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THE LADINIAN AMMONOIDS FROM CALCARE DI ESINO OF VAL PARINA (BERGAMASC ALPS, NORTHERN ITALY). PT. 1

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Key-words: Taxonomy, Biochronology, Ladinian, Calcare di Esino, Western-Southern Alps, Italy.

Riassunto. In questa Pt.1 sono illustrati gli Ammonoidea ladinici provenienti da lenti di Calcare di Esino affioranti sul versante settentrionale della Val Parina, di fronte alla Val di Lavaggio. Tutto il materiale, raccolto da M. Gervasutti, è stato donato al Museo Civico di Scienze Naturali "E. Caffi" di Bergamo, dove ora è depositato.

Sono state identificate complessivamente oltre 60 specie, delle quali una ventina nuove. Sono presenti anche tre generi nuovi: *Parinaia* della fam. Ceratitidae, *Rossiceras* della fam. Hungaritidae e *Gervasuttia* della fam. Aplococeratidae. Gli strati fossiliferi si estendono da 550 m a 850 m s.l. m. In questo intervallo sono state distinte dal basso verso l'alto 5 associazioni: 1) a *Chieseiceras perticaense* con *Norites, Gevanites, Iberites, Epigymnites, Aplococeras, Proarcestes, Procladiscites, Eoprotrachyceras, Monophyllites;* 2) a *Eoprotrachyceras recubariense* con *Norites, Chieseiceras, Gevanites, Sturia, Epigymnites, Aplococeras, Eoprotrachyceras, Monophyllites;* 3) a *Protrachyceras margaritosum* con *Iberites, Epigymnites, Gervasuttia, Argolites, Monophyllites;* 4) a *Gervasuttia, Arpadites, Protrachyceras, Monophyllites;* 5) a *Protrachyceras longobardicum* con *Sageceras, Iberites, Rossiceras, Sturia, Epigymnites, Praepinacoceras, Proarcestes, Protrachyceras, Detoniceras, Arpadites, Argolites, Monophyllites.*

Le associazioni 1) e 2) possono essere attribuite alla Zona a Curionii, 3) e 4) alla Zona a Gredleri e infine l'associazione 5) alla base della Zona ad Archelaus.

Abstract. This paper deals with the description of a rich ammonoid assemblage collected in calcareous lenses outcropping within the Ladinian Calcare di Esino of Val Parina (Northern Italy). The faunas come from lenses outcropping on the northern slope opposite of Val di Lavaggio. The Material was collected by M. Gervasutti and is stored in the Museo Civico di Scienze Naturali "E. Caffi" in Bergamo (Italy).

More than 60 species were identified, including about twenty new species and three new genera: *Parinaia* (fam. Ceratitidae), *Rossiceras* (fam. Hungaritidae) and *Gervasuttia* (fam. Aplococeratidae). The new taxa give a substantial contribution to the knowledge of the poorly studied Tethyan faunas of the Ladinian. Whether these faunas are endemic or not is at present difficult to determine. The fossiliferous levels extend from 550 m to 850 m altitude. In this interval 5 assemblages were recognized (from bottom to top): 1) Assemblage with *Chieseiceras perticaense, Norites, Gevanites, Iberites, Epigymnites, Aplococeras, Proarcestes, Procladiscites, Eoprotrachyceras, Monophyllites;* 2) Assemblage with *Eoprotrachyceras recubariense, Norites, Chieseiceras, Gevanites, Sturia, Epigymnites, Aplococeras, Eoprotrachyceras, Monophyllites;* 3) Assemblage with *Protrachyceras margaritosum, Iberites, Epigymnites, Gervasuttia, Argolites, Monophyllites;* 4) Assemblage with *Gervasuttia, Arpadites, Protrachyceras, Monophyllites;* 5) Assemblage with *Protrachyceras longobardicum, Sageceras, Iberites, Rossiceras, Sturia, Epigymnites, Praepinacoceras, Proarcestes, Protrachyceras, Detoniceras, Ar-*

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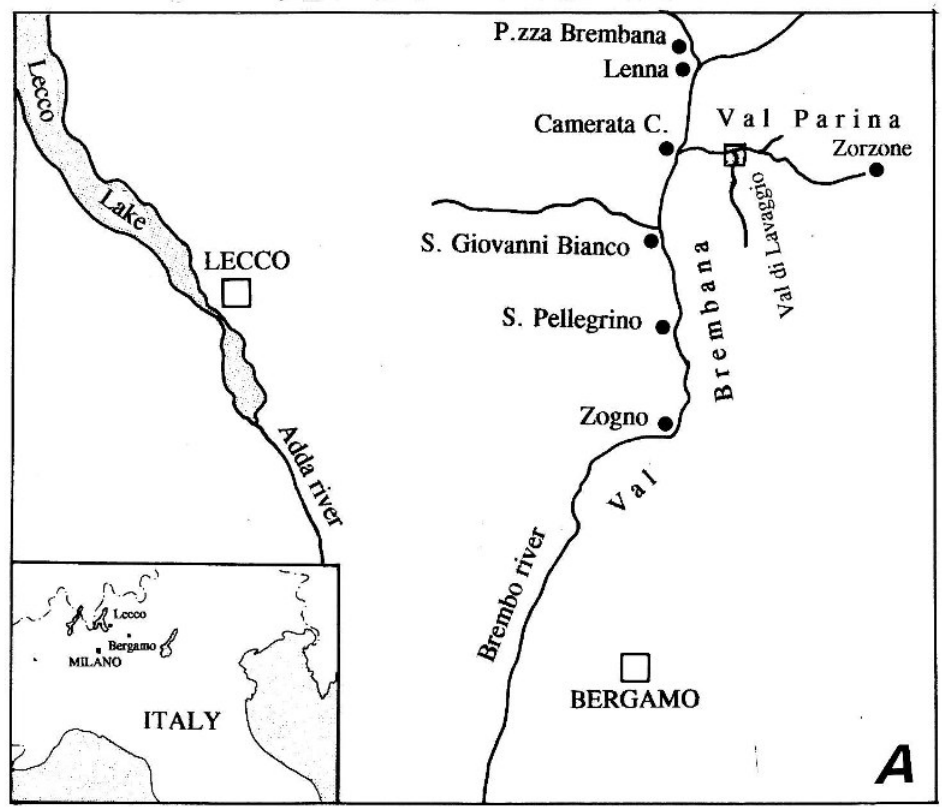
padites, Argolites, Monophyllites. The assemblages 1) and 2) can be ascribed to the Curionii Zone; assemblages 3) and 4) to the Gredleri Zone, and assemblage 5) to the lower part of the Archelaus Zone.

Foreword.

This paper deals with the description and illustration of Ladinian ammonoids from limestone lenses of the Calcare di Esino (Esino Limestone) outcropping on the northern slope of Val Parina (Parina Valley), north of Bergamo (Northern Italy; Fig. 1) at the confluence with Val di Lavaggio (Lavaggio Valley, located on the opposite side; Fig. 2). A minor set of ammonoid bearing limestone lenses with a less diversified faunas, outcropping within the Calcare di Esino slightly eastward, will be object of a second paper actually in preparation, along with the few species collected from the southern side of Val Parina. All the fossil material was collected, and successively prepared by M. Gervasutti, who did a very skilful work. The collection has been donated by M. Gervasutti to the Museo Civico di Scienze Naturali "E. Caffi", Bergamo (Paganoni, 1985), where all the specimens are stored.

Fossiliferous localities.

The portion of Val Parina stretching from the village of Zorzone to the junction with the Val Brembana is entirely cut through the Calcare di Esino, made of grey limestones and unconformably overlain by the Calcare Rosso. Within the complex internal structure of the Esino carbonate platform Jadoul (in Jadoul, Gervasutti & Fantini Sestini, 1992) identified six different lithozones. Fossiliferous layers are located at the transition between lithozones 3 and 4, as well as in the lower portion of the lithozone 4 in proximity of the southern margin of the Esino platform in Val Parina. Bioclastic lenses, 10 to 100 cm thick, yielded thousands of specimens belonging to ammonoids, nautiloids, gastropods, bivalves, brachiopods, corals, echinoderms, calcareous algae, and vertebrates in variable abundance from place to place (Jadoul, Gervasutti & Fantini Sestini, 1992, tab. 1). All fossils are included in pockets and lenses of bioclastic rudites outcropping on the mountain slope, between the river bed at about 500 m altitude and at 850 m altitude. Stratigraphically this fossiliferous band can be placed between about 200-350 m from the base and 550 m from the top of the Calcare di Esino. Being beds only gently dipping toward SW, altitudes give also the approximate thicknesses. The ammonoids are generally well preserved, with tests totally replaced by calcite. Internal moulds are less frequent. From a sedimentological viewpoint the locally high density of fossils with moderate sorting and the lenticular geometry of the bioclastic pockets suggest accumulation mechanisms, driven storm-induced bottom currents. This feature prevents the reconstruction of a detailed biostratigraphic succession. However, the single lenses do not display any evidence of condensation. Nevertheless, the abundance of the specimens, the occurrence of several new taxa, and the excellent preservation made worthy the study of this fossil collection.



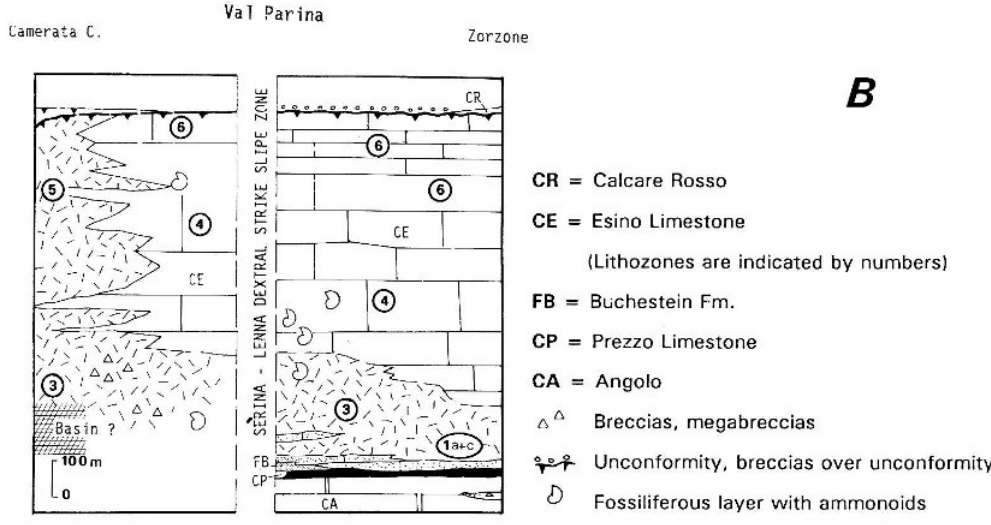


Fig. 1 - A) Location map of Val Parina with studied area detailed in Fig. 2. B) Stratigraphic cross section of the Middle Triassic succession in Val Parina.

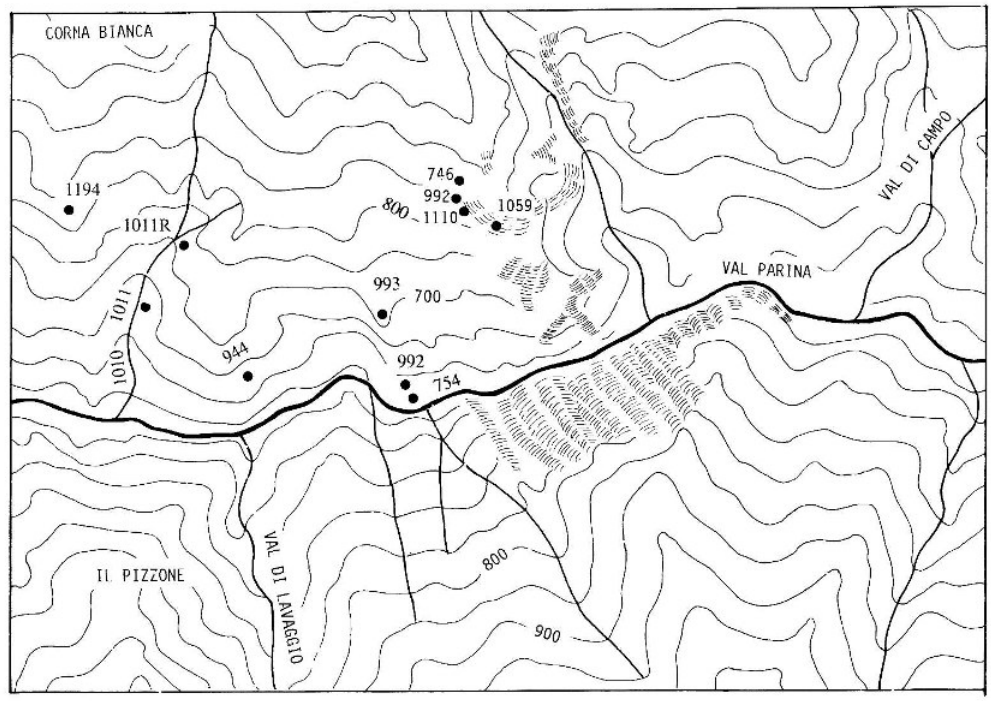


Fig. 2 - Geographic setting of studied fossiliferous outcrops on the northern slope of Val Parina.

The fossiliferous lenses were numbered, but not in succession, by M. Gervasutti during the field work. They can be grouped into two distinct sets, A and B, located respectively eastward and westward of Val di Lavaggio. The number of the identified specimens from each lens is reported in brackets.

Group A: lenses located on the northern slope of Val Parina (Fig. 2), between the bottom of the valley and 715 m altitude, eastward of Val di Lavaggio.

S754 - Fossiliferous lenses located at the edge of the gully, eastward of the end of the old railroad at 555/565m altitude.

Norites dieneri Arthaber (1)
Chieseiceras perticaense Brack & Rieber (78)
Ch. aff. *pemphix* (Merian) (2)
Chieseiceras sp. n. A (2)
Epigymnites credneri (Mojsisovics) (6)
E. moelleri (Mojsisovics) (3)
E. aff. *paronae* (Longhi) (2)
Aplococeras orobicum sp. n. (2)
Eoprotrachyceras rieberi sp. n. (1)
Monophyllites wengensis (Klipstein) (1)

S759 - Debris of S754.
Chieseiceras sp. n. C (1)

S992 A-G - Fossiliferous lenses scattered between S944 (600 m altitude) and S754 (565 m altitude).

A *Iberites* sp. ind. (1)
Eoprotrachyceras sp. ind. (4)

Monophyllites wengensis (Klipstein) (4)
B *Epigymnites credneri* (Mojsisovics) (3)
C *Proarcestes pannonicus* (Mojsisovics) (7)
E *Gevanites* sp. ind. (1)
F *Chieseiceras perticaense* Brack & Rieber (1)
Epigymnites credneri (Mojsisovics) (1)
G *Epigymnites credneri* (Mojsisovics) (5)

S944 E,F,H - Fossiliferous lenses scattered in the lower portion of a gully, opposite of Val di Lavaggio, at 600-650 m altitude.
E *Epigymnites credneri* (Mojsisovics) (1)
Aplococeras orobicum sp.n. (3)
Monophyllites wengensis (Klipstein) (3)
F *Norites dieneri* Arthaber (1)
Chieseiceras perticaense Brack & Rieber (1)
Aplococeras orobicum sp. n. (35)
Proarcestes pannonicus (Mojsisovics)(26)
Eoprotrachyceras rieberi sp. n. (2)
Monophyllites wengensis (Klipstein) (14)
H 50 m above S944F.
Proarcestes cf. *marcheanus* (Mojsisovics) (2)
Monophyllites wengensis (Klipstein) (2)

S993 A-E - Outcrops located on the ridge, westward of S992, between 695 m (A) and 715 m (E) altitude.
A *Chieseiceras perticaense* Brack & Rieber (9)
Epigymnites credneri (Mojsisovics) (1)
E. moelleri (Mojsisovics) (8)
E. aff. *paronae* (Longhi) (1)
B *Chieseiceras perticaense* Brack & Rieber (4)
C *Epigymnites moelleri* (Mojsisovics) (1)
D *Epigymnites moelleri* (Mojsisovics) (1)
E *Procladiscites rodostoma* Tommasi (2)

S904 - Debris at the bottom of the valley, 500 m altitude.
Chieseiceras perticaense Brack & Rieber (1)
Eoprotrachyceras rieberi sp. n. (1)
Monophyllites wengensis (Klipstein) (4)

S1059 - Lens located at the top of a gully at 820 m altitude, eastward of S993.
Iberites sp. ind. (1)
Epigymnites credneriformis sp. n. (5)
Gervasuttia shevyrevi sp. n. (24)
G. plicata sp. n. (14)
Protrachyceras cf. *margaritosum* (Mojsisovics) (2)
Argolites aff. *paronai* (Mariani) (1)
Argolites sp. n. A (1)
Argolites sp. n. B (1)
Monophyllites wengensis (Klipstein) (4)

S939 - Blocks in the gully below S1059.
Epigymnites credneriformis sp. n. (14)
Argolites sp. ind. (1)
Monophyllites wengensis (Klipstein) (23)

S1110 - Lens in proximity of S746 at 830 m altitude.
Gervasuttia nodosa sp. n. (6)
G. nodosissima sp. n. (10)

G. irregularis sp. n. (14)
Arpadites cf. *arpadis* (Mojsisovics) (2)
A. dichotomus sp. n. (5)
Protrachyceras sp. ind. (1)
Monophyllites wengensis (Klipstein) (4)

S902 - Small lens, near S746, at 840 m altitude.
Rossiceras orobicum sp. n. (4)
Epigymnites ecki (Mojsisovics) (3)
Gervasuttia irregularis sp. n. (8)
Proarcestes esinensis (Mojsosvics) (2)
Protrachyceras longobardicum (Mojsisovics) (1)
Arpadites telleri Mojsisovics (1)

S746 - Fossiliferous lenses located between the two upper branches of a gully, at 840/845 m altitude.
Sageceras walteri Mojsisovics (6)
Megaphyllites oenipontanus Mojsisovics (6)
Gevanites aff. *epigonus* Parnes (1)
Iberites nodosus sp. n. (22)
Rossiceras gervasuttii sp. n. (57)
R. intermedium sp.n. (48)
R. orobicum sp. n. (93)
Sturia sansovinii (Mojsisovics) (4)
Epigymnites ecki (Mojsisovics) (502 adults and 777 juvenile sp.)
E. credneriformis sp. n. (82)
E. frequens sp. n. (31)
Praepinacoceras stoppanii (Airaghi) (20)
Proarcestes boeckhi (Mojsisovics) (2)
P. marcheanus (Mojsisovics) (3)
P. cf. *reyeri* (Mojsisovics) (1)
P. cf. *subtridentinus* (Mojsisovics) (2)
Protrachyceras irregulare sp. n. (23)
P. ladinum (Mojsisovics) (1)
P. longobardicum (Mojsisovics) (38)
P. parinaense sp. n. (5)
P. pseudoarchelaus (Boeckh) (17)
P. steinmanni (Mojsisovics) (15)
Detoniceras varicostatum sp. n. (6)
Arpadites cinensis Mojsisovics (185)
A. bracki sp. n. (39)
A. pulcher sp. n. (40)
A. telleri Mojsisovics (1)
Argolites fortis sp. n. (17)
A. mojsisovicsi (De Lorenzo) (74)
Monophyllites wengensis (Klipstein) (391)

S1040 - Debris eastward of S746.
Protrachyceras parinaense sp. n. (1)
Monophyllites wengensis (Klipstein) (1)

S747 - Debris of S746.
Protrachyceras steinmanni (Mojsisovics) (1)
Monophyllites wengensis (Klipstein) (4)

Group B: set of lenses outcropping on the northern slope of Val Parina, 200/300 m westward of Val di Lavaggio, at variable elevations (from 550 to 700 m altitude).

