDMANN, p. 61, Pl. 6, Figure 8

Material. 5 well preserved internal moulds from Tata.

Description. Discoidal or slightly ellipticone forms with very stong bullae, 6–8 per whorl. Bullae start from the umbilical edge and crosses over the venter continuously. Intercalated ribs appear; they are strong and also pass the venter. Suture cannot be observed.

Discussion. The specimens show good resemblance to JACOB's (1908) first description except that the bullae are not sinuous. A little stronger ornamentation makes difference from the similar form of *U. rebouli* JACOB, 1908, although JACOB (1908) mentioned similarities between "*U. rebouli* JACOB, 1908 and *U. walleranti* JACOB, 1908 besides *U. balmense* JACOB, 1908 and *Pachydiscus* spp.". According to the same stratigraphic position and morphology, *U. balmensis* and *U. rebouli* can be interpreted as intraspecific variations of one species but without further studies of the holotypes it cannot be proved.

Occurrence. The species occurs in the condensed Upper Aptian basal pockets of the Tata Limestone Formation, otherwise known from the Lower Albian of France, Switzerland, Poland and the Middle Albian of Madagascar.

Subfamily Desmoceratinae ZITTEL, 1895
Genus *Desmoceras* ZITTEL, 1884
Type species: *Ammonites latidorsatus* MICHELIN, 1838
Subgenus *Desmoceras* ZITTEL, 1885
Type species: *Ammonites latidorsatus* MICHELIN, 1838

Desmoceras (Desmoceras) latidorsatum (MICHELIN, 1838)

Pl. III, Figure 25, Pl. XIV, Figure 10, Pl. XIX, Figure 3, 4, Pl. XXVIII, Figure 6, Pl. XXVI, Figure 1, 2

1908 *Desmoceras (Latidorsella) latidorsatum* MICHELIN — JACOB, Pl. 4, Figure 10, 11, 13; Pl. 5, Figure 1
1908 *Desmoceras (Latidorsella) latidorsatum* MICHELIN var. *aplatie* JACOB — JACOB, Pl. 5, Figure 2
1963 *Desmoceras latidorsatum* MICHELIN — COLLIGNON, p. 84, Pl. 273, Figure 1176, 1178, 1179
1963 *Desmoceras latidorsatum* MICHELIN var. *inflata* BREISTROFFER — COLLIGNON, p. 84, Figure 1177
1963 *Desmoceras latidorsatum* MICHELIN var. *medida* JACOB — COLLIGNON, p. 84, Pl. 273, Figure 1180
1975 *Desmoceras falcistriatum* (ANTHULA) — FÜLÖP, p. 104
1979 *Desmoceras latidorsatum* MICHELIN — SCHOLZ, p. 61–62
1989 *Desmoceras latidorsatum* MICHELIN — FÖLLMI, p. 135, Pl. 8, Figure 2, 3, 4
1990 *Desmoceras (Desmoceras) latidorsatum latidorsatum* (MICHELIN) — MARCINOWSKI & WIEDMANN, Pl. 7, Figure 2
1990 *Desmoceras (Desmoceras) latidorsatum inflatum* BREISTROFFER — MARCINOWSKI & WIEDMANN, Pl. 7, Figure 3

Material. 13 poorly preserved internal moulds and fragments from Tata, and several specimens from Tilos Forest as well.

Description. Bubbled specimens with deep umbilicus and depressed whorl section with moderate involution. Sinuous constrictions start from the umbilical edge and cross the venter straight. No other ornamentation or the suture is visible.

Discussion. The specimens, despite the bad state of preservation, can be identified quite well on the basis of the bubbled shape and the well visible constrictions although the high variability of the species is well known (WIEDMANN & DIENI 1968; MARCINOWSKI & WIEDMANN 1990).

Occurrence. In Hungary the species occurs in the condensed basal pockets of the Upper Aptian Tata Limestone Formation and also reported from the Upper Albian – Lower Cenomanian Pénzeskút Marl Formation, from surface localities and boreholes as well. Otherwise the species was a cosmopolitan taxon of the Early Albian – Cenomanian times.

Family Silesitidae HYATT, 1900
Genus *Neosilesites* BREISTROFFER, 1951a
Type species: *Silesites Seranonis* D'ORBIGNY var. *balearensis* FALLOT, 1920a

Neosilesites nepos (H. DOUVILLÉ, 1917)
Pl. XIII, Figures 2, 10, 12, 13

*1917 *Silesites nepos* H. DOUVILLÉ, p. 109, Pl. XV, Figure 8, 9

Material. Four specimens from the Tatabánya Ta–1426 borehole at 265, 258, 255.5 and 253 metres.

Description. Small, evolutee, discoidal forms with dense, narrow, strong ribs, rib index is around 40 but exactly cannot be determined due to the lack of a complete specimen. Ribs bifurcate at the ventral edge, secondary ribs cross the venter continuously. Whorl section is circular, which is characteristic of the genus.

Remarks. H. DOUVILLÉ (1917) described *Silesites nepos* from Moghara. It resembles *S. seranonis* (D'ORBIGNY, 1841), a former index fossil of the Barremian. FALLOT (1920a) also described a *Silesites* species, but according to the different stratigraphical occurrence and a bit different ornamentation, separated the new form as a new subspecies of *seranonis* called *balearensis* (FALLOT, 1920a). It differs from nepos in the mode of ribbing — primary ribs end at midflank and do not bifurcate. BREISTROFFER (1951a) created a new genus (*Neosilesites*) for the specimens of *S. seranonis* var. *balearensis* FALLOT, 1920a (p. 55, Pl. III, Figure 5), which stratigraphic position is much younger as of *S. seranonis*, Upper Aptian – Lower Albian.

Occurrence. The species is known from the Upper Aptian – Lower Albian deposits of France, the Balearic Islands, Poland and North Africa, a rather rare fossil. In Hungary the species is known from the Upper Aptian – Lower Albian sequence of the Tatabánya Ta–1426 borehole, 253 m, 255.5 m, 258 m and 265 m.

Superfamily Acanthocerataceae GROSSOUVRE, 1894
Family Brancoceratidae SPATH, 1933
Subfamily Brancoceratinae SPATH, 1934
Genus *Brancoceras* STEINMANN, 1881
Type species: *Ammonites senequieri* D'ORBIGNY, 1841

Brancoceras senequieri (D'ORBIGNY, 1841)
Pl. XIII, Figure 1

*1841 A*mmonites senequieri* D'ORBIGNY, p. 292, Pl. 86, Figure 3–5
2004b *Brancoceras senequieri* (D'ORBIGNY, 1841) — KENNEDY, p. 256, Pl. 4, Figs 1–3, 14–15; Pl. 5, Figures 20–28; Pl. 6, Figs 1–12; Text-Figures 6E, j, 7F (with synonymy).

Material. A single, flattened, fragmented specimen from Tatabánya Ta–1462 borehole from 210.8 metres.

Description. A flattened third whorl of a small, evolute specimen with prominent ribs that start from the umbilical edge, flattening across the venter and become fan-like on the ventral edge. The ventral region is not visible.

Discussion. The small size and the shape of the ribs make the specific identification clear.

Occurrence. The species co-occurs with typical Upper Aptian assemblage in the Upper Aptian – Lower Albian sequence of Tatabánya Ta–1462 borehole. Otherwise the genus was cosmopolitan and reported from Lower Albian – Middle Albian deposits.

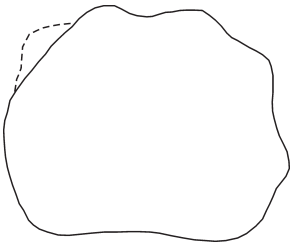
Subordo Ancyloceratina WIEDMANN, 1966
Superfamily Ancyloceratacеae GILL, 1871
Family Ancyloceratidae GILL, 1871
Subfamily Ancyloceratinae GILL, 1871
Genus *Ancyloceras* D'ORBIGNY, 1842
Type species: *Ancyloceras Matheronianus* D'ORBIGNY, 1842

?Ancyloceras matheroni D'ORBIGNY, 1842
Pl. IV, Figure 6

*1842 *Ancyloceras Matheronianus* D'ORBIGNY, p. 497, Pl. 122

Material. A 7 centimetres long fragment of an internal mould from Kálvária Hill locality.

Description. A slightly curved fragment with an almost same sized, suboctogonal whorl section (Text-Figure 40) at the two ends (34 vs. 36 mm in diameter). The dorsal side is smooth with light striae. Ribs start at the lower lateral part and become tuberculated. Umbilical tubercle is the smallest and other are getting bigger towards the venter. In the interspaces there are secondaries with no tubercles. Suture cannot be observed.



Text-Figure 40. Whorl section of *Ancyloceras matheroni* D'ORBIGNY, 1842 M: 1×

Discussion. At the genera *Ancyloceras* and *Toxoceratoides*, the ornamentation of the phragmocone is almost similar. The only difference between the two forms is in the body chamber and the size of the conch. Due to the fragmentation of the present specimen, body chamber cannot be observed. The specimens of the genus Ancyloceras are rather large, although specimens of Toxoceratoides are few centimetres long apart from *Toxoceras honnoratum* (D'ORBIGNY 1841). Neither KLINGER & KENNEDY (1977) nor AGUIRRE–URRETA (1986) identifies *T. honnoratum* as a member of genus *Toxoceratoides*, so the position of the species is uncertain. According to the rather large size of the Hungarian specimen, and on the basis of the ornamentation, the author prefers to identify the fragment as an ?*Ancyloceras* species.

Occurrence. In Hungary the species is reported from the condensed Upper Aptian basal pockets of Tata Limestone Formation at Kálvária Hill, otherwise the species was cosmopolitan in the Barremian – Early Aptian times worldwide.

Genus *Tonohamites* SPATH, 1924
Type species: *Tonohamites decurrens* SPATH, 1924

Tonohamites boldii SZIVES & MONKS, 2002

Pl. IV, Figure 10

Material. A single specimen from Eperkés Hill locality.

Description. A hook-shaped conch with a dorso-ventrally compressed whorl section. The conch is slightly twisting. Strong ribs start from the dorsal part and wear three bullate tubercles. The ribs slightly rursiradiate, completely effaced dorsally and partially effaced between the ventarl nodes. Ventral tubercles are less distinct near the aperture but they occur on most ribs. Ventrolateral spines are irregularly distributed. Suture is unknown.

Remarks. The specimen resembles to *Protanisoceras (Torquistylus)* in the twisting body chamber, but the rounded ribs and the single pair of tubercles make clear difference between the two taxa.

Occurrence. The species was described from Hungary, from the condensed Upper Aptian section of Tata Limestone Formation of Eperkés Hill.

