

ANISIAN AMMONITES FROM GEBZE AREA (KOKAELI PENINSULA, TURKEY)

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Riassunto. Sono illustrati gli Ammonoidei raccolti negli anni 1969 e 1971 da R. Assereto nell'area di Gebze, nella Penisola di Kokaeli, l'antica Bithynia (Turchia), che comprende la località-tipo del sottopiano Bithynico dell'Anisico medio, istituito da R. Assereto nel 1974.

I fossili provengono dal Calcare Nodulare, formazione suddivisa in 3 membri, nell'ambito dei quali Assereto ha distinto 8 livelli litologici. I primi 4 livelli, costituenti il Membro inferiore, hanno dato Conodonti riferibili al tardo Egeico, mentre gli Ammoniti qui studiati provengono dai Membri medio e superiore, corrispondenti ai livelli 5-8. Questa parte della successione si estende dalla base del Bithynico (Zona a Osmani), attraverso il Pelsonico (Zona a Ismidicum e Balatonicus) sino alla base dell'Illyrico (Zona a Trinodosus).

Sono state identificate complessivamente 36 specie, delle quali 5 nuove: *Megaphyllites gebzensis*, *Acrochordiceras asseretoi*, *Cuccoceras asseretoi*, *Hollandites asseretoi*, *Isculites asseretoi*. La frequenza delle specie è assai varia, accanto a specie presenti lungo tutta la successione vi sono specie di grande significato stratigrafico.

Incertezze permangono nella delimitazione delle biozone già note, soprattutto per quanto riguarda l'intervallo compreso tra la scomparsa di *Nicomedites osmani* e la comparsa di *Anagymnoceras ismidicum* (Liv. 6 di Assereto). Questo intervallo ha dato una fauna assai simile a quella della Zona a Ismidicum come definita da Assereto, e per questo motivo è stato riunito a questa biozona, come parte inferiore, dato che nessuna delle specie qui identificate era limitata a questo intervallo e poteva essere scelta come indicatore. Analogamente, alla scomparsa di *Anagymnoceras ismidicum* non segue subito la comparsa di *Balatonicus balatonicus* della zona successiva, che è presente in posizione più elevata. Per questo breve intervallo sembra avere un certo significato biostratigrafico *Epacrochordiceras pustericum*. Non viene infine affrontato il controverso problema della collocazione di *Paraceratites binodosus* per mancanza di dati obiettivi.

Le faune della parte alta della successione (Zona a Balatonicus e Trinodosus) possono essere facilmente correlate con le coeve faune alpine, mentre per l'intervallo più antico correlazioni sono possibili con l'Iran Centrale (Regione di Anarak) e la Cina (Central Zinghai), aree dove appunto affiorano gli strati più antichi dell'Anisico medio.

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Foreward.

Aim of the present paper is the description of an Ammonite fauna collected from the Gebze area (Kokaeli Peninsula, Turkey) by late R. Assereto in 1969 and 1971 (Fig. 1). Preliminary data on these Ammonites were reported by Assereto (1972), who in 1974 proposed the Kokaeli Peninsula, near the town of Gebze, along the Istanbul-Izmid railway-line from km 49.780 to km 51.500 as type locality of the Bithynian, a new Anisian Substage (see Assereto, 1974).

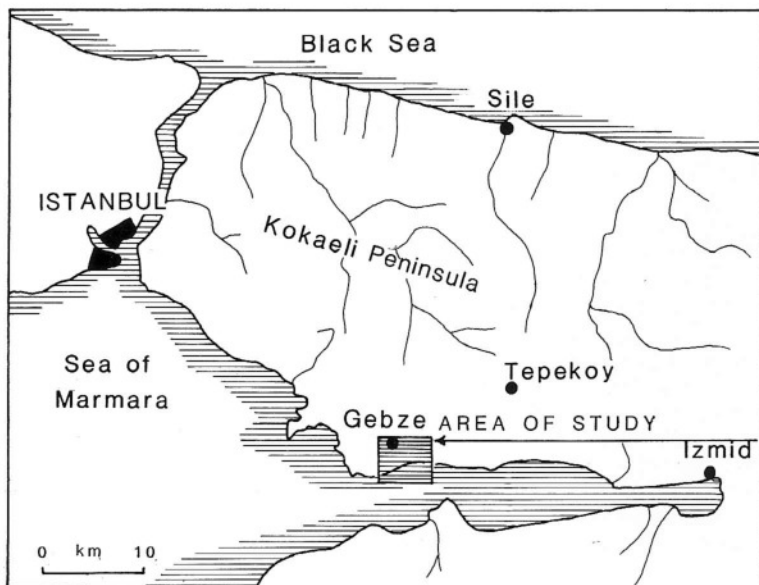


Fig. 1- Location map of the studied area (after Assereto, 1974).

Triassic fossils from the Kokaeli Peninsula, formerly called Bithynia, have been previously described by Toulou (1896) and Arthaber (1914): unfortunately both authors omitted exhaustive biostratigraphic indications.

Studied material.

All fossils come from the Nodular Limestone. This Formation has been subdivided in three members, Lower, Middle and Upper Member, respectively with four, three, and one lithostratigraphic levels (Assereto, 1972) (Fig. 2).

From the older four levels of the Lower Member, Assereto recorded *Mentzelia propontica* Toulou and few specimens possibly related to *Prychites cylindroides* Arthaber, which along with some other material today are missing from Milan's collection. On the occurrence of *Neogondolella regale* Mosher from Level 1 Nicora (1977) dated the base

of the sequence as Late Aegean in age.

The Middle Member contains Levels 5 through 7. The base of the Level 5 coincides with the beginning of the *Nicomedites osmani* Zone, whereas *Anagymsotoceras ismidicum* appears at the base of the Level 7.

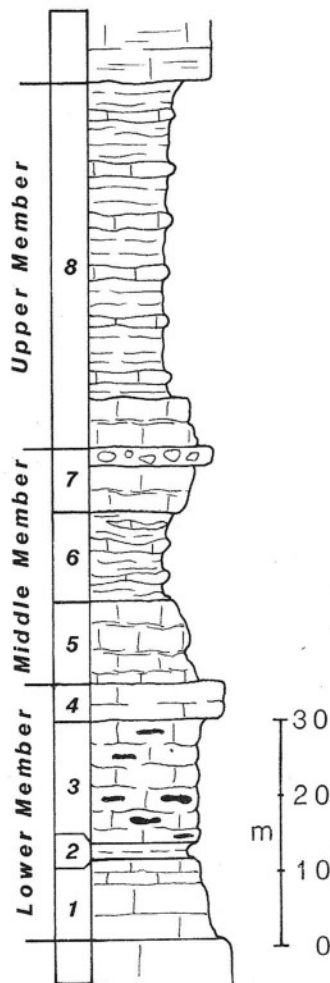


Fig. 2 - Generalized stratigraphic section of the Nodular Limestone with Levels 1 to 8 (after Assereto, 1974).

The more omogeneous Upper Member, equated to Level 8, yielded a rich fauna belonging to the *Balatonites balatonicus* Zone of Pelsonian age, whereas the youngest fossiliferous layers should be correlated with the *Paraceratites trinodosus* Zone of the Alpine domain (Assereto, 1972).

The Ammonite faunas here investigated come from the Middle and Upper Members of the Nodular Limestone and, specifically, from the lithologic Levels 5 to 8 (*sensu* Assereto, 1974) (Fig. 2), to which the reader should refer.

Most of fossils were collected from a single bed and their occurrence is plotted in Fig. 4 to 9. When the material was not collected in place, but the original lithostratigraphic level could be identified, sample number is preceded by an asterisk. The location of studied sections is shown in Fig. 3. At km 51.080 of the railway, there is the type locality of the *Anagyminotoceras ismidicum* Zone, whereas that of the *Nicomedites osmani* Zone is recorded at km 50.210 (Assereto, 1974).

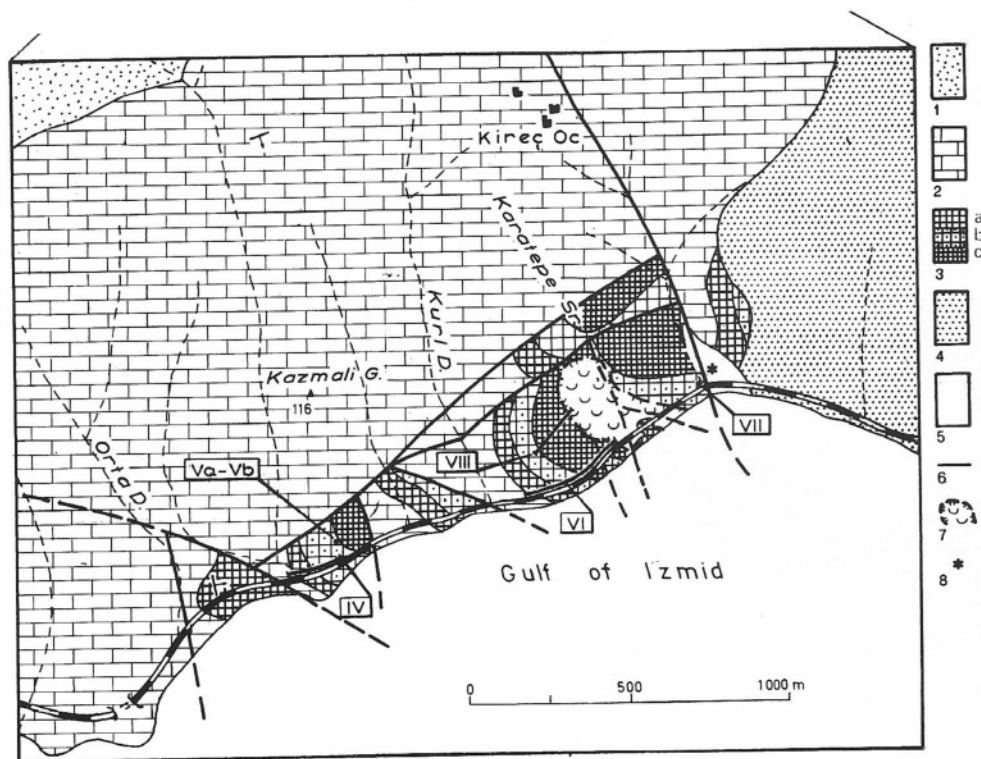


Fig. 3 - Geological sketch map of the Gebze area and location of stratigraphic sections IV, Va, Vb, VI, VII, VIII (after Nicora, 1977). 1) Variegated Sandstone and Marl (Lower Triassic); 2) Grey Limestone and Dolomite (Upper Scythian-Lower Anisian); 3) Nodular Limestone (Anisian): a) Lower Member, b) Middle Member, c) Upper Member; 4) Cretaceous Formations; 5) Neogene and Quaternary cover; 6) faults; 7) landslides; 8*) tunnel of the new rail-road, few meters inland respect to the old track.

Some fossils, however, could not be relocated in any of the illustrated successions. They are listed here below grouped by levels according to Assereto (1974) and from his field notes of the 1969 and 1971 campaigns (from old to young). T numbers correspond to Assereto's sampling, and also in this case the asterisk indicates that samples were not collected *in situ*.

Level 5.

- T22 - By the beach, base of the Osmani Zone.
Nicomedites barbarossae (Toula) (12 specimens)
Nicomedites osmani Toula (4 specimens)
Grambergia ? solimani (Toula) (4 specimens)
Sturia sansovinii Mojsisovics (3 specimens)
Gymnites toulai Arthaber (1 specimen)
Isculites asseretoi sp. n. (1 specimen)
Phyllocladiscites proponticus (Toula) (1 specimen)
Leiophyllites cf. *confucii* (Diener) (1 specimen)
Monophyllites anatolicus Toula (2 specimens)
- T23 - Above T22 (almost in place).
Acrochordiceras sp. ind. (2 specimens)
Nicomedites barbarossae (Toula) (16 specimens)
Nicomedites osmani Toula (29 specimens)
Sturia sansovinii Mojsisovics (3 specimens)
Gymnites toulai Arthaber (1 specimen)
Phyllocladiscites proponticus (Toula) (1 specimen)
Leiophyllites confucii (Diener) (1 specimen)
- T24 - By the beach, base of the Osmani Zone.
Isculites asseretoi sp. n.
- T36 - At the end of the trench V, base of the Osmani Zone.
Nicomedites barbarossae (Toula) (4 specimens)
Nicomedites osmani Toula (5 specimens)
Grambergia ? solimani (Toula) (1 specimen)
Sturia sansovinii Mojsisovics
- T93 - By the sea, from trench IV (almost in place), equivalent to samples T22 and T23.
Acrochordiceras sp. ind. (3 specimens)
Nicomedites barbarossae (Toula) (8 specimens)
Grambergia ? solimani (Toula) (1 specimen)
Gymnites toulai Arthaber (1 specimen)
Isculites asseretoi sp. n. (1 specimen)
- *T317 - Debris from Dil-Iskilessi Tunnel.
Nicomedites barbarossae (Toula) (2 specimens)
Nicomedites osmani Toula (2 specimens)
Phyllocladiscites proponticus (Toula) (1 specimen)
Ptychites sp. ind.

Level 6.

- T125 - Trench IV, km 50.290.
Megaphyllites procerus Arthaber (1 specimen)
Sturia yalakensis (Arthaber) (1 specimen)

Level 7.