S1011 A-D-H-M-N-P-Q-R- Outcrops scattered along a gully and on its eastern ridge from 550 m up to 700 m altitude.

A *Epigymnites* aff. *paronae* (Longhi) (1)
D *Epigymnites moelleri* (Mojsisovics) (2)
Eoprotrachyceras rieberi sp. n. (1)
E. cf. *recubariense* (Mojsisovics) (2)
Monophyllites wengensis (Klipstein) (4)
H *Epigymnites moelleri* (Mojsisovics) (5)
Eoprotrachyceras rieberi sp. n. (1)
Monophyllites wengensis (Klipstein) (2)
M *Norites dieneri* Arthaber (1)
Sturia forojulensis Mojsisovics (1)
Monophyllites wengensis (Klipstein) (2)
N *Aplococeras orobicum* sp. n. (2)
P *Chieseiceras* sp. n. B (1)
Gevanites sp. ind. (1)
Sturia forojulensis Mojsisovics (1)
Epigymnites moelleri (Mojsisovics) (7)
Eoprotrachyceras gervasuttii sp. n. (2)
E. rieberi sp.n. (1)
E. cf. *recubariense* (Mojsisovics) (1)
Monophyllites wengensis (Klipstein) (57)
Q *Eoprotrachyceras gervasuttii* sp. n. (1)
E. rieberi sp. n. (1)
R *Parinaia semicostata* sp. n. (26)
Epigymnites moelleri (Mojsisovics) (1)
Arpadites cf. *cinensis* Mojsisovics (3)
Arpadites sp. ind. (3)

S1010 A-B-D- Scattered blocks in the S1011 gully. S1010D places near S1011P.
Iberites sp. ind. (1)
Epigymnites moelleri (Mojsisovics) (8)
Eoprotrachyceras gervasuttii sp. n. (1)
E. rieberi sp. n. (3)
Monophyllites wengensis (Klipstein) (6)
A *Epigymnites moelleri* (Mojsisovics) (1)
Proarcestes pannonicus (Mojsisovics) (1)
Monophyllites wengensis (Klipstein) (1)
B *Norites dieneri* Arthaber (1)
D *Norites dieneri* Arthaber (1)
Gevanites sp. ind. (1)
Epigymnites moelleri (Mojsisovics) (6)
Pompeckjites sp. ind. (1)
Procladiscites griesbachi Mojsisovics (5)
Eoprotrachyceras gervasuttii sp. n. (1)
E. rieberi sp. n. (1)
Monophyllites wengensis (Klipstein) (47)

S1117 - Ridge between the 2nd and 3rd gully, eastward of S1010.
Norites dieneri Arthaber (1)
Megaphyllites sp. ind. (4)
Epigymnites moelleri (Mojsisovics) (3)
Proarcestes cf. *pannonicus* (Mojsisovics) (2)
P. cf. *subtridentinus* (Mojsisovics) (2)
Monophyllites wengensis (Klipstein) (5)

S1194 - Saddle westward of S1010 gully, at 835 m altitude.
Megaphyllites oenipontanus Mojsisovics (1)
Arpadites sp. ind. (2)

Biochronology.

A tethyan standard ammonoid zonation for Ladinian is still in progress. During the recent years several options have been proposed. Some of them are substantiated also by taxonomic papers (Brack & Rieber, 1986, 1993), whereas some others are not and have a general validity only as working schemes (Krystyn & Mariolakos, 1975; Krystyn, 1983; Mietto & Manfrin in De Zanche et al., 1993). In the present paper I shall test the discussed ammonoid assemblages and their ranges against the mentioned proposals.

As previously described, the ammonoid localities constitute two distinct groups, A and B.

Group A. The richest succession crops out on the northern slope of Val Parina, to the E of the Lavaggio gully scouring the opposite southern slope of the valley (Fig. 2). Here, ammonoids may be found along a 300 m thick section, which develop from the bottom of the valley (about 550 m a.s.l.) up to 845 m a.s.l. Being beds only gently inclined, altitudes give also the approximate thicknesses.

From bottom up to 715 m a.s.l., *Chieseiceras perticaense* Brack & Rieber is present in all the fossiliferous lenses, and locally is frequent. As in Bagolino (Brack & Rieber, 1986, 1993), this species is associated with *Eoprotrachyceras rieberi* sp. n. (= *Eoprotrachyceras* cf. *laczkoi* in Brack & Rieber, 1986) (S754, S944). Also present are the following genera: *Norites, Gevanites, Iberites, Epigymnites, Aplococeras, Proarcestes, Procladiscites* and *Monophyllites.* The abundance of *Aplococeras, Epigymnites* and *Proarcestes,* besides *Chieseiceras perticaense* characterizes the assemblage. To be noted here that the genera *Aplococeras* and *Norites*, usually considered of Late Anisian age, occur here with an assemblage considered of Early Ladinian age.

Brack & Rieber (1986, 1993) recognized the Curionii Zone as the basal zone of the Ladinian and identified 3 horizons from bottom to top: *Eoprotrachycears curionii, Chieseiceras perticaense, Eoprotrachyceras recubariense.* In Group A, evidence of the first horizon was never found, whilst the following *C. perticaense* horizon is well documented and its thickness may exceed 150 m.

From 715 m a.s.l. to 820 m a.s.l. non fossiliferous lenses have been detected. Taking in account the ammonoid fauna collected higher up and also westward in the Group B of lenses, this barren interval could correspond to the *Eoprotrachyceras recubariense* horizon.

At 820 m a.s.l., the lens S1059 yielded a fauna characterized by specimens of small size, belonging to genera *Gervasuttia, Iberites, Epigymnites, Argolites, Protrachyceras* and *Monophyllites.* Only two specimens may be referred to *Protrachyceras margaritosum* (Mojsisovics). It does exist thus a suggestion towards the base of the Gredleri Zone (Brack & Rieber, 1993) or the *margaritosum* subzone (Mietto & Manfrin in De Zanche et al., 1993).

In a lens (S1110) located 10 m above (830 m a.s.l.), an assemblage fairly similar as far the generic composition is concerned, but totally different at the specific level, has been identified. Only small size specimens are here present, belonging exclusively

to the genera *Gervasuttia, Arpadites,* another genus very like *Argolites, Protrachyceras* and *Monophyllites*. It is difficult to insert this fauna into a zonal scheme. Its stratigraphic position could however represent a part of the Gredleri Zone. Comparisons are difficult because of endemic species and because the insufficient knowledge of the ammonoid fauna of the Gredleri Zone.

At 840-845 m a.s.l. a cluster of lenses yielded thousand of fossils. The genus *Protrachyceras* is very frequent, namely with *P. longobardicum* (Mojsisovics). Other genera are *Sageceras, Megaphyllites, Gevanites, Iberites, Rossiceras, Sturia, Epigymnites, Praepinacoceras, Proarcestes, Detoniceras, Arpadites, Argolites* and *Monophyllites*. This assemblage could be referred to the base of the Archelaus Zone, *longobardicum* subzone of Mietto & Manfrin (in De Zanche et al., 1993).

Group B. Moving westward, along a gully and its eastern ridge, located 300 to 900 m from the previous group A of fossiliferous lenses, the lenses belonging to Group B may be recognized (Fig. 2). They lie between the bottom of the Val Parina and an elevation of 700 m a.s.l. According to Jadoul (in Jadoul et al., 1992), the area is dissected by a system of small faults.

The assemblage recognized in the basal part (S1011 A, H, M, N) is similar to those of the *perticaense* horizon of the Group A lenses. However, the index-species of this horizon was never found. In the following upwards lens S1011 P and also in S1011 D, there are associated *Eoprotrachyceras rieberi* n. sp. and *E. recubariense*. This last species is identified with some reserve, due to its bad preservation. The same assemblage has been also recorded at Pertica by Brack & Rieber (1986, fig. 7). Should this identification be confirmed, these lenses could be attributed to the *E. recubariense* horizon of the Curionii Zone (Brack & Rieber, 1986). The following genera are also present: *Norites, Chieseiceras, Gevanites, Epigymnites, Aplococeras, Sturia, Monophyllites.*

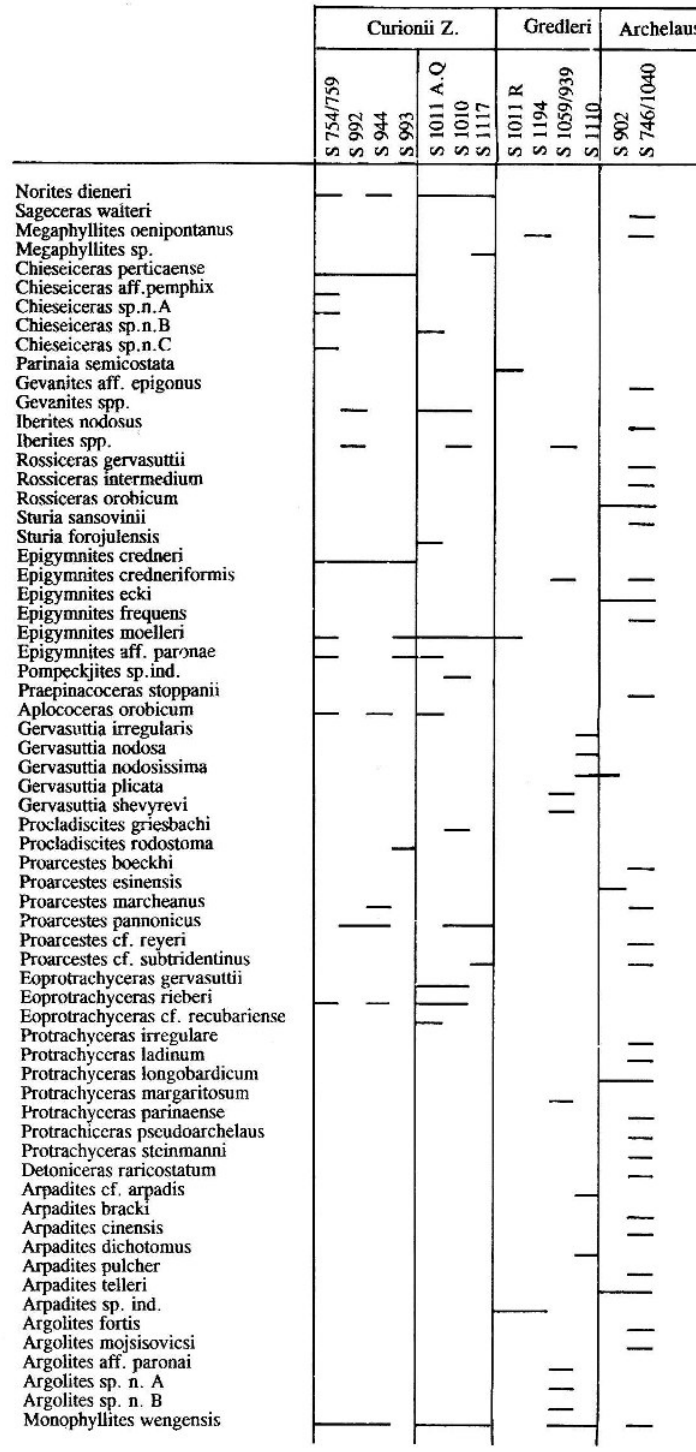
The following lenses S1011 R and S1194 contain along with *Megaphyllites, Parinaia, Epigymnites, Monophyllites*, the genus *Arpadites*, which ranges from the Gredleri to the Archelaus Zones (Brack & Rieber, 1993). Due to the geometric position, could be tentatively ascribed to the Gredleri Zone.

Thus, the biostratigraphic data confirm the fault with a remarkable throw existing between Groups A and B lenses. In fact, in Group B at the altitude of 700 m a.s.l. the Gredleri Zone could be already present, whilst in A at the same altitude the Curionii Zone is still persisting.

Integrating data from the two successions, we have the following results.

1) The Curionii Zone is represented by the two horizons with *C. perticaense* and *E. recubariense*, following the Brack & Rieber nomenclature, or *curionii* and *recubariense* subzones in the Mietto & Manfrin proposal. The base of Curionii Zone however, seems to be missing. Consequently, the earliest Ladinian seems to be missing, whatever the base of this stage is defined.

2) The Gredleri Zone is also represented. Following the Mietto and Manfrin nomenclature, *margaritosum* and *gredleri* subzones should be present.


Curionii Z.
Gredleri
Archelaus
S 754/759
S 992
S 944
S 993
S 1011 A.Q
S 1010
S 1117
S 1011 R
S 1194
S 1059/939
S 1110
S 902
S 746/1040
Norites dieneri
Sageceras waiteri
Megaphyllites oenipontanus
Megaphyllites sp.
Chieseiceras perticaense
Chieseiceras aff.pemphix
Chieseiceras sp.n.A
Chieseiceras sp.n.B
Chieseiceras sp.n.C
Parinaia semicostata
Gevanites aff. epigonus
Gevanites spp.
Iberites nodosus
Iberites spp.
Rossiceras gervasuttii
Rossiceras intermedium
Rossiceras orobicum
Sturia sansovinii
Sturia forojulensis
Epigymnites credneri
Epigymnites credneriformis
Epigymnites ecki
Epigymnites frequens
Epigymnites moelleri
Epigymnites aff. paronae
Pompeckjites sp.ind.
Praepinacoceras stoppanii
Aplococeras orobicum
Gervasuttia irregularis
Gervasuttia nodosa
Gervasuttia nodosissima
Gervasuttia plicata
Gervasuttia shevyrevi
Procladiscites griesbachi
Procladiscites rodostoma
Proarcestes boeckhi
Proarcestes esinensis
Proarcestes marcheanus
Proarcestes pannonicus
Proarcestes cf. reyeri
Proarcestes cf. subtridentinus
Eoprotrachyceras gervasuttii
Eoprotrachyceras rieberi
Eoprotrachyceras cf. recubariense
Protrachyceras irregulare
Protrachyceras ladinum
Protrachyceras longobardicum
Protrachyceras margaritosum
Protrachyceras parinaense
Protrachiceras pseudoarchelaus
Protrachyceras steinmanni
Detoniceras raricostatum
Arpadites cf. arpadis
Arpadites bracki
Arpadites cinensis
Arpadites dichotomus
Arpadites pulcher
Arpadites telleri
Arpadites sp. ind.
Argolites fortis
Argolites mojsisovicsi
Argolites aff. paronai
Argolites sp. n. A
Argolites sp. n. B
Monophyllites wengensis

Tab. 1

3) The lower part of the Archelaus Zone is recorded in the uppermost fossiliferous lenses, with the *longobardicum* subzone. Younger Ladinian ammonoid horizons are not documented. However, this time interval could be represented by the topmost part of the Calcare di Esino of Val Parina and/or by the Calcare Rosso unit, which conclude the Anisian-Ladinian T/R cycles.

Paleontological descriptions

In this paper we describe and illustrate only the new taxa and the species previously poorly described, recovered in two groups of Esino limestone bearing lenses, Group A and B. In this study we apply the classification by Tozer (1981a), which is the most commonly used. It is worth mentioning that the classification by Shevyrev (1986) is also very valid, especially for what concerns the suborders which better identify the various evolutionary lineages. As regard the taxa here studied, there are some discrepancies between these two classifications, occasionally even important, which the detailed study of the suture line should explain. In the Shevyrev's classification the Family Noritidae is included in the Superfamily Sageceratacеae together with the Family Sageceratidae. The Family Sturiidae is not included in the Superfamily Pinacoceratacеae, but in the Superfamily Ptychitaceae together with the Cladiscitidae. The genera of the Superfamily Trachyceratacеae are also differently attributed within the various families. In particular, the genera *Eoprotrachyceras* Tozer and *Protrachyceras* Mojsisovics are both included in the Family Trachyceratidae.