Superfamily Turrilitaceae GILL, 1871
Family Ptychoceratidae GILL, 1871
Genus *Ptychoceras* D'ORBIGNY, 1841
Type species: *Ptychoceras Emericianum* D'ORBIGNY, 1841

Ptychoceras laeve MATHERON, 1842

Pl. IV, Figures 3, 4, 5

*1842	*Ptychoceras laevis* MATHERON, p. 266, Pl. 41, Figure 3
1897	*Ptychoceras adpressum* (J. SOWERBY) — PARONA & BONARELLI, p. 105
1907	*Ptychoceras laeve* MATHERON var. *Hamaimensis* — PERVINQUIERE, p. 90, Pl. 4, Figure 5, 6
1907	*Ptychoceras laeve* MATHERON — PERVINQUIERE, p. 90
1920a	*Ptychoceras laeve* MATHERON — FALLOT, p. 16
1933	*Ptychoceras minimum* ROUCHADZÉ, p. 180, Pl. 1, Figure 8
1960	*Ptychoceras minimum* ROUCHADZÉ — DRUSCHICH & KUDRYAVTSEV, p. 265, Pl. 11, Figure 5
1962b	*Ptychoceras laeve* laeve MATHERON — WIEDMANN, p. 90, Pl. 7, Figure 1, Text-Figures 31, 32
1975	*Ptychoceras minimum* ROUCHADZE — FÜLÖP, p. 104, Pl. 49, Figure 110
1987	*Ptychoceras laeve* MATHERON — IMMEL, p. 127, Pl. 4, Figures 5, 6
1989	*Ptychoceras minimus* ROUCHADZÉ — DOGUZHAEVA & MUTVEI, p. 94, Pls. 3, 4
1989	*Ptychoceras laeve laeve* MATHERON — FÖLLMI p. 120, Pl. 3, Figure 17
1992	*Ptychoceras minimus* ROUCHADZÉ — WIEDMANN & KAKABADZE, p. 396, Text-Figure 3

Material. Almost 50 fragments of internal moulds from all localities.

Description. Small, 1–2 centimetres long fragments of ptychocon forms. Whorl section is more or less circular (Text-Figure 41). Shafts are adpressed, usually smooth, but on some specimens there is a corrugation just before the hook. Hook is rounded or slightly conical. Older shaft always adpressed with the younger ones at any stage of growth, which is a generic character. Suture cannot be observed.

Discussion. P. laeve could be easily confused with *P. adpressum* (J. SOWERBY, 1814), which is a bit smaller (MONKS 1999). Ontogenetic evolution of the genus was carefully studied by WIEDMANN & KAKABADZE (1992). PERVINQUIÉRE (1907) mentioned that in MATHERON's (1842) first description the shafts are absolutely smooth, while his own specimens have rugae before the knees, which characterize a new subspecies. The roundness of the knee is changing according to the stratigraphic position, (MONKS, pers. comm.), the youngest forms (from about the Early Albian) have the more conical shape in contrast to the rounded-kneed older forms. The genus *Ptychoceras* can be easily separated from the Barremian genus *Euptychoceras* by the continuously adpressed shafts.

Text-Figure 41. Shaft section of *Ptychoceras laeve* MATHERON, 1842

The systematic position of the genus is quite uncertain. Some authors put genus *Ptychoceras* into the Turrilitaceae superfamily (ARKELL 1957; WIEDMANN & DIENI 1968), while others put the genus into the Ancyloceratacеae superfamily (WRIGHT et al. 1996). In a short communication BREISTROFFER (1951b) cleared up the relation with the family Hamitidae. The most recent paper on the topic is from MONKS (1999). After a detailed cladistic analysis pointed out that Ptychoceratidae should be place into Turrilitaceae superfamily together with the Hamitidae, Anisoceratidae, Baculitidae and Turrilitidae families. Within the Ptychoceratidae, MONKS splitted the Ptychoceratinae and the Worthoceratinae subfamilies.

Occurrence. In Hungary the species is known from the condensed Upper Aptian basal pockets of Tata Limestone Formation. From the Upper Aptian the species is known from France, Spain, North Africa and Georgia. It is also known from the Lower Albian of Escragnolles.

Family Anisoceratidae HYATT, 1900
Genus *Protanisoceras* SPATH, 1923
Type species: *Hamites raulinianus* D'ORBIGNY, 1842

Protanisoceras acteon (D'ORBIGNY, 1850)

Pl. IV, Figures 7, 8, Pl. V, Figure 5

*1850	*Hamites acteon* D'ORBIGNY, p. 126
1908	*Hamites* nov. sp. cf. *virgulatus* PICTET — JACOB, p. 315
non1940	*Hamites acteon* D'ORBIGNY — BREISTROFFER, p. 134
1953	*Protanisoceras blanchet* PICTET & CAMPICHE — BREISTROFFER & VILLOUTREYS, p. 70
1961b	*Protanisoceras (Protanisoceras) acteon* D'ORBIGNY — CASEY, p. 109, Pl. 24, Figure 1–4; Text-Figure 36d
1977	*Protanisoceras acteon* D'ORBIGNY — PHILLIPS, p. 152
1989	*Protanisoceras acteon* D'ORBIGNY — FÖLLMI, p. 126, Pl. 5, Figure 1

Material. Two fragments from Eperkés Hill.

Description. Medium-sized fragment of a shaft and a hooked shaft. Whorl section is oval and dorso-ventrally compressed. Ribs are broad and rounded, wearing ventral tubercles that weaken near the aperture. Ribs are slightly rectiradiate and effaced dorsally.

Discussion. A pair of tubercles on the ribs at both side of the sulca is a generic character which is well visible on the specimen.

Occurrence. From Hungary the species is known from the condensed Upper Aptian basal pockets of the Tata Limestone Formation. The species is known from the Upper Aptian — Middle Albian sequences of Western Europe, Madagascar, Peru and India.

Genus *Ephamulina* COLLIGNON, 1963
Type species: *Anisoceras trituberculatum* COLLIGNON, 1949

Ephamulina arcuata (COLLIGNON, 1962)

Pl. V, Figures 1, 2

*1962	*Pictetia arcuata* COLLIGNON, Pl. 221, Figure 958
1963	*Ephamulina arcuata* COLLIGNON — COLLIGNON, Pl. 252, Figure 1083
2000	*Ephamulina* cf. *arcuata* COLLIGNON — KENNEDY et al., p. 684, Figure 50e, j, k
2002	*Ephamulina* cf. *arcuata* COLLIGNON — SZIVES & MONKS, p. 1142, Text-Figure 5e, f

Material. Six huge, heavily eroded fragments of internal moulds and some smaller ones from Kékkő Quarry locality.

Description. Criocone, huge, fragmented internal moulds with circular whorl section. Huge specimens lack ornamentation. Suture is florid, with wide, bifid lobes and saddles.

Discussion. Despite the bad state of preservation, on the basis of the specific morphology and the suture, the fragment can be identified quite well. Small specimens are trituberculated and resemble to *Ephamulina trituberculata* (COLLIGNON 1949), but due to the lack of a complete specimen we cannot decide if trituberculation characterizes just an early ontogenetic stage or marks a distinct species.

Occurrence. In Hungary, all specimens are from the condensed Upper Aptian basal pockets of Tata Limestone Formation from Kékkő Quarry locality. Otherwise, the genus is known from the Upper Aptian – Middle Albian deposits of Madagascar, France and Georgia.

Family Hamitidae GILL, 1871
Genus *Hamites* PARKINSON, 1811
Type species: *Hamites attenuatus* J. SOWERBY, 1814

Hamites praegibbosus SPATH, 1941
Pl. IV, Figure 9

1939 *Hamites* sp. nov. SPATH, p. 563
*1941 *Hamites praegibbosus* SPATH, p. 627, Pl. 70, Figures 13–15; Text-Figure 227a–f
1947 *Hamites praegibbosus* SPATH — BREISTROFFER, p. 24, 40
1949 *Hamites praegibbosus* SPATH — COLLIGNON, p. 124
1951 *Hamites praegibbosus* SPATH — CASEY, p. 97
1961 *Hamites praegibbosus* SPATH — CASEY, p. 94, Pl. 22, Figures 4 (a, b), 5 (a–c), Text-Figure 33 (a, b)
1961 *Hamites dixoni* CASEY, p. 97, Pl. 22, figs 6 (a–c), Text-Figure 33c
1960 *Hamites praegibbosus* SPATH — OWEN, p. 369
1975 *Hamites* div. sp. — FÜLÖP, p. 104, Pl. 49, Figures 9, 11
1977 *Hamites praegibbosus* SPATH — PHILLIPS, p. 82
2002 *Hamites praegibbosus* SPATH — SZIVES & MONKS, p. 1143, Text-Figures 4b, c; 5c, d

Material. Four, slightly flattened internal moulds from Eperkés Hill and Márvány Quarry localities.

Description. Ancylocone forms with oval whorl section. Dorsal part smooth, weak ribs tending to appear and getting stronger towards the venter. Ribs sharp and narrow, equal in width to the interspaces.

Discussion. The tight body chamber and sharp, equally spaced ribs characterize the species.

Occurrence. According to WRIGHT et al. (1996), the genus appeared in the lower part of the *Douvilleiceras mammillatum* Superzone, and shows the same stratigraphic range in India, Madagascar, England and France. In the Vocontian Basin the species occurs on the top of the *Leymeriella (L.) tardefurcata* Zone (KENNEDY, pers. comm) already. From Hungary, all specimens are from the condensed Upper Aptian basal pockets of Tata Limestone Formation from Eperkés Hill and Márvány Quarry localities.

Hamites csaszari SZIVES & MONKS, 2002

*2002 *Hamites csaszari* SZIVES & MONKS, p.1145, Text-Figure 6b, c

Material. A unique specimen numbered as Kv77 from Kálvária Hill locality.

Description. A small fragment with laterally compressed whorl section. Weak, blunt, straight or slightly prorsiradiate ribs start at midflank, widening on the venter. Rib index is 4. Dorsal region is smooth.

Discussion. Although the fragment is very tiny, it is different from any other Hamites species and has such a distinctive ornamentation with the weak, very wide and blunt ribs.

Occurrence. Species known only from the Upper Aptian condensed basal pockets of Tata Limestone Formation at Kálvária Hill locality.

Hamites fueloepi SZIVES & MONKS, 2002
Pl. IV, Figures 11, 12

1975 *Hamites* sp. — FÜLÖP, Pl. 49, Figure 9
*2002 *Hamites fueloepi* SZIVES & MONKS, p. 114, Text-Figures 6f, g, h, i

Material. Two fragments of internal moulds from Kékkő Quarry locality.

Description. Two fragments of an ancylocone specimen with circular whorl section. Ribs blunt, rursiradiate on the descending shaft, rib index around 7, decreasing near the aperture. Ribs are qually distanced as the interspaces between them. Suture is partly visible on the holotype with small internal lobe and trifid, small umbilical lobe.

Discussion. Specimens of the new taxon suggest this form was more tightly folded and larger than other *Hamites* taxa, though resembles to Middle Albian *Hamites gibbosus* J. SOWERBY, 1812, it is better to separate the two forms due to the different stratigraphic range.

Occurrence. The species is known only from the Upper Aptian condensed basal pockets of Tata Limestone Formation at Kékkő Quarry locality.

Hamites kalvariensis Szives & Monks, 2002
Pl. V, Figures 3, 4, 6

*2002 *Hamites kalvariensis* Szives & Monks, p.1145, Text-Figures d, e

Material. Two specimens from Kálvária Hill locality.

Description. Ancylocone form with subcircular whorl section. Ribs dense, straight, rectiradiate, very sharp and effaced on the dorsal surface. Rib index around 10.