- T42 - Along the shore, on a small promontory facing T40.
Acrochordiceras haueri Arthaber (1 specimen)
Acrochordiceras halili Toulou (1 specimen)
Anagymnotoceras ismidicum (Arthaber) (10 specimens)
Nicomedites toulai (Arthaber) (4 specimens)
Hollandites asseretoi sp. n. (2 specimens)
Phyllocladiscites proponticus (Toulou) (1 specimen)
- T43 - Above T42:
Anagymnotoceras ismidicum (Arthaber) (1 specimen)
Nicomedites toulai (Arthaber) (1 specimen)
- *T45 - As the following T46 (almost in place).
Acrochordiceras asseretoi sp. n. (1 specimen)
Acrochordiceras halili Toulou (2 specimens)
Acrochordiceras sp. ind.
Nicomedites toulai (Arthaber) (1 specimen)
Proarcestes bramantei (Mojsisovics) (1 specimen)
Phyllocladiscites proponticus (Toulou) (1 specimen)
- T46 - Above rail-road escarpment, on the small hill.
Acrochordiceras sp. ind.
Anagymnotoceras ismidicum (Arthaber) (3 specimens)
Nicomedites toulai (Arthaber) (1 specimen)
Hollandites asseretoi sp. n. (1 specimen)
- T47 - Above T46.
Anagymnotoceras ismidicum (Arthaber) (1 specimen)
- *T52 - Debris from a 6 meters thick band, below T47.
Ismidites marmarensis Arthaber (1 specimen)
Acrochordiceras halili Toulou (10 specimens)
Acrochordiceras sp. ind.
Anagymnotoceras ismidicum (Arthaber) (12 specimens)
Nicomedites toulai (Arthaber) (4 specimens)
Ptychites sp. ind.
Gymnites toulai Arthaber (1 specimen)
Phyllocladiscites proponticus (Toulou) (1 specimen)
Leiophyllites confucii (Diener) (2 specimens)
Monophyllites anatolicus Toulou (3 specimens)
- T70 - Along the road leading to the quarry, at the curving point.
Acrochordiceras sp. ind.
Anagymnotoceras ismidicum (Arthaber) (11 specimens)
Nicomedites toulai (Arthaber) (6 specimens)
Ptychites sp. ind.
Gymnites toulai Arthaber (2 specimens)
- T72 - At the eastern exit of the last tunnel (before the Cretaceous formations).
Nicomedites toulai (Arthaber) (1 specimen)
Monophyllites anatolicus Toulou (1 specimen)

- *T73 - Debris below T72.
Megaphyllites procerus Arthaber (1 specimen)
Acrochordiceras haueri Arthaber (1 specimen)
Acrochordiceras sp. ind.
Anagymnotoceras ismidicum (Arthaber) (1 specimen)
Nicomedites toulai (Arthaber) (3 specimens)
Proarcestes sp. ind. (1 specimen)
Leiophyllites confucii (Diener) (1 specimen)
Monophyllites kieperti Toulai (1 specimen)
- T94 - Within trench IV, close to T93 (Level 5).
Anagymnotoceras ismidicum (Arthaber) (1 specimen)
Nicomedites toulai (Arthaber) (1 specimen)
- T127 - Northward of trench IV, km 50,250.
Acrochordiceras haueri Arthaber (1 specimen)
Acrochordiceras sp. ind.
- T155 - At the eastern exit of the tunnel at km 50,270.
Acrochordiceras halili Toulai (1 specimen)
Acrochordiceras sp. ind.
Leiophyllites confucii (Diener) (1 specimen)
- Level 8.
- *T54 - Debris collected 15 meters above T52 (Level 7).
Acrochordiceras halili Toulai (1 specimen)
Epacrochordiceras pustericum (Mojsisovics) (1 specimen)
Cuccoceras asseretoi sp. n. (1 specimen)
Discoptychites pauli (Mojsisovics) (1 specimen)
Gymnites toulai Arthaber (1 specimen)
- *T69 - Debris, km 51.280.
Acrochordiceras bibymicum Arthaber (1 specimen)
Epacrochordiceras pustericum (Mojsisovics) (1 specimen)
Cuccoceras cf. *cuccense* (Mojsisovics) (1 specimen)
Paraceratites binodosus (Hauer) (1 specimen)
Proarcestes bramantei (Mojsisovics) (2 specimens)
Proarcestes cf. *escheri* (Mojsisovics) (1 specimen)
Proarcestes sp. ind. (1 specimen)
Flexoptychites cf. *flexuosus* (Mojsisovics) (1 specimen)
Leiophyllites confucii (Diener) (1 specimen)

Biostratigraphy.

The analysis of the whole fauna allowed us to improve the biostratigraphic framework of the Middle and Upper Anisian interval of the Gebze area, and consequently of Tethys.

Thirtysix species were identified, including five new taxa. Their distributions are plotted in Fig. 10.

The Level 5 (m 11 thick in average) is equated to the Osmani Zone. The Ammonite assemblages are dominated by the genus *Nicomedites* represented by the species *N. osmani*, *N. barbarossae* and *N. toulai*. The first two species, rather frequent, disappear at the top of the level, whereas *N. toulai*, much rarer, appears in the uppermost part of the Level 5 (and reaches its maximum abundance in Level 7), while the lowermost strata yielded *Grambergia ? solimani*. Thus, the base of this interval is characterized by the co-occurrence of *N. osmani*, *N. barbarossae*, and *G. ? solimani*, and the its top by the co-occurrence of *N. osmani*, *N. barbarossae*, and *N. toulai* in absence of *G. ? solimani*.

The base of Level 6 (m 12 thick in average) is marked by the appearance of representatives of the genera *Sageceras*, *Megaphyllites*, *Acrochordiceras* with large nodes and *Hollandites*. The faunas from this level are more diversified than those from Level 5, but the specimens are much rarer possibly consequently to different diagenesis. The decrease in abundance of *Nicomedites* is balanced by the appearance of *Acrochordiceras* sp. in Arthaber, *Hollandites asseretoi* and *Sturia yalakensis*, which all occur up till Level 7, and

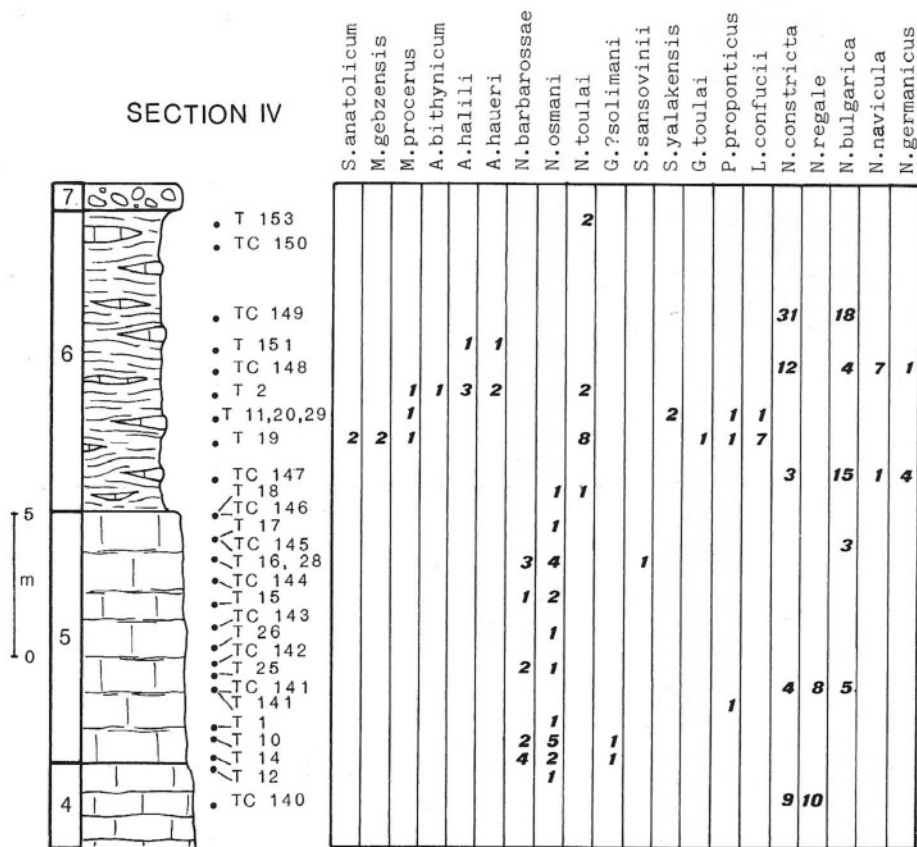


Fig. 4 - Section IV after Nicora (1977). T) ammonite samples; TC) conodont samples.

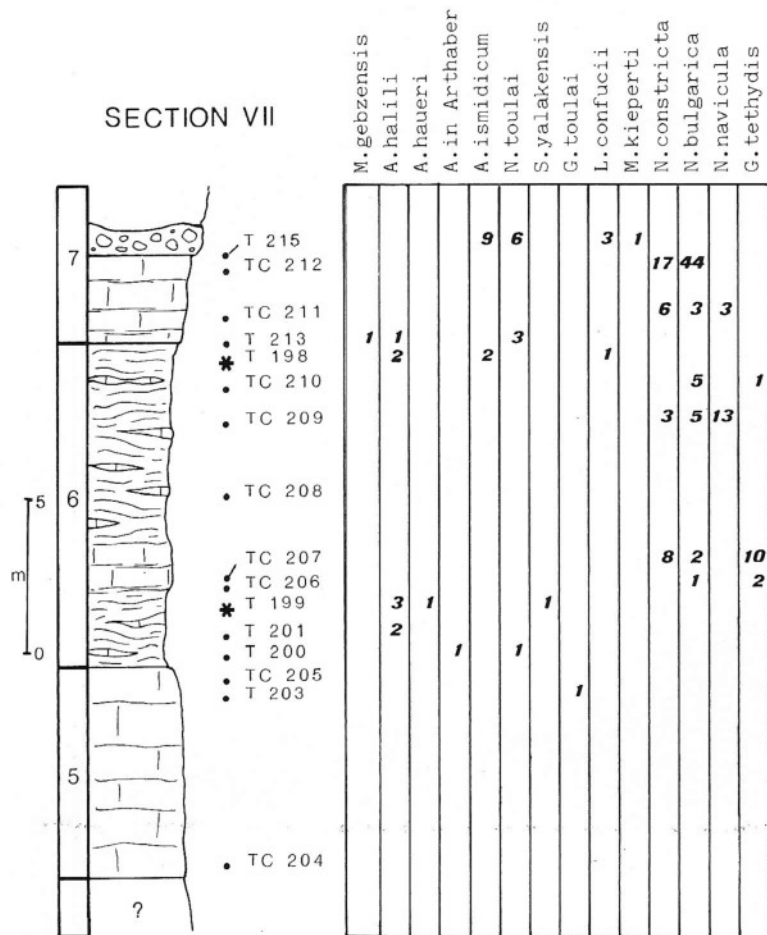


Fig. 8 - Section VII after Nicora (1977). T) ammonite samples; TC) conodont samples; *) samples not *in situ* but in stratigraphic order.

of *Sageceras anatolicum*, *Megaphyllites gebzensis*, *M. procerus*, *Acrochordiceras bithynicum*, *A. halili*, *A. haueri*, which all persist till Level 8. *Gymnites toulai*, *Phyllocladiscites proponticus* and *Leiophyllites confucii* are also present; these latter species mainly occur throughout almost the entire sequence including Level 5. None of the species identified has a range confined to Level 6, which, however, can be identified as the interval from the disappearance of *N. osmani* (below) and the appearance of *Anagymnotoceras ismidicum* (above).

Fig. 7 - Section VI after Nicora (1977). T) ammonite samples; TC) conodont samples; *) samples not *in situ* but in stratigraphic order.

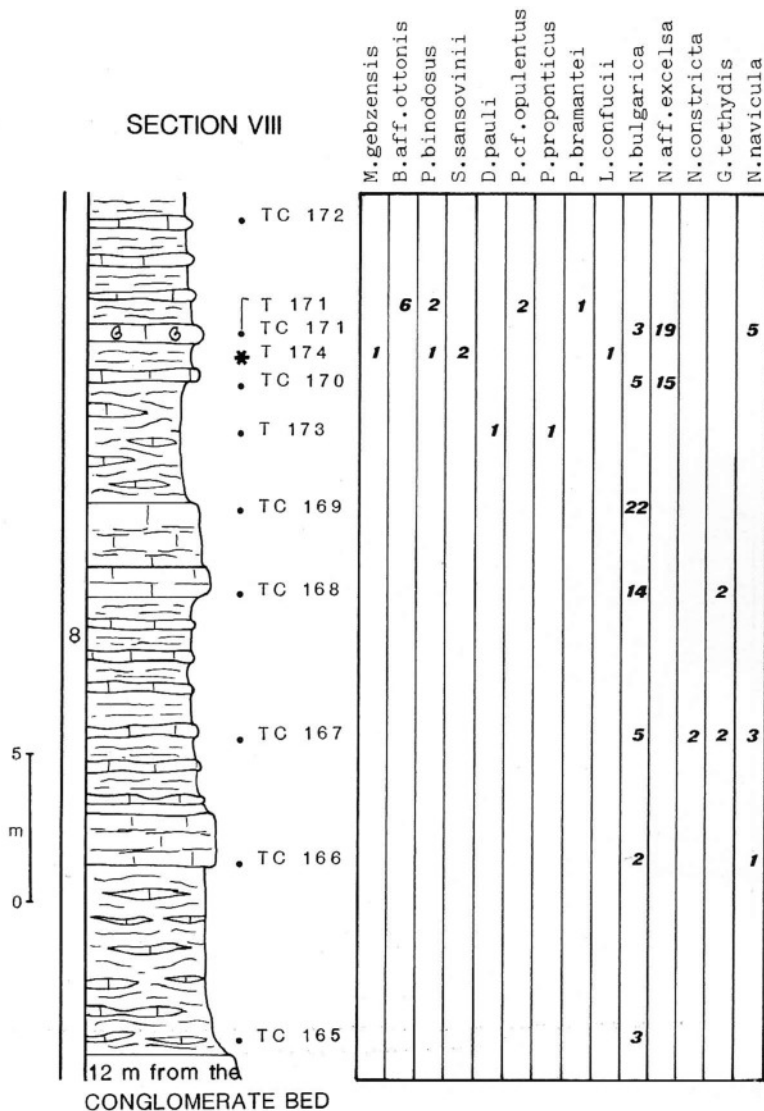


Fig. 9 - Section VIII after Nicora (1977). T) ammonite samples; TC) conodont samples; *) samples not *in situ* but in stratigraphic order.