Numeration and repository. The ammonoids from the Val Parina are deposited at the Museo di Scienze Naturali "E. Caffi", Bergamo, Italy. The first number (i.e., N. 9084) refers to register number of this Museum. S numbers in brackets correspond to M. Gervasutti's sampling. The type specimens of *Eoprotrachyceras rieberi* sp. n. are deposited at the Paleontological Institute and Museum of the University of Zurich (PIMUZ).

Abbreviations. The standard abbreviations used are: D: diameter; H: whorl heigth; W: whorl width; U: umbilical width; E: external lobe; L: lateral lobe; U: umbilical lobe; I: internal lobe.

Ammonoidea

Order Ceratitida Hyatt, 1884

Superfamily *Noritaceae* Karpinsky, 1889

Family *Noritidae* Karpinsky, 1889

Genus *Norites* Mojsisovics, 1879

Type species: *Ammonites gondola* Mojsisovics, 1869

Norites dieneri Arthaber, 1903

Text-fig. 4 m

1900 *Ceratites cordevolicus* - Diener, p. 25, pl. 2, fig. 3.

1903 *Norites dieneri* Arthaber, p. 26, pl. 1, fig. 9.
1973 *Norites dieneri* - Rieber, p. 71, pl. 17, fig. 17,18,20.

Material. N.8966 (S944F); N.9048 (S944F); N.9052 (S944F); N.9044 (S754); N.8963 (S1010B) (Fig. 4 m); N.8964 (S1010D); N.8965 (S1011M); N.8986 (S1117).

The most characteristic morphological features of this species are the large size, the wide venter, and almost flat flanks.

Dimensions (in mm):

	D	H		W		U	
8963	38,5	19,5	51%	9,5	25%	6,3	16%
8966	21,3	11,4	53%	5,7	27%	2,3	11%
8964	21,1	11,4	54%	5,5	26%	-	
9048	19,1	10,9	57%	-		2,8	15%

Occurrence. *N. dieneri* Arthaber occurs at Hajmàskès-Berekhegy (Bakony) and Monte S. Giorgio, Switzerland (*Ticinites polymorphus* zone, following Rieber, 1973; Reitzi/Kellnerites zone, following Brack & Rieber, 1993).

Superfamily *Sageceratataceae* Hyatt, 1884
Family *Sageceratidae* Hyatt, 1884

Representatives of this family are confined to the genus *Sageceras* Mojsisovics, 1873, of which only six specimens referable to *S. walteri* Mojsisovics, 1882 were collected from S746. Although poorly preserved, the specimens could be reliably attributed to the Mojsisovics species because of the typical suture line and the very compressed section (Mojsisovics, 1882, pl. 53, fig. 9).

Superfamily *Megaphyllitaceae* Mojsisovics, 1896
Family *Megaphyllitidae* Mojsisovics, 1896

The genus *Megaphyllites* Mojsisovics, 1879 represented by *M. oenipontanus* Mojsisovics, 1882 occurs in S746 (six specimens) and in S1194 (one specimen). This species (Pl. 1, fig. 5) differs from *M. jarbas* (Münster, 1841) because the suture line is less complex and the whorl section is more regularly elliptical. In addition four small-size specimens referable to the genus *Megaphyllites* were collected from S1117.

Superfamily *Ceratitaceae* Mojsisovics, 1879
Family *Ceratitidae* Mojsisovics, 1879
Genus *Chieseiceras* Brack & Rieber, 1986
Type species: *Chieseiceras chiesense* Brack & Rieber, 1986

Representatives of this genus are very frequent in the lower part of the Ladinian succession in Val Parina. *Chieseiceras perticaense* Brack & Rieber, 1986 with 94 speci-

mens occurs in S904, S754, S992F, S944F, S993A, S993B (Pl. 5, fig. 3,6). In addition, few specimens attributable to different species of *Chieseiceras* occur in S754/759 associated with *C. perticaense* and in S1011P (see below).

Chieseiceras aff. **pemphix** (Merian, 1854)

Pl. 7, fig. 4, 5

Material. N. 9091 (S754) (Pl. 7, fig. 4); N. 9092 (S754) (Pl. 7, fig. 5).

Two fragmented specimens have been studied. They are rather similar to the specimen figurated as *Ceratites pemphix* (Merian) by Mojsisovics (1882, pl. 39, fig. 9), which successively was tentatively attributed to *Chieseiceras chiesense* (Mojsisovics) by Brack & Rieber (1986). The studied specimens show a similar venter, but the shell is more involute, the primary ribs are longer and strong, whereas the intercalatory ribs are thinner and are missing in the inner whorls. They are for sure attributable to the genus *Chieseiceras* Brack & Rieber, 1986, but they do not belong to the species *C. chiesense.*

Occurrence. *C. pemphix* (Merian) occurs in the Upper Anisian from M. San Salvatore near Lugano, whereas the Val Parina materials was collected from lower Ladinian.

Chieseiceras sp. n. A

Pl. 12, fig. 5a,b

Material. N. 9006 (S754) (Pl. 12, fig. 5).

Two fragments of the internal mould of only the body chamber with ribs thickened at about 2/3 of the height, then bifurcated and weak till the ventrolateral shoulder, where small rounded nodes were observed. Venter wide and flat. One of the fragments displays a preserved test, very thick with very large and robust ribs, also near the ventrolateral shoulder.

The specimens do not seem to belong to any already known species and they are tentatively attributed to the genus *Chieseiceras*. They occur from S754 (Curionii Zone).

Chieseiceras sp. n. B and C

Pl. 5, fig. 4,5

Material. N. 9093 (S1011P) (Pl. 5, fig. 5); N. 9099 (S759) (Pl. 5, fig. 4).

A single involute specimen (*Chieseiceras* sp. n. B, Pl. 5, fig. 5a,b), compressed with subtrapezoidal section. The venter is smooth and flat, the umbilicus is narrow. The primary ribs begin from the umbilical nodes, which are strong and prominent. The ribs bifurcate at the umbilical nodes and at half way of height; intercalatory ribs

are rare. The ribs are initially straight and proverse, then slightly adorally concave, ending near the ventral nodes, spirally elongate and very weak. The primary and intercalatory ribs, wide and flat, become more prominent for a short interval at about half way of height, in correspondence of the max. width of the section. Suture line ceratitic with three large saddles and numerous auxiliary elements.

The affinity between our specimen and the juvenile stages of *Chieseiceras perticaense* Brack & Rieber is evident, however, in the specimen studied the shell is involute also at 63 mm of the diameter, the ribs are more prominent at half way of height and the auxiliary elements of the suture are more numerous and better defined. Definitely, we are dealing with a species still undescribed.

Another specimen (*Chieseiceras* sp. ind. C, Pl. 5, fig. 4), collected from debris of the lowermost strata (S759), displays general characters similar to the previous one, but it differs from *Chieseiceras* sp. ind. B in having wide and flat ribs less sinuous and covered by thin costellae. Both specimens occur from Curionii Zone.

Parinaia gen. n.

Type species. *Parinaia semicostata* sp. n.
Name derivation. The name has been chosen because of Parina Valley.

Diagnosis. Shell involute, compressed with narrow and deep umbilicus. Venter narrow, flat in the inner whorls, then feebly convex. Ribs falcoid, more prominent ventrally. Suture line ceratitic with L large, lobes frilled and four saddles between the ventrolateral shoulder and the umbilical rim.

Discussion. The general shape of this new genus frequently occurs in specimens belonging to the Upper Anisian *Beyrichites* Waagen, 1985. However the suture line of the n. gen. *Parinaia* is characterized by the presence of entire saddles rounded at the top. That means it is a typical ceratitic suture.

Occurrence. At present, this new genus is recorded only from the Esino Limestone of Val Parina.

Age. Gredleri Zone, Ladinian.

Parinaia semicostata sp. n.

Pl. 10, fig. 2,3; Text-fig. 4i

Types. Holotype N.9132 (S1011R) (Pl.10, fig.2). 25 Paratypes: N.9133 (S1011R) (Pl.10, fig.3); N.9134 (S1011R) (Fig.4i); N.9135 (S1011R); N.9136 (S1011R).
Repository. Museo Civico di Scienze Naturali "E. Caffi", Bergamo, Italy.
Derivation of name. From latin because of ribs well visible only on the outer part the flanks.
Horizon and locality. Gredleri Zone (Ladinian), Val Parina, Bergamo.

Diagnosis. Shell small, involute, compressed with almost flat flanks. Venter narrow, slightly rounded or flat. Umbilicus deep, narrow with high umbilical wall. Ribs falcoid, very weak near umbilicus, wide and prominent on the outer part of flanks.

Suture ceratitic with L large and four saddles between the ventrolateral shoulder and the umbilical suture.

Description. The shell is involute with a narrow and deep umbilicus. The tabulate section is very compressed with the max. width near the umbilicus and almost concave near the venter. Initially, the venter is wide and almost flat, then becomes narrow and slightly rounded in the adult. At about 10 mm of the diameter the falcoid ribs appear: on the inner part of the flanks they are proverse, weak and thin; at 1/3 of the height of the whorls the ribs become retroverse, adorally concave, wide and flat, declive adorally and steep aborally. Very thin riblets are visible on and between the ribs, in well preserved specimens. The suture line is ceratitic with L large and deep and three frilled umbilical lobes visible on the flanks and four saddles.

Dimensions (in mm):

	D	H		W		U	
9132	33	18	55%	8.5	26%	-	
9134	31.7	17.5	55%	8.4	26%	3.7	12%
9133	21.7	12	55%	-		2.6	12%

Remarks. The specimens attributed to this n. sp. are very omogeneous and were collected from a single lense (S1011R). They shear similar ornaments and general shape with some species of the genus *Beyrichites* Waagen, 1895, but their suture is ceratitic instead of subammonitic as in *Beyrichites*.

Family *Hungaritidae* Waagen, 1895

Genus *Gevanites* Parnes, 1975

Type species: *Gevanites awadi* Parnes, 1975

Gevanites sp. ind

Pl. 10, fig. 1 a,b

Material. N.9253 (S992E); N.9254 (S1010D); N.9255 (S1011P); N.9256 (S746) (Pl. 10, fig. 1).

Representative of the genus *Gevanites* Parnes, 1975 are rarely present in our material and, when present, only one specimen occurs in each level. It is noteworthy that the genus *Gevanites* is represented by a single specimen in these faunal associations so rich in species and individuals. Moreover, they are in general poorly preserved, all differ one from the other, and any of them can be confidently attributed to one of the species described by Parnes (1975). Only specimen N.9256 (S746) from the Archelaus Zone shows some similarities with *G. epigonus* Parnes, 1975. This specimen is compressed, slightly involute with tabulate and carenate venter and maximum width at the inner third of whorl height (Pl. 10, fig. 1). Slightly sinuous ribs branch at the prominent lateral nodes. Ventrolateral nodes are smaller and slightly more numerous than the lateral nodes. It differs from typical *G. epigonus* in having a wider umbili-

cus and less high whorls. It also differs from *G. awadi* Parnes, 1975 which possesses nodes much closer to the umbilical rim that are still visible in the umbilicus.

Genus *Iberites* Hyatt, 1900

Type species: *Ceratites pradoi* D'Archiac, 1860

Iberites nodosus sp. n.

Pl. 10, fig. 4-6; Text-fig. 4 n

Types. Holotype N. 9097 (S746) (Pl. 10, fig. 6a,b). 21 Paratypes: N. 9012 (S746) (Pl. 10, fig. 5a,b; Fig. 4 n); N. 9098 (S746) (Pl. 10, fig. 4a,b); N. 8977 (S746); N. 8978 (S746).

Repository. Museo Civico di Scienze Naturali "E. Caffi", Bergamo, Italy.

Derivation of name. From latin adjective *nodosus-a-um*, to draw the attention to the presence of strong nodes.

Horizon and locality. Archelaus Zone, Upper Ladinian, Val Parina, Bergamo.

Diagnosis. Shell compressed, involute, ventrally acute. Narrow venter with high median keel and weak marginal keels. Deep umbilicus with high and rounded umbilical wall. Falcoid ribs and strong lateral nodes. Suture line ceratitic with five high and rounded saddles.

Description. The shell is slightly involute; section is lanceolate with a largest width at 1/4 of whorl height and almost flat sides. The high fastigate venter is surmounted by a thin keel that persists also in the adult stage. Two marginal keels mark the ventrolateral shoulders. The umbilical spiral shows a distinct egression on the outer whorls. The umbilical falcoid ribs begin thickened, then become ventrally very weak. On the outer whorls the ribs become stronger and less numerous. On the body chamber the nodes are initially small, than become large and rounded. The nodes are located at the end of the swelling, forming the basal part of the ribs strongly proverse. Weak nodes can be present already on the phragmocone. The suture line is ceratitic with five entire saddles between the ventrolateral shoulder and the umbilical suture. The saddles are high and slender. All the lobes are frilled.

Dimensions (in mm):

	D	H		W		U	
9012	61.1	28.3	46%	16.8	27%	9.1	15%

Remarks. This new specie differs from *Iberites pradoi* (D'Archiac, 1860) because of the absence of marginal nodes on the body chamber. Moreover, the lateral row of nodes are closer to the umbilicus, and in the suture line the saddles are higher and narrower than in *I. pradoi.*

Iberites spp.

Pl. 9, fig. 4a,b

Material. N. 9193 (S992A); N. 9192 (S1010); N. 9194 (S1059) (Pl. 9, fig. 4).

Various lenses yielded involute, compressed specimens with a fastigate venter, surmounted by a distinct keel. The umbilicus is open and graded; the section is oval with the maximum width at one third of the whorl height. The weak, sinuous ribs end with small, spirally elongate nodes at the ventrolateral shoulder. Bifurcate or intercalatory ribs are present, so the marginal nodes are very numerous. The studied specimens could belong to different species. They are attributed overall to the genus *Iberites* Hyatt, 1900. According to Tozer (1981a) and Shevyrev (1986) the genera *Israelites* Parnes, 1962 and *Andalusites* Parnes, 1977 should be interpreted as junior synonyms of the genus *Iberites*. The scarce and poorly preserved specimens prevent reliable identification at specific level.

Rossiceras gen. n.

Type species. *Rossiceras gervasuttii* sp. n.

Name derivation. The genus is dedicated to Carla Rossi Ronchetti, former Professor of Paleontology at the University of Milano.

Diagnosis. Shell involute, compressed with tabulate section. Umbilicus small; venter in the inner whorls smooth, narrow, flat and bordered by entire marginal keels. From about 20-25 mm of the diameter the keels can become crenulate or also clavate. Consequently, the venter appears feebly convex or flat.

Inner whorls smooth; the outer whorls with weak ribs in the lower part of the flanks, sligthly prorsiradiate, ventrally projected, usually branching at the lateral nodes. Two rows of nodes, more evident on the outer whorls, lateral and marginal.

Suture line ceratitic with five saddles between E and the umbilical margin, rounded on the top, rather high and slender.

Composition of the genus: *Rossiceras gervasuttii* sp. n., *R. orobicum* sp. n., *R. intermedium* sp. n.

Discussion. In the inner whorls the venter shows features similar to those of *Norites*, but in the outer whorls the keels can be entire, crenulate or clavate. The lateral nodes are strong, but they may also be missing.

The new genus is easely distinguished from the genus *Gevanites* Parnes, 1985, because of the smooth venter and its ontogenesis; in the suture line the saddles are higher and E wider than in *Gevanites*. Moreover, *Hungarites* Mojsisovics, 1879, differs for the high median keel, whereas *Rimkinites* Mojsisovics, 1902 possesses three visible keels in the inner and outer whorls and more frilled suture line.

Occurrence. At present, this genus is recorded only from the Esino Limestone of Val Parina (Archelaus Zone).

Age. Upper Ladinian, Archelaus Zone.

Rossiceras gervasuttii sp. n.

Pl. 6, fig. 1-3; Text-fig. 4 c

Types. Holotype N. 9019 (S746) (Pl. 6, fig. 1). 56 Paratypes: N. 9020 (S746) (Pl. 6, fig. 2); N. 9021 (S746) (Pl. 6, fig. 3); N. 9022 (S746) (Fig. 4c); N. 9023 (S746); N. 9024 (S746); N. 9025 (S746); N. 9026 (S746); N. 9027 (S746); N. 9028 (S746).

Repository. Museo Civico di Scienze Naturali E. Caffi, Bergamo, Italy.

Horizon and locality. Archelaus Zone (Upper Ladinian), Val Parina, Bergamo.

Derivation of name. The new species is dedicated to M. Gervasutti, who enthusiastically collected the fossils from the Val Parina.

Diagnosis. Shell involute, compressed with subtrapezoidal section. Moderately open umbilicus also in the inner whorls. Venter narrow, flat or gently arched. At about 20 mm of the diameter the two entire marginal keels become crenulate passing to clavate. Inner whorls with rare weak ribs, irregularly distributed. At about 15-20 mm of the diameter there are sharp prorsiradiate ribs, which decrease rapidly in number becoming rare and rectiradiate, usually branching at the lateral nodes. Intercalatory ribs are also present. Consequently, the marginal clavi develop on the keels. Suture line ceratitic with E very large and five saddles between the shoulder and the umbilical edge.