Discussion. The form resembles to the Middle Albian *Hamites tenuicostatus* Spath, 1941, but the new species has sharper and much straight ribs.

Occurrence. In Hungary it is from the condensed Upper Aptian basal pockets of Tata Limestone Formation.

Superfamily Douvilleiceratacеae Parona & Bonarelli, 1897
Family Douvilleiceratidae Parona & Bonarelli, 1897
Subfamily Cheloniceratinae Spath, 1923
Genus *Procheloniceras* Spath, 1923
Type species: *Ammonites stobieckii* d'Orbigny, 1850

Procheloniceras albrechti austriae (Uhlig, 1883)
Pl. V, Figure 7, Pl. VI, Figure 1

*1883 *Acanthoceras Albrechti Austriae* Uhlig, p. 129, Pl. 22; Pl. 20, Figure 13; Pl. 23, Figure 1
1960 *Procheloniceras albrechti-austriae* (Uhlig — Druschich & Kudryavtsev, p. 335, Pl. 16, Figure 1

Material. Two specimens from Kálvária Hill locality.

Description. Big, slightly flattened forms with wide umbilicus. Ribs are strong, heavily rectiradiate, on the dorsal side wearing two or three light tubercles or bullae. Intercalated ribs present. Ventral region and the suture cannot be observed due to the compression.

Discussion. Despite the poor preservation, the specimens are well identified according to the wide umbilicus and the rectiradiate, tubercled ribs.

Occurrence. From Hungary the species is from the condensed Upper Aptian basal pockets of the Tata Limestone Formation at Kékkő Quarry locality, otherwise it is known from the Lower Aptian deposits of the "Mediterranean" region and Mangyshlak.

Genus *Cheloniceras* Hyatt, 1903
Type species: *Ammonites Cornuelianus* d'Orbigny, 1840

The genus *Cheloniceras*, from stratigraphical and evolutionary point of view, is one of the most important taxa in the Early Aptian. It contains more than 70 species which number is too much for correct and useful taxonomic and stratigraphic interpretation. Generic characters and the description of the different ontogenetic stages of the type species are fully discussed by Casey (1961b, p. 194–198). Accordig to the lack, presence or the size of ventral tubercles, the genus divided into three subgenera (Wright et al. 1996):

— *Cheloniceras* Hyatt, 1903 — lack of ventral tubercles.

— *Epicheloniceras* Casey, 1954 — presence of "normal" sized ventral tubercles.

— *Paracheloniceras* Collignon, 1962 — presence of big, ear-shaped ventral tubercles.

Lots of the systematic descriptions of *Cheloniceras* species are from the early 20th century and, even the later ones, completely lack the idea of intraspecific variation which became common when later documented among the ammonites (Kennedy & Cobban 1976). Further investigation needed for making clear the problem of sexual dimorphism, intraspecific variation and a possible merge of present *Cheloniceras* species.

Subgenus *Cheloniceras* Hyatt, 1903
Type species: *Ammonites Cornuelianus* d'Orbigny, 1840

Cheloniceras (Cheloniceras) cornuelianum (d'Orbigny, 1840)
Pl. VI, Figures 2, 3, 7, 8, 9, 12

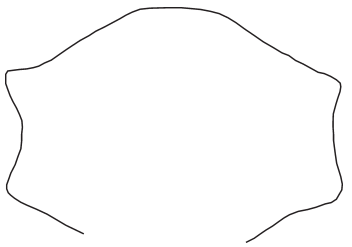
*1841 *Ammonites Cornuelianus* d'Orbigny, p. 364, Pl. 112, Figure 1, 2
1955 *Cheloniceras cornueli* d'Orbigny — Eristavi, p. 145
1955 *Cheloniceras cornueli* d'Orbigny var. pygmea Nikschitsch — Eristavi, p. 145
1960 *Cheloniceras cornuelianum* d'Orbigny — Druschich & Kudryavtsev, p. 336, Pl. 18, Figures 1a–c, 2a–c, 3

1960 *Cheloniceras cornueli pygmaea* NIKSCHITSCH — DRUSCHICH & KUDRYAVTSEV, p. 337, Pl. 18, Figures 4a, b
non 1960 *Cheloniceras cornuelianum sinzowi* LUPPOV — DRUSCHICH & KUDRYAVTSEV, p. 338, Pl. 18, Figures 5a, b
1961b *Cheloniceras (Ch.) cornuelianum* D'ORBIGNY — CASEY, p. 509, 510, 520, 522, 548, 571, 609
1965 *Cheloniceras (Ch.) cornuelianum* D'ORBIGNY — CASEY, p. 198, Pl. 33, Figures 7a, b; Pl. 34, Figures 1a, b; 9a, b; Pl. 35, Figures 1a, b, 2, 3; Text-Figures 60a–c, 61, 62, 67e–f
1967 *Cheloniceras (Ch.) cornuellianum* D'ORBIGNY — DIMITROVA, p. 170, Pl. 82, Figure 3
1977 *Cheloniceras cornuelianum* D'ORBIGNY — KOTETISHVILI, p. 98, Pl. 19, Figure 3a–c
1994 *Cheloniceras* cf. *cornuelianum* D'ORBIGNY — VASICEK et al., p. 68, Pl. 21, Figure 5

Material. More than a hundred internal moulds and fragments at various state of preservation from all surface localities.
Measurement.

	D	H	W	U	W/H
Fazekas street					
1.	23	8(35)	10(44)	9(39)	1.25
2.	19	9(47)	10(53)	8(42)	1.11
3.	21	9(43)	10(48)	8(38)	1.11
4.	21	9(43)	10(48)	8(38)	1.11
5.	17	6(35)	8(47)	6(35)	1.33

Description. Small and medium-sized, moderately evolutee forms with coronate-polygonal, compressed whorl section (Text-Figure 42). Ribs start from the umbilical edge then wear a bulla at the lateral side. Bullate ribs wear tubercle on the midflank. Primary ribs split after the tubercle and together with the secondaries cross the well rounded venter straight.



Text-Figure 42. Whorl section of *Cheloniceras (Ch.) cornuelianum* (D'ORBIGNY, 1840). M: 3×

Discussion. Almost a half century after the description the *Ammonites Cornuelianus* and *Ammonites Martini* by D'ORBIGNY (1841), opinions about the two species were different about the separation of the two species. According to NEUMAYR & UHLIG (1881), the two species represent two different ontogenetic stages of the same form: "*martini*" is the juvenile; the "*cornuelianum*" is the adult one. ANTHULA (1899) also shared their opinion but discovered that the number of the secondary ribs is also changing: on the early whorls he found 1–4, later only one rib. Despite of them, KILIAN's (1913) view was to separate the two clear, distinct species. According to CASEY's (1961b) opinion, the two forms are different and he accepted the *martini* and the *cornuelianum* as two distinct species. Besides this, OWEN (1996a) pointed out that different stratigraphic position also makes difference between the two species. The only statement we can add, that Hungarian *cornuelianum* assemblage do not have tuberculated venter at any visible stage of growth. Considering the heavily condensed Hungarian material, none of the opinions can be endorsed.

Occurrence. The species was cosmopolitan between the Early to Late Aptian, and known from the Hungary from the Upper Aptian condensed basal pockets of Tata Limestone Formation from all surface localities.

Subgenus *Epicheloniceras* CASEY, 1954
Type species: *Douvilleiceras tschernyischewi* SINZOW, 1906

The stratigraphic position of subgenera *Cheloniceras–Epicheloniceras* was always a point of disagreement. CASEY (1961a) reported that "appearance of the Subgenus *Cheloniceras* (*Epicheloniceras*) forms a well definable lower limit to the Upper Aptian (Gargasian) in Europe...". OWEN (1996a) mentiones the opinion of DELAMETTE (1988), that *Epicheloniceras* persist from the *Cheloniceras (Epicheloniceras) buxtorfi* subzone of the *Cheloniceras (Epicheloniceras) martinioides* Zone (OWEN 1996a) together with the genus *Parahoplites*, then *Parahoplites* is replaced by its descendant *Eodouvilleiceras* in the *Hypacanthoplites jacobi* Zone (OWEN 1996a). *Parahoplites* species still known from the lower *Hypacanthoplites jacobi* Zone together with *Acanthohoplites*. The condensed Hungarian material is not eligible for stratigraphic investigations.

***Cheloniceras (Epicheloniceras)* sp.**

Pl. VI, Figures 10, 11

Material. Two fragments from Kálvária Hill locality.
Description. Two fragments of a ventral part of two internal moulds. Primary ribs start from a ventrolateral tubercle, then bifurcate and cross the venter straight.
Occurrence. In Hungary it is from the condensed Upper Aptian basal pockets of the Tata Limestone Formation.

Subgenus *Parachelonicera* COLLIGNON, 1962
Type species: *Epicheloniceras (Parachelonicera) wrighti*, COLLIGNON 1962

Cheloniceras (Parachelonicerasl) rerati COLLIGNON, 1965

Pl. V. Figures 8, 9, 10, 11, 12, Pl. XIII. Figure 11

1962 *Epicheloniceras (Parachelonicerasl) wrighti* COLLIGNON, p. 42, Figure 994
1965 *Cheloniceras (Parachelonicerasl) guenoti* COLLIGNON, p. 49, Pl. 1, Figures 1, 2
*1965 *Cheloniceras (Parachelonicerasl) rerati* COLLIGNON, p .49, Pl. 1, Figures 3, 4
2000 *Parachelonicerasl rerati* COLLIGNON — KENNEDY et al., p. 690, Figures 58d–g, j–m

Material. 32 poorly preserved specimens from the Vájáriskola, Kálvária Hill and Kékkő Quarry localities.

Description. Strongly flattened, discoidal specimens with moderate evolution. Ribs start at the umbilical edge with strong bullae which flatten and widen across the lateral region. At the ventral edge ribs end in ear-shaped bullae forming a sulcus at the ventral region. Some specimen has tubercles at the outer part of the lateral region as well.

Discussion. COLLIGNON separated three species (*wrighti* 1962; *rerati* 1965 and *guenoti* 1965) from Madagascar. KENNEDY (2000), as the first revising author, merged *rerati* and *guenoti* species with chosen the name of *rerati*, and described it from France.

Occurrence. The species is known from the Upper Aptian of Madagascar, the *Hypacanthoplites jacobi* Zone of South France. From Hungary, the species is documented from the Upper Aptian condensed basal pockets of the Tata Limestone Formation at Kálvária Hill and Kékkő Quarry localities.