The next Level 7 (only 8 m thick) coincides with Assereto's Ismidicum Zone. The zonal marker, *A. ismidicum*, is very common. But other species, less abundant than the zonal marker such as *Ismidites marmarensis*, *Acrochordiceras asseretoii*, *Leiophyllites* aff. *pitamaha* in Tozer and *Monophyllites kiepertii* seem to be confined to this interval.

As mentioned above, Level 6 yielded only long range species. On the other hand, at the beginning of Level 6, the Ammonite fauna displays a remarkable similarity with that from the overlying Level 7 as testified by the presence of taxa such as *Acrochor-*

diceras with large nodes, *Sageceras*, *Megaphyllites* and *Hollandites*, which increase in importance in Level 7, while *N. osmani* is totally absent. It means that a change, better a biologic renovation of fauna occurred at the base of Level 6. For this reason, we suggest that Level 6 should be included in the Ismidicum Zone, which could be splitted in two subzones, the older characterized by the appearance of mentioned taxa without *A. ismidicum*, which instead does characterize the younger subzone. Alternatively, *N. toulai* could be suggested as zonal marker. The latter species is common in both intervals and disappears at the top of Level 7, but appears at the Osmani Zone top.

The Ammonite fauna changed again at the base of Level 8. The species whose range was limited to the Ismidicum Zone went extinct, whereas *Epacrochordiceras pustericum* appears since the very base of Level 8. The latter species, collected within debris but just above the top of the Ismidicum Zone (see Fig. 7, T41), is recorded *in situ* in the lower and middle part of Level 8 (Fig. 7, T77, T62). Moreover in the latter level, before the disappearance of *E. pustericum*, the first representatives of the genus *Balatonites* and *Paraceratites binodosus* are also recorded. The Ammonite assemblages still contain the long range species recorded from both underlying Osmani and Ismidicum Zones.

In the top most layers of Level 8 the Ammonite fauna becomes poorly diversified. The only species collected in place are *Flexoptychites flexuosus* (very frequent), *Discoptychites pauli* and *Phyllocladiscites proponticus*: the latter species was already recorded from the Osmani Zone.

The biostratigraphic interpretation of the interval corresponding to Level 8 from Gebze succession is still uncertain, because of the different definitions of Mojsisovics' Binodosus Zone suggested by various authors. Assereto (1972, 1974) stated that "the horizon in which *P. binodosus* occurs already belongs to the following *trinodosus* Zone...Naturally the name *binodosus* Zone cannot be mantained for the older faunas of the Pelsonian, that might be grouped under the name Balatonicus Zone, with which this faunas were originally defined by Mojsisovics (1873, 1874)". Assereto's interpretation is still followed by Krystyn (1983) and Gaetani (personal communication, 1987). On the contrary, Tozer (1981) considers the *binodosus* horizon as still belonging to Pelsonian and retain the Binodosus Zone essentially as used by Mojsisovics (1882), because "Assereto's biological argument seems weak".

A single specimen of *B. balatonicus* and three specimens of *P. binodosus* are recorded from sample T63 (Fig. 7), neither the former nor the seconds were collected in place. So, it cannot be ascertained if the two species appeared at the same level or if *P. binodosus* belongs to distinct younger layers.

On the other hand, in the Gebze succession there is a discrete interval comprised between the extinction level of *A. ismidicum* (top of the Level 7) and sample T63 with *B. balatonicus* and *P. binodosus*. This discrete interval is characterized by *E. pustericum* along with the oldest *Balatonites* (not *in situ*). According to us this interval should represent the Balatonicus Zone, even in absence of the zonal index.

The following upward event is the occurrence of *F. flexuosus* in sample T64 (Fig. 7). Tentatively, the 10-13 meters thick interval above sample T63, could be referred to

the Trinodosus Zone of the Alpine domain.

Based on data available, with special emphasis to the Bithynian, the succession of events from the Gebze area can be tentatively reconstructed as follows:

Illyrian	Trinodosus Zone	{ <i>Flexoptrychites flexuosus</i> ? <i>Paraceratites binodosus</i>
Pelsonian	Balatonicus Zone	{ <i>Balatonites balatonicus</i> <i>Epacrochordiceras pustericum</i>
Bithynian	{ Ismidicum Zone	{ <i>Anagymnotoceras ismidicum</i> Appearance of <i>Acrochordiceras</i> with large nodes
	{ Osmani Zone	{ Top: appearance of <i>N. toulai</i> Base: <i>Grambergia ? solimani</i>

Biogeographic remarks.

About 40% of the species identified are known only from the Kokaeli Peninsula. The remain species have a larger geographic distribution being recorded from the Alps, Balkans, Dobrougia, Greece and Iran to Himalaya.

The species recorded in the Binodosus Zone (sensu Mojsisovics, 1882) of the Alps are: *E. pustericum*, *C. succense*, *B. balatonicus*, *B. ottonis*, *P. binodosus*. *S. sansovinii*, *D. pauli*, *D. seebachi*, *F. flexuosus*, *P. escheri*, *P. opulentus* come from Trinodosus Zone (sensu Mojsisovics, 1882); and *M. procerus* and *P. bramantei* are common to both zones. Moreover, *S. sansovinii*, recorded from Balkans, Dobrugia, Greece and Himalaya, also occurs in older layers as in Aegean age levels (Chios, Greece); *L. confucii* occurs from the Aegean to Trinodosus Zone in Hungary, Greece and Himalaya.

The Ammonite faunas from the Kokaeli Peninsula have several species in common with those from the Alam Formation (Anarak Region, Central Iran) described by Tozer in 1972 and display the same order of appearance. Tozer's *Leiophyllites* Beds yielding *H. proponticus* (= *Grambergia ? solimani* in this paper) can be correlated with the base of the Osmani Zone; the *Anagymnotoceras* Beds of Iran contain *A. ismidicum* and *N. toulai* and correlate with the Ismidicum Zone. The overlying *Epacrochordiceras* Beds yielded some *Epacrochordiceras* not identified specifically, but very close to *E. pustericum*. Because the later species appears at the base of the Balatonicus Zone, then Tozer's *Epacrochordiceras* Beds may correlate with the base of Gebze's Balatonicus Zone. Tozer's

Zones Levels	Osmani	Ismidicum		Balat.	Trin.
	5	6	7	8	
<u>Sageceras anatolicum</u> Arthaber				---	
<u>Ismidites marmarensis</u> Arthaber					
<u>Megaphyllites gebzensis</u> sp.n.					
<u>Megaphyllites procerus</u> Arthaber			---		
<u>Acrochordiceras asseretoi</u> sp.n.					
<u>Acrochordiceras bithynicum</u> Arthaber					---
<u>Acrochordiceras halili</u> Toula					---
<u>Acrochordiceras haueri</u> Arthaber					---
<u>Acrochordiceras</u> sp.in Arthaber			---		---
<u>Epacrochordiceras pustericum</u> (Mojs.)					
<u>Cuccoceras asseretoi</u> sp.n.			---	---	
<u>Cuccoceras</u> cf. <u>cuccense</u> (Mojsisovics)				---	
<u>Balatonites balatonicus</u> Mojsisovics				---	
<u>Balatonites</u> aff. <u>ottonis</u> Buch					
<u>Balatonites</u> sp.in Arthaber				---	
<u>Anagymnotoceras ismidicum</u> (Arthaber)					
<u>Nicomedites barbarossae</u> (Toula)					
<u>Nicomedites osmani</u> Toula					
<u>Nicomedites toulai</u> (Arthaber)		---			
<u>Hollandites asseretoi</u> sp.n.					
<u>Paraceratites binodosus</u> (Hauer)					
<u>Grambergia</u> ? <u>solimani</u> (Toula)					
<u>Sturia sansovinii</u> (Mojsisovics)				---	
<u>Sturia yalakensis</u> (Arthaber)			---		
<u>Discoptychites pauli</u> (Mojsisovics)					
<u>Discoptychites</u> cf. <u>seebachi</u> (Mojsisovics)				---	
<u>Gymnites toulai</u> Arthaber					
<u>Isculites asseretoi</u> sp.n.					
<u>Flexoptychites flexuosus</u> (Mojsisovics)				---	
<u>Phyllocladiscites proponticus</u> (Toula)					
<u>Proarcestes bramantei</u> (Mojsisovics)					
<u>Proarcestes</u> cf. <u>escheri</u> (Mojsisovics)					
<u>Leiophyllites confucii</u> (Diener)					
<u>Leiophyllites</u> sp.aff. <u>pitamaha</u> in Tozer			---		---
<u>Monophyllites anatolicus</u> Toula					
<u>Monophyllites kieperti</u> Toula					

Fig. 10 - Distribution chart of the species identified in Gebze area (this paper). Plain line) specimens collected *in situ*; dashed line) specimens from samples not *in situ* but in stratigraphic order.

Gymnites Beds seem to correspond to the upper part of the Balatonicus Zone from Kokaëli Peninsula based on the occurrence of *Paraceratites* sp. aff. *P. binodosus* and *Ptychites* sp. aff. *P. pauli*. Other two species, namely *Leiophyllites* sp. aff. *L. pitamaha* and *Monophyllites kieperti*, also occurring in the *Gymnites* Beds, are recorded in older levels in the Gebze area.

It is worth mentioning that *N. osmani* and *N. barbarossae* are recorded from the Central Qinghai (China) (He, Wang & Chen, 1986).

From this short review of the Ammonite faunal succession we can state with Assereto (1972) that during the Anisian the Tethys was belonging to one single bioprovince. The biogeographic differences claimed in the past among the various Ammonite faunas are attributable to the fact that faunas of different ages were supposed as belonging to a single coeval fauna.

* Paleontological descriptions

Ammonoidea

Order Ceratitida

Family *Sageceratidae* Hyatt, 1884

Genus *Sageceras* Mojsisovics, 1873

Type species: *Goniatites haidingeri* Hauer, 1847

Sageceras anatolicum Arthaber, 1914

1914 *Sageceras anatolicum* Arthaber, p. 153, pl. 13, fig. 7.

Material. 3 specimens: N. 6049 (T158), N. 6050 (T19).

Three specimens, preserved as internal moulds; they are compressed, with their peculiar suture showing several subequal auxiliary and adventive elements.

Occurrence. Ismidicum and Balatonicus Zones of Kokaëli Peninsula.

Family *Dinaritidae* Mojsisovics, 1882 -

Genus *Ismidites* Arthaber, 1914

Type species: *Ismidites marmarensis* Arthaber, 1914

Ismidites marmarensis Arthaber, 1914

Pl. 9, fig. 1

* First number (e. i. N. 6049) refers to register number of Paleontological Museum of the Dipartimento di Scienze della Terra in the Milan University. T numbers in brackets correspond to Assereto's sampling.

1914 *Ismidites marmarensis* Arthaber, p. 185, pl. 15, fig. 9, 10.

1951 *Ismidites marmarensis* - Spath, p. 151.

Material. 2 specimens: N. 6045 (T39, T52).

Only two specimens, not perfectly preserved, with weak radial folds and peculiar suture: E/L very high and narrow, L very large, L/U a little higher and wider than E/L. Occurrence. Upper Ismidicum Zone of Kokaeli Peninsula.

Family *Megaphyllitidae* Mojsisovics, 1896

Genus *Megaphyllites* Mojsisovics, 1879

Type species: *Ammonites jarbas* Münster, 1841

***Megaphyllites gebzensis* sp. n.**

Pl. 9, fig. 2a - c

1914 *Megaphyllites procerus* - Arthaber, p. 163, pl. 15, fig. 2.

1963 *Megaphyllites* cf. *procerus* Assereto, p. 74 (non pl. 8, fig. 6).

Types. Holotype N. 6121 (T75h) from Ismidicum Zone (Pl. 9, fig. 2a-c). Paratypes N. 6122-6130 (T19, T33, T38, T40, T62, T158, T159, T161, T174, T213).

Collocation. Paleontological Museum of the Milan University.

Horizon and locality. Holotype and Paratypes N. 6122 (T38, T40) and N. 6130 (T213) from Upper Ismidicum Zone; Paratypes N. 6128 (T19) and N. 6129 (T33) from Lower Ismidicum Zone; Paratypes N. 6123 (T161), N. 6124 (T159), N. 6125 (T174), N. 6126 (T62), N. 6127 (T158) from Balatonicus Zone, Gebze, Kokaeli Peninsula, Turkey.