Description. The section is subtrapezoidal with the outer part of the flanks slightly concave and the greatest width at the level of the lateral nodes. The width can vary from 26% to 34%. The venter is always narrow and flat or feebly arched with marginal keels. The umbilical wall is high and perpendicular. Ribs are sinuous; lateral nodes at 1/3 of side height, are very prominent and rounded, from 5 to 7 over one half of the whorl.

Marginal clavi dense and small, then becoming strong. Suture line with high and slender saddles, rounded on the top; E very wide with large ventral saddle. All specimens are slightly deformed.

Remarks. Among the collected specimens two morphotypes can be distinguished on the basis of the width of the whorls. Morphotype A, which includes the holotype (Pl. 6, fig. 1) is less compressed with more robust ribs than morphotype B (Pl. 6, fig. 3). Because the differences, however, do not affect the general aspect, the two morphotypes are lumped in the same species.

Dimensions (in mm):

	D	H		W		U	
9019	63.5	29	46%	21.4	34%	13	20%
9021	63.5	29	47%	16.5	26%	11.5	18%
9020	52.8	24.9	47%	18.2	34%	9.7	18%
9022	47.5	22.5	47%	16.5	35%	9.5	20%

Discussion. Within the new genus *Rossiceras* three species are distinguished. Because of the flat venter and entire marginal keels, the first whorls can not be easily separable one from the other. The specific characters appear at 15-20 mm of diameter.

R. gervasuttii is characterized by the largest and deep umbilicus, a subtrapezoidal section, more prominent sculpture with strong lateral nodes and an early appearance of marginal clavi.

R. intermedium is characterized by an umbilicus varying from narrow to larger in the outer whorls, a tabulate section with convex flanks, weak sinuous, ribs with rare bullae and marginal clavi on the keels.

R. orobicum possesses a compressed section, a narrow umbilicus with small egression at the body chamber, a narrow venter with entire persistent keels, absence of ornaments in the inner whorls, then weak, sinuous ribs, more evident ventrally.

Rossiceras intermedium sp. n.

Pl. 6, fig. 4; Pl. 7, fig. 3; Text-fig. 3c, 4d

Types. Holotype N.9029 (S746) (Pl. 7, fig. 3; Fig. 3c). 47 Paratypes: N.9030 (S746) (Pl. 6, fig. 4); N.9031 (S746) (Fig. 4d); N.9032 (S746); N.9033 (S746); N.9034 (S746); N.9035 (S746); N.9036 (S746).

Repository. Museo Civico di Scienze Naturali "E. Caffi", Bergamo, Italy.

Derivation of name. The name has been chosen because of the intermediate morphological features between *R. gervasuttii* and *R. orobicum.*

Horizon and locality. Archelaus Zone (Upper Ladinian), Val Parina, Bergamo.

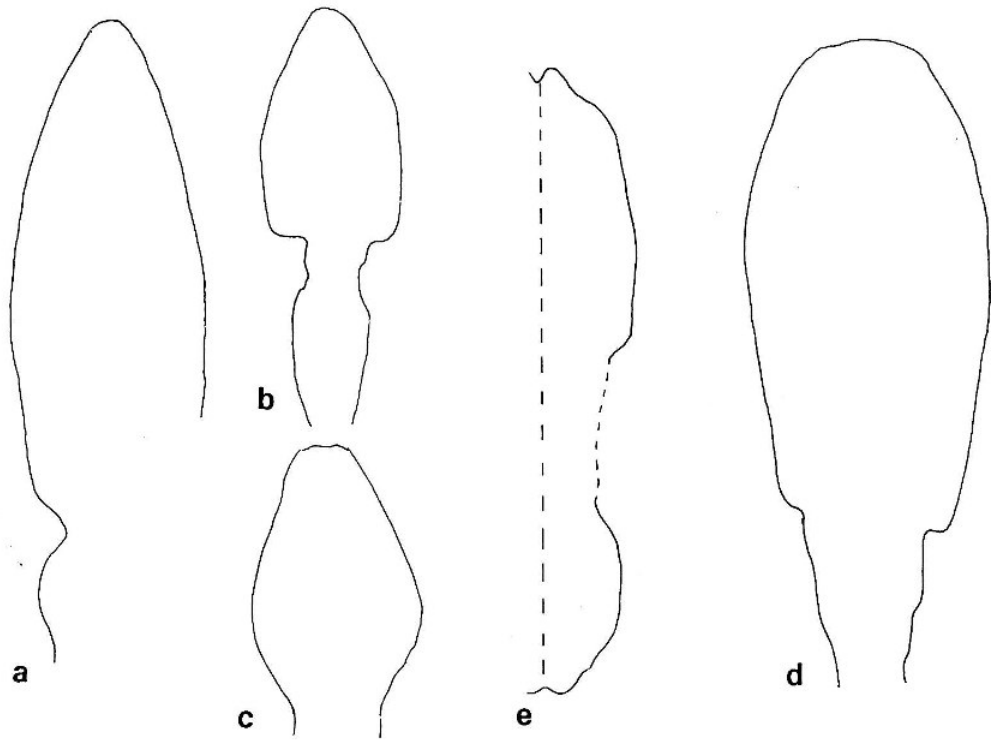


Fig. 3 - Whorl section of the following species; x 1: a) *Epigymnites credneriformis* sp. n. N. 8903 (S746), holotype (Pl. 2, fig. 2). b) *Rossiceras orobicum* sp. n. N. 9014 (S746), holotype (Pl. 7, fig. 1). c) *Rossiceras intermedium* sp. n. N. 9029 (S746), holotype (Pl. 7, fig. 3). d) *Epigymnites* aff. *paronae* (Longhi) N. 8990 (S754), (Pl. 2, fig. 1). e) *Eoprotrachyceras gervasuttii* sp. n. N. 9037 (S1010D), holotype (Pl. 5, fig. 1).

Diagnosis. Shell involute, compressed with tabulate section, umbilicus deep, slightly open in the inner whorls, evident egression at the beginning of the body chamber. Flanks convex; greatest width below the middle. Venter flat in the inner whorls, then convex. From about 25 mm of diameter marginal entire keels become crenulate because of overlapping ribs. In the body chamber the sculpture becomes more irregular and sharp. Suture line ceratitic with five saddles between the ventrolateral and periumbilical edges.

Description. All specimens are morphologically very similar. Only in the body chamber the ornaments become more pronounced and irregular. Test very thick.

Dimensions (in mm):

	D	H		W		U	
9032	47.3	23.9	51%	14	30%	5	11%
9034	43.5	22.2	51%	11.4	26%	6.2	14%
(internal mould)							
9030	42.3	22.8	54%	13.2	31%	4	9%
9032	37.8	19.7	52%	10.8	29%	5	13%

Discussion. See the discussion in *R. gervasuttii* sp. n.

Rossiceras orobicum sp. n.

Pl. 6, fig. 5; Pl. 7, fig. 1, 2; Text-fig. 3b, 4b

Types. Holotype N.9014 (S746) (Pl. 7, fig. 1; Fig. 3b, 4b). 93 Paratypes: N.9015 (S746) (Pl. 6, fig. 5); N.9016 (S746) (Pl. 7, fig. 2); N.9017 (S746); N.9018 (S746); N.9063 (S746); N.9064 (S746); N.9065 (S746); N. 9280 (S902).

Repository. Museo Civico di Scienze Naturali "E. Caffi", Bergamo, Italy.

Horizon and locality. Archelaus Zone (Upper Ladinian), Val Parina, Bergamo.

Derivation of name. The name has been chosen because of the geographical location of the type area (Prealpi Orobiche, Bergamo).

Diagnosis. Shell involute, compressed with tabulate section. Venter narrow, with two entire, marginal keels. Umbilicus narrow, deep with high vertical wall. Sculpture very weak: absent in the inner whorls, then sinuous ribs, wider ventrally, overlapped by very thin riblets. Weak bullae can be present at 2/3 of the height of the sides. Suture line ceratitic with five saddles between the shoulder and the umbilical edge.

Description. The shell is involute; a slight egression appears at the beginning of the body chamber. The venter is rounded in the inner whorls; from about 10 mm of the diameter it becomes slightly convex or flat, bordered by two entire marginal keels. Small umbilicus. Very weak sinuous ribs are present only in the outer whorls, which are wider and more prominent on the ventral side of the flanks. Suture line with E and L wide and deep, E/L slightly less high than L/U.

Dimensions (in mm):

	D	H		W		U	
9014	57.9	30.9	53%	18.3	32%	7.1	12%
9016	30.7	15.2	50%	9	29%	-	
9017	30.3	15.2	50%	8.3	27%	2.5	8%

Discussion. The peculiarities of this new species are the entire marginal keels in the inner and outer whorls and the very weak ornaments. See also the discussion in *R. gervasuttii* sp. n.

Superfamily *Pinacocerataceae* Mojsisovics, 1879

Family *Sturiidae* Kiparisova, 1958

Genus *Sturia* Mojsisovics, 1882

Type species: *Amaltheus sansovinii* Mojsisovics, 1869

Two species attributable to the genus *Sturia* were found in Val Parina, *Sturia sansovinii* (Mojsisovics, 1869) spanning the Anisian and Ladinian, and *Sturia forojulensis* Mojsisovics, 1882 from Ladinian. The former represented by four large, but fragmented specimens occurs in S746. The latter is represented by one specimen each in S1011P and S1011M. *S. forojulensis* is characterizes by periumbilical, radial folds and striae distributed on the venter, but not on the flanks.

Family *Gymnitidae* Waagen, 1895

Genus *Epigymnites* Diener, 1916

Type species: *Gymnites ecki* Mojsisovics, 1882

This genus is very frequent throughout the entire Ladinian succession of Val Parina. Six species were identified: *E. credneri* (Mojsisovics), *E. credneriformis* sp. n., *E. ecki* (Mojsisovics, 1882), *E. frequens* sp. n., *E. moelleri* (Mojsisovics, 1882), *E.* aff. *paronae* (Longhi, 1899). In the lower part of the Ladinian succession (S754, S992, S944, S993, S1010, S1011, S1117) occur *E. credneri*, *E. moelleri* and *E.* aff. *paronae*. *E. moelleri* (Pl. 1, fig. 3) is very frequent and occurs in several levels, *E. credneri* is present in S754, S992, S944 and S993. *E.* aff. *paronae* (Pl. 2, fig. 1; Fig. 3d) occurs with few specimens only in S754, S993 and S1011. The genus *Epigymnites* reappears in S1059 and S939 with *E. credneriformis* (Pl. 1, fig. 2; Pl. 2, fig. 2; Fig. 3a). In S746 this genus is present with *E. ecki* (Pl. 1, fig. 1) and *E. frequens* (Pl. 8, fig. 1-5; Fig. 4e, f). These species are the dominant element within the very diverse S746 assemblage. *E. ecki* is represented by over thousand specimens.

Epigymnites credneriformis sp. n.

Pl. 1, fig. 2; Pl. 2, fig. 2; Text-fig. 3a

Types. Holotype N.8903 (S746) (Pl. 2, fig. 2; Fig. 3a). 81 Paratypes: N.8902 (S746) (Pl. 1, fig. 2); N.9181 (S746); N.9182 (S746); N.9183 (S746); N.9184 (S746); N.9185 (S746); N.9187 (S746); N. 9278 (S1059); N.9279 (S939).

Repository. Museo di Scienze Naturali "E. Caffi", Bergamo, Italy.

Derivation of name. Because of the similarity to *E. credneri* (Mojsisovics).

Horizon and locality. Gredleri and Archelaus Zone, Ladinian, Val Parina, Bergamo.

Diagnosis. Shell compressed, involute with very narrow umbilicus. Thin, almost flat venter with rounded ventrolateral shoulders. Two marginal entire keels are present on the internal moulds. Weak sinuous ribs, prominent only near the lateral nodes. Nodes well visible only in the outer whorls. Suture line ammonitic with very large saddles and small lobes.

Description. The shell is large (phragmocone persisting at 130 mm of the diameter), always very involute and very compressed. The ornaments are always weak. The suture line, poorly preserved because of recrystallization, shows saddles very large and frilled.

Dimensions (in mm):

	D	H		W		U	
8902	52.8	31.2	59%	9.7	18%	3.6	7%

Discussion. This species is similar to *E. credneri* (Mojsisovics) for the general shape. It differs by having a shell always more involute with a very narrow umbilicus. Moreover, the saddles of suture line are more complex.

Epigymnites frequens sp. n.

Pl. 8, fig. 1-5; Text-fig. 4 e,f

Types. Holotype N. 9137 (S746) (Pl. 8, fig. 3). Paratypes: N. 9138 (S746) (Pl. 8, fig. 1; Fig. 4e); N. 9139 (S746) (Pl. 8, fig. 2); N. 9140 (S746) (Pl. 8, fig. 4); N. 9143 (S746) (Pl. 8, fig. 5; Fig. 4f). Other 26 paratypes: N. 9141 (S746); N. 9142 (S746).

Repository. Museo di Scienze Naturali "E. Caffi", Bergamo, Italy.

Horizon and locality. Archelaus Zone (Upper Ladinian), Val Parina, Bergamo.

Derivation of name. The name is derived from the common occurrence of the species.

Diagnosis. Shell evolute, compressed with elliptical section, venter rather wide and rounded, umbilicus large with high umbilical wall and rounded edge. Rare, weak radial folds, slightly convex adorally. Outer whorls with bullae at 1/2 of the heigth of

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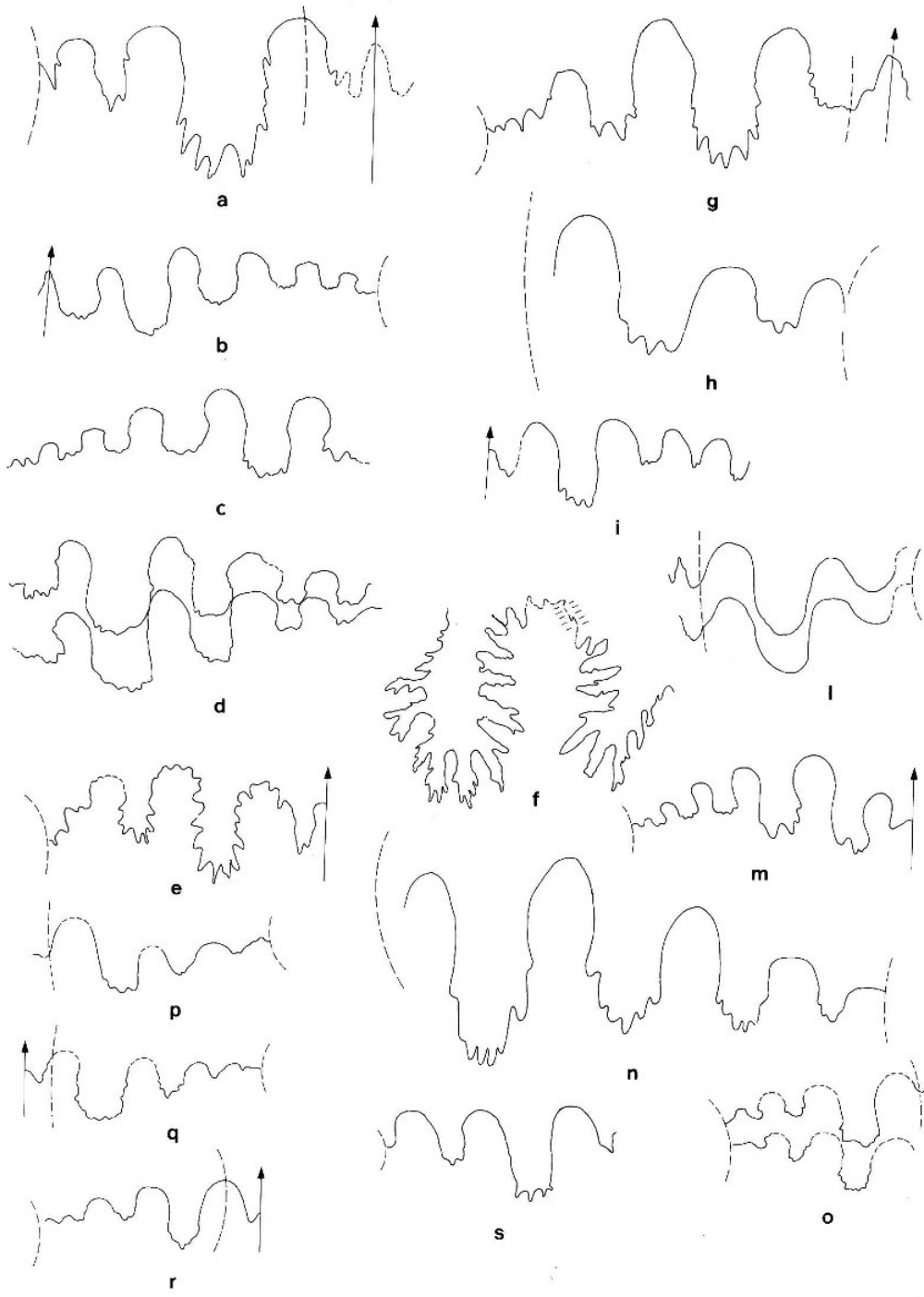
Fig. 4 - Suture lines. a) *Eoprotrachyceras gervasuttii* sp. n. N. 9037 (S1010D), H=22 mm, holotype (Pl. 5, fig. 1). b) *Rossiceras orobicum* sp. n. N. 9014 (S746), H=18.9 mm, holotype (Pl. 7, fig. 1). c) *Rossiceras gervasuttii* sp. n. N. 9022 (S746), H=22.7 mm, paratype. d) *Rossiceras intermedium* sp. n. N. 9031 (S746), H=21.7 and 23 mm, paratype. e) *Epigymnites frequens* sp. n. N. 9138 (S746), H=16.5 mm, paratype (Pl. 8, fig. 1). f) *Epigymnites frequens* sp. n. N. 9143 (S746), H=40 mm, paratype (Pl. 8, fig. 5). g) *Chieseiceras* sp. n. B. N. 9093 (S1011P), H=20 mm (Pl. 5, fig. 5). h) *Eoprotrachyceras rieberi* sp. n. PIMUZ 7001, H=21.5 mm, holotype (Pl. 3, fig. 1). i) *Parinaia semicostata* sp. n. N. 9134 (S1011R), H=9.7 mm, paratype. l) *Aplococeras orobicum* sp. n. N. 9104 (S944E), H=5.8 mm, holotype (Pl. 8, fig. 8). m) *Norites dieneri* Arthaber. N. 8963 (S1010B), D=35.5 mm. n) *Iberites nodosus* sp. n. N. 9012 (S746), D=61.1 mm, paratype (Pl. 10, fig. 5). o) *Gervasuttia nodosissima* sp. n. N. 9205 (S1110), H=4.8 mm, paratype (Pl. 11, fig. 7). p) *Gervasuttia irregularis* sp. n. N. 9199 (S1110), H=5.2, paratype. q) *Gervasuttia plicata* sp. n. N. 9209 (S1059), H=3.2, paratype. r) *Gervasuttia shevyrevi* sp. n. N. 9196 (S1059), H=5.2, paratype. s) *Detoniceras raricostatum* sp. n. N. 9095 (S746), H=6 mm, paratype (Pl. 8, fig. 9).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the side. Suture line subammonitic with three saddles, slightly frilled, descending steeply to the umbilical suture. Adult suture with acute and slender frillings in the saddles and lobes.