Genus *Diadochoceras* HYATT, 1900
Type species: *Ammonites Nodosocostatus* D'ORBIGNY, 1841

Diadochoceras nodosocostatum (D'ORBIGNY, 1841)

Pl. VI, Figures 4, 5, 6; Pl. VII, Figures 1, 2, 3, 6

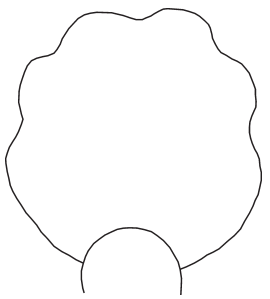
*1841 *Ammonites Nodosocostatus* D'ORBIGNY, p. 258, Pl. 75, Figure 1–4
1955 *Cheloniceras* cf. *nodosocostatum* D'ORBIGNY — ERISTAVI, p. 150
1962 *Diadochoceras nodosocostatum* D'ORBIGNY — COLLIGNON, p. 43, Figure 996
1965 *Diadochoceras nodosocostatum* D'ORBIGNY — EGOIAN, p. 137, Pl. 9, Figure 6, 7; Pl. 10, Figures 1, 2
1963 *Diadochoceras nodosocostatum* D'ORBIGNY — MIKHAILOVA, p. 68, Pl. 7, Figures 3–4
1975 *Diadochoceras nodosocostatum* (D'ORBIGNY) — FÜLÖP, p. 104, Pl. 50, Figure 18
1982 *Diadochoceras* aff. *nodosocostatum* D'ORBIGNY — RENZ, p. 27, Pl. 2, Figures 7a, b; 8a, b; 9a, b; Text-Figure 16a.

Material. More than two hundred specimens from all localities in variable state of preservation.

Measurement.	D	H	W	U	W/H
Fazekas street					
1.	23	9(39)	9(39)	8(35)	1.00
2.	22	8(36)	8(36)	8(36)	1.00
3.	28	10(36)	11(39)	11(39)	1.10
4.	22	9(41)	9(41)	8(36)	1.00
5.	20	9(45)	8(40)	7(35)	0.88
6.	25	8(32)	8(32)	10(40)	1.00
Kálvária Hill					
8.	22	9(41)	10(45)	8(36)	1.11
9.	20	8(40)	8(40)	7(35)	1.00

Description. Small, evolute forms with deep umbilicus. Whorl section is very characteristic, coronate-polygonal (Text-Figure 43), with rounded outline. Primary ribs running straigt from the umbilicus through the venter, having two lateral and a ventral tubercles. In between the tubercled primaries there are two or three untubercled intermediate ribs, they start from the mid-lateral region. Venter rounded. Suture cannot be observed.

Discussion. The genus *Diadochoceras* can be easily separated from *Cheloniceras* on the basis of the round whorl section and the two lateral tubercles. MIKHAILOVA (1963) pointed out that the ontogenetical suture differentiation of *Diadochoceras* resembles most to the *Acanthohoplites* and *Hypacanthoplites*, therefore the genus *Diadochoceras* is adviced to be placed into the family Parahoplitidae (SCHINDEWOLF 1966; BOGDANOVA, MIKHAILOVA 2004) in contrast to the opinion of WRIGHT et al. (1996), who put *Diadochoceras* not even into a different family (Douvilleiceratidae) but into a different superfamily (Douvilleiceratacеae). Here I follow the classification of WRIGHT et al. (1996). The extreme richness of *Diadochoceras* in the Hungarian material is very unusual. MIKHAILOVA (1963) reported five species from Mangyshlak, the only area apart from Hungary, where *Diadochoceras* also very abundant.



Text-Figure 43. Whorl section of *Diadochoceras nodosocostatum* (D'ORBIGNY, 1841). M: 3×

Occurrence. The genus was cosmopolitan in the Upper Aptian and can be used as an index fossil for the lower part of it. In Hungary it is found in the Upper Aptian condensed basal pockets of Tata Limestone Formation.

Diadochoceras margariti MIKHAILOVA, 1963

Pl. VI, Figures 13, 15, 16, 19

*1963 *Diadochoceras margariti* MIKHAILOVA, p. 73, Tab. 7, Figure 8a, b
Pars 1965 *Nodosohoplites subplanatus* EGOIAN — p. 145, Tab. XI, Figures 7, 8 only

Material. Sixteen fragmented internal moulds from Kálvária Hill and Fazekas street localities.

Description. Whorl section is higher than that of the *nodosocostatum*. The ornamentation of the phragmocone is the same as for *nodosocostatum*, apart from the last whorl and the body chamber of an adult specimen. On the last whorl of the *margariti*, tubercles weaken until they disappear, the interspace between the ribs getting wider and the ribs themselves getting sharp, thinner and sinuous. Intercalated ribs are present at any visible stage of growth.

Discussion. The author believes — on the basis of the size and the ornamentational resemblance — that sexual dimorphism is present in the genus *Diadochoceras*, *nodosocostatum* (D'ORBIGNY, 1841) – *margariti* MIKHAILOVA (1963) are micro- and macroconch pairs, and *hokodzense* MIKHAILOVA (1963) is also a macroconch. *D. crebicostatum* MIKHAILOVA (1963) is look like a *Nolaniceras nolani* (SEUNES, 1887).

Occurrence. In Hungary it is from the condensed Upper Aptian basal pockets of Tata Limestone Formation, otherwise known from the Upper Aptian *Nolaniceras nolani* Zone deposits of North Caucasus.

Diadochoceras hokodzense MIKHAILOVA, 1963

Pl. VII, Figures 4, 5

*1963 *Diadochoceras hokodzense* MIKHAILOVA, p. 69, tab. 7, Figure 5–7
Pars 1965 *Diadochoceras mutabilis* EGOIAN — p. 144, Tab. X, Figures 4, 5, 6, 7, 8

Material. Eleven fragments of internal moulds from Kálvária Hill and Fazekas street localities.

Description. Evolute, small to medium sized forms with coronate-polygonal whorl section. Primary ribs are mostly untubercled and start from an umbilical bulla. Ribs are strong and straight; tend to be prorsiradiate on the venter. On the last whorl, the interspace between two ribs is getting wider, ribs tend to be stronger, intermediate ribs appear.

Discussion. Differs from *D. margariti* MIKHAILOVA (1963) with the stronger and straighter ribbing, lack of tubercles and presence of umbilical bullae.

Occurrence. The species was described from the Upper Aptian *Nolaniceras nolani* Zone of North Caucasus. In Hungary it is from the condensed Upper Aptian basal pockets of Tata Limestone Formation.

Diadochoceras spinosum MIKHAILOVA, 1963

Pl. VI, Figures 14, 17, 18, 20; Pl. VII, Figure 7

*1963 *Diadochoceras spinosum* MIKHAILOVA, p. 69, Tab. 7, Figure 5–7
Pars 1965 *Nodosohoplites subplanatus* EGOIAN, p. 145, Tab. 11, Figure 9 (only)
Non 1975 *Diadochoceras nodosocostatum* (D'ORBIGNY) — FÜLÖP, Pl. 50, Figure 18

Material. 30 fragments and complete internal moulds from Kálvária Hill and Fazekas street localities.

Description. Evolute, highly ornamented forms with coronate-polygonal whorl section. The primary ribs are straight or slightly prorsiradiate on the venter and almost disappear under the heavy tubercles. Each rib has two laterals and one ventral tubercle. Between two tuberculated ribs there is only one intermediate rib, usually starting also from the umbilical edge. Intermediates are sharp, thin and never wear tubercles nor bullae.

Discussion. D. spinosum differs from other *Diadochoceras* species in the stronger tuberculation, the disappearance of the tuberculated ribs and the presence of a single, narrow intermediate rib between two tuberculated one. Besides small fragments, some quite big internal moulds also found compared to the average size of the genus. This is opposite to EGOIAN's (1965) opinion, who reported the strong tuberculation as connected to a certain ontogenetic stage. According to the extremely rich Hungarian material we have to disclaim his opinion.

Occurrence. The species is knows the Clansayesian deposits of Georgia and Mangyshlak. In Hungary it is from the condensed Upper Aptian basal pockets of Tata Limestone Formation.

Subfamily Douvilleiceratinae PARONA & BONARELLI, 1897
Genus *Eodouvilleiceras* CASEY, 1961b
Type species: *Douvilleiceras horridum* RIEDEL, 1938

Eodouvilleiceras sp.
Pl. VIII, Figure 1

Material. A heavily eroded single internal mould from Kékkő Quarry.

Description. Massive, huge fragment with wide umbilicus and compressed-polygonal whorl section. Outer whorls are heavily eroded, but the presence of multituberculated ribs is visible.

Discussion. Due to the bad state of preservation specific characters are not visible.

Occurrence. In Hungary the species is known from the condensed Upper Aptian basal pockets of the Tata Limestone Formation from Kékkő Quarry locality.

Eodouvilleiceras clansayense (JACOB, 1905)
Pl. VII, Figures 8, 9, 10, 11

*1905 *Douvilleiceras clansayense* JACOB, p. 413, Pl. 13, Figure 4
1965 *Epicheloniceras clansayense* (JACOB) — EGOIAN, p. 156, Tab. 13, Figure 6; Tab. 14, Figures 1–3
1971 *Epicheloniceras clansayense* (JACOB) — KVANTALIANI, p. 108, Pl. 16, Figure 3
1975 *Epicheloniceras apanashevi* EGOIAN — FÜLÖP, p. 104

Material. 17 fragments of internal moulds from all Tata localities.

Description. Evolute, large fragments with compressed, hexagonal whorl section. Strong primary ribs are multituberculated. Slight, untuberculated intermediate ribs appear. Ribs wear divided tubercles on both sides of the ventral sulcus, while lateral tubercles lack bifurcation. Secondary ribs disappear later during the ontogeny.

Discussion. Fragments are well identifiable on the basis of the compressed hexagonal whorl section, presence of multituberculate ribs and the heavy sculpture.

Occurrence. In Hungary, the species is known from the condensed Upper Aptian basal pockets of Tata Limestone Formation. The species is described from the Clansayesian of Southern France. The genus was desribed from Colombia (RIEDEL 1938), also known from Turkmenia, Georgia, Japan and California.

Genus *Douvilleiceras* GROSSUVRE, 1894
Type species: *Ammonites Mammillatus* SCHLOTHEIM, 1813

?Douvilleiceras sp.
Pl. VIII, Figure 2

Material. A plaster cast of an imprinted fragment from Kálvária Hill locality.

Description. The plaster cast shows the ventral region of a large form with wide venter and characteristically wide ventral sulcus. On both side of the ventral sulcus mammillated tubercles appear.

Discussion. Douvilleiceras is one of the most easily identifiable ammonoid genera in the Cretaceous. Due to the presence of the unique mammillate tubercles, a tiny fragment is enough for the identification of the genus. Hitherto, the question marked generic identification seems to be unlikely if considering the Late Aptian age. First certain representatives of the genus are known from Southern England, from the *Leymeriella (L.) tardefurcata* Zone of the Early Albian (CASEY 1962). *Douvilleiceras* specimens reported from older deposits as well (PICTET & RENEVIER 1854, JACOB 1905), but these records are revised (BREISTROFFER 1947, CASEY 1962) or due to the lack of an adequate description meant to be unidentifidable (ANDERSON 1938).

Occurrence. Considering the palaeogeographical distribution, the genus was cosmopolitan and from stratigraphical point of view known from the Lower Albian deposits of Venezuela, Colombia, USA, Europe, Russia, Caucasia, Madagascar and India. In Hungary it is from the condensed Upper Aptian basal pockets of Tata Limestone Formation at Kálvária Hill.