Diagnosis. Shell very involute, small sized, with whorl section compressed and elliptical, sides weakly convex, venter wide and rounded; umbilicus very narrow and deep; constrictions sinuous, weak and rare (1-3 per whorl). Suture line with phylloid saddles.

Dimensions (in mm):

	D	H	W	U
Paratype 6128 (T19a)	9.2	0.5?	54%	4.9 53%
Paratype 6129 (T33a)	11.2	6.3	56%	5.3 47%
Paratype 6123 (T161a)	12.5	7.2	58%	6.2 49%
Paratype 6124 (T161b)	15.0	8.8	59%	6.8 45%
Holotype 6121 (T75h)	18.6	10.5	56%	9.0 48%

Discussion. Arthaber (1914) referred to *M. procerus* Arthaber one specimen with wider section and more globose general shape. It is therefore strictly comparable with the specimens here considered as belonging to a new species, their W/D ranging from 44 to 53%, while in *M. procerus* this same ratio ranges from 31 to 37%.

Since there is no overlapping between the two characters variability ranges, it is likely that the two species are really distinct. The specimens from Contrada Gobbia (Assereto, 1963, p. 74) can be ascribed to this new species, having their W/D ranging

from 51 to 54%, but the figured specimen (pl. 8, fig. 6) is here considered a true *M. procerus* Arthaber.

Such a size-difference is may be attributable to sexual dimorphism.

Occurrence. Ismidicum and Balatonicus Zones of Kokaeli Peninsula and Trinodosus Zone of the Alps.

Megaphyllites procerus Arthaber, 1896

Pl. 9, fig. 3a-c

1896 *Megaphyllites procerus* Arthaber, p. 87, pl. 7, fig. 11.

non 1914 *Megaphyllites procerus* - Arthaber, p. 163, pl. 15, fig. 2.

1963 *Megaphyllites* cf. *procerus* Assereto, p. 74, pl. 8, fig. 6 (*pars*).

Material. 8 specimens: N. 6116 (T2, T11, T19, T125), N. 6117 (T73, T75), N. 6118 (T62, T63).

Some small sized specimens; their section is compressed (W/D ranging from 31 up to 37%), elliptical, very high, with slightly convex sides and narrowly rounded venter. They are perfectly comparable with the type figured by Arthaber (1896, pl. 7, fig. 11).

Dimensions (in mm):

	D	H	W	U
N. 6116 (T125)	10.5	5.8 55%	3.9 37%	1.0? 10%
N. 6118 (T63a)	15.4	8.5 55%	5.0 32%	1.2 8%
N. 6116 (T11)	18.4	9.7? 53%	6.9 37%	-

Occurrence. Binodosus and Trinodosus Zones of the Alps and Ismidicum and Balatonicus Zones of Kokaeli Peninsula.

Family *Acrochordiceratidae* Arthaber, 1911

Genus *Acrochordiceras* Hyatt, 1877

Type species: *Acrochordiceras hyatti* Meek, 1877

***Acrochordiceras asseretoi* sp. n.**

Pl. 9, fig. 5a-c; Text-fig. 11d, 12d

1914 *Acrochordiceras balarama* - Arthaber, p. 180, pl. 13, fig. 8.

Types. Holotype N. 6095 (T107a) (Pl. 9, fig. 5a-c). Paratypes N. 6098 (T107b), N. 6097 (T75), N. 6100 (T87), N. 6099 (T45).

Collocation. Paleontological Museum of the Milan University.

Horizon and locality. Upper Ismidicum Zone, Gebze, Kokaeli Peninsula, Turkey.

Diagnosis. Whorls slightly evolute, always with depressed section, transversally elliptical; venter very wide, slightly rounded; umbilicus large, with high umbilical slope. Ribs strong, weak on the umbilical slope, simple, bi or trifurcate at the large lateral nodes; these are remarkably prominent, at the side half-height. Suture subceratitic with

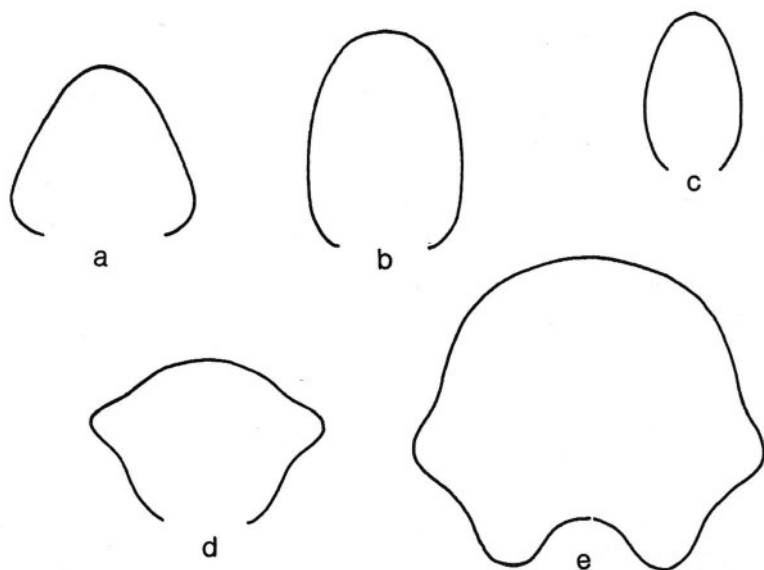


Fig. 11 - Whorl sections of species belonging to the genera *Acrochordiceras* Hyatt and *Epacrochordiceras* Spath. a) *A. bithynicum* Arthaber (N. 6019, T65a); b) *A. balili* Toulou (N. 6145, T213a); c) *E. pustericum* (Mojsisovics) (N. 6058, T122a); d) *A. asseretoi* sp. n. (N. 6095, T107a); e) *A. haueri* Arthaber (Collection of Arthaber, 1914); x 1.

E small, L very large and deep; 3 rather wide saddles, before the umbilical seam, have rounded ending.

Dimensions (in mm):

	D	H		W		U
Holotype N. 6095 (T107a)	59.3	21.0	35%	25.0	42%	22.0 37%
Paratype N. 6100 (T87a)	23.8	9.0	38%	10.7	45%	9.2 39%

Discussion. Distinguishing character of this species is the venter width; its wide curve runs up to the lateral nodes. W/D, including nodes, accounts for 58% in the holotype.

One large, even incomplete, specimen N. 6021 (T2m) (about 170 mm in diameter), seems to represent the gerontic stage of this new species. The section is slightly compressed; the venter is very wide and slightly convex. At the beginning of the last half whorl it still possesses rare ribs without nodes which rapidly vanish. In the inner whorls the ribs are strong and prominent with large nodes at the half-height sides. Ribs are missing on the venter and close to the umbilical seam.

The similar *A. balarama* Diener, 1895 shows slightly higher whorls, narrower umbilicus and periumbilical instead of lateral nodes: thus its section has its maximum width near the umbilicus; therefore it is not transversally elliptical.

A. haueri Arthaber, 1911 shows as well a very wide venter, but sides are already

subparallel when they reach the lateral nodes, which are set toward the umbilicus (Arthaber, 1914, fig. 12).

Occurrence. Ismidicum Zone of Kokaeli Peninsula.

Acrochordiceras bithynicum Arthaber, 1914

Pl. 9, fig. 4a, b; Text-fig. 11a

1914 *Acrochordiceras bithynicum* Arthaber, p. 179, pl. 14, fig. 2.

Material. 11 specimens: N. 6020 (T2), N. 6019 (T62, T63, T65, T69, T109, T160, T161).

Several specimens with whorl section initially depressed, then slightly compressed, subtrapezoidal. Venter narrowly rounded, with maximum width at the big and frequent periumbilical nodes. Ribs strong, rounded, originating from nodes; simple ribs are rare. Few specimens (T65 and T160) show a venter as wide as the specimen figured by Arthaber (1914); in all the others the venter is narrower.

This species, though showing similar ornamentation, differs from *A. fischeri* Mojsisovics (1882, p. 142, pl. 33, fig. 8) in nodes which are less prominent and more numerous.

Dimensions (in mm):

	D	H		W		U
N. 6019 (T65a)	49.0	23.0	47%	24.0	49%	15.3 31%

Occurrence. Ismidicum, Balatonicus and Trinodosus Zones of Kokaeli Peninsula.

Acrochordiceras halili Toula, 1896

Pl. 10, fig. 2a, b; Text-fig. 11b

1896 *Acrochordiceras halili* Toula, p. 168, pl. 19, fig. 10.

1905 *Acrochordiceras halili* - Frech, pl. 10, fig. 1.

1914 *Acrochordiceras halili* - Arthaber, p. 181, pl. 14, fig. 3, 4.

1934 *Acrochordiceras halili* - Spath, p. 398.

Material. 68 specimens: N. 6144 (T2, T59, T151, T162, T199, T201), N. 6145 (T37, T38, T39, T41, T42, T45, T52, T75, T97, T108, T114, T155, T163, T198, T213), N. 6143 (T54, T77, T122).

Many specimens, often incomplete. Whorl section variable throughout the ontogenesis, depressed to compressed: generally isodiametrical with a diameter of about 20 mm. Whorl section elliptical; ribs strong, nearly straight, with rare bifurcations at the periumbilical nodes, weak and rare.

Dimensions (in mm):

	D	H		W		U
N. 6145 (T37c)	15.0	6.0	40%	6.0	40%	- -
N. 6145 (T97a)	24.0	11.2	46%	11.5	47%	8.0 33%
N. 6145 (T97b)	49.5	22.0	44%	18.7	38%	14.0 28%
N. 6145 (T213b)	66.4	31.0	47%	24.6	37%	18.2 27%

Remarks. Some specimens, with the same ornamentation, show a somewhat different general shape; section in fact is still isodimensional when diameter is more than 50 mm, so that the whole shell looks thicker. Growth, besides, is slightly slower thus H/D is on the average a little lower.

Occurrence. Ismidicum and Balatonicus Zones of Kokaeli Peninsula.

Acrochordiceras haueri Arthaber, 1911

Pl. 10, fig. 1a, b, 3; Text-fig. 11e

1911 *Acrochordiceras haueri* Arthaber, p. 272.

1914 *Acrochordiceras haueri* - Arthaber, p. 182, pl. 14, fig. 5, 6.

1931 *Acrochordiceras haueri* - Renz, p. 57.

1934 *Acrochordiceras (Acrochordiceras) haueri* - Spath, p. 396.

Material. 21 specimens: N. 6053 (T2, T151, T199), N. 6054 (T41, T42, T73, T75, T97, T108, T127, T163, T164), N. 6055 (T65).

Some incomplete specimens. Whorl section from very to slightly depressed. Venter wide and sides flat. Ribs very strong, irregular, ventrally missing in large specimens; nodes rare, radially elongated; their maximum prominence is near the half side.

Occurrence. Anisian of Albany and Greece; Ismidicum and Trinodosus Zones of Kokaeli Peninsula.

Acrochordiceras sp. in Arthaber, 1914

1914 *Acrochordiceras* sp. ind. Arthaber, p. 180, pl. 14, fig. 1.

Material. 6 specimens: N. 6026 (T97), N. 6027 (T200).

Few, very incomplete large specimens. Whorl section subelliptical with subparallel sides and wide, rounded venter. Ribs very regular, like in *A. halili* Toula, but venter much wider. They possibly represent gerontic forms of *A. halili*.

Occurrence. Ismidicum Zone of Kokaeli Peninsula.

Genus *Epacrochordiceras* Spath, 1934

Type species: *Acrochordiceras portisi* Martelli, 1904

Epacrochordiceras pustericum (Mojsisovics, 1882)

Pl. 11, fig. 3a, b; Text-fig. 11c

1882 *Acrochordiceras pustericum* Mojsisovics, p. 143, pl. 6, fig. 4.

1896 *Acrochordiceras pustericum* - Arthaber, p. 180.

1914 *Acrochordiceras pustericum* - Arthaber, p. 183, pl. 14, fig. 7.

1927 *Acrochordiceras pustericum* - Gugenberger, p. 144.

1934 *Acrochordiceras* (*Epacrochordiceras*) *pustericum* - Spath, p. 402.

Material. 14 specimens: N. 6058 (T54, T62, T69, T77, T122, T161, T175, N. 6057 (T41, T97).

Numerous specimens from small to large sizes. Whorls compressed, subelliptical, high, with a narrow venter; small umbilicus. Ribs thin, slightly sinuous, almost always bifurcate, without nodes. Suture lines show saddles and lobes a little more frilled than in *Acrochordiceras*.

Occurrence. Balatonicus Zone of the Alps and Balkans and Kokaeli Peninsula.

Family *Balatonicidae* Spath, 1951

Genus *Cuccoceras* Diener, 1905

Type species: *Trachyceras cuccense* Mojsisovics, 1873

***Cuccoceras asseretoi* sp. n.**

Pl. 11, fig. 1a, b, 2a, b; Text-fig. 12c

Types. Holotype N. 6092 (T54a) from Balatonicus Zone (Pl. 11, fig. 1a, b). Paratype N. 6093 (T75c) from Upper Ismidicum Zone (Pl. 11, fig. 2a, b).

Collocation. Paleontological Museum of the Milan University.

Horizon and locality. Upper Ismidicum and Balatonicus Zones, Gebze, Kokaeli Peninsula, Turkey.

Diagnosis. Shell involute, compressed with section subelliptical in the inner whorls, then subrectangular. Constrictions frequent, 12 per whorl in adult specimens; periumbilical, rounded tubercles; from three to six irregular ribs between the constrictions. Simple, ceratitic suture line with large L.