Description. The shell is evolute, compressed with an elliptical section. The venter is wide and rounded, the flanks are almost flat and the umbilical wall is high and declive towards the umbilicus. The test is very thick, therefore the internal moulds seem more compressed. Each whorl covers only the venter and the outermost part of the previous whorl. The suture line is less frilled than in the true *Epigymnites*, but lobes and saddles show the same disposition. One specimen, about 110 mm in diameter (Pl. 8, fig. 5), with similar inner whorls, possesses a fragment of the outer whorl, which shows one row of spirally elongate nodes and very frilled saddles and lobes (Fig. 4f). The U/D varies from 40% to 44%, the H/D from 32% to 34% and W/D from 25% to 28%. The general shape is so very uniform.

Discussion. In the other species of *Epigymnites* the inner whorls are more involute with a more frilled suture line. This new species shows some similarities with other species of *Gymnites* Mojsisovics, 1882 of the Upper Anisian. However, the latter do not possess nodes on the outer whorls and the suture line is more frilled.

Epigymnites aff. **paronae** (Longhi, 1899)

Pl. 2, fig. 1; Text-fig. 3d

Material. N. 8990 (S754) (Pl. 2, fig 1; Fig. 3d); N. 8991 (S754); N. 8992 (S1011A); N. 8993 (S993A).

Description. Shell compressed, from involute to slightly involute; umbilicus from narrow to medium with high umbilical wall and rounded margin. Subelliptical section with rounded venter. Irregular ornaments: weak riblets and a row of lateral nodes on the inner whorls. Outer whorls with sinuous ribs more visible dorsally, rarely accompanied by deep and wide furrows and one or two rows of lateral nodes. Suture line ammonitic with high saddles.

Discussion. These specimens could be attributable to Longhi's species (1899, p. 27, pl. 4, fig. 1-3) which displays a similar irregularly distributed ornaments and a section wide and rounded ventrally. However, the identification should be considered tentative because the holotype could not be examined. On the other hand, the greater width of the section and the irregular ornaments differentiate our specimens from the other species belonging to the genus *Epigymnites*.

Dimensions (in mm):

	D	H		W		U	
8993	66.8	36	54%	14	21%	6.9	10%

Occurrence. Ladinian of Valdepena (Italy).

Family *Pinacoceratidae* Mojsisovics, 1879

This family is represented by the two genera described from the Ladinian so far: *Pompeckjites* Mojsisovics, 1902 and *Praepinacoceras* Fantini Sestini, 1992. A single poorly preserved specimen about 15 mm of the diameter was attributed to the former genus (*Pompeckjites* sp. ind.). Its shell is compressed with a medium sized umbilicus. The radial folds run only on the ventral portion of the whorl sides, which show a weak spiral depression at half way of the height. This specimen comes from S1010D. The other specimens found in S746 (N. 9079) are attributable to *Praepinacoceras stoppanii* (Airaghi, 1902) (Pl. 1, fig. 4). The generic attribution is supported by the presence of a rather simple suture, as in *Praepinacoceras* (Fantini Sestini, 1992).

Superfamily *Danubitaceae* Spath, 1951

Family *Aplococeratidae* Spath, 1951

Genus *Aplococeras* Hyatt, 1900

Type species: *Trachyceras avisianum* Mojsisovics, 1878

Aplococeras orobicum sp. n.

Pl. 8, fig. 6-8; Text-fig. 4l

Types. Holotype N. 9104 (S944E) (Pl. 8, fig. 8; Fig. 4l). 41 Paratypes: N. 9105 (S944E) (Pl. 8, fig. 7); N. 9106 (S944E); N. 9259 (S944F); N. 9260 (S944F); N. 9107 (S754) (Pl. 8, fig. 6); N. 9108 (S754); N. 9109 (S1011N); N. 9110 (S1011N).

Repository. Museo Civico di Storia Naturale "E. Caffi", Bergamo, Italy.

Derivation of name. The name has been chosen because of geographical location of the type area (Prealpi Orobiche, Bergamo).

Horizon and locality. Curionii Zone (Lower Ladinian), Val Parina, Bergamo.

Diagnosis. Shell evolute, very compressed, with almost flat flanks and narrow venter. Large and shallow umbilicus. Goniatitic suture line with three saddles: two very wide and one small, near the umbilical suture. L large and rounded.

Description. The shell possesses a very compressed, elliptical section. The whorls grow very slowly: the umbilicus is large and shallow. Very thin, sinuous riblets are rarely visible. The goniatitic suture line shows E very deep, L very wide and rounded, U small. The saddles are wide, but the third is poorly visible.

Dimensions (in mm):

	D	H	W	U
9104	27.7	7.7 28%	6.3 23%	12.6 45%

Discussion. The goniatitic suture of *A. orobicum* is very similar to that of *Lecanites vodgesi* Hyatt & Smith, 1905 or *L. parvus* Smith (Smith, 1914, pl. 30). *A. avisianum* (Mojsisovics, 1878) differs from this new species in having a suture line with L frilled (Brack & Rieber, 1993, fig. 17 c) and ornaments well developed. *A. misanii* (Mojsisovics, 1882) differs for possessing less high whorls and larger umbilicus.

Gervasuttia gen. n.

Type species. *Gervasuttia shevyrevi* sp. n.

Name derivation. The genus is dedicated to M. Gervasutti, who collected the present fossils from Val Parina, Bergamo.

Diagnosis. Small shell, involute or slightly evolute, compressed with subrectangular section. Flanks almost flat, venter wide with median part feebly convex and ventrolateral shoulders emphasized by rib endings. Ribs thin or swollen, falcoid; sometimes a row of nodes on the flanks. Suture line ceratitic with large L and four saddles between the ventrolateral shoulder and the umbilical rim.

Composition of the genus. *G. shevyrevi* sp. n., *G. irregularis* sp. n., *G. nodosa* sp. n., *G. nodosissima* sp. n., *G. plicata* sp. n.

Discussion. This new genus is characterized by the venter shape and by the suture line. The truncate venter shows a median part feebly convex and two shallow sulci. The ribs pass over the ventrolateral shoulder and terminate against the sulci widening the venter. The ceratitic suture line with four saddles shows always a L very large and deep. The involution and ornament variations characterize the individual species of this new genus.

Age. Gredleri and Archelaus Zones, Ladinian.

Gervasuttia shevyrevi sp. n.

Pl. 11, fig. 1; Text-fig. 4r, 5e

Types. Holotype N. 9195 (S1059) (Pl. 11, fig. 1; Fig. 5e). 23 Paratypes: N. 9196 (S1059) (Fig. 4r), N. 9197 (S1059), N. 9258 (S1059).

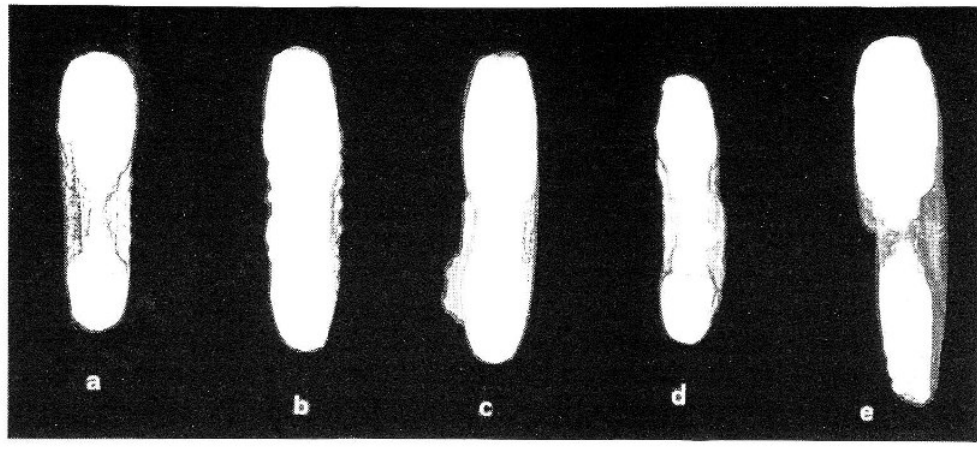

Fig. 5 - Whorl section of the following species; x 2: a) *Gervasuttia nodosa* sp. n. N. 9203 (S1110), paratype. b) *Gervasuttia nodosissima* sp. n. N. 9206 (S1110), paratype (Pl. 11, fig. 5). c) *Gervasuttia irregularis* sp. n. N. 9200 (S1110), paratype. d) *Gervasuttia plicata* sp. n. N. 9208 (S1059), holotype (Pl. 11, fig. 8). e) *Gervasuttia shevyrevi* sp. n. N. 9195 (S1059), holotype (Pl. 11, fig. 1).

Repository. Museo di Scienze Naturali "E. Caffi", Bergamo, Italy.
Derivation of name. This new species is dedicated to A.A. Shevyrev of Moscow University.
Horizon and locality. Gredleri Zone, Ladinian, Val Parina, Bergamo.

Diagnosis. Shell involute, compressed with almost flat flanks and wide, slightly convex venter; umbilicus deep. Ribs falcoid, prominent only ventrally, crossing ventrolateral shoulder, very projectate. Suture line ceratitic with large L and other three lobes visible.

Description. In the inner whorls the flanks are almost flat and the venter is very slightly convex as in the outer whorls. The umbilical shoulder is rounded with steep umbilical wall. The falcoid ribs are almost absent in the inner part of the flanks, ventrally projectate and prominent, large and dense. In the body chamber the ribs become very thin. A little and shallow furrow runs between the central part of the venter and the ends of the ribs. The suture line is ceratitic with two large saddles and L very deep. The other elements are much smaller.

Dimensions (in mm):

	D	H	W	U
9195	25.1	10.4 41%	5.7 23%	5.8 23%
9197	19.9	8.4 42%	-	4.6 23%

Discussion. Five species are described within the new genus *Gervasuttia*. In all species the venter is very feebly convex in the median part, which is bordered by two shallow and thin furrows. The endings of the lateral projectate ribs finish in these furrows passing over the ventrolateral shoulder. The individuals are always small sized. The suture line is very similar in all species: E few deep, L large with E/L high and wide, U subdivided in three small lobes with three saddles visible before the umbilical rim. These species differ one from other because of the ornaments and involution.

In *G. shevyrevi* the shell is involute with regular, falcoid ribs which become very thin and dense in the body chamber.

In *G. irregularis* the shell is always involute, but the ribs are irregular, more or less prominent, more distant than in *G. shevyrevi*.

In *G. plicata* the shell is very slightly involute. The ribs are swollen, rare in the inner part of the flanks, ventrally thin. Intercalatory ribs are present.

In *G. nodosa* the shell is evolute or very slightly involute. At 2 to 2 the riblets starting from the high umbilical wall meet in big nodes at about one third of the whorl height. On the outer part of the flank the ribs are stronger and more numerous because of the presence of the intercalatory ribs.

In *G. nodosissima* the shell is more involute than in *G. nodosa* and the whorls are higher. The nodes are very numerous and approximated.

Gervasuttia irregularis sp. n.

Pl. 11, fig. 2; Text-fig. 4p, 5c

Material. Holotype N. 9198 (S1110) (Pl. 11, fig. 2). 21 Paratypes: N. 9199 (S1110) (Fig. 4p), N. 9200 (S1110) (Fig. 5c), N. 9295 (S902).

Repository. Museo Civico di Scienze Naturali "E. Caffi", Bergamo, Italy.

Derivation of name. From latin adjective *irregularis-e.*

Horizon and locality. Gredleri and Archelaus Zones, Ladinian, Val Parina, Bergamo.

Diagnosis. Small shell, involute, compressed with flanks slightly convex; umbilicus shallow. Venter rather wide and feebly rounded. Ribs falcoid, irregularly thickened at the inner third of the whorl height. Suture line ceratitic.

Description. The small shell is involute with a shallow umbilicus. Along the feebly convex venter run two small lateral furrows against which the ribs terminate. The ornaments are variably thick and approximated: the ribs are falcoid, thickened at the inner third of the flanks, projectate. The suture line is characterized by a wide L, flanked by two large saddles. All the elements appear slightly frilled, but possibly these small denticulations can be related to recrystallization.

Dimensions (in mm):

	D	H		W		U	
9198	23.9	11.5	48%	-		5.1	21%
9200	18.6	8.7	47%	4.9	26%	3.9	21%

Discussion. See the discussion in *G. shevyrevi* sp. n.

Gervasuttia nodosa sp. n.

Pl. 11, fig. 3,4; Text-fig. 5a

Types. Holotype N. 9201 (S1110) (Pl. 11, fig. 4). 5 Paratypes: N. 9202 (S1110) (Pl. 11, fig. 3); N. 9203 (S1110) (Fig. 5a).

Repository. Museo Civico di Scienze Naturali "E. Caffi", Bergamo, Italy.

Derivation of name. From latin adjective *nodosus-a-um.*

Horizon and locality. Gredleri Zone, Ladinian, Val Parina, Bergamo.

Diagnosis. Shell from evolute to slightly involute, compressed with almost flat flanks and feebly convex venter. Umbilicus deep with steep umbilical wall. Ribs falcoid, projectate and more prominent near venter, very dense and thin in the body chamber. A row of strong and rare nodes at a third of whorl height.

Description. The inner whorls are very few evolute, the following whorls are more involute. The flanks are almost flat and the venter is feebly convex. The umbilical wall is at first rounded, after steep. A row of strong and rare nodes starts at about 10 mm of the diameter at a third of the whorl height. They are elongated radially. In the body chamber they become very dense and small. The falcoid ribs are of the same number of the nodes. The ribbing shows frequent fibulations between the nodes and the umbilical rim. In the outer part of the flanks the ribs are projectate and numerous because of presence of secondary and intercalatory ribs. The ribs end in the furrows bordering the central part of the venter. This is convex and smooth and seems to be a

large keel. Sometimes the ribs extend on the venter untill joining with that of the opposite side. The suture line is not preserved.

Dimensions (in mm):

	D	H	W	U
9203	16.2	5.2 32%	4.2 26%	6.9 43%
9201	24.8	9.5 38%	9.3 37%	-

Discussion. See the discussion in the *G. shevyrevi* sp. n.

Gervasuttia nodosissima sp. n.

Pl. 11, fig. 5-7; Text-fig. 4o, 5b

Types. Holotype N. 9204 (S1110) (Pl. 11, fig. 6). Paratypes: N. 9205 (S1110) (Pl. 11, fig. 7; Fig. 4o), N. 9206 (S1110) (Pl. 11, fig. 5; Fig. 5b) and other 7 paratypes N. 9207 (S1110).

Repository. Museo Civico di Scienze Naturali "E. Caffi", Bergamo, Italy.

Derivation of name. From latin superlative adjective *nodosissimus-a-um.*

Horizon and locality. Gredleri Zone, Ladinian, Val Parina, Bergamo.

Diagnosis. Shell involute, compressed, with very feebly convex flanks and convex venter. Umbilicus small with rounded umbilical rim. Ribs falcoid, more prominent and wider near the venter, with fibulations near the umbilicus. Nodes radially elongate at one third of the whorl height. Suture line ceratitic with large L and four saddles between the shoulder and the umbilical edge.

Description. The shell is more evolute in the inner whorls with subelliptical section. The umbilicus is small, not very deep. The umbilical rim is rounded. The central part of the venter is convex, bordered by two shallow furrows simulating like-a-keel in the larger specimens. The ribs start from the umbilical suture, are very thin with fibulations which terminate with lateral nodes. Then, the ribs become adorally concave, prominent and bifurcate. The rib endings cover the ventrolateral shoulder and disappear in the lateral furrow of the venter. The nodes are very approximated on the outer whorls, but are more rounded and spaced in the inner whorls.

Dimensions (in mm):

	D	H	W	U
9205	20	8.4 42%	-	6 30%
9206	23.3	10.5 45%	-	6 26%

Discussion. See discussion in *G. shevyrevi* sp. n.

Gervasuttia plicata sp. n.