Superfamily Deshayesitaceae STOYANOW, 1949
Family Deshayesitidae STOYANOW, 1949
Subfamily Deshayesitinae STOYANOW, 1949
Genus *Dufrenoyia* KILIAN & REBOUL, 1915
Type species: *Ammonites Furcatus* J. de C. SOWERBY in FITTON, 1836

Dufrenoyia katalinae sp. nov.
Pl. IV., Figure 1

1975 *?Dufrenoyia* sp. — FÜLÖP, p. 104, Pl. 50, Figure 16
1999b cf. *Leymeriella recticostata* SAVELIEV, 1973 — SZIVES, p. 404, Pl. II, Figure 7
2002 *?Leymeriella (Leymeriella) recticostata* SAVELIEV, 1973 — SZIVES, p. 84, Pl. II, Figure 33

Material. A single quarter whorl of a big specimen from the Fazekas street locality, Tata.

Derivation of name. The species is named atfer my mother.

Location. The holotype is housed in the Palaeontological Department of the Hungarian Natural History Museum, repository number is 2007.103.1.

Dimensions.

	D	H	W	W/H	U
2007.103.1.	–	22	17	0.77	18

Description. Compressed fragment with high whorl section. Very strong, straight, flat topped ribs start at the umbilical shoulder and broaden continuously towards the ventral edge. No intercalated ribs occur between the primaries, only the deep interspaces. Ribs end in peaks which overhang the ventral edge. During the ontogeny, ribs tend to be tuberculated on the lower and outer lateral region, and the ventral nodes getting more prominent and high. Ribs are in pairs at the two sides of the ventral sulcus, do not alternate.

Discussion. There are some morphological similarities between the present form and the first description of *Dufrenoyia lurensis* KILIAN (1913). But most *Dufrenoyia* species are small sized, in many cases intercalated ribs are present and ribs alternating, zigzagging on the two sides of the venter. BARABOSHKIN (pers. comm., 2007) pointed out that *Dufrenoyia* specimens from the Russian Platform are bigger and much coarsely ornamented than the European ones.

There is also a significant morphologic similarity between the present form and *Leymeriella (Leymeriella) recticostata* SAVELIEV (1973). *Dufrenoyia lurensis* KILIAN (1913) is known from the Gargasian, while *Leymeriella (L.) recticostata* SAVELIEV is reported from the mid Early Albian of Mangyshlak and represent the second morphological trend of the genus *Leymeriella* which is marked with the appearance of the ventral nodes. This in contrast to the opinion of CASEY (1957), who noted nodded forms as an ancestral form of *Leymeriella*. His opinion is that the appearance of the ventral node of the ribs is an evolutionary tendency of the genus which is in contradiction with his conclusion. According to Saveliev's stratigraphical interpretation of *L. (L.) recticostata*, it is very unlikely that a well developed neoleymerielliid form appears in Aptian deposits. The first occurrence of a primitive form of genus *Leymeriella* in the Hungarian Early Albian deposits is reported from the overlying siltstone deposits, but only from boreholes. It is also less likely, that after the appearance of a well developed, neoleymeriellid form, a more primitive lineage occure in younger deposit.

The fragment is considered to be a homeomorph of *L. (L.) recticostata* and on the basis of its startigraphic range and referred into a new species of *Dufrenoyia*. This new species represent a late morphological stage of the genus — which is mostly known from Early Aptian deposits — and characterized by the size development and the evolvation of coarse ribbing together with the reduction of secondary and intercalated ribs.

Occurrence. From Hungary, the specimen was found from the condensed Middle Aptian – Upper Aptian basal pockets of Tata Limestone Formation at Fazekas street locality. Otherwise the genus is known from the Early Aptian deposits of Europe, and Middle to Late Aptian deposits of texas, Mexico, Colombia, Venezuela and Japan.

Subfamily Mathoceratinae CASEY, 1964

Genus *Mathoceras* CASEY, 1964

Type species: *Hoplites (Kilianella?) matho* PERVINQUIERE, 1907

Mathoceras sumerensis (STOYKOVA, 1990)

Pl. VIII, Figure 3

*1990 *Venezuella sumerensis* STOYKOVA, p. 26, Pl. 1., Figure 6; Pl. 2., Figure 4

2007 *Mathoceras sumerensis* STOYKOVA, 1990 — BARRAGÁN & SZIVES, p. 27, Figure 4 (6)

Material. A unique, slightly deformed specimen from Vájáriskola, repository number K15033. (Locality was misgiven in BARRAGÁN & SZIVES (2007), corrected here.)

Description. Moderately evolute, medium sized, circular specimen with high whorl section. Strong, slightly prorsiradiate ribs start from the umbilical edge, form bullae on the inner flank and strong tubercles appear on outer flank. Ribs do not cross the venter until the diameter reaches 45–50 mm. When ribs cross the venter, they form strong clavi on the ventrolateral edge. After 50 mm diameter, the ornamentation became less prominent. No secondary ribs visible.

Discussion. Mathoceras can be well identifiable with the three rows of tubercles. The suture is less florid than that of *Dufrenoyia* (CASEY 1964) which it can be mixed with. The specimens resemble *M. venezolanum* RENZ, apart from the presence of secondaries.

Occurrence. The genus is reported from the Upper Aptian deposits of Venezuela, Tunisia, the Baleares and Bulgaria. In Mexico, *Mathoceras*-bearing sections are from the Middle Aptian *Cheloniceras* spp. Zone (BARRAGÁN-MANZO 2000; BARRAGÁN-MANZO & MÉNDEZ-FRANCO 2005) which probably can be correlated with the *Cheloniceras (Epicheloniceras) subnodosocostatum* of the Mediterranean standard (BARRAGÁN & SZIVES, 2007). In Hungary the species is came from the condensed Upper Aptian basal pockets of Tata Limestone Formation at Vájáriskola locality.

?Family Parahoplitidae SPATH, 1922a
Subfamily Acanthohoplitinae STOYANOW, 1949
Genus *Colombiceras* SPATH, 1923
Type species: *Parahoplites Tobleri* JACOB in JACOB & TOBLER, 1906

Colombiceras tobleri (JACOB in JACOB & TOBLER, 1906)

Pl. IX., Figures 1, 4

*1906	*Parahoplites tobleri* JACOB in JACOB & TOBLER 1906, Pl. 2, Figure 4
1907	*Acanthohoplites tobleri* (JACOB) — SINZOW, p. 486, Pl. 5, Figures 14, 15
1913	*Acanthohoplites tobleri* JACOB — SINZOW, p. 113, Pl. 6, Figure 2
1938	*Colombiceras* aff. *tobleri* JACOB — RIEDEL, p. 51, Pl. 8, Figures 23, 24
1953	*Colombiceras tobleri* JACOB — GLAZUNOVA, p. 47, Pl. 9, Figures 1–4
1960	*Colombiceras tobleri* JACOB — DRUSCHICH & KUDRYAVTSEV, p. 328, Pl. 14, Figures 1, 2
1968	*Colombiceras tobleri* JACOB — WIEDMANN & DIENI, p. 92, Pl. 9, Figure 14

Material. Two fragments of internal moulds from Fazekas street and Kálvária Hill localities.

Description. Fragments characterized by circular whorl section and rounded venter, evolution of the conch cannot be observed. Ribs are strong, wide and getting flat-topped on the venter. Intercalated ribs appear between primaries. Suture cannot be visible.

Remarks. The species is well characterized by the flat-topped, wide, coarse ribs and the circular whorl section.

Occurrence. The species was cosmopolitan in the Middle to Late Aptian times. In Hungary it was collected from the condensed Upper Aptian basal pockets of Tata Limestone Formation at Fazekas street and Kálvária Hill localities.

?Genus *Protacanthoplites* TOVBINA, 1970
Type species: *Parahoplites abichi* ANTHULA, 1899

According to the opinion of WRIGHT et al. (1996), genus *Protacanthoplites* TOVBINA, 1970 is sorted as a synonym of genus *Acanthohoplites* SINZOW, 1907. I use the name of ?*Protacanthoplites originalis* SHARIKADZE et al. (2004) temporary for the specimens figured and described here. On the basis of the Hungarian material, a description of a new genus is in process in a separate paper.

?Protacanthoplites originalis SHARIKADZE et al., 2004

Pl. VIII, Figures 4–15

*2004	*Protacanthoplites? originalis* SHARIKADZE et al., p. 393, Pl. 81., Figures 3–5
1999b	cf. *Neosilesites* n. sp. SZIVES, Pl. 1, Figure 3
2002	*?Callizoniceras* n. sp. SZIVES, p. 75, Pl. II, Figures 6–10, 13

Material. Totally 57 specimens and fragments of internal moulds from three Tata localities.

Measurement.

	D	H	W	U	W/H
1.	43	16(37)	16(37)	20(46)	1
2.	19	6(31)	6(32)	9(47)	1
3.	28	9(32)	10(36)	10(36)	1.1
4.	32	11(34)	10(31)	12(38)	0.9

Description. Small circular forms with rounded whorl section. There are 4–6 deep, sometimes collared constrictions running through from one side of the dorsal part to the other, straightly crossing the venter. Two-three straight, strong ribs appear at the umbilical edge between the constrictions. Suture cannot be observed.

Remarks. The identification is with question mark, because the generic characters as the presence of strong constrictions, the evolute and circular conch are not perfectly fit to any described genera.

Occurrence. The species known from the Middle Aptian of Colombia and from the condensed Upper Aptian deposits of Hungary, from Kálvária Hill, Fazekas street and Vájáriskola localities.

Genus *Acanthohoplites* SINZOW, 1907
Type species: *Parahoplites aschiltaensis* ANTHULA, 1899

Acanthohoplites spp.

Pl. IX, Figures 7, 19, Pl. X, Figure 2

Material. Several fragments from all surface localities.

Description. Fragments are characterized with circular whorl section. Ribs start from the umbilical edge and cross the

lateral side and the venter straight, without any sign of bifurcation. Intercalated ribs sometime occur. No tubercles or bullae. No suture is visible.

Discussion. Considering the ornamentation, some fragments resembles to *Colombiceras crassicostatum* (D'ORBIGNY 1842) but the whorl section is circular which is not corresponds.

Occurrence. The genus known worldwide from the Middle to Upper Aptian deposits. In Hungary it is described from the condensed Upper Aptian basal pockets of Tata Limestone Formation of all surface localities.

Acanthohoplites bigoureti (SEUNES, 1887)

Pl. IX, Figure 5; Pl. X, Figures 1, 7

*1887 *Acanthoceras Bigoureti* SEUNES, p. 566, Pl. 14, Figures 3, 4
1899 *Parahoplites Bigoureti* (SEUNES) — ANTHULA, p. 117, Pl. 13, Figures 2a–c
1907 *Douvilleiceras bigoureti* (SEUNES) — PERVINQUIÉRE, p. 195, Pl. 8, Figure 37
1938 *Acanthohoplites bigoureti* SEUNES — RIEDEL, p. 45, Pl. 8, Figure 7
1955 *Acanthoplites bigoreti* (SEUNES) — ERISTAVI, p. 101, Pl. 4, Figure 1
1960 *Acanthohoplites bigoureti* (SEUNES) — DRUSCHICH & KUDRYAVTSEV, p. 321, Pl. 8, Figures 1a, b; 2a, b.
1961 *Cheloniceras bigoureti* (SEUNES) — ERISTAVI, Tab. 4, Figure 1
non 1971 *Acanthohoplites bigoureti* (SEUNES) — KVANTALIANI, p. 42, Pl. 4, Figure 3
1975 *Acanthohoplites bigoureti* SEUNES — FÜLÖP, p. 104
1987 *Acanthohoplites* aff. *bigoureti* (SEUNES) — IMMEL, p. 123, Pl. 13, Figure 5
2006 *Acanthohoplites bigoureti* (SEUNES, 1887) — RAISOSSADAT, p. 921, Figure 5A, B

Material. Twelve fragments of internal moulds from Tata localities.