Description. Two specimens of very different size. The smaller one [N. 6093 (T75c)] is an internal mould, slightly involute, compressed; the subelliptical section has weakly convex sides and narrow rounded venter. It shows seven constrictions per whorl, slightly adorally concave, but more projected near the venter. On the high umbilical wall, there are three rounded tubercles every two constrictions. Ribs, generally bifurcate and parallel to the constriction, originate from those tubercles; they also show a weak tubercle on the ventro-lateral shoulder.

The larger specimen [N. 6092 (T54c)] is more involute, with subrectangular section, nearly flat sides, wide and slightly rounded venter, more numerous and ventrally very deep constrictions (six in about a half whorl); between these latter there are from three to six irregular ribs, stronger on the ventro-lateral shoulder.

Suture line (Text-fig. 12c) shows saddles not frilled, high but narrow, slightly asymmetrical; E is shallow, L is large and deep with few irregular notches, U is shallow.

Dimensions (in mm):

	D		H		W		U	
Paratype N. 6093 (T75c)	27.5		10.8	39%	6.7	24%	9.5	35%
Holotype N. 6092 (T54a)	61.2		25.0	41%	18.5	30%	20.0	33%

Remarks. The larger specimen, lacking the inner whorls, represents the body chamber of an adult, on the contrary the smaller one has preserved the whole fragmone and a part of the body chamber. They possibly represent two different ontogenetic stages of the same species: H/D and U/D are comparable, while W/D is bigger in N. 6092 (T54a) so that also its venter is wider though showing an identical shape. The constrictions number increases in the last two whorls from four to seven in N. 6093 (T75c); as a consequence N. 6092 (T54a), whose diameter is larger, could have up to 11 constrictions. The number of ribs is the same in the two specimens.

This new species differs from the others similar ones because they show either lateral nodes (*C. carnicum* Arthaber, 1912) or more frequent constrictions [(*C. taramellii* (Mojsisovics, 1873) and *C. marinonii* (Mojsisovics, 1882)] or not ribs between constrictions [(*C. succense* (Mojsisovics, 1873)]. *C. yoga* Diener, 1907, though a similar ornamentation shows a slower growth, a larger umbilicus and a narrower shape.

Cuccoceras cf. succense (Mojsisovics, 1873)

Material. 1 specimen: N. 6139 (T69).

Only one fragment of evolute, compressed specimen with almost flat sides, narrow venter and wide umbilicus. Numerous constrictions, about 5 per 1/4 whorl, sinuous and umbilical nodes (Mojsisovics, 1873, p. 429, pl. 13, fig. 1).

Occurrence. Balatonicus Zone of the Alps and Kokaeli Peninsula.

Genus *Balatonites* Mojsisovics, 1879

Type species: *Trachyceras balatonicus* Mojsisovics, 1873

Balatonites balatonicus (Mojsisovics, 1873)

Pl. 11, fig. 5

1873 *Trachyceras balatonicum* Mojsisovics, p. 426, pl. 13, fig. 3, 4.

1882 *Balatonites balatonicus* - Mojsisovics, p. 78, pl. 4, fig. 2 - 6; pl. 30, fig. 20.

1896 *Balatonites balatonicus* - Arthaber, p. 60, pl. 6, fig. 2.

1912 *Balatonites balatonicus* - Arthaber, p. 350, pl. 17, fig. 7.

1958 *Balatonites balatonicus* - Popow, Kiparisova & Robinson, pl. 10, fig. 3 (*pars*).

1966 *Balatonites balatonicus* - Assereto, p. 597, pl. 39, fig. 2.

1986 *Balatonites balatonicus* - Gu, He & Wang, p. 353, fig. 7, pl. 2, fig. 26, 27.

Material. 1 specimen: N. 6075 (T63).

Only one fragment. Whorl compressed with almost flat sides and fastigate venter; ribs are both primary and intercalatory, dense, weakly sinuous, with periumbilical, lateral, marginal and ventral tubercles. Only primary ribs show at about 2/3 the whorl height, very weak tubercles which are consequently set between the lateral and marginal ones.

Occurrence. Balatonicus Zone of the Alps, Hungary, Balkans and Tibet and Kokaëli Peninsula.

Balattonites aff. ottonis (Buch, 1848)

Pl. 11, fig. 4

1914 *Balattonites* cf. *ottonis* Arthaber, p. 129, pl. 12, fig. 7.

Material. 14 specimens: N. 6067 (T63, T160, T161, T171).

Some fragments with low whorl section even when diameter is large; whorl section is slightly higher than wide, with almost flat sides and venter large and fastigate. Ribs strong, sharp, regular on the inner whorls with homogeneously placed intercalatory, which are less common in the outer whorls. Periumbilical and lateral tubercles are weak, while marginal ones are prominent and rounded.

Remarks. The general shape must have been a serpenticone with a large umbilicus and slow growth. This is probably a new species differing from *B. ottonis* (Buch, 1849, p. 18, pl. 4, fig. 4-6) in the general shape, more evolute and in the ornamentation, stronger but less dense.

Occurrence. Binodosus Zone of the Alps, Balkans, and Balatonicus Zone of Kokaëli Peninsula.

Balattonites sp. in Arthaber, 1914

Pl. 11, fig. 6

1914 *Balattonites* sp. ind. (A) Arthaber, p. 130, pl. 12, fig. 8.

Material. 3 specimens: N. 6046 (T161).

Three fragments, closely related to the specimen figured by Arthaber (1914, pl. 12, fig. 8) as *Balattonites* sp. ind. A, showing a very slow growth like *B. ottonis*, but a more frequent and weaker ornamentation with hardly visible tubercles. They probably belong to a new species.

Occurrence. Balatonicus Zone of Kokaëli Peninsula.

Family *Ceratitidae* Mojsisovics, 1879

Genus *Anagymnotoceras* McLearn, 1966

Type species: *Gymmotoceras varium* McLearn, 1948

Anagymnotoceras ismidicum (Arthaber, 1914)

Pl. 11, fig. 7-9; Pl. 12, fig. 1

1914 *Ceratites* (*Hollandites*) *ismidicus* Arthaber, p. 126, pl. 12, fig. 6.

1972 *Anagymnotoceras ismidicus* - Tozer, p. 31, pl. 6, fig. 1; text-fig. 2c.

Material. 137 specimens: N. 6022 (T37, T39, T40, T42, T43, T46, T47, T52, T70, T73, T74, T75, T76, T94, T97, T104, T108, T111, T163, T198, T215).

Shell moderately involute, with inner whorls compressed and sides nearly flat, venter slightly wide and rounded, umbilicus medium sized with umbilical slope. Ornamentation consists of strong and sinuous ribs, almost always bifurcate at the lateral nodes and ending on the ventro-lateral shoulder with a series of weak marginal nodes. Body chamber with very wide venter and high umbilical wall; ribs very strong, lowering ventrally, where marginal tubercles are missing.

Dimensions (in mm):

	D	H	W	U
N. 6022 (T75ba)	51.5	22.5 44%	13.4? 26%	14.2 28%
N. 6022 (T75bb)	64.5	30.0 46%	18.5 28%	14.5 23%

Occurrence. Upper Ismidicum Zone of Kokaeli Peninsula and Anarak Region (Central Iran).

Genus *Nicomedites* Toula, 1896

Type species: *Nicomedites osmani* Toula, 1896

Nicomedites barbarossae (Toula, 1896)

Pl. 12, fig. 2a, b

- 1896 *Koninckites barbarossae* Toula, p. 177, pl. 21, fig. 10.
 1896 *Nicomedites prusiae* Toula, p. 181, pl. 22, fig. 4.
 1896 *Nicomedites mitbridatis* Toula, p. 180, pl. 22, fig. 3.
 1896 *Beyrichites omari* Toula, p. 173, pl. 21, fig. 9.
 1896 *Beyrichites kazmaliensis* Toula, p. 172, pl. 21, fig. 8.
 1896 *Beyrichites fritschi* Toula, p. 173, pl. 21, fig. 7.
 1905 *Beyrichites barbarossae* - Frech, pl. 10, fig. 9.
 1914 *Beyrichites barbarossae* - Arthaber, p. 117, pl. 11, fig. 5-7.
 1934 *Nicomedites barbarossae* - Spath, p. 410.
 1986 *Nicomedites barbarossae* - He & Wang, p. 221, pl. 7, fig. 7-9.
 1986 *Nicomedites* sp. He, Wang & Chen, p. 223, pl. 7, fig. 14-18; text-fig. 23.

Material. 57 specimens: N. 6052 (T10, T14, T15, T16, T22, T23, T25, T36, T55, T56, T93, T317).

Several specimens with subovoidal, compressed section; umbilicus becomes wider during growth. Ribs are always weak, dense and sinuous (see *N. osmani*).

Dimensions (in mm):

	D	H	W	U
N. 6052 (T22a)	40.7	21.0 52%	11.3 28%	7.0? 12%
N. 6052 (T23b)	50.5	26.5 52%	16.7 33%	8.0 16%
N. 6052 (T22h)	52.0	26.0 50%	13.5 33%	- -
N. 6052 (T23a)	72.1	38.9 54%	22.0 31%	9.2 12%

Occurrence. Osmani Zone of Kokaeli Peninsula and China.

Nicomedites osmani Toulou, 1896

Pl. 12, fig. 3a, b

- 1896 *Nicomedites osmani* Toulou, p. 182, pl. 22, fig. 6-11.
 1896 *Nicomedites abu-bekeri* Toulou, p. 181, pl. 22, fig. 5.
 1896 *Koninckites saladini* Toulou, p. 179, pl. 22, fig. 2.
 1896 *Koninckites hannibalis* Toulou, p. 179, pl. 22, fig. 1.
 1905 *Beyrichites osmani* - Frech, pl. 10, fig. 2, 3.
 1914 *Beyrichites osmani* - Arthaber, p. 118, pl. 11, fig. 8-10.
 1934 *Nicomedites osmani* - Spath, p. 409, fig. 140.
 1984 *Nicomedites osmani* - Wang, pl. 64, fig. 26-28.
 1986 *Nicomedites osmani* - He, Wang & Chen, p. 222, pl. 8, fig. 7-9; text-fig. 23.

Material. 67 specimens: N. 6051 (T1, T10, T12, T14, T15, T16, T17, T18, T22, T23, T25, T26, T28, T36, T55, T56, T93, T317).

Shell moderately involute and compressed; whorl section subovoidal with maximum width at the inner third of the whorl height. Ornaments of strong nearly straight ribs, thinner and weakly sinuous in the inner whorls. Suture with high saddles, frilled on the sides, and deep lobes.

Dimensions (in mm):

	D	H		W		U
N. 6051 (T10a)	76.7	37.3	49%	22.0	29%	-

Remarks. The difference between this species and the similar *N. barbarossae* (Toulou) is not always evident in the juvenile specimens. In the *N. osmani* adult specimens ribs are stronger and straight, but in *N. barbarossae* ribs are always weak and slightly sinuous.

Occurrence. Osmani Zone of Kokaeli Peninsula and China.

Nicomedites toulai (Arthaber, 1914)

Pl. 12, fig. 4a, b

- 1914 *Aspidites toulai* Arthaber, p. 114, pl. 11, fig. 3, 4.
 1934 *Nicomedites toulai* - Spath, p. 411.
 1972 *Nicomedites* cf. *toulai* Tozer, p. 31, fig. 4A; pl. 10, 14a, b.

Material. 90 specimens: N. 6064 (T18, T32), N. 6065 (T2, T29, T33, T153, T200), N. 6066 (T37, T38, T39, T40, T42, T43, T45, T46, T52, T70, T72, T73, T74, T75, T76, T94, T97/3, T102, T111, T163, T164, T213, T215).

Numerous compressed and deformed specimens, with lanceolate section, small umbilicus and very weak radial ribs. Suture shows frilled saddles, except for the ending; E deep, E/L high and narrow, L a little deeper than E, L/U higher and stouter than E/L.

Remarks. In the phragmocone internal moulds, the venter, always very thin, is tabulate. Then the general shape is recalling that of the genus *Norites*, but with a different suture line.

Occurrence. Middle Anisian of Anarak Region (Central Iran) and Upper Osmani and Ismidicum Zones of Kokaeli Peninsula.

Genus *Hollandites* Diener, 1905

Type species: *Ammonites voiti* Oppel, 1863

***Hollandites asseretoi* sp. n.**

Pl. 13, fig. 1, 2a, b; Text-fig. 12f

Types. Holotype N. 6108 (T163b) (Pl. 13, fig. 1). Paratypes 10: N. 6110 (T40), N. 6112 (T42) (Pl. 13, fig. 2a, b), N. 6114 (T46), N. 6109 (T75), N. 6111 (T76), N. 6113 (T104) from Upper Ismidicum Zone; N. 6119 (T59) from Lower Ismidicum Zone.

Collocation. Paleontological Museum of Milan University.

Horizon and locality. Ismidicum Zone of Gebze, Kokaeli Peninsula, Turkey.

Diagnosis. Shell compressed, involute, with subelliptical section; umbilicus deep. Ribs weak, sinuous, simple or, more often, bifurcate at the lateral tubercles. Suture line subceratitic.