Pl. 11, fig. 8; Text-fig. 4q, 5d

Types. Holotype N. 9208 (S1059) (Pl. 11, fig. 8; Fig. 5d). 13 Paratypes: N. 9209 (S1059) (Fig. 4q); N. 9210 (S1059).

Repository. Museo Civico di Scienze Naturali "E. Caffi", Bergamo, Italy.

Derivation of name. Because the presence of strong ribs or plicae.
Horizon and locality. Gredleri Zone, Ladinian, Val Parina, Bergamo.

Diagnosis. Small shell slightly evolute, compressed, with almost flat flanks, venter fleebly rounded. Umbilicus shallow. Rare, strong ribs beginning from umbilical rim with very thin intercalatory ribs: all projectate and covering the ventrolateral shoulder. Suture line with four saddles between the shoulder and the umbilical edge and large L.

Description. The small sized shell is compressed and feebly evolute. The ornaments consist in ribs swollen in the inner part of the flanks, ventrally very thin as the intercalatory ribs. Primary and intercalatory ribs are projectate and cover the ventrolateral shoulder, ending in the shallow and narrow furrows which border the median area of the venter. In the body chamber the ribs become thin and approximated. The suture line consists of a E few deep, a clearly frilled L and second lobe with denticulation very weak.

Dimensions (in mm):

	D	H		W		U	
9208	17.2	6	35%	3.7	22%	6.5	38%

Discussion. See the discussion in *G. shevyrevi* sp. n.

Superfamily *Arcestaceae* Mojsisovics, 1875
Family *Cladiscitidae* Zittel, 1884

The genus *Procladiscites* Mojsisovics, 1882 is the only representative of the family in Val Parina. Five specimens from S1010D, attributable to *P. griesbachi* Mojsisovics, 1882 exhibit strong radial striae on the outer part of the flanks of the body chamber. These ornaments were not illustrated so far. Two specimens from S993E, not well preserved, show a feebly convex venter as juvenile specimens of *P. griesbachi.* However, the fact that this character persists also at great diameter suggests the attribution of these two specimens to *P. rodostoma* Tommasi, 1899. Numerous small *Procladiscites* are present also in S746.

Family *Arcestidae* Mojsisovics, 1875

The family Arcestidae is represented only by the genus *Proarcestes* Mojsisovics, 1893 from Ladinian of Val Parina. In the lower part of the stratigraphic succession it is not very frequent (S944F, S992C, S1010A). Conversely, rappresentatives of *Proarcestes* are very numerous in S746, S902 e S1117. A statistical study would be in order to define the field of variability of the numerous species described by Mojsisovics (1875, 1882), Tommasi (1899), Diener (1908), etc. Some specimens here studied were tentatively identified at specific level: *P. pannonicus* (Mojsisovics, 1882) in S944F, S1010A, S992C and possibly in S1117 together with *P.* cf *subtridentinus* (Mojsisovics,

1882), *P. marcheanus* (Mojsisovics, 1882) (Pl. 9, fig. 1, 2) in S746 and possibly in S944H, *P. esinensis* (Mojsisovics, 1882), *P. boeckhi* (Mojsisovics, 1882), *P.* cf. *reyeri* (Mojsisovics, 1882) and *P.* cf. *subtridentinus* (Mojsisovics, 1882) in S746 or S902.

Superfamily *Trachyceratataceae* Hang, 1884

Family *Arpaditidae* Hyatt, 1900

Subfamily *Protrachyceratinae* Tozer, 1971

Genus *Eoprotrachyceras* Tozer, 1980

Type species: *Eoprotrachyceras matutinum* Tozer, 1980

Tozer (1980) established the new genus *Eoprotrachyceras* on specimens from the Asperum Zone of British Columbia. Tozer's specimens exhibited a "lateral tuberculation and ventral deep sulcus bordered by more or less clavate tubercles", but differed from *Protrachyceras* Mojsisovics, 1893 by possessing a ceratitic suture line. According to Tozer the new taxon should include the earlier protrachyceratinids, whereas the later genus *Protrachyceras* was characterized by an ammonitic suture. It is worth mentioning, however, that the typical ceratitic suture illustrated by Tozer (1980, pl. 17.1, fig. a) is also present in *Eoprotrachyceras rieberi* sp. n. but it is slightly different in *E. curionii* (Mojsisovics) (1882, pl. 14, fig. 4) and in *E. gervasuttii* sp. n. (Fig. 4a). A similar suture reappears also in *Protrachyceras steinmanni* (Mojsisovics) from the Gredleri or Archelaus Zone (Brack & Rieber, 1993, fig. 17g). Only one specimen from Archelaus Zone of Val Parina, with poorly preserved suture line seems to confirm such observation. Moreover, Brack & Rieber (1993, p. 484, fig. 17n) emphasized that the specimens from Curionii or Gredleri Zone, attributed by these authors to *Trachyceras margaritosum* Mojsisovics (= *Eoprotrachyceras margaritosum* in Tozer, 1980) possess a suture with denticulated saddles as in *Protrachyceras*. The holotype of *T. margaritosum* is not well figured by Mojsisovics (1882, pl. 82, fig. 1), because the saddles are not entire, but denticulated in the original specimen. Thus, this species must be assigned to *Protrachyceras*. Our conclusions are that in the Southern Alps the oldest species cannot be separated from the younger ones only on the basis of the ceratitic or ammonitic suture line.

In the lower part of the Ladinian succession of Val Parina occur *E. gervasuttii* sp. n., *E. rieberi* sp. n. and *E.* cf. *recubariense* (Mojsisovics) and other specimens, poorly preserved, not identified at specific level.

Eoprotrachyceras gervasuttii sp. n.

Pl. 5, fig. 1,2; Text-fig. 4a

1992 *Eoprotrachyceras* sp. n. A Jadoul, Gervasutti & Fantini Sestini, pl. 23, fig. 2.

Types. Holotype N. 9037 (S1010D) (Pl. 5, fig. 1; Fig. 4a). 4 Paratypes: N. 9041 (S1010); N. 9040 (S1011Q); N. 9038 (S1011P) (Pl. 5, fig. 2); N. 9039 (S1011P)

Repository. Museo Civico di Scienze Naturali "E. Caffi", Bergamo, Italy.
Derivation of name. Dedicated to M. Gervasutti, who collected the material.
Horizon and locality. Curionii Zone (Lower Ladinian), Val Parina, Bergamo.

Diagnosis. Shell involute, compressed with flanks almost flat, venter rounded with a thin furrow; umbilicus shallow. Ribs slightly prorsiradiate, projected ventrally rarely branching at the umbilical or inner lateral nodes. Five rows of nodes: peri umbilical nodes few and prominent; lateral nodes at about 1/3 of the side height absent from 50 mm of the diameter; outer lateral nodes rounded near the marginal nodes, ventral nodes alternate. Suture line ceratitic with three large saddles and L wide and deep.

Description. The shell is very compressed with a shallow umbilicus, which is deeper in the inner whorls. The rounded venter becomes compressed and subacute at the beginning of the body chamber. The ribs are very regular, rarely bifurcate; the nodes are evident except in the inner lateral row.

Dimensions (in mm):

	D	H		W		U	
9037	72.5	34	47%	24	33%	19.5	27%
9038	26	11.4	44%	9.6	37%	7.4	28%

Discussion. The species differs from the others belonging to the genus *Eoprotrachyceras* Tozer, 1980, by having a very regular and dense ribs and the nodes well evident only in the three outer rows, whereas umbilical and inner lateral nodes are very weak. It is also similar to *E. gredleri* (Mojsisovics), which differs by possessing a larger venter and more prominent inner nodes.

Eoprotrachyceras rieberi sp. n.

Pl. 3, fig. 1-4; Text-fig. 4h

Types. Holotype PIMUZ 7001 (Pl. 3, fig. 1; Fig. 4h). Paratypes: PIMUZ 7003 (Pl. 3, fig. 2), PIMUZ 7000, 7002, 7004

Repository. Palaeontologisches Institut und Museum der Universität, Zürich, Switzerland.

Additional material. The specimens from Curionii Zone of Val Parina are stored at the Museo Civico di Scienze Naturali "E. Caffi", Bergamo: N. 8994 (S1010D) (Pl. 3, fig. 4); N. 9003 (S754) (Pl. 3, fig. 3); N. 9002 (S904); N. 9001 (S944F); N. 8997 (S1011H); N. 8998 (S1011P); N. 8999 (S1011Q); N. 8994 (S1011D); N. 8995 (S1010); N. 8996 (S944F).

Derivation of name. The species is named after Prof. H. Rieber from Zurich University.

Horizon and locality. 1.6 m above the Chiesense groove in Pertica column, Forno d'Ono, Pertica Bassa, Brescian Prealps.

Diagnosis. During the ontogenesis the shell becomes from slightly involute to evolute, always compressed with flanks from almost flat to fleebly convex. Venter narrow with a thin furrow. Ribs gently sinuous, acute and dense, bifurcate at the umbilical nodes or at about 1/3 of the whorl height. Umbilical nodes more or less prominent; marginal nodes very small; ventral nodes sharp. Suture line ceratitic with three saddles between the shoulder and the umbilical edge.

Description. During the ontogenesis the umbilicus becomes wider, consequently the whorls are less high. The ribs change from thin and dense to strong and more spaced. Branching ribs are frequent at the umbilical nodes in the inner whorls, later the branchings become more frequent at 1/3 of flanks height, where the umbilical branching disappears.

Dimensions (in mm):

	D	H	W	U
PIMUZ 7001	121	43.5 36%	-	44.6 37%
8996	24	10.5 44%	-	5 21%

Remarks. The types of the new species have been mentioned by Brack & Rieber as *Protrachyceras* cf. *laczkoi* (1986, p. 204, fig. 7).

Brack & Rieber's specimens are much better preserved than the Val Parina material. Therefore, the diagnosis of *P. rieberi* sp. n. is based on the former specimens in which morphological characters are more diagnostic.

Discussion. The new species is close to *Protrachyceras laczkoi* Diener (1899, p. 13, pl. 1, fig. 7), but it displays more compressed section and narrower venter than Diener's species. Moreover, in the new species branching or intercalary ribs on the outer side of flanks are missing. The suture line is ceratitic instead of subammonitic as in *P. laczkoi*. It is worth noticing that on the basis of the suture line features and position of ventral nodes at the same level on both sides, the species *laczkoi* is attributable to the genus *Anolcites* Mojsisovics, 1893 and does not belong to the genus *Eoprotrachyceras*. Another species similar is also *Protrachyceras gortanii* Pisa (1966, p. 33, pl. 71, fig. 1-4), which differs by having ribs bifurcated in correspondence of the umbilical nodes and at 1/3 of the whorl height also in the inner whorls. Moreover the shape of the venter much larger and rounded is different.

Genus *Protrachyceras* Mojsisovics, 1893

Type species: *Trachyceras archelaus* Laube, 1869

Several species of *Protrachyceras* are recorded in the collected material from Val Parina where they are represented by individuals very close to the types figured by various authors. Identified species are: (1) in S746 *P. ladinum* (Mojsisovics, 1882), *P. longobardicum* (Mojsisovics, 1882) (also in S902) (Pl. 4, fig. 4), *P. pseudoarchelaus* (Boeckh, 1873) and *P. steinmanni* (Mojsisovics, 1882) (Pl. 4, fig. 1), in addition to the new species *P. irregulare* and *P. parinaense* (also in S1040) and (2) in S1059 two fragmented specimens tentatively attributed to *P. margaritosum* (Mojsisovics, 1882) (Pl. 2, fig. 3).

Protrachyceras irregulare sp. n.

Pl. 12, fig. 1-4

Types. Holotype N. 9213 (S746) (Pl. 12, fig. 1). 14 Paratypes: N. 9214 (S746) (Pl. 12, fig. 2); N. 9215 (S746) (Pl. 12, fig. 3); N. 9216 (S746) (Pl. 12, fig. 4); N. 9217 (S746), N. 9218 (S746).

Repository. Museo Civico di Scienze Naturali "E. Caffi", Bergamo, Italy.
Derivation of name. From the latin adjective *irregularis-e.*
Horizon and locality. Archelaus Zone, Upper Ladinian, Val Parina, Bergamo.

Diagnosis. Shell slightly involute, compressed with rather flat flanks and wide venter; umbilicus open with rounded rim. Ribs slightly prorsiradiate, strong, bifurcating at different height. Six rows of strong, rounded nodes. Four to five rows in the inner whorls. Spacing between rows irregular. Ammonitic suture line with three high and slender saddles between ventrolateral shoulder and umbilical rim.

Description. The shell is slightly involute: in the umbilicus are visible the previous whorls with small nodes. The section is subrectangular with a rather wide venter; the umbilical wall is high and smooth; the umbilical nodes are developed in the height and are not projected over the umbilical rim. The nodes are rounded, irregularly distributed, consequently the spiral rows of nodes can appear discontinuous. Spacing between umbilical nodes and inner lateral ones is broad and so also between the inner lateral and second lateral nodes. The strong ribs start from the umbilical rim and support six nodes, four to five in the inner whorls. Bifurcating ribs are present at the different whorl height. The ammonitic suture line, poorly preserved, is very similar to that of *P. longobardicum* (Mojsisovics, 1882, pl. 28, fig. 4). The three saddles are feebly frilled, high and slender.

Dimensions (in mm):

	D	H		W		U	
9217	57.8	25	43%	18	31%	16.8	29%
9213	48.8	23.9	49%	17	35%	11.7	24%

Discussion. The new species shows some similarities with *P. margaritosum* (Mojsisovics, 1882). However, it possesses (1) nodes developed in height not projected beyond the umbilical rim, (2) the lateral rows of nodes are less numerous (five instead of eight) as in Mojsisovics species and (3) the nodes are more rounded and stronger.

It also differ from *P. parinaense* sp. n. by having again a lower number of node rows, rounded nodes instead of spirally elongated, and a larger ventral furrow. In *P. pseudoarchelaus* (Boeckh, 1873) the flanks are more convex with maximum width near the umbilicus, consequently the umbilical wall is higher than in *P. irregulare.* Moreover, there are seven rows of nodes. In *P. archelaus* (Laube, 1868) the venter is very wide, the umbilical wall is much higher, and six rows of nodes are more regularly spaced than in the new species.

Protrachyceras parinaense sp. n.

Pl. 4, fig. 2, 3

Types. Holotype N. 9004 (S746) (Pl. 4, fig. 2). 5 Paratypes: N. 9005 (S746), N. 9042 (S746), N. 9043 (S1040) (Pl. 4, fig. 3).
Repository. Museo Civico di Scienze Naturali "E. Caffi", Bergamo, Italy.

Horizon and locality. Archelaus Zone, Upper Ladinian, Val Parina, Bergamo.
Derivation of name. From Val Parina, Bergamo.

Diagnosis. Shell compressed with feebly convex flanks, rather wide venter, open and deep umbilicus. Ribs wide and flat, with rounded or spirally elongated and very large nodes in 9 spiral rows.

Description. The flanks are almost flat, the ribs are wide and slightly prominent, spaced, generally simple, rarely bifurcate, at the level of the third or fourth lateral node. There are 9 spiral rows of nodes which are strong, rounded or spirally elongated. The suture line is not preserved.

Remarks. Later in the ontogenesis the nodes become larger and the ribs tend to disappear. *Protrachyceras longobardicum* (Mojsisovics) differs from the new species in having predominantly ribs with very weak nodes in the adults. *Protrachyceras margaritosum* (Mojsisovics) has always nodes rounded, less strong, well aligned along the ribs, which are more prominent than in this new species.

Genus *Detoniceras* Manfrin & Mietto, 1991

Type species: *Detoniceras rex* Manfrin & Mietto, 1991

Detoniceras raricostatum sp. n.

Pl. 8, fig. 9,10; Text-fig. 4s

Types. Holotype N. 9094 (S746) (Pl. 8, fig. 10a,b). Paratype: N. 9095 (S746) (Pl. 8, fig. 9a,b; Fig. 4s). Other 4 Paratypes: N. 9096 (S746).
Repository. Museo di Scienze Naturali "E. Caffi", Bergamo, Italy.
Derivation of name. From the latin because of rarely of the ribs.
Horizon and locality. Archelaus Zone (Upper Ladinian), Val Parina, Bergamo.

Diagnosis. Shell slightly involute, compressed with subpolygonal section. Venter narrow and umbilicus with high umbilical wall. Ribs rare, strong, rectiradiate with bifurcations at the lateral nodes; rare intercalatory ribs. In the inner whorls ribs are dense, rarely bifurcating. Four rows of nodes: umbilical prominent, lateral strong, marginal numerous and smaller, ventral dense, spirally elongate. Suture ceratitic with 3 large and rounded saddles between the shoulder and the umbilical edge.

Description. The specimens studied are of small size, except for two which are 45 mm of diameter. The shell is compressed, the ventral furrow faid of about 40 mm of the diameter. The principal ribs, starting from the umbilical nodes, are very spaced and bifurcate at half way of H in correspondence of the lateral nodes. The intercalatory ribs are rare; the marginal nodes display in half a whorl a 15:6 ratio in respect to the lateral nodes. Four rows of nodes: the umbilical and lateral become less prominent during ontogeny. The suture, also in small sized specimens, is ceratitic characterized by L large and deep with 5 weak frills.

Dimensions (in mm):

	D	H		W		U	
9094	42.1	16.3	39%	12.3	29%	13.4	32%
9095	26.9	10.2	38%	8.6	32%	8.8	33%

Comparison. This new species is very similar to *D. tetranodosum* (De Toni), but the intercalatory ribs are less numerous as well the marginal nodes. The suture line is ceratitic and not goniatitic (Manfrin & Mietto, 1991).