Description. Specimens are fragmented show characteristically coarse ornamentation. Strong ribs start from the umbilical edge and sometimes form tubercles on the midflank. Intercalated ribs also appear. Constrictions also present, every three-four ribs are followed by one. No tubercles are visible. Suture cannot be observed.

Discussion. Rounded venter and gibbose flanks are generic characters against the flat-ventered and flattened *Hypacanthoplites*. The coarse ornamentation and the rounded venter make the species well identifiable.

Occurrence. The species is one of the significant Clansayesian ammonites of the Mediterranean region. In Hungary it is from the condensed Upper Aptian basal pockets of Tata Limestone Formation.

Acanthohoplites aschiltaensis (ANTHULA, 1899)

Pl. IX, Figures 12, 13, 14, 16, 17, 18, 20

*1899 *Parahoplites aschiltaensis* ANTHULA, p. 117, Pl. 10, Figures 2a, b, 3a,b, 4
1955 *Acanthohoplites aschiltaensis* (ANTHULA) — ERISTAVI, p. 97
1960 *Acanthohoplites aschiltaensis* (ANTHULA) — DRUSCHICH & KUDRYAVTSEV, p. 319, Pl. 7, Figures 2a, b, 3a, b
1967 *Acanthohoplites aschiltaensis* (ANTHULA) — DIMITROVA, p. 185, Pl. 89, Figure 4
1975 *Acanthohoplites aschiltaensis* (ANTHULA) — FÜLÖP, p. 104
1982 *Acanthohoplites aschiltaensis* (ANTHULA) — KEMPER, Pl. 3, Figures 3a, c
1987 *Acanthohoplites aschiltaensis* (ANTHULA) — AUTRAN & DELANOY, Pl. 1, Figure 4
2006 *Acanthohoplites aschiltaensis* (ANTHULA, 1899) — RAISOSSADAT, p. 921, Figure 5D

Material. 76 specimens from all surface localities.

Measurement.

	D	H	W	U	W/H
1.	–	8	7	7	0.87
2.	25	11(44)	10(40)	9(36)	0.90
3.	22	9(41)	9(41)	8(36)	1.00
4.	18	7(21)	6(33)	6(33)	0.86
5.	25	11(44)	9(36)	10(40)	0.81
6.	19	9(47)	7(36)	7(36)	0.77

Description. Small, discoidal evolute specimens. Whorl section compressed, venter well rounded. Ribs narrow, dense and slightly sinuous, RI = 40–44 on the last whorl. Primary ribs are sometimes branching from the umbilical bullae, otherwise intercalated ribs present. Sometimes tubercles may appear on the outer lateral part but not on the body chamber. Suture is not visible.

Discussion. Relationship is close with *A. bigoureti* (SEUNES, 1887) which has stronger and coarser ornamentation that makes difference, probably these species are the intraspecific variations of the same species but without examining the holotypes it is impossible to decide.

Occurrence. Known from the Clansayesian strata worldwide. In Hungary it is documented from the condensed Upper Aptian basal pockets of Tata Limestone Formation.

Acanthohoplites abichi (ANTHULA, 1899)

Pl. IX, Figures 2, 3, 6, 8, 15; Pl. X, Figure 5

*1899 *Parahoplites abichi* ANTHULA, p. 118, Pl. 9, Figure 2
1938 *Acanthohoplites* aff. *abichi* ANTHULA — RIEDEL, p. 46, Pl. 12, Figure 8
1955 *Acanthohoplites abichi* (ANTHULA) — ERISTAVI, p. 1, Pl. 4, Figure 5
1960 *Acanthohoplites abichi* (ANTHULA) — DRUSCHICH & KUDRYAVTSEV, p. 321, Text-Figure 110, Pl. 8, Figure 3
1961 *Cheloniceras abichi* (ANTHULA) — ERISTAVI, tab. 4, Figure 2
1967 *Acanthohplites abichi* (ANTHULA) — DIMITROVA, p. 187, Pl. 89, Figures 6, 6a
1968 *Acanthohoplites abichi* (ANTHULA) — WIEDMANN & DIENI, p. 88
1975 *Acanthohoplites abichi* (ANTHULA) — FÜLÖP, p. 104

Material. 29 specimens from all Tata localities in good state of preservation.
Measurement.

	D	H	W	U	W/H
1.	20	9(45)	8(40)	8(40)	0.88

Description. Specimens are small, slightly bubbled with wide umbilicus. Whorl height increases slowly, whorl section is circular. Ribs dense, narrow and appear on the umbilical edge, RI = 34 on the las whorl. Primary ribs wear tubercles on the outer side of the flank; branching, secondary rib starts from the tubercle. Intercalated ribs are without tubercle. Suture cannot be observed.

Discussion. The species is related to the group of *A. bigoureti* (SEUNES, 1887) but has lower flanks and less coarse ornamentation. *A. aschiltaensis* (ANTHULA, 1899) has similar fine ribbing but whorl section is oval, in contrary to the circular whorl section of *A. abichi*.

Occurrence. Characteristic ammonite of the Mediterranean Clansayesian. In Hungary it is known from the condensed Upper Aptian basal pockets of Tata Limestone Formation.

Acanthohoplites andranomenensis BESAIRE, 1936

Pl. IX, Figures 9, 10, 11

1947 *Acanthohoplites andranomenensis* BESAIRE — BREISTROFFER, p. 67
1962 *Acanthohoplites andranomenensis* BESAIRE — COLLIGNON, p. 51, Pl. 235, Figure 1017
1968 *Acanthohoplites andranomenensis* BESAIRE — WIEDMANN & DIENI, p. 86, Pl. 9, Figure 6, Text-Figure 61

Material. Three specimens from Kálvária Hill locality.

Description. Small, oval specimens with shallow and narrow umbilicus. Very fine ribs start at the umbilical edge and wear tubercles on the midflank. Ribs are branching after the tubercle, secondary ribs crossing the outer flank and the venter slightly rectiradiate. Intermediate ribs are also present. The venter is rounded. Between the primaries, 2–3 intercalated ribs appear, wearing no tubercles. Suture cannot be observed.

Discussion. The species is well identifiable on the basis of its fine, small sculpture — dense, fine ribbing and tuberculated primaries.

Occurrence. The species is known from the Clansayesian of the Mediterranean region. In Hungary it is from the condensed Upper Aptian basal pockets of Tata Limestone Formation.

Genus *Nolaniceras* CASEY, 1961a
Type species: *Hoplites nolani* SEUNES, 1887

Nolaniceras nolani (SEUNES, 1887)

Pl. X, Figures 4, 20, 21, Pl. XIII, Figure 8

*1887 *Hoplites Nolani* SEUNES, p. 564, Pl. 13, Figure 4
1905 *Parahoplites Nolani* (SEUNES) — JACOB, p. 408, Figure 3
1955 *Hypacanthoplites nolani* (SEUNES) — ERISTAVI, p. 104, Pl. 4, Figure 8
1961 *Acanthohoplites nolani* (SEUNES) — ERISTAVI, p. 56, Tab. 2, Figure 8
1960 *Acanthoplites nolani* (SEUNES) — DRUSCHICH & KUDRYAVTSEV, p. 326, Pl. 13, Figures 1–4
1968 *Acanthohoplites nolani* (SEUNES) — WIEDMANN & DIENI, p. 88, Pl. 9, Figures 10, 17
non 1975 *Acanthohoplites nolani* (SEUNES) — FÜLÖP, p. 104, Pl. 19
1982 *Acanthohoplites nolani* (SEUNES) — RENZ, p. 29, Pl. 2, Figures 5a, b; Text-Figures 18a, b

Material. Fourteen specimens from Kálvária Hill and Fazekas street localities.
Measurement.

	D	H	W	U	W/H
1.	30	11(37)	8(27)	10(33)	0.72
2.	24	10(42)	8(33)	7(29)	0.8

3.	23	10(43)	6.5(26)	8 (35)	0.6
4.	28	11(40)	9(32)	11(40)	0.81

Description. Small, compressed, ellipticone specimens with wide and shallow umbilicus. Fine ribs bifurcate from the umbilical bullae; the number of the bullae on the last whorl is 19–21. Intercalated ribs start from the inner flank which results in very dense ribbing, RI = 46 on the last whorl. Ribs are tending to be more sinuous and prorsiradiate towards the aperture and cross the venter. The venter is rounded. Suture cannot be observed.

Discussion. Fine, dense and sinuous ribbing and rounded venter resembles to *A. andranomenensis* BESAIRE (1936) but *nolani* lack tubercles.

Occurrence. The species is an index fossil of the Late Aptian *Nolaniceras nolani* Zone, known worldwide. In Hungary it is from the condensed Upper Aptian basal pockets of Tata Limestone Formation.

Genus *Hypacanthoplites* SPATH, 1923
Type species: *Acanthoceras Milletianum* D'ORBIGNY var. *plesiotypica* FRITEL, 1906

Hypacanthoplites spp.

Pl. X, Figures 3, 14, 22, Pl. XIII, Figure 4

Material. Great numbers of internal moulds in various state of preservation from all Tata localities.

Description. Discoidal forms with moderate involution. Primary ribs start from the umbilical edge, if it is visible.

Occurrence. The genus *Hypacanthoplites* is known from Upper Aptian – Lower Albian deposits, worldwide. In Hungary the genus is reported from the Upper Aptian basal pockets of Tata Limestone Formation.

Hypacanthoplites cf. *milletianus* (D'ORBIGNY, 1841)

Pl. X, Figures 6, 17

*1841	*Ammonites Milletianus* D'ORBIGNY, p. 263, Pl. 77, Figures 1, 2
1947	*Hypacanthoplites Milletianus* (D'ORBIGNY) — BREISTROFFER, p. 40
pars1965	*Hypacanthoplites milletianus* (D'ORBIGNY) — CASEY, p. 433, Pl. 73, Figures 7a, b, **c**, Text-Figure 160

Material. Five specimens from Fazekas street and Kálvária Hill localities.

Measurement.

	D	H	W	U	W/H
1.	–	36	16	–	0.44

Description. Big fragments with coarse ornamentation. Wide primary ribs start from the umbilical edge; intercalated ones appear on midflank and cross the flattened venter rectiradiate. Early whorls can have small tubercles on the umbilical edge which disappear during the ontogeny.

Discussion. Ventral region of CASEY's (1965) specimen is rounded which makes the generic identification questionnable. Pl. X, Figure 17 specimen resembles to *H. trivialis* BREISTROFFER (1947) but the ribbing of *milletianus* is coarser and tubercles are present at young stage.