Description. Subelliptical section with weakly convex sides and narrowly rounded venter. Umbilicus deep, with well evident umbilical shoulder. Ornamentation consists of weak ribs, ventrally stronger, subfalcoïd, often bifurcate at the lateral tubercles, which are very prominent and rounded. In the suture line the first two saddles are high and frilled on the sides, entire on the ending; L is large and deep, U is divided in small lobes.

Dimensions (in mm):

	D	H	W	U
Paratype N. 6114 (T46a)	22.9	11.5 50%	7.9 34%	4.5 20%
Paratype N. 6112 (T42g)	33.3	16.4 49%	9.8 29%	5.7 17%
Holotype N. 6108 (T163b)	36.0	15.8? 44%	10.4 29%	- -

Discussion. This *Hollandites* species differs from the others of this genus in very evident lateral tubercles; moreover there is no trace of periumbilical or ventral tuberculation.

Genus *Paraceratites* Hyatt, 1900

Type species: *Ceratites elegans* Mojsisovics, 1882

***Paraceratites binodosus* (Hauer, 1850)**

Pl. 13, fig. 7

1850 *Ammonites* (*Ceratites*) *binodosus* Hauer, p. 114, pl. 19, fig. 1-4.

1882 *Ceratites binodosus* - Mojsisovics, p. 19, pl. 11, fig. 1-4.

1904 *Ceratites binodosus* - Martelli, p. 86, pl. 5, fig. 7.

1914 *Ceratites binodosus* - Arthaber, p. 121, pl. 12, fig. 1, 2.

1934 *Paraceratites binodosus* - Spath, p. 435.

Material. 18 specimens: N. 6076 (T63, T69, T161, T171, T174).

Shell involute and compressed, whorl section subrectangular, both bifurcate and intercalatory ribs with lateral and marginal nodes: these latter are often more than twice the lateral ones.

All the specimens coming from Gebze show more close ornamentation than those from the Southern Alps; in particular marginal nodes are more numerous. Anyway this is the only different character: the general shape is perfectly the same.

Dimensions (in mm):

	D	H		W		U	
N. 6076 (T161a)	39.2	19.7	50%	10.2?	27%	6.9	19%
N. 6076 (T161b)	24.5	10.0	40%	-	-	8.0	32%

Remarks. The attribution of this species to the genus *Paraceratites* was questioned by Assereto (1972) and Tozer (1981). A careful analysis of ornamentation and suture of the studied specimens and of those from Dont, the *P. binodosus* type locality, did not show characters different enough to support a new identification at generic level.

Occurrence. Binodosus Horizon of the Alps, Balkans and Kokaëli Peninsula.

Family *Sturiidae* Kiparisova, 1958

Genus *Sturia* Mojsisovics, 1882

Type species: *Amaltheus sansovinii* Mojsisovics, 1869

Sturia sansovinii (Mojsisovics, 1869)

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

1882 *Sturia sansovinii* - Mojsisovics, p. 241, pl. 49, fig. 6, 7; pl. 50, fig. 1.

1895 *Sturia sansovinii* - Diener, p. 61, pl. 15.

1904 *Sturia sansovinii* - Martelli, p. 102, pl. 6, fig. 5.

1913 *Sturia sansovinii* - Simionescu, p. 338, pl. 7, fig. 8; text-fig. 69.

1914 *Sturia sansovinii* - De Toni, p. 167, pl. 13, fig. 1, 2.

1981 *Sturia* sp. ind. - Fantini Sestini, p. 53, pl. 5, fig. 1.

1986 *Sturia sansovinii* - Shevryev, fig. 42.

Material. 13 specimens: N. 6031 (T16, T22, T23, T35, T36), N. 6032 (T161, T174).

Some fragmentary specimens, medium and large sized, with typical lanceolate whorl section; ornamentation consists of large spiral striae, which are flat and well spaced near the umbilicus, but thin and hardly visible on the external part of the sides.

Suture line is complex, poorly preserved.

Occurrence. Anisian and Ladinian of the Alps, Bosnia, Serbia, Greece and Himalaya, and Osmani and Balatonicus Zones of Kokaëli Peninsula.

Sturia yalakensis (Arthaber, 1914)

Pl. 13, fig. 3a, b, 4a-c; Text-fig. 12a, b

1914 *Procladiscites yalakensis* Arthaber, p. 176, pl. 17, fig. 12a-c.

Material. 5 specimens: N. 6047 (T20, T125, T199), N. 6048 (T52).

Few specimens with elliptical and compressed section; sides weakly convex and venter rounded at small diameter; during the growth the shape become more lanceolate. Umbilicus deep and rather large; periumbilical folds weak. Suture with bifid L, high saddles with phylloid endings.



Fig. 12 - Suture lines. a) *Sturia yalakensis* (Arthaber) (N. 6047, T20b; D: 30 mm); b) *Sturia yalakensis* (Arthaber) (N. 6047, T125; D: 16 mm); c) *Cuccoceras asseretoi* sp. n. (Paratype, N. 6093, T75c; D: 19 mm); d) *Acrochordiceras asseretoi* sp. n. (Holotype, N. 6095, T107a; D: 51.5 mm); e) *Iskulites asseretoi* sp. n. (Holotype, N. 6101, T37a; D: 12.8 mm); f) *Hollandites asseretoi* sp. n. (Holotype, N. 6108, T163b; H: 9 mm).

Dimensions (in mm):

	D	H	W	U
N. 6047 (T20a)	16.0	9.3 58%	6.2 39%	1.7 11%
N. 6047 (T199)	30.8	18.3 60%	10.5 31%	3.4 11%
N. 6047 (T20b)	31.6	18.0 56%	10.5 33%	3.5 11%

Remarks. The smallest specimens (T20a, T125) are perfectly similar in shape and dimensions to the one figured by Arthaber (1914) for his new species *Procladiscites yalakensis*. Suture line, instead, has not been correctly figured (Fig. 12c). The attribution to *Procladiscites* seems to be doubtful because section, even at large diameter, is not rectangular and spiral ornamentation is missing, while periumbilical folds are present. However all the known specimens are only preserved as internal moulds. Suture shows E with median saddle wide and complex and L bifid, E/L always smaller than L/U₁, with a lateral branch which is ventrally very wide, appearing during the growth. This suture (as a whole), appears very much like the one of *Sturia semiarata* Mojsisovics (1882, pl. 48, fig. 8c). For this reason it seems right to ascribe Arthaber's species to *Sturia* itself. It must however be distinct from *Sturia mohamedi* Toulou (1896, p. 174, pl. 20, fig. 8), which differs in the suture and in the much more evident radial folds. The distinction from *S. semiarata* is less obvious since both suture and general shape are very similar; specimens coming from Bithynia however, show a less compressed section as well a larger umbilicus.

Occurrence. Ismidicum Zone of Kokaeli Peninsula.

Genus *Discoptychites* Diener, 1916

Type species: *Ammonites megalodiscus* Beyrich, 1867

***Discoptychites pauli* (Mojsisovics, 1882)**

1882 *Ptychites pauli* Mojsisovics, p. 251, pl. 62, fig. 2.

1913 *Ptychites pauli* - Simionescu, p. 341, pl. 4, fig. 1.

1914 *Ptychites pauli* - Arthaber, p. 144, pl. 13, fig. 2.

1963 *Discoptychites pauli* - Assereto, p. 79, pl. 11, fig. 4.

Material. 13 specimens: N. 6090 (T54, T62, T63, T66, T159, T161, T173, T175).

Some very poorly preserved specimens with large umbilicus and high umbilical wall; sides converge toward venter, which is narrowly rounded.

Occurrence. Upper Anisian of the Alps; Anisian of Dobrugia, Dinarids; Balatonicus and Trinodosus Zones of Kokaeli Peninsula.

***Discoptychites cf. seebachi* (Mojsisovics, 1882)**

Material. 3 specimens: N. 6091 (T161).

Some poorly preserved specimens with ventrally narrower section and weak and right ribs, as in *D. seebachi* (Mojsisovics) (1882, p. 249, pl. 67, fig. 7; pl. 70, fig. 2).

Occurrence. This species occurs in the Trinodosus Zone from the Alps to Greece and, perhaps, in the Balatonicus Zone of Kokaëli Peninsula.

Family *Gymnitidae* Waagen, 1895

Genus *Gymnites* Mojsisovics, 1882

Type species: *Ammonites incultus* Beyrich, 1867

Gymnites toulai Arthaber, 1914

1914 *Gymnites toulai* Arthaber, p. 150, pl. 17, fig. 4, 5.

Material. 18 specimens: N. 6060 (T22, T23, T56, T93), N. 6062 (T19, T33, T203), N. 6061 (T52, T70, T75, T163), N. 6063 (T54, T62).

Several specimens, generally incomplete, medium and small sized: the maximum diameter is 70 mm.

Occurrence. From Osmani to Balatonicus Zone of Kokaëli Peninsula.

Family *Iscolitidae* Spath, 1951

Genus *Iscolites* Mojsisovics, 1886

Type species: *Clydonites hauerinus* Stoliczka, 1865

Iscolites asseretoi sp. n.

Pl. 14, fig. 4a, b, 6a, b; Text-fig. 12e

Types: Holotype N. 6101 (T37a) (Pl. 14, fig. 4a, b); Text-fig. 12e. Paratypes N. 6103 (T22), N. 6102 (T24), N. 6105 (T37b) (Pl. 14, fig. 6a, b), N. 6106 (T93), N. 6104 (T97), N. 6107 (T108).

Collocation. Paleontological Museum of the Milan University.

Horizon and locality. Holotype N. 6101 (T37a) and Paratypes N. 6104 (T97), N. 6105 (T37b), N. 6107 (T108) from Upper Ismidicum Zone; Paratypes N. 6102 (T24), N. 6103 (T22), N. 6106 (T93) from Osmani Zone, Gebze, Kokaëli Peninsula, Turkey.

Diagnosis. Shell small sized, globular; section depressed, with maximum width near the umbilicus which is narrow and deep; venter arched even when the body chamber is slightly uncoiled. Constrictions wide and rather deep, slightly sinuous, four per whorl. Suture simple: E with a wide middle saddle; three subequal saddles slightly denticulate, almost entire to the ending; there are at least two other small saddles near the umbilical seam; lobes irregularly serrated.

Dimensions (in mm):

	D	H	W	U
Paratype N. 6107 (T108)	23.0	10.2	44%	18.6 81%
Holotype N. 6101 (T37a)	13.8	6.5	47%	11.7 85%
Paratype N. 6103 (T22u)	8.8	4.2	48%	7.6 86%

Remarks. Among here considered specimens are also two very incomplete ones [N. 6107 (T108) and N. 6106 (T93)] of about 23 mm in diameter, likely belonging to this

new species. Their outer whorl is represented by the body chamber, which shows the same section as the internal whorls.

This species can be distinguished from *I. hauerinus* (Stoliczka, 1865), as figured by Diener (1895, p. 39, pl. 27, fig. 3; pl. 31, fig. 11), because the venter is not narrowly rounded in the large specimens. In *I. asseretoi*, on the other hand, the little saddle of E is better characterized and the first saddle is slightly frilled also on the ventral side while all the other saddle endings are more rounded. The similar *I. middlemissi* Diener (1913, p. 64, pl. 10, fig. 1) shows a larger umbilicus; its suture has narrower and simpler lobes (L most of the all); furthermore, the first saddle has a straight ventral side.

Family *Ptychitidae* Mojsisovics, 1882

Genus *Ptychites* Mojsisovics, 1875

Type species: *Ammonites rugifer* Mojsisovics, 1875

Ptychites cf. opulentus Mojsisovics, 1882

Material. 3 specimens: N. 6081 (T161, T171).

Three medium sized specimens (60/67 mm in diameter) with from depressed to compressed section during the growth and relatively small umbilicus. Strong, rounded ribs, more evident on the body chamber, as in *P. opulentus* Mojsisovics (1882, p. 259, pl. 73, fig. 1-4). These specimens are rather similar to those figured by Pelosio (1973, pl. 19, fig. 1, 3).

Occurrence. Anisian of the Alps, Dinarids, Greece and, perhaps, Balatonicus Zone of Kokaeli Peninsula.

Genus *Flexoptychites* Spath, 1951

Type species: *Ptychites flexuosus* Mojsisovics, 1882

Flexoptychites flexuosus (Mojsisovics, 1882)

Pl. 13, fig. 6

- 1882 *Ptychites flexuosus* Mojsisovics, p. 261, pl. 63, fig. 2-8; pl. 64, fig. 1-3; pl. 66, fig. 2, 3.
 1968 *Flexoptychites flexuosus* - Venzo & Pelosio, p. 127, pl. 16, fig. 18; pl. 17, fig. 9 (*cum syn.*).
 1973 *Flexoptychites flexuosus* - Pelosio, p. 162, pl. 21, fig. 5.
 1981 *Flexoptychites flexuosus* - Casati et al., p. 429, pl. 32, fig. 1.

Material. 26 specimens: N. 6086 (T63, T64, T66, T69, T159, T174).

Several small and large sized specimens, often deformed or incomplete, very thin because preserved as internal moulds. Suture and ornamentation always clearly visible.

Occurrence. Upper Anisian and Ladinian of the Alps, Balkans, Dobrugia and Trinodosus Zone of Kokaeli Peninsula. Here some specimens have been also collected in debris of Balatonicus Zone.