Subfamily *Arpaditinae* Hyatt, 1900

Genus *Arpadites* Mojsisovics, 1879

Type species: *Ammonites arpadis* Mojsisovics, 1870

The genus *Arpadites* occurs only in the middle and upper part of the Ladinian succession from Val Parina. Several, but poorly preserved specimens occur in S1011R; some of them might be attributable to *A. cinensis* Mojsisovics. This species is definitely present in S746 (Pl. 11, fig. 11). Moreover, fragments of *Arpadites* were found in S1194, a lense stratigraphically higher than S1011R.

The rare specimens from S1110 could belong *A. arpadis* (Mojsisovics) together with the new species *A. dichotomus*.

In S902 and S746 the genus is well represented: besides *A. cinensis*, already mentioned and here very frequent (185 specimens) the assemblage includes *A. telleri* Mojsisovics and the new species *A. bracki* and *A. pulcher*.

Arpadites bracki sp. n.

Pl. 11, fig. 13,14

Types. Holotype N. 9227 (S746) (Pl. 11, fig. 14). 37 Paratypes: N. 9228 (S746) (Pl. 11, fig. 13); N. 9229 (S746); N. 9233 (S746); N. 9234 (S746).

Repository. Museo Civico di Scienze Naturali "E. Caffi", Bergamo, Italy.

Derivation of name. The name is after P. Brack from Zurich, ETH (Swiss Federal Institute of Technology Zurich).

Horizon and locality. Archelaus Zone, Upper Ladinian, Val Parina, Bergamo.

Diagnosis. Shell very evolute, compressed with subelliptical section. Venter narrow, gently arched with two rounded keels. Ribs distant, strong with umbilical swelling.

Description. The shell is very compressed with feebly convex flanks and narrow venter. The umbilicus is large and shallow in the outer whorls. The keels are rounded and separate by a thin, smooth area from the flanks. The broad ribs show an umbilical swelling and decrease in thickness ventrally, where they become projectate and end against the smooth area bordering the keels. In the outer whorls the ornaments become more irregular owing to the presence of few intercalatory ribs. These last ribs are very long, placed side by side of the first order ribs.

Dimensions (in mm):

	D	H		W		U	
9227	28	8	29%	7.5	27%	13.8	49%
9228	21.2	7	33%	4.9	23%	9	42%

Discussion. This new species is very similar to *A. arpadis* (Mojsisovics) in the general shape, but it differs on the ornaments. In *A. arpadis* the ribs are very thin, approximated with weak umbilical nodes and frequent intercalatory ribs. In the new species the ribs are strong, distant with umbilical swelling and very rare intercalatory ribs.

Arpadites dichotomus sp. n.

Pl. 11, fig. 9,10

Types. Holotype N. 9224 (S1110) (Pl. 11, fig. 9). Paratypes: N. 9225 (S1110) (Pl. 11, fig. 10) and other 3 Paratypes N. 9226 (S1110).
Repository. Museo Civico di Scienze Naturali "E. Caffi", Bergamo, Italy.
Derivation of name. Because the presence of bifurcate ribs.
Horizon and locality. Gredleri Zone, Ladinian, Val Parina, Bergamo.

Diagnosis. Shell slightly involute, compressed with elliptical section. Venter narrow and rounded with two keels divided by a deep furrows. Ribs sinuous, strong and very prominent near umbilical rim, greatly projectate, sometimes bifurcating. Intercalatory ribs thinner than primary ribs.

Description. The small shell is slightly involute with flanks feebly convex and narrow venter. The umbilicus is shallow and the ribs project with their initial part thickened. The ribs are sinuous, projectate, growing thin ventrally. To each primary rib correspond a bifurcate or intercalatory one. The ribs are strong also in the inner whorls. The keels are high and smooth. A shallow furrow intervenes between the ribs ending and keel.

Dimensions (in mm):

	D	H		W		U	
9224	18.2	7.2	40%	-		6.4	35%

Discussion. *A. fassaensis* Wilckens, 1909 (pl. 7, fig. 10) is similar, but is slightly more evolute, with less high whorls and wider venter. Their ribs are thinner, especially in the inner whorls. The keels are less high. *A. philippi* Wilckens, 1909 (Philipp, 1904, pl. 4, fig. 21) is more evolute and the ribs are very different.

Arpadites pulcher sp. n.

Pl. 11, fig. 15a,b

Types. Holotype N.9230 (S746) (Pl.11, fig.15). 39 Paratypes: N.9231 (S746), N.9232 (S746).
Repository. Museo Civico di Scienze Naturali "E. Caffi", Bergamo, Italy.

Derivation of name. From latin adjective *pulcher-ra-um.*
Horizon and locality. Archelaus Zone, Upper Ladinian, Val Parina, Bergamo.

Diagnosis. Shell evolute, compressed with almost flat flanks and narrow and rounded venter. Umbilicus shallow. Small ventral keels with wide median sulcus. Ribs distant and bifurcate starting from the umbilical rim with a swelling or a node.

Description. The shell is evolute with a shallow umbilicus. The venter, arched and narrow, is surrounded by two keels, low and rounded but well separated by a wide and shallow furrow. The broad, distant ribs start from the umbilical rim with a very short swelling, which rapidly is replaced by a node. All the ribs are bifurcate, but the secondary ribs are of different size. Ventrally the ribs are projectate, enough prominent and can also possess a small node.

Dimensions (in mm):

	D	H		W		U	
9230	22	7.2	33%	4.8	22%	9.3	42%

Discussion. The new species differs from all the other species of the genus *Arpadites* by having very regular bifurcated ribs. On the other hand, *A. pulcher* is similar to *A. bracki* sp. n. in the general shape and the density of the ribs. The new species differs also from *A. arpadis*, which exhibits approximated and thin ribs.

Genus *Argolites* Renz, 1939 emend.

Discussion. Renz identified *Argolites* as a subgenus of *Arpadites* Mojsisovics, 1879 without giving a diagnosis or indicating the type species. This author, however, described a new species (unnamed) displaying some affinities with *Trachyceras arpaditoides* Mojsisovics, 1882 and *Arpadites celtitoides* Airaghi, 1902. Later, Jacobshagen (1967) identified Renz's species as *Arpadites (Argolites) celtitoides.* Nevertheless this identification is incorrect, because in the Jacobshagen's specimen the ribs have three rows of nodes also in the inner whorls. On the contrary the nodes are completely absent in the Airaghi's species. It is plausible that the specimens from Argolis represent a new species. The subgenus *Argolites* Renz, 1939 is now considered a genus different from *Arpadites* (Tozer, 1981a; Shevyrev, 1986). We indicate *Arpadites mojsisovicsi* De Lorenzo, 1896 as the type species of the genus *Argolites*, because the best known: numerous specimens occur in the Ladinian limestones of Lagonegro (De Lorenzo, 1896) and Val Parina. On the other hand, the two types of *Trachyceras arpaditoides* Mojsisovics and *Arpadites celtitoides* Airaghi, deposited in the Museums of Strasbourg and Turin respectively are not more available, because lost. The study of the Val Parina material allows us to better describe the diagnostic characters of the genus.

Type species: *Arpadites mojsisovicsi* De Lorenzo, 1896

Diagnosis. Shell evolute, slightly compressed with subtrapezoidal section. Umbilicus large, venter wide, with two rounded keels separated by a shallow sulcus. Keels

entire, crenulate or nodate. Ribs strong frequently thickened ventrally. One two or three rows of the nodes may be present. Ceratitic suture with three large and rounded saddles.

Composition of the genus. *Arpadites celtitoides* Airaghi, 1902; *Arpadites arietiformis* De Toni, 1914; *Trachyceras arpaditoides* Mojsisovics, 1882; *Arpadites mojsisovicsi* De Lorenzo, 1896; *Arpadites paronai* Mariani, 1902; *Argolites fortis* sp. n.

Comparison. *Argolites* differs from *Arpadites* Mojsisovics in having an almost evolute shell with sharp and distant ribs, a venter broaded by the ends of the ribs prominent ventrally and also by acute, rounded marginal nodes, instead in *Arpadites* the venter is rounded and narrow, the keels high and thin. The well preserved specimens from Val Parina exhibit a very thick tests preventing the observation of the suture line. The keels appear entire (*A. fortis*, Pl. 11, fig. 12), crenulate (*Argolites* sp. n. A and B, Pl. 10, fig. 7,8) or with paired nodes as in the Carnian *Klipsteinia* Mojsisovics, 1882.

Argolites mojsisovicsi (De Lorenzo, 1896)

Pl. 11, fig. 16,17

1896 *Arpadites mojsisovicsi* De Lorenzo, p. 147, pl. 20, fig. 7-14.

Material. N. 9235 (S746) (Pl. 11, fig. 16); N. 9236 (S746) (Pl. 11, fig. 17); N. 9237 (S746); N. 9238 (S746); N. 9239 (S746); N. 9240 (S746); N. 9241 (S746).

The specimens studied are similar to those illustrated by De Lorenzo (1896, pl. 20, fig. 7-14). In particular, in some well preserved specimens we could observe that the marginal nodes, very prominent extend as small, hollow spinae that easily brocken leaving a low, wide outline simulating a node. Fibulations are present between nodes and spinae.

Argolites aff. **paronai** (Mariani, 1902)

Pl. 12, fig. 6

Material. N. 9247 (S1059).

Only one specimen slightly evolute, compressed with subrectangular section. Venter wide with two strong keels separated by a wide furrow. Ribs start from the umbilical rim with a swelling confined to the inner half of the flanks, where a small node appears. At half of the side height the ribs are wide and flat, then they grow prominent near the ventrolateral shoulder, where marginal nodes are present. The frequent intercalatory ribs are thinner and prive of the umbilical nodes.

The availability of only one specimen prevents a reliable specific identification. Our specimen is close to *A. paronai* (Mariani) (in Airaghi, 1902, p. 32, fig. 3). However, in *A. paronai* the ribs are more regularly distributed, less approximated, thinner and without umbilical swelling.

Argolites fortis sp. n.

Pl. 11, fig. 12a,b

Types. Holotype N. 9148 (S746) (Pl. 11, fig. 12a,b). 16 Paratypes: N. 9149 (S746).
Repository. Museo Civico di Storia Naturale "E. Caffi", Bergamo, Italy.
Derivation of name. From latin adjective *fortis-e.*
Horizon and locality. Archelaus Zone, Ladinian, Val Parina, Bergamo.

Diagnosis. Very evolute, slightly depressed, with subtrapezoidal section. Venter wide, rounded with two low keels. High and rounded umbilical wall. Ribs swollen approximated in the inner whorls, more distant in the outer one, weak ventrally.

Description. The shell is very evolute with whorls low and venter wide and rounded. The keels are few prominent, wide and bevelled. The ribs start from the umbilical suture in the inner whorls, from the umbilical rim in the outer whorls with a swelling increasing till half of the side height; then, the ribs rapidly fade to total disappearance. The ribs are more or less broad, rectiradiate but also slightly rursiradiate, approximated, especially in the inner whorls.

Dimensions (in mm):

	D	H	W	U
9148	13.3	3.9 29%	5.1 38%	6.5

Discussion. This new species is similar to *A. celtitoides* (Airaghi), but in the latter species the venter is wide and flat and the ribs are prominent also near the ventro lateral shoulder. The other species belonging to the genus *Argolites* are all characterized by the presence of one or two rows of nodes.

Argolites spp. n. A and B

Pl. 10, fig. 7,8

Material. N. 9250 (S1059) (Pl. 10, fig. 7); N. 9251 (S1059) (Pl. 10, fig. 8).

Only two small specimens possess the crenulate ventral keels. Specimen N. 9250, about 20 mm of the diameter, is evolute, compressed with a strong and distant ribs. Three rows of nodes: two lateral and one marginal are visible on the flanks. The other specimen (N. 9251) is less evolute and compressed than the specimen N. 9250. The irregular ribs, starting from umbilical rim with a swelling reach the marginal node and continue very projectate.

Order Phylloceratida

Superfamily *Phylloceratoceae* Zittel, 1884

Family *Ussuritidae* Hyatt, 1900

Genus *Monophyllites* Mojsisovics, 1879

Type species: *Ammonites sphaerophyllus* Hauer, 1850

This order is present only with the *Monophyllites wengensis* (Klipstein, 1850) (Pl. 2, fig. 4; Pl. 9 fig. 3). This species occurs from bottom to top of the Ladinian succession of Val Parina and is very frequent in S 746 (391 specimens).

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REFERENCES

Airaghi C. (1902) - Nuovi Cefalopodi del Calcare di Esino. *Palaeont. Ital.*, v. 8, pp. 21-41, Pisa.

Arthaber G. (1903) - Neue Funde in den Werfener Schichten und im Muschelkalke des Suedlichen Bakony und Revision der Cephalopodenfauna des Muschelkalkes. *Res. Wiss. Erforsch. Balatonsees*, v. 3, 26 pp., Wien.

Brack P. & Rieber H. (1986) - Stratigraphy and Ammonoids of the lower Buchenstein Beds of the Brescian Prealps and Giudicarie and their significance for the Anisian/Ladinian boundary. *Ecl. Geol. Helv.*, v. 86, pp. 415-527, Basel.

Brack P. & Rieber H. (1993) - Towards a better definition of the Anisian/Ladinian boundary: New biostratigraphic data and correlations of boundary sections from the Southern Alps. *Ecl. Geol. Helv.*, v. 86, pp. 415-527, Basel.

De Lorenzo G. (1896) - Fossili del Trias medio di Lagonegro. *Palaeont. Ital.*, v. 2, pp. 113-148, Pisa.

De Toni A. (1914) - Illustrazione della fauna triassica di Valdepena (Cadore). *Mem. Ist. Geol. Univ. Padova*, v. 2, pp. 109-194, Padova.

De Zanche V., Gianolla P., Mietto P., Siorpaes C. & Vail P. R. (1993) - Triassic sequence stratigraphy in the Dolomites (Italy). *Mem. Sc. Geol.*, v. 45, pp. 1-27, Padova.

Diener C. (1899) - Mitteilungen ueber einige Cephalopodensuiten aus der Trias des Suedlichen Bakony. *Res. Wiss. Erforsch. Balatonsees*, pp. 1-22, Wien.

Diener C. (1900) - Neue Beobachtungen ueber Muschelkalk Cephalopoden des suedlichen Bakony. *Res. Wiss. Erforsch. Balatonsees*, v. 3, pp. 23-32, Wien.

Diener C. (1908) - Ladinic, Carnic and Noric faunae of Spiti, Himalayan fossils. *Palaeont. Indica*, v. 5, 157 pp., Calcutta.

Jacobshagen V. (1967) - Cephalopoden-Stratigraphy der Hallstaetter Kalke am Asclepieion von Epidauros (Argolis, Griechenland). *Geol. Paleont.*, v. 1, pp. 13-33, Marburg.

Jadoul F., Gervasutti M. & Fantini Sestini N. (1992) - The Middle Triassic of the Brembana Valley: preliminary study of the Esino Platform (Bergamasc Alps). *Riv. Ital. Paleont. Strat.*, v. 98, n. 3, pp. 299-324, Milano.

Krystyn L. (1983) - Das Epidauros-Profil (Griechenland) - ein Beitrag zur Conodonten-Standardzonierung des tethyalen Ladin und Unterkarn. In Zapfe H. - Neue Beitraege zur Biostratigraphie der Tethys-Trias. *Schrift. Erdwiss. Komm. Oesterr. Akad. Wiss.*, v. 5, pp. 231-258, Wien.

Krystyn L. & Mariolakos I. (1975) - Stratigraphie und Tektonik der Hallstaetter-Kalk-Scholle von Epidauros (Griechenland). *Sitzunsber. Oesterr. Akad. Wiss.*, v. 184, pp. 181-195, Wien.

Longhi P. (1899) - Di alcune *Gymnites* della nuova fauna triassica di Valdepena presso Lorenzago in provincia di Belluno. *Atti Soc. Ven. Trent. Sc. Nat.*, v. 4, 30 pp., Padova.

Manfrin S. & Mietto P. (1991) - *Detoniceras* nuovo genere di ammonoidi triassici dedicato ad Antonio De Toni, nel centenario della sua nascita. *Mem. Sc. Geol.*, v. 43, pp. 125-135, Padova.

Mojsisovics E. (1873-1902) - Das Gebirge um Hallstatt. Abt. 1. Die Cephalopoden der Hallstaetter Kalke. *Abhandl. Geol. Reichsanst.*, v. 6, pp. 1-835, Wien.

Mojsisovics E. (1882) - Die Cephalopoden der mediterranen Triasprovinz. *Abhandl. K. K. Geol. Reichsanst.*, v. 10, 322 pp., Wien.

Paganoni A. (1985) - Una importante donazione di fossili: la "Collezione Gervasutti". *Riv. Mus. Sc. Nat. Bergamo*, v. 9, pp. 147-148, Bergamo.

Parnes A. (1962) - Triassic Ammonites from Israel. *Bull. Geol. Surv. Israel*, v. 33, 59 pp., Jerusalem.

Parnes A. (1975) - Middle Triassic ammonite biostratigraphy in Israel. *Bull. Geol. Surv. Israel*, v. 66, 35 pp., Jerusalem.

Parnes A. (1986) - Middle Triassic Cephalopods from the Negev (Israel) and Sinai (Egypt). *Bull. Geol. Surv. Israel*, v. 79, pp. 9-59, Jerusalem.

Philipp H. (1904) - Geologisch-Palaeontologische Untersuchungen aus dem Gebiet von Pedrazzo. *Zeitschr. Deutsch. Geol. Ges.*, v. 56, 99 pp., Berlin.