Occurrence. The species known from Clansayesian of England, France and Georgia. In Hungary it is from the condensed Upper Aptian basal pockets of Tata Limestone Formation.

Hypacanthoplites plesiotypicus (FRITEL, 1906) (= *Hypacanthoplites jacobi* COLLET, 1907)

Pl. X, Figures 10, 16, 18, 19, 23

*1906	*Acanthoceras Milletianum* D'ORBIGNY sp. var. *plesiotypica* FRITEL, p. 245, 246, Text-Figure 2
1907	*Parahoplites jacobi* COLLET, p. 520, Pl. 8, Figures 1–3
1947	*Hypacanthoplites jacobi* sp. var. *obsoleta* (COLLET) — BREISTROFFER, p. 31, 83
1955	*Hypacanthoplites jacobi* SEUNES — ERISTAVI, p. 107
1960	*Hypacanthoplites jacobi* (COLLET) — DRUSCHICH & KUDRYAVTSEV, p. 331, Pl. 15, Figures 1a, b
1961	*Hypacanthoplites jacobi* (COLLET) — ERISTAVI, p. 60, Pl. 3, Figure 1
1961b	*Hypacanthoplites jacobi* (COLLET) — CASEY, p. 529, 560, 609
1965	*Hypacanthoplites jacobi* (COLLET) — CASEY, p. 424, Pl. 72, Figures 5a, b, Text-Figures 156, 162a, f
1982	*Hypacanthoplites jacobi* (COLLET) — KEMPER, Pl. 3, Figures 4, 7, 8, 10, 11, 12
1982	*Hypacanthoplites 'plesiotypicus'* (FRITEL) — KEMPER, Pl. 3, Figures 6, 9
2000	*Hypacanthoplites plesiotypicus* (FRITEL) — KENNEDY et al., Figures 56a–k, 57j, r

Material. Five fragmented specimens from Fazekas street and Kálvária Hill localities.

Measurement.

	D	H	W	U	W/H
1.	52	24(46)	15(28)	20(38)	0.625

Description. Medium sized compressed forms with subrectangular whorl section, with medium wide and shallow umbilicus. Ribs start at the umbilical edge, slightly sinuously cross the flanks and cross the venter prorsiradiate or rectiradiate. Intercalated ribs start at the outer flank, RI= 20–22 on the last whorl. The venter is flat, the ventrolateral edge is sharp.

Discussion. KENNEDY (KENNEDY et al. 2000) discussed the species and pointed out: "...the types of *plesiotypicus* FRITEL, 1906 and *jacobi* of COLLET, 1907 are conspecific, with the former name having priority. For clarity of communication, the term *jacobi* Zone has been retained here, however.". Here his opinion is followed.

Occurrence. Hypacanthoplites jacobi is the index fossil of the Late Aptian *Hypacanthoplites jacobi* Zone, is known from the Western Tethyan region. In Hungary the species is reported from the condensed Upper Aptian basal pockets of Tata Limestone Formation.

***Hypacanthoplites elegans* (FRITEL, 1906) (= *Hypacanthoplites elegans* (FRITEL, 1906), *Hypacanthoplites hannovrensis* (COLLET, 1907) and *Hypacanthoplites spathi* DUTERTRE, 1938)**

Pl. X, Figures 8, 11, 12

*1906	*Acanthoceras Milletianum* D'ORBIGNY var. *elegans* FRITEL, p. 246, Figure 3
1947	*Hypacanthoplites elegans* (FRITEL) — BREISTROFFER, p. 8
1955	*Hypacanthoplites hannovrensis* COLLET var. *elegans* (FRITEL) — ERISTAVI, p. 106, Pl. 5, Figure 4
1961b	*Hypacanthoplites elegans* (FRITEL) — CASEY, p. 529, 560, 609
1965	*Hypacanthoplites elegans* (FRITEL) — CASEY, p. 439, Pl. 71, Figures 1a, b; Pl. 72, Figure 3, Pl. 74, Figures 10a, b, Text-Figures 163a–c
1971	*Hypacanthoplites elegans* (FRITEL) — KEMPER, Pl. 28, Figure 2; Pl. 29, Figures 5a, b
2006	*Hypacanthoplites* cf. *elegans* (FRITEL, 1906) — RAISOSSADAT, p. 915, Figures 4J, K

Material. Three specimens from Vájáriskola and Kálvária Hill localities.

Measurements.

	D	H	W	U	W/H
1.	–	12	7	–	0.58
2.	39	–	–	11(28)	–

Description. Moderately evolute specimens with compressed whorl section, with high flanks and flat topped venter. Feeble bullae or tubercles are present on the umbilical edge. Ribs are branching from bullae on the lower flank. Ribs are fine, dense and narrow. Sometimes intercalated ribs are also present.

Discussion. Dense, fine ribbing and slight tubercles are specific characters. KENNEDY (in KENNEDY et al. 2000) considered *H. elegans* (FRITEL, 1906), *H. hannovrensis* (COLLET, 1907) and *H. spathi* DUTERTRE (1938) as the same species and keep the name of *elegans* due to the reason of priority.

Occurrence. The species is known from the Late Aptian *Hypacanthoplites jacobi* Zone of France, England, Germany and Iran. In Hungary it is reported from the condensed Upper Aptian basal pockets of Tata Limestone Formation.

***Hypacanthohoplites acutecostum* (RIEDEL, 1938)**

Pl. X, Figures 9, 13, 15

*1938	*Acanthohoplites acutecosta* RIEDEL, p. 42, Pl. 8, Figures 1–6; Pl. 14, Figure 23

Material. Three specimens from Vájáriskola locality.

Description. Medium sized form with moderate involution. The primary ribs start at the umbilical edge from bullae then bifurcate. Intercalated ribs are also present. Ribs are fine and cross the lateral part sinuously. On the ventral edge, sometimes weak tubercles present. The venter is flattened, ribs goes straight on it.

Discussion. The flattened venter makes the generic specification clear. The specimens resemble to *H. elegans* (FRITEL, 1906) but the ribbing is coarser and more rigid. According to RIEDEL's opinion (1938, p. 43) the species is resembles to *Gargasiceras interiectus* (RIEDEL, 1938).

Occurrence. RIEDEL (1938) reported the specimen from the Upper Aptian deposits of Colombia. In Hungary it is reported from the condensed Upper Aptian basal pockets of Tata Limestone Formation at Vájáriskola locality.

Subfamily Parahoplitinae SPATH, 1922a

Genus *Parahoplites* ANTHULA, 1899

Type species: *Parahoplites melchioris* ANTHULA, 1899

?Parahoplites melchioris ANTHULA, 1899

Pl. XI., Figures 1, 4, 5

*1899 *Parahoplites melchioris* ANTHULA, p. 111, Pl. 8, Figures 4a, b, c; 5a, b
1907 *Parahoplites melchioris* ANTHULA, 1899 — SINZOW, p. 462, Pl. 2, Figures 1–4
1971 *Parahoplites melchioris* ANTHULA, 1899 — KEMPER, Pl. 24, Figure 4, Pl. 26, Figures 5a, b; Pl. 28, Figures 5a, b

Material. Seven specimens from various Tata localities.

Description. Specimens are slightly flattened; the shape of the conch is almost rounded. Lateral side is flat, the venter is well rounded and the umbilicus is medium deep. At the umbilical edge bullae appear and then primary ribs start and cross the lateral side straight. During the ontogeny ribs tend to be sinous with a slight prorsiradiation on the venter. Secondary ribs appear on the midflank, neither them nor the primaries wear tubercles. Suture cannot visible.

Discussion. The sharp ribs and the circular shape of the conch characterize the species, but the flattened preservation does not let us to examine the venter, therefore the generic status is questionnable. The lateral side ornamentation of *Acanthohoplites aschiltaensis* (ANTHULA, 1899) is very similar, but on the basis of the rather big size it is more likely that the specimens belong to *Parahoplites*.

Occurrence. The species is reported from the condensed Upper Aptian basal pockets of Tata Limestone Formation from Tata localities, otherwise known from Germany, the Kaukasus and Mangyshlak.

Parahoplites multicostatus SINZOW, 1907

Pl. XII, Figures 2, 3

*1907 *Parahoplites multicostatus* SINZOW, p. 463, Pl. 2, Figures 5, 7, 9, 11
1971 *Parahoplites multicostatus* SINZOW — KEMPER, Pl. 26, Figures 3a, b; Pl. 27, Figures 3a, b

Material. Two well preserved specimens from Kékkő Quarry, Tata.

Description. Bubbled fragment of an internal mould with well rounded wide venter and slightly flattened flanks. Ribs are narrow, dense, arise from an umbilical bullae; primaries bifurcate but intercalated ribs appear as well. Both ribs are getting equal in width at the outer flank and cross the venter straight.

Discussion. The generic identification is clear due to the excellent preservation. The dense and fine ribbing and the lack of ventrolateral tubercles characterize the species.

Occurrence. The species known from Hungary from the condensed Upper Aptian basal pockets of Tata Limestone Formation at Kékkő Quarry locality, otherwise known from Switzerland, Germany, Russia and Mangyshlak.

?Parahoplites tenuicostatus (SINZOW, 1907)

Pl. XI. Figures 2, 3, 6

*1907 *Acanthohoplites multispinatus* ANTHULA var. *tenuicostata* SINZOW — Pl. 7, Figures 1, 2, 3

Material. Seven internal moulds and fragmens from Tata localities, mainly from Kékkő Quarry.

Description. Relatively huge specimens with characteristically high whorl section and narrow umbilicus. Ribs arise from strong umbilical bullae, than cross the lateral side sinuously. Intercalated ribs appear on the midflank. Venter and sutures cannot be observed.

Discussion. The generic identification is uncertain because of the flattening and the unobservable venter, but on the basis of the big size is is more likely, that the specimens belong to *Parahoplites* rather than *Acanthohoplites*. The species can be identifyable with the high whorl section and the sinuous ribs start from umbilical bullae. The Hungarian specimens resemble very much to *Deshayesites* but the Early Aptian age seems to be unlikely considering the whole ammonite assemblage. Unfortunately the ventral area cannot be observed; therefore the generic name is with question mark. The species is also resembles to *Neodeshayesites* RIEDEL, 1938 but this genus is reported only from the Early Albian of Venezuela and Colombia.

The stratigraphical distribution of *Parahoplites*, and also the co-occurence with *Acanthohoplites* and *Hypacanthoplites* is problematic. According to the opinion of OWEN (1996a), the last members of genus *Parahoplites* co-occur with *Hypacanthoplites* in the Late Aptian *Nolaniceras nolani* Zone and *Parahoplites* also co-occur with *Cheloniceras* with the whole stratigraphic range of the two genera. CASEY (1996) refused both statements. In the Kopet Dagh Basin (RAISSOSADAT 2006), genera *Acanthohoplites, Hypacanthoplites* and *Parahoplites* are partly co-occur together.

Distribution. The species is known from the Upper Aptian deposits of Russia, the Caucasus and Mangyshlak, in Hungary the species is reported from the condensed Upper Aptian basal pockets of Tata Limestone Formation from Tata localities.