Family *Longobarditidae* Spath, 1951Genus *Grambergia* Popov, 1961Type species: *Grambergia taymirensis* Popov, 1961***Grambergia ? solimani* (Toula, 1896)**

- 1896 *Hungarites solimani* Toula, p. 176, pl. 21, fig. 3, 4.
 1896 *Hungarites proponticus* Toula, p. 176, pl. 21, fig. 5, 6.
 1905 *Hungarites solimani* - Frech, pl. 10, fig. 4.
 1905 *Hungarites proponticus* - Frech, pl. 10, fig. 3.
 1914 *Hungarites solimani* - Arthaber, p. 112, pl. 11, fig. 1, 2.
 1951 *Hungarites solimani* - Spath, p. 17.
 1951 *Hungarites proponticus* - Spath, p. 17.
 1972 "*Hungarites*" cf. "*H. proponticus*" - Tozer, pp. 31, 34, fig. 3C; pl. 5, fig. 4a, b.

Material. 8 specimens: N. 6068 (T10, T14, T22, T36, T93).

Some very incomplete specimens, perfectly corresponding to the ones figured by Toula (1896) and Arthaber (1914).

Remarks. As already pointed out by Tozer (1972) and Assereto (1974), the attribution to *Hungarites* Mojsisovics, 1879 is not correct. Unfortunately the poor preservation of our specimens does not allow a complete understanding of this species: the body chamber infact is always missing. Thus the generic attribution is still uncertain.

Nonetheless a look to the observable morphological characters (general shape tending to oxicone, weak keel and ceratitic suture) would confirm the attribution to *Grambergia* Popov, 1961, from the Lower Anisian of the Arctic and East Pacific.

The distinction between *H. solimani* and the closely related *H. proponticus* Toula is long been a matter of debate. The differences in the suture seemed to be due either to the kind of preservation or to individual differences, also involving ontogenetic stages. It seems reasonable ascribing all the specimens to *G. ? solimani*, the species firstly described by Toula.

Occurrence. Lower or Middle Anisian of Anarak Region (Central Iran) and Lower Osmani Zone of Kokaeli Peninsula.

Family *Cladiscitidae* Zittel, 1884Genus *Phyllocladiscites* Mojsisovics, 1902Type species: *Procladiscites crassus* Hauer, 1888***Phyllocladiscites proponticus* (Toula, 1896)**

Pl. 14, fig. 7a, b, 8a, b

- 1896 *Procladiscites proponticus* Toula, p. 170, pl. 20, fig. 12.
 1914 *Procladiscites proponticus* - Arthaber, p. 175, pl. 15, fig. 8.
 1915 *Procladiscites (Phyllocladiscites) proponticus* - Diener, p. 229.

Material. 20 specimens: N. 6069 (T22, T23, T60, T102, T141, T317), N. 6072 (T19, T29, T33), N. 6071 (T42, T45, T52, T76, T164), N. 6070 (T62, T64, T160, T173).

Several often incomplete specimens of various size, generally preserved as internal moulds. Shell involute with flattened sides, venter large and flat, ventro-lateral shoulder well evident. Pseudomorph shell is thin near the umbilicus, thicker ventrally; its surface is slightly strigate; folds are very weak, prorsiradiate, adorally concave on the sides, but more prominent and adorally convex on the venter. Suture line shows typical phylloid saddle endings.

Dimensions (in mm):

	D	H	W	U
N. 6072 (T29a)	10.3	5.7 55%	6.5 63%	- -
N. 6071 (T52h)	24.5	13.1 53%	14.9 61%	1.6 6%
N. 6069 (T317a)	27.8	14.5 53%	16.2 60%	1.7 6%

Occurrence. From Osmani to Trinodosus Zone of Kokaeli Peninsula.

Family *Arcestidae* Mojsisovics, 1875

Genus *Proarcestes* Mojsisovics, 1893

Type species: *Arcestes bramantei* Mojsisovics, 1869

***Proarcestes bramantei* (Mojsisovics, 1869)**

Pl. 13, fig. 5

1869 *Arcestes bramantei* Mojsisovics, p. 575, pl. 16, fig. 1; pl. 19, fig. 4.

1875 *Arcestes bramantei* - Mojsisovics, p. 112, pl. 58, fig. 16, 19.

1882 *Arcestes bramantei* - Mojsisovics, p. 161, pl. 46, fig. 3- 6.

1899 *Proarcestes bramantei* - Tommasi, p. 36, pl. 5, fig. 6.

1904 *Proarcestes bramantei* - Martelli, p. 92, pl. 3, fig. 1, 2.

1914 *Proarcestes bramantei* - Arthaber, p. 171, pl. 15, fig. 7.

Material. 19 specimens: N. 6082 (T63, T69, T122, T160, T161, T171, T175), N. 6134 (T39, T45, T163).

Numerous specimens, poorly preserved, very incomplete with funnel-shaped umbilicus and wide venter. Constrictions present on inner whorls and body chamber, slightly sinuous.

Occurrence. Middle and Upper Anisian of the Alps, Balkans and Greece; Upper Ismidicum and Balatonicus Zones of Kokaeli Peninsula.

***Proarcestes cf. escheri* (Mojsisovics, 1875)**

Material. 6 specimens: N. 6077 (T63, T69, T77, T122, T161).

Inner whorls of some deformed specimens, preserved as internal moulds, without constrictions, quite similar to *P. escheri* Mojsisovics (1875, p. 112, pl. 5, fig. 18).

Occurrence. Trinodosus Zone of the Alps and Dinarids and Balatonicus Zone of Kokaeli Peninsula.

Proarcestes sp. ind.

Material. 13 specimens: N. 6131 (T37, T73, T97, T104, T215), N. 6132 (T69, T158, T161, T171, T174, T175).

Numerous small and medium sized specimens, poorly preserved with depressed section and relatively wide umbilicus. Slightly sinuous constrictions on the inner whorls, rare but deeper on the outer whorls. These specimens differ from the representatives of *P. bramantei* (Mojsisovics) because their less depressed section and larger umbilicus.

Occurrence. Upper Ismidicum and Balatonicus Zones of Kokaeli Peninsula.

Order Phylloceratida

Family *Ussuritidae*Genus *Leiophyllites* Diener, 1915

Type species: *Monophyllites suessi* Mojsisovics, 1882

***Leiophyllites confucii* (Diener, 1895)**

Pl. 14, fig. 2

- 1895 *Monophyllites (Leiophyllites) confucii* Diener, p. 107, pl. 30, fig. 7.
 1896 *Monophyllites* cf. *suessi* Toulou, p. 171, pl. 20, fig. 7.
 1903 *Monophyllites (Leiophyllites) confucii* - Frech, p. 17, fig. 4.
 1907 *Monophyllites (Monophyllites) confucii* - Diener, p. 103, pl. 13, fig. 10.
 1914 *Monophyllites confucii* - Arthaber, p. 151, pl. 13, fig. 6.
 1928 *Monophyllites suessi* var. *confucii* - Renz, p. 155.
 1931 *Monophyllites (Leiophyllites) confucii* - Renz, p. 57.
 1976 *Leiophyllites confucii* - Wang & He, p. 429, pl. 47, fig. 5; text-fig. 73f.

Material. 55 specimens: N. 6033 (T22, T23), N. 6034 (T11, T19, T33), N. 6037 (T37, T38, T40, T52, T73, T75, T76, T103, T155, T198, T215), N. 6036 (T62, T63, T65, T69, T157, T159, T160, T161, T174, T175).

Several specimens, perfectly similar to the figured types: their growth is characteristic because it is very slow even when diameter is large, moreover the elliptical section is very compressed.

Occurrence. Anisian of Hungary, Greece, Himalaya, and from Osmani Zone to Trinodosus Zone of Kokaeli Peninsula.

***Leiophyllites* sp. aff. *pitamaha* in Tozer, 1972**

Pl. 14, fig. 5

A single small specimen, very compressed, with fairly fast growth. Suture with an L nearly as wide as U₂.

It probably belongs to a new species, which should also include the Anarak (Central Iran) specimen.

Occurrence. *Gymmites* Beds (Middle Anisian) of Anarak Region (Central Iran) and Upper Ismidicum Zone of Kokaeli Peninsula.

Genus *Monophyllites* Mojsisovics, 1879

Type species: *Ammonites sphaerophyllus* Hauer, 1850

Monophyllites anatolicus Toulou, 1896

Pl. 14, fig. 1

1896 *Monophyllites anatolicus* Toulou, p. 170, pl. 20, fig. 5.

1914 *Monophyllites anatolicus* - Arthaber, p. 152, pl. 16, fig. 12.

Material. 11 specimens: N. 6084 (T22), N. 6085 (T40, T52, T72, T75, T163), N. 6083 (T77, T161).

Several specimens, more or less incomplete, perfectly similar to the specimen figured by Arthaber (pl. 16, fig. 12). Sides slightly convex, venter wide and rounded, umbilical wall high and rounded. The specimens show a smooth surface with only some rare constrictions. Suture with L very wide and trifurcate while U₂, though almost as deep, is much narrower.

Occurrence. From Osmani Zone to Balatonicus Zone of Kokaeli Peninsula.

Monophyllites kieperti Toulou, 1896

Pl. 14, fig. 3

1896 *Monophyllites kieperti* Toulou, p. 170, pl. 20, fig. 6.

1972 *Monophyllites kieperti* - Tozer, p. 32, pl. 10, fig. 10a, b; text-fig. 4E, F.

Material. 5 specimens: N. 6043 (T73, T75, T76, T163, T215).

Few specimens very poorly preserved with rounded section, large umbilicus, weak ornamentation on the inner whorls.

This species differs from the preceding one in the ornamentation and more evolute form.

Occurrence. Middle Anisian of Anarak Region (Central Iran) and Upper Ismidicum Zone of Kokaeli Peninsula.

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PLATE 9

- Fig. 1 - *Ismidites marmarensis* Arthaber. Gebze, N. 6045 (T39a). Side; x 1.
- Fig. 2a-c - *Megaphyllites gebzensis* sp. n. Gebze. Holotype, N. 6121 (T75h). Respectively: a) side, b) venter, c) front; x 1.5.
- Fig. 3a-c - *Megaphyllites procerus* Arthaber. Gebze, N. 6118 (T63a). Respectively: a) side, b) front, c) venter; x 1.5.
- Fig. 4a,b - *Acrochordiceras bihyemicum* Arthaber. Gebze, N. 6019 (T65a). Respectively: a) venter, b) side; x 1.
- Fig. 5a-c - *Acrochordiceras asseretoi* sp. n. Gebze. Holotype, N. 6095 (T107a). Respectively: a) side, b) front, c) venter; x 1.

PLATE 10

- Fig. 1a,b - *Acrochordiceras haueri* Arthaber. Gebze, N. 6054 (T42a). Respectively: a) side, b) venter; x 1.
- Fig. 2a,b - *Acrochordiceras halili* Toulou. Gebze, N. 6145 (T213a). Respectively: a) side, b) venter; x 1.
- Fig. 3 - *Acrochordiceras haueri* Arthaber. Gebze, N. 6054 (T97m). Side; x 1.

PLATE 11

- Fig. 1a,b - *Cuccoceras asseretoi* sp. n. Gebze. Holotype, N. 6092 (T54a). Respectively: a) side, b) venter; x 1.
- Fig. 2a,b - *Cuccoceras asseretoi* sp. n. Gebze. Paratype, N. 6093 (T75c). Respectively: a) venter, b) side; x 1.
- Fig. 3a,b - *Epacchordiceras pustericum* (Mojsisovics). Gebze, N. 6058 (T122a). Respectively: a) venter, b) side; x 1.
- Fig. 4 - *Balatonites* aff. *otomis* (Buch). Gebze, N. 6067 (T161l). Side; x 1.
- Fig. 5 - *Balatonites balatonicus* (Mojsisovics). Gebze, N. 6075 (T63c). Side; x 1.
- Fig. 6 - *Balatonites* sp. in Arthaber. Gebze, N. 6046 (T161m). Side; x 1.
- Fig. 7 - *Anagymnotoceras ismidicum* (Arthaber). Gebze, N. 6022 (T75ba). Side; x 1.
- Fig. 8 - *Anagymnotoceras ismidicum* (Arthaber). Gebze, N. 6022 (T75bb). Side; x 1.
- Fig. 9 - *Anagymnotoceras ismidicum* (Arthaber). Gebze, N. 6022 (T74a). Side; x 1.