***?Parahoplites robustus* (SINZOW, 1907)**
Pl. XII, Figures 1, 4; Pl. XIII, Figure 15

*1907 *Acanthohoplites multispinatus* ANTHULA var. *robusta* SINZOW — Pl. 7, Figure 7, 8

Material. Three specimens from Kékkő Quarry, Fazekas street and the Tatabánya Ta–1426 borehole at 277.8 m.

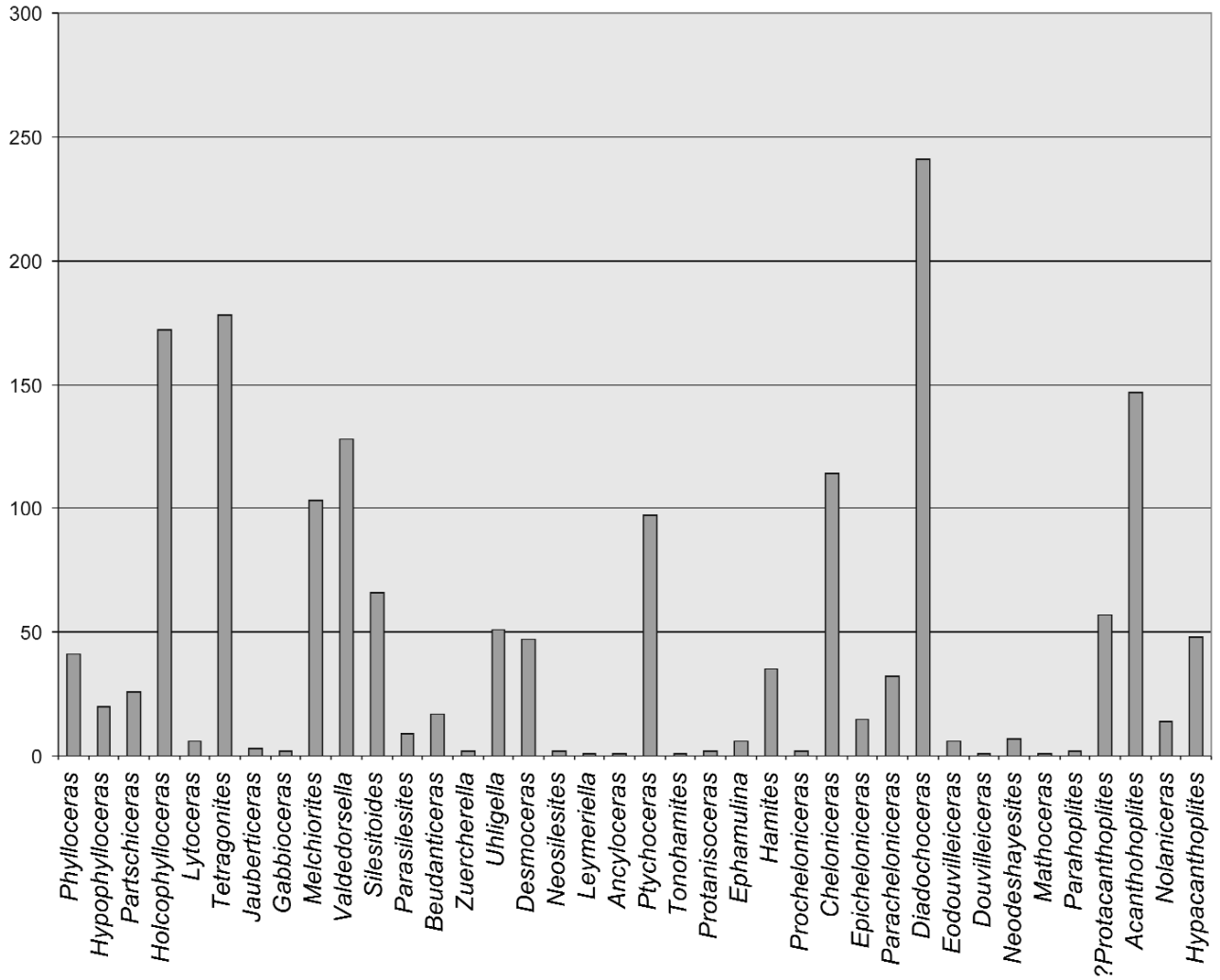
Description. Specimens are flattened. Fragments are huge, moderately involute. Primary ribs arise from umbilical bullae, then getting slighter on the midflank with a delicate sinuous. Intercalated ribs appear on the outer third of the flank and both with the primaries getting broader and blunter when crossing the venter.

Discussion. The ornamentation of the specimens show close resemblance to *P. multispinatus* (ANTHULA, 1899) var. *robusta* (SINZOW, 1907) but the flattened preservation does not let us to examine if ventral tubercles are present.

Occurrence. The species known from Hungary from the condensed Upper Aptian basal pockets of Tata Limestone Formation at Kékkő Quarry locality, otherwise known from Russia and Mangyshlak.

Appendix of the systematic description of Aptian

The summarized generic data (Text-Figure 44) for all Tata localities is presented here, as well as the numerical data of the Hungarian Late Aptian ammonite assemblages (Table 3).



Text-Figure 44. Generic distribution of the collected specimens of the basal lenses from all Tata localities

Table 3. Total number of identified specimens for all localities. Full specimen number data for each locality

Ammonite data of all localities	1	2	3	4	5	6
	Number of specimens					
Subordo Phylloceratina ARKELL**, 1950**						
Phylloceratidae gen. et. sp. indet.	35					
Phylloceras sp.				2		4
Phylloceras (Hypophylloceras) subseresitense WIEDMANN, 1963	5		9			
Phylloceras (Hypophylloceras) velledae (MICHELIN, 1834)	4			2		
Partschiceras baborense (COQUAND, 1880)	15		11			
Holcophylloceras guettardi (RASPAIL, 1831)*	65	56	42	6		3
Subordo Lytoceratina HYATT**, 1889**						
Lytoceras sp.	1	5				
Tetragonitidae gen. et. sp. indet.	52					
Tetragonites sp.		1		4		5
Tetragonites (Tetragonites) duvalianus (D´ORBIGNY, 1840)	78	5	20	13		5
Tetragonites (Tetragonites) heterosulcatum ANTHULA, 1899	38			8		1
Jauberticeras jaubertianum (D´ORBIGNY, 1851)			2	1		
Gabbioceras michelianum (D'ORBIGNY 1850)			1	1		
Subordo Ammonitina HYATT**, 1889**						
Melchiorites sp.						8
Melchiorites melchioris (TIETZE, 1872)	19	7	20	35	1	3
Melchiorites emerici (RASPAIL, 1831)						10
Valdedorsella getulina (COQUAND, 1880)	58	18	45	2		5
Silesitoides escragnollensis (JACOB, 1908)	38	21				1
Silesitoides superstes (JACOB, 1908)		4	2			
Parasilesites kilianiformis (FALLOT, 1920)*	3	2	3	1		
Beudanticeras sp.*	(2*)					
Beudanticeras (Beudanticeras) beudanti (BROGNIART, 1824)	3	-	4	-	-	-
Beudanticeras (Beudanticeras) cf. *convergens* (JACOB, 1908)*	1	6	1	1	1	
Zuercherella zuercheri (JACOB & TOBLER, 1906)				2		
Uhligella sp.				14		
Uhligella balmensis (JACOB, 1908)	10	1	5	-	-	-
Uhligella clansayensis (JACOB, 1905)	16	1	4			
Desmoceras sp.		23		8		
Desmoceras (Desmoceras) latidorsatum (MICHELIN, 1838)	11			5		
Neosilesites nepos (FALLOT, 1910)*	(6 *)					
Brancoceras sp.*	(2*)					
Subordo Ancyloceratina WIEDMANN**, 1966**						
?Ancyloceras matheroni (D'ORBIGNY, 1842)	1					
Tonohamites boldii SZIVES & MONKS, 2002					1	
Ptychoceras laeve MATHERON, 1842	27	17	38	8	3	4
Protanisoceras acteon (D'ORBIGNY, 1850)					2	
Ephamulina arcuata COLLIGNON, 1962		6				
Hamites sp.	16	4	9	3	5	3
Hamites praegibbosus SPATH, 1939					2	3
Hamites csaszari SZIVES & MONKS, 2002	1					
Hamites fazekasensis SZIVES & MONKS, 2002			1			
Hamites kalvariensis SZIVES & MONKS, 2002	2					
Hamites fueloepi SZIVES & MONKS, 2002		1				
Douvilleiceratidae gen. et. sp. indet.	26					
Prochelonicerasalbrechti austriae (UHLIG, 1883)	2					
Cheloniceras sp.			15			
Cheloniceras (Cheloniceras) cornuelianum (D´ORBIGNY, 1841)	23		65	6		18
Cheloniceras (Epicheloniceras) sp.	2					
Cheloniceras (Parachelonicerasrerati COLLIGNON, 1962*	7	21		4		
Diadochoceras sp.			11			
Diadochoceras nodosocostatum (D´ORBIGNY, 1840)	134	4	98	3		2
Diadochoceras hokodzense MIKHAILOVA 1963			11			
Diadochoceras spinosum MIKHAILOVA 1963	26	2	1	1		
Diadochoceras margariti MIKHAILOVA 1963	8		7			1
Eodouvilleiceras clansayense (JACOB, 1908)	6	8	1	2		
?Douvilleiceras sp.	1					
Dufrenoyia katalinae sp. nov			1			
Mathoceras sumerensis (STOYKOVA, 1990)				1		
Colombiceras tobleri (JACOB & TOBLER, 1906)	1		1			
?Protacanthoplites originalis SHARIKADZE et al., 2004	31	4	15	7		
Acanthohoplites sp.	4	2	3	5	1	6
Acanthohoplites bigoureti (SEUNES, 1887)	2			3		7
Acanthohoplites aschiltaensis (ANTHULA, 1899)	3	9	23	20	1	
Acanthohoplites abichi (SEUNES, 1887)			8		3	14
Acanthohoplites bigoti (SEUNES, 1887)	1					
Acanthohoplites andranomenensis (BESAIRE, 1936)	2					1
Nolaniceras nolani (SEUNES, 1887)*	10	1	3			
Hypacanthoplites sp.	29	4	6	5		2
Hypacanthoplites acutecostum (RIEDEL, 1938)				3		
Hypacanthoplites plesiotypicus (FRITEL, 1906)	1		4			
Hypacanthoplites cf. *milletianus* (D´ORBIGNY, 1841)		3		2		
Hypacanthoplites elegans (FRITEL, 1906)				2		
?Parahoplites sp.*	(1*)					
?Parahoplites melchioris ANTHULA, 1899	3	2	2			
?Parahoplites tenuicostatus (SINZOW, 1907)	1	5	1			
?Parahoplites multicostatus SINZOW, 1907		2				
?Parahoplites robustus (SINZOW, 1907)		1	1			
Total	822	247	493	182	20	106
Total number of determined specimens	1870					

Abbreviations: 1 — Kálvária Hill, ,2 — Kékkő Quarry, 3 — Fazekas street, 4 — Vájáriskola, 5 — Eperkés Hill, 6 — Márvány Quarry. Taxa found in boreholes are marked with *.