PLATE 12

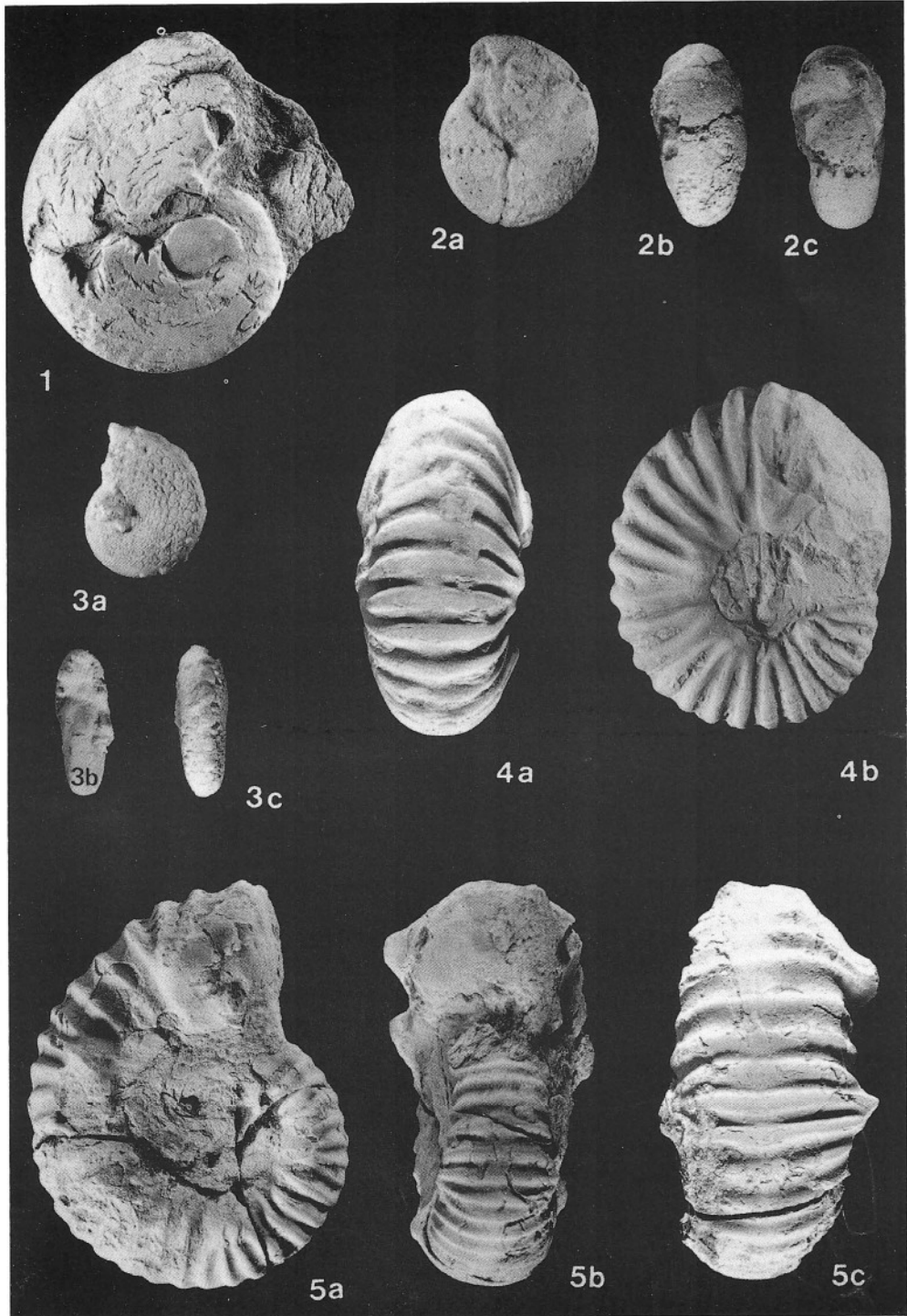
- Fig. 1 - *Anagymnotoceras ismidicum* (Arthaber). Gebze, N. 6022 (T163a). Side; x 1.
 Fig. 2a,b - *Nicomedites barbarossae* (Toula). Gebze, N. 6052 (T22h). Respectively: a) side, b) venter; x 1.
 Fig. 3a,b - *Nicomedites osmani* Toula. Gebze, N. 6051 (T10a). Respectively: a) side, b) venter; x 1.
 Fig. 4a,b - *Nicomedites toulai* (Arthaber). Gebze, N. 6066 (T70g). Respectively: a) side, b) venter; x1.

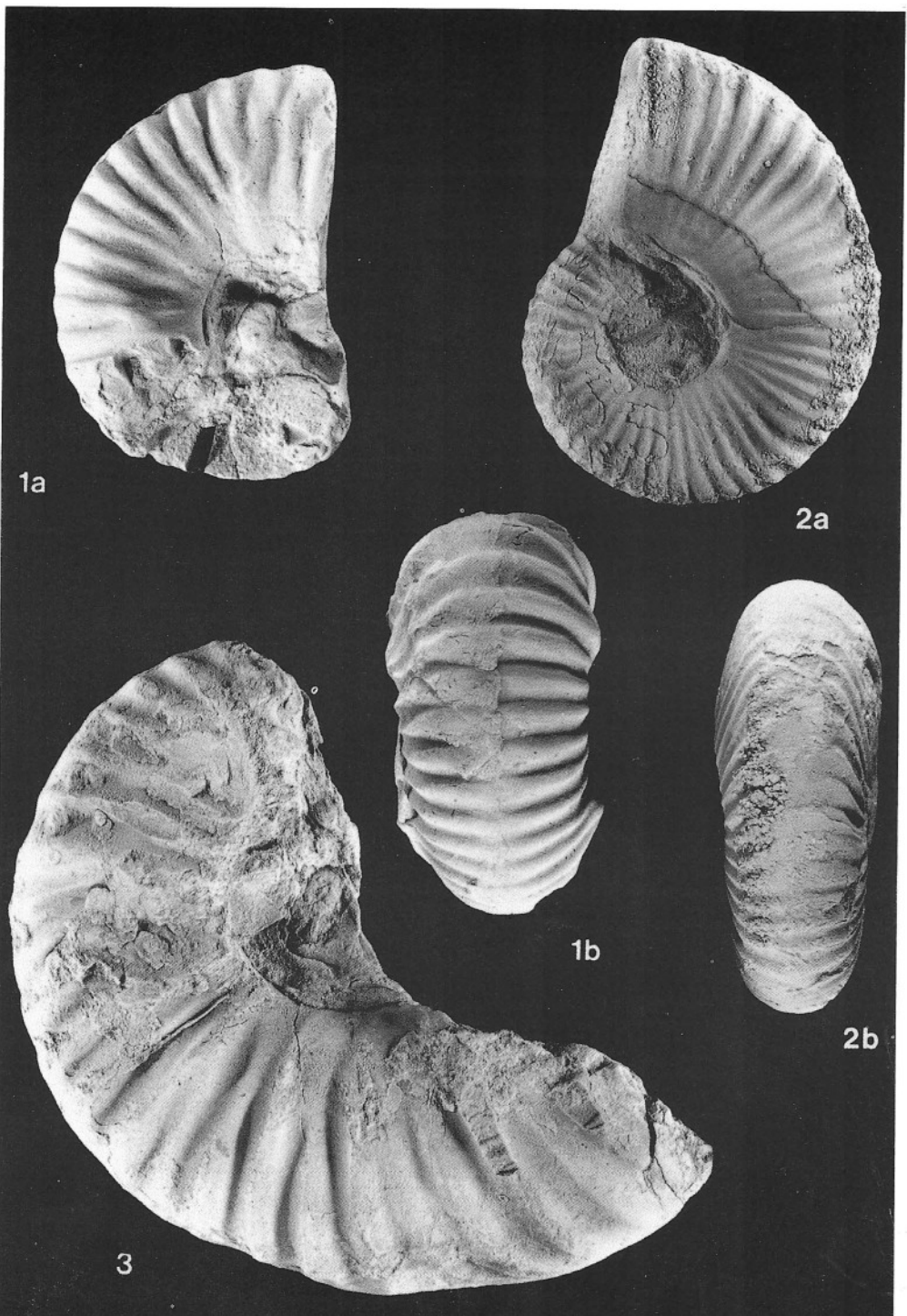
PLATE 13

- Fig. 1 - *Hollandites asseretoi* sp. n. Gebze. Holotype, N. 6108 (T163b). Side; x 1.
 Fig. 2a,b - *Hollandites asseretoi* sp. n. Gebze. Paratype, N. 6112 (T42g). Respectively: a) venter, b) side; x 1.
 Fig. 3a,b - *Stuvia yalakensis* (Arthaber). Gebze, N. 6047 (T199a). Respectively: a) side, b) front; x 1.
 Fig. 4a-c - *Stuvia yalakensis* (Arthaber). Gebze, N. 6047 (T20a). Respectively: a) venter, b) front, c) side; x 1.5
 Fig. 5 - *Proarcestes bramantei* (Mojsisovics). Gebze, N. 6082 (T175h). Side; x 1.
 Fig. 6 - *Flexoptychites flexuosus* (Mojsisovics). Gebze, N. 6086 (T64c). Side; x 1.
 Fig. 7 - *Paraceratites binodosus* (Hauer). Gebze, N. 6076 (T161b). Side; x 1.

PLATE 14

- Fig. 1 - *Monophyllites anatolicus* Toula. Gebze, N. 6085 (T52a). Side; x 1.
 Fig. 2 - *Leiophyllites confucii* (Diener). Gebze, N. 6037 (T75r). Side; x 1.
 Fig. 3 - *Monophyllites kieperti* Toula. Gebze, N. 6043 (T75s). Side; x 1.
 Fig. 4a,b - *Isculites asseretoi* sp. n. Gebze. Holotype, N. 6101 (T37a). Respectively: a) side, b) front; x 1.5.
 Fig. 5 - *Isculites asseretoi* sp. aff. *pitamaha* in Tozer. Gebze, N. 6088 (T97t). Side; x 1.5.
 Fig. 6a,b - *Isculites asseretoi* sp. n. Gebze. Paratype, N. 6105 (T37b). Respectively: a) side, b) front; x 1.5.
 Fig. 7a,b - *Phyllocladiscites proponticus* (Toula). Gebze, N. 6069 (T317a). Respectively: a) front, b) side; x 1.
 Fig. 8a,b - *Phyllocladiscites proponticus* (Toula). Gebze, N. 6071 (T42r). Respectively: a) side, b) venter; x 1.





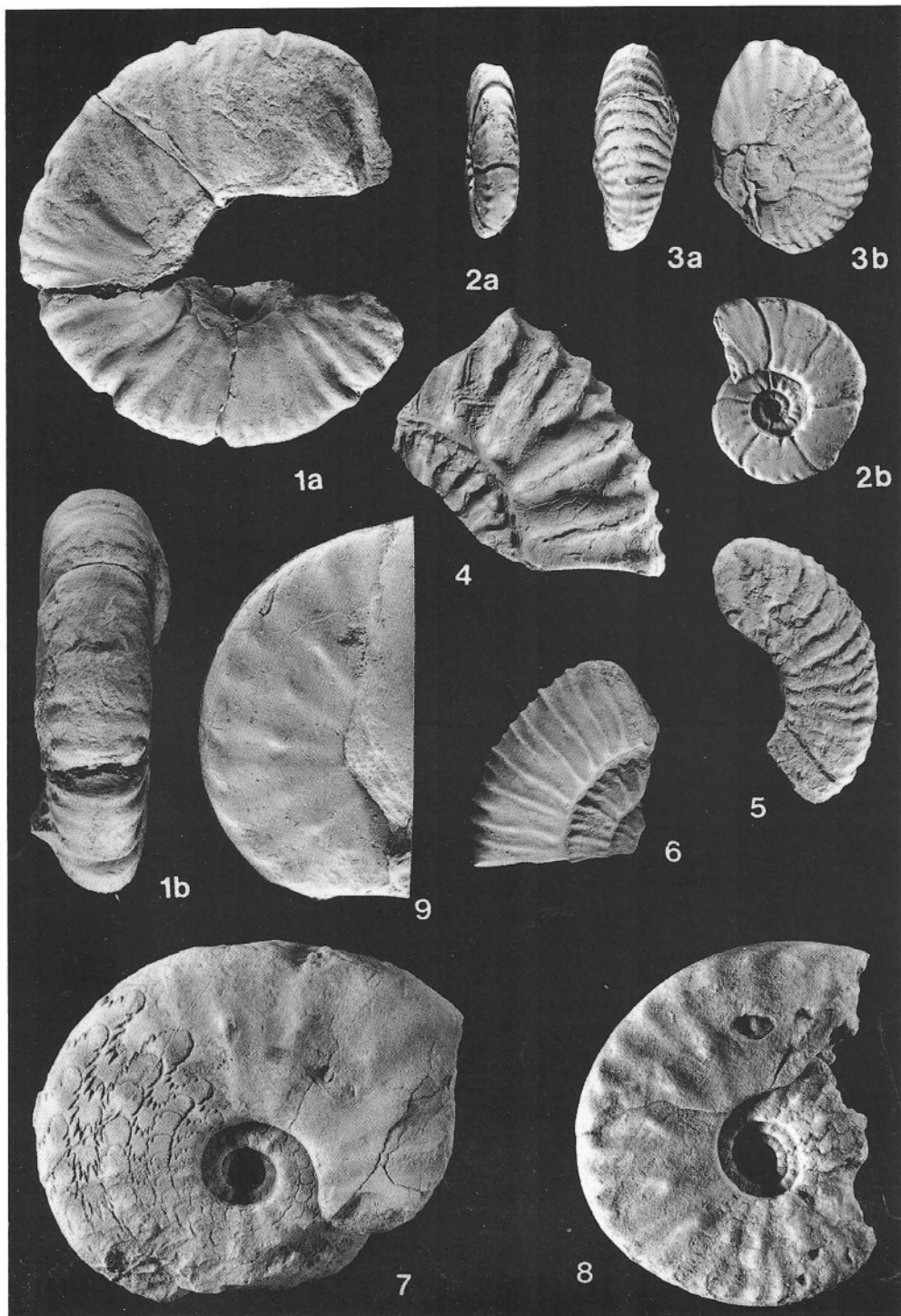
1a

2a

1b

2b

3

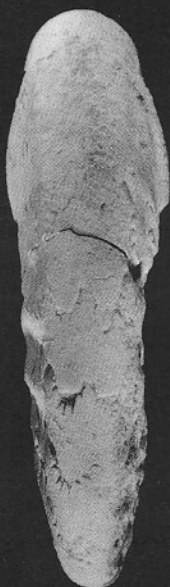




1



2a



3b



4b



2b



3a



4a