Pisa G. (1966) - Ammoniti Ladiniche dell'alta Valle del Tagliamento (Alpi Carniche). *Giorn. Geol.*, v. 33, pp. 618-685, Bologna.

Renz C. (1939) - Nachtraege zu den tieftriadischen Cephalopodenfauna der Argolis. *Praktika Acad. Athènes*, v. 14, pp. 235-255, Athens.

Rieber H. (1973) - Cephalopoden aus der Grenzbitumenzone (Mittlere Trias) des Monte San Giorgio (Kt. Tessin Schweiz). *Mem. Schweiz. Palaeont.*, v. 93, 96 pp., Basel.

Rossi Ronchetti C. (1960) - Il Trias in Lombardia (Studi geologici e paleontologici). Cefalopodi del Gruppo delle Grigne. *Riv. Ital. Paleont. Strat.*, v. 66, n. 1, pp. 1-64, Milano.

Salomon W. (1895) - Geologische und palaeontologische Studien ueber die Marmolata. *Palaeontographica*, v. 42, 210 pp., Stuttgart.

Shevyrev A. A. (1986) - Ammonoidea Triassica. *Trudy Paleont. Inst.*, v. 217, 184 pp., Moskva.

Shevyrev A. A. (1990) - Ammonoids and chronostratigraphy of the Triassic. *Akad. Nauk*, v. 241, 179 pp., Moskva.

Smith J. P. (1914) - The Middle Triassic marine Invertebrate faunas of North America. *U. S. Geol. Surv. Prof. Paper*, 148 pp., Washington.

Stoppani A. (1858-60) - Les pétrifications d' Esino ou description des fossiles appartenants au dépôt triasique supérieur des environs d' Esino en Lombardie. *Paléont. Lomb.*, 151 pp., Milano.

Tommasi A. (1899) - La fauna dei calcari rossi e grigi del M. Clapsavon nella Carnia occ. *Palaeont. Ital.*, v. 5, 54 pp., Pisa.

Tozer E. T. (1980) - New genera of Triassic Ammonoidea. In Current Research, Pt. A, *Geol. Surv. Canada, Paper*, v. 80-1A, pp. 107-113, Ottawa.

Tozer E. T. (1981a) - Triassic Ammonoidea: Classification, Evolution and Relationships with Permian and Jurassic forms. In House M. R. & Senior J. R. (Eds.) - The Ammonoidea. *The Syst. Ass.*, sp. vol., v. 18, pp. 66-100, Acad. Press, London.

Tozer E. T. (1981b) - Triassic Ammonoidea: Geographic and stratigraphic distribution. In House M. R. & Senior J. R. (Eds.) - The Ammonoidea. *The Syst. Ass.*, sp. vol., v. 18, pp. 397-431, Acad. Press, London.

Wilckens R. (1909) - Palaeontologische Untersuchungen triadischer Faunen aus der Umgebung von Predazzo in Suedtirol. *Verh. Nat. Med. Ver. Heidelb.*, v. 10, pp. 81-231, Heidelberg.

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PLATE 1

Fig. 1 - *Epigymnites ecki* (Mojsisovics). Val Parina, Archelaus Zone. N. 8900 (S746). Side; x 0.75.
Fig. 2 - *Epigymnites credneriformis* sp. n. Val Parina, Archelaus Zone. Paratype, N. 8902 (S746). Side; x 1.
Fig. 3 - *Epigymnites moelleri* (Mojsisovics). Val Parina, Curionii Zone. N. 9054 (S1010). Side; x 1.
Fig. 4 - *Praepinacoceras stoppanii* (Airaghi). Val Parina, Archelaus Zone. N. 9079 (S746). Side; x 1.
Fig. 5 a,b - *Megaphyllites oenipontanus* Mojsisovics. Val Parina, Archelaus Zone. N. 9087 (S746). Side and venter; x 1.

PLATE 2

Fig. 1 - *Epigymnites* aff. *paronae* (Longhi). Val Parina, Curionii Zone. N. 8990 (S754). Side; x 0,75.
Fig. 2 - *Epigymnites credneriformis* sp. n. Val Parina, Archelaus Zone. Holotype, N. 8903 (S746). Side; x 1.
Fig. 3 - *Protrachyceras* cf. *margaritosum* (Mojsisovics). Val Parina, Gredleri Zone. N. 8983 (S1059). Side; x 1.
Fig. 4 - *Monophyllites wengensis* (Klipstein). Val Parina, Archelaus Zone. N. 4055 (S746). Venter; x 1.

PLATE 3

Fig. 1 - *Eoprotrachyceras rieberi* sp. n. Pertica, Curionii Zone. Holotype, PIMUZ N. 7001. Side; arrow shows the body chamber beginning; x 1.
Fig. 2a,b - *Eoprotrachyceras rieberi* sp. n. Pertica, Curionii Zone. Paratype, PIMUZ N. 7003. Respectively side and venter; x 1.
Fig. 3 - *Eoprotrachyceras rieberi* sp. n. Val Parina, Curionii Zone. Paratype, N. 9003 (S754). Side; x 1.
Fig. 4 - *Eoprotrachyceras rieberi* sp. n. Val Parina, Curionii Zone. Paratype, N. 8994 (S1010D). Side; x 1.

PLATE 4

Fig. 1 - *Protrachyceras steinmanni* (Mojsisovics). Val Parina, Archelaus Zone. N. 8967 (S746). Side; x 1.
Fig. 2 - *Protrachyceras parinaense* sp. n. Val Parina, Archelaus Zone. Holotype, N. 9004 (S746). Side; x 1.
Fig. 3 a,b - *Protrachyceras parinaense* sp. n. Val Parina, Archelaus Zone. Paratype, N. 9043 (S1040). Respectively side and venter; x 1.
Fig. 4 a,b - *Protrachyceras longobardicum* (Mojsisovics). Val Parina, Archelaus Zone. N. 8973 (S746). Respectively lateral and ventral views; x 1.

PLATE 5

Fig. 1 - *Eoprotrachyceras gervasuttii* sp. n. Val Parina, Curionii Zone. Holotype, N. 9037 (S1010D). Side; x 1.
Fig. 2 a,b - *Eoprotrachyceras gervasuttii* sp. n. Val Parina, Curionii Zone. Paratype, N. 9038 (S1011P). Respectively venter and side; x 1.

Fig. 3 - *Chieseiceras perticaense* Brack & Rieber. Val Parina, Curionii Zone. N. 8957 (S992F). Side; x 1.
Fig. 4 - *Chieseiceras* sp. n. C. Val Parina, Curionii Zone. N. 9099 (S759). Side; x 1.
Fig. 5 a,b - *Chieseiceras* sp. n. B. Val Parina. Curionii Zone. N. 9093 (S1011P). Respectively side and venter; x 1.
Fig. 6 - *Chieseiceras perticaense* Brack & Rieber. Val Parina, Curionii Zone. N. 8904 (S754). Side; x 1.

PLATE 6

Fig. 1 a-c - *Rossiceras gervasuttii* sp. n. Val Parina, Archelaus Zone. Holotype, N. 9019 (S746). Respectively lateral, ventral and oral views; x 1.
Fig. 2 a-c - *Rossiceras gervasuttii* sp. n. Val Parina, Archelaus Zone. Paratype, N. 9020 (S746). Respectively lateral, ventral and oral views; x 1.
Fig. 3 - *Rossiceras gervasuttii* sp. n. Val Parina, Archelaus Zone. Paratype, N. 9021 (S746). Side; x 1.
Fig. 4 a-c - *Rossiceras intermedium* sp. n. Val Parina, Archelaus Zone. Paratype, N. 9030 (S746). Respectively lateral, ventral and oral views; x 1.
Fig. 5 a,b - *Rossiceras orobicum* sp. n. Val Parina, Archelaus Zone. Paratype, N. 9015 (S746). Respectively side and venter; x 1.

PLATE 7

Fig. 1 a,b - *Rossiceras orobicum* sp. n. Val Parina, Archelaus Zone. Holotype, N. 9014 (S746). Respectively side and venter; x 1.
Fig. 2 a,b - *Rossiceras orobicum* sp. n. Val Parina, Archelaus Zone. Paratype, N. 9016 (S746). Respectively venter and side; x 1.
Fig. 3 a,b - *Rossiceras intermedium* sp. n. Val Parina, Archelaus Zone. Holotype, N. 9029 (S746). Respectively side and venter; x 1.
Fig. 4 a-d - *Chieseiceras* aff. *pemphix* (Merian). Val Parina, Curionii Zone. N. 9091 (S754). a,b) Side and venter of the outer whorls; c,d) side and venter of an inner whorl; x 1.
Fig. 5 a,b - *Chieseiceras* aff. *pemphix* (Merian). Val Parina, Curionii Zone. N. 9092 (S754). Respectively venter and side; x 1.

PLATE 8

Fig. 1 - *Epigymnites frequens* sp. n. Val Parina, Archelaus Zone. Paratype, N. 9138 (S746). Side (internal mould); x 1.
Fig. 2 - *Epigymnites frequens* sp. n. Val Parina, Archelaus Zone. Paratype, N. 9139 (S746). Side; x 1.
Fig. 3 - *Epigymnites frequens* sp. n. Val Parina, Archelaus Zone. Holotype, N. 9137 (S746). Side; x 1.
Fig. 4 - *Epigymnites frequens* sp. n. Val Parina, Archelaus Zone. Paratype, N. 9140 (S746). Section; x 1.
Fig. 5 - *Epigymnites frequens* sp. n. Val Parina, Archelaus Zone. Paratype, N. 9143 (S746). Side; x 1.
Fig. 6 a,b - *Aplococeras orobicum* sp. n. Val Parina, Curionii Zone. Paratype, N. 9107 (S754). Respectively side and venter; x 1.
Fig. 7 a-c - *Aplococeras orobicum* sp. n. Val Parina, Curionii Zone. Paratype, N. 9105 (S944E). Respectively venter, side, front; x 1.
Fig. 8 - *Aplococeras orobicum* sp. n. Val Parina, Curionii Zone. Holotype, N. 9104 (S944E). Side; x 1.
Fig. 9 a,b - *Detoniceras raricostatum* sp. n. Val Parina, Archelaus Zone. Paratype, N. 9095 (S746). Respectively side and venter; x 1.
Fig. 10 a,b - *Detoniceras raricostatum* sp. n. Val Parina, Archelaus Zone. Holotype, N. 9094 (S746). Respectively venter and side; x 1.

PLATE 9

Fig. 1 - *Proarcestes marcheanus* (Mojsisovics). Val Parina, Archelaus Zone. N. 9115 (S746). Side; x 1.
Fig. 2 a,b - *Proarcestes marcheanus* (Mojsisovics). Val Parina, Archelaus Zone. N. 9116 (S746). Venter and side; x 1.
Fig. 3 - *Monophyllites wengensis* (Klipstein). Val Parina, Archelaus Zone. N. 4055 (S746). Side; x 1.
Fig. 4 a,b - *Iberites* sp. Val Parina, Gredleri Zone. N. 9194 (S1059). Side and venter; x 1.

PLATE 10

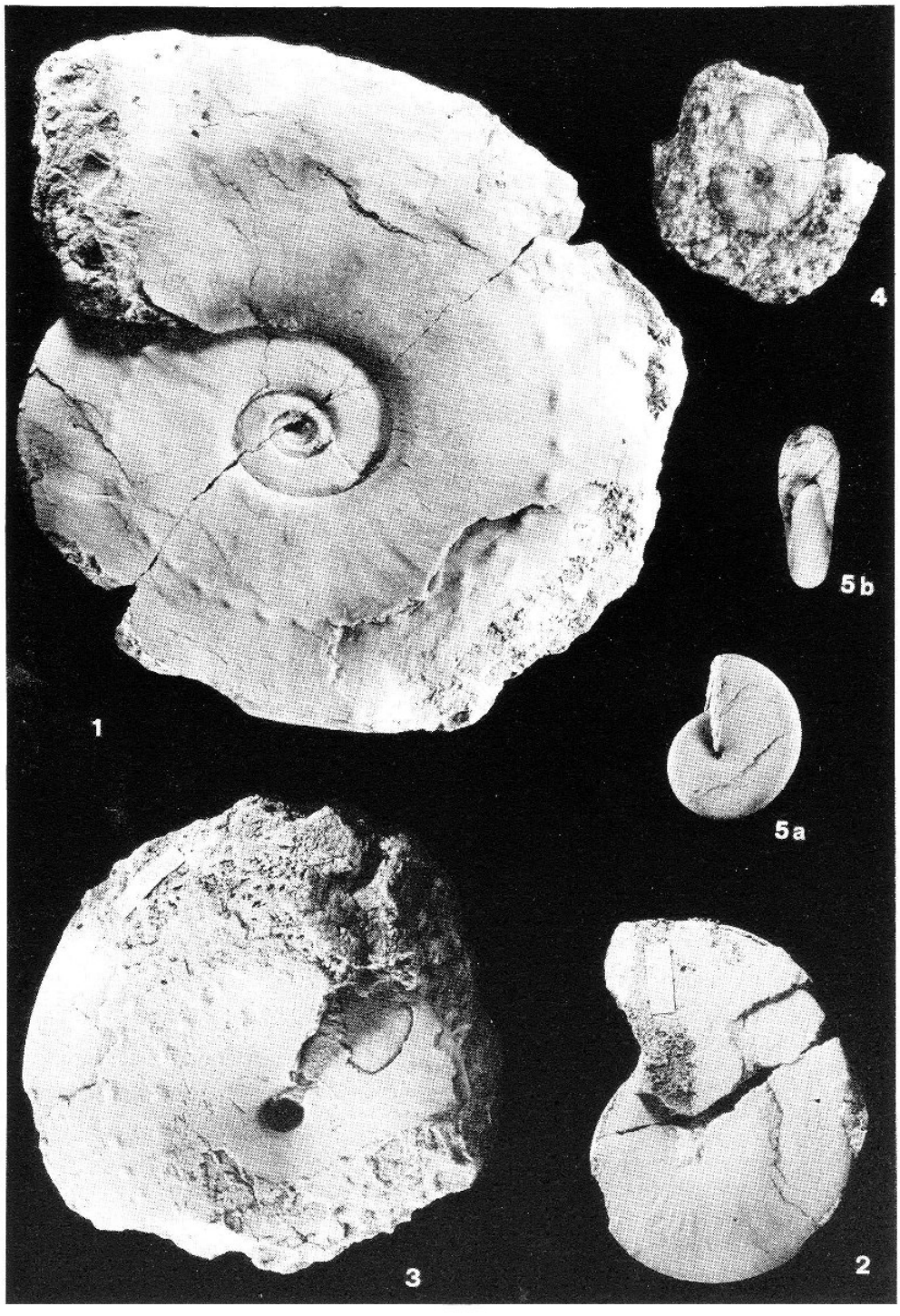
Fig. 1 a,b - *Gevanites* aff. *epigonus* Parnes. Val Parina, Archelaus Zone. N. 9256 (S746). Side and venter; x 1.
Fig. 2 - *Parinaia semicostata* sp. n. Val Parina, Gredleri Zone. Holotype, N. 9132 (S1011R). Side; x 1.
Fig. 3 - *Parinaia semicostata* sp. n. Val Parina, Gredleri Zone. Paratype, N. 9133 (S1011R). Venter; x 1.
Fig. 4 a,b - *Iberites nodosus* sp. n. Val Parina, Archelaus Zone. Paratype, N. 9098 (S746). Side and venter; x 1.
Fig. 5 a,b - *Iberites nodosus* sp. n. Val Parina, Archelaus Zone. Paratype, N. 9012 (S746). Side and venter; x 1.
Fig. 6 a,b - *Iberites nodosus* sp. n. Val Parina, Archelaus Zone. Holotype, N. 9097 (S746). Venter and side; x 1.
Fig. 7 - *Argolites* sp. n. A. Val Parina, Gredleri Zone. N. 9250 (S1059). Venter; x 1.
Fig. 8 - *Argolites* sp. n. B. Val Parina, Gredleri Zone. N. 9251 (S1059). Venter; x 1.

PLATE 11

Fig. 1 a,b - *Gervasuttia shevyrevi* sp. n. Val Parina, Gredleri Zone. Holotype, N. 9195 (S1059). Respectively side and venter; x 1.
Fig. 2 a,b - *Gervasuttia irregularis* sp. n. Val Parina, Gredleri Zone. Holotype, N. 9198 (S1110). Respectively side and venter; x 1.
Fig. 3 a,b - *Gervasuttia nodosa* sp. n. Val Parina, Gredleri Zone. Paratype, N. 9202 (S1110). Respectively side and venter; x 1.
Fig. 4 - *Gervasuttia nodosa* sp. n. Val Parina, Gredleri Zone. Holotype, N. 9201 (S1110). Side; x 1.
Fig. 5 a,b - *Gervasuttia nodosissima* sp. n. Val Parina, Gredleri Zone. Paratype, N. 9206 (S1110). Respectively side and venter; x 1.
Fig. 6 - *Gervasuttia nodosissima* sp. n. Val Parina, Gredleri Zone. Holotype, N. 9204 (S1110). Side; x 1.
Fig. 7 - *Gervasuttia nodosissima* sp. n. Val Parina, Gredleri Zone. Paratype, N. 9205 (S1110). Side; x 1.
Fig. 8 - *Gervasuttia plicata* sp. n. Val Parina, Gredleri Zone. Holotype, N. 9208 (S1059). Side; x 2.
Fig. 9a,b - *Arpadites dichotomus* sp. n. Val Parina, Gredleri Zone. Holotype, N. 9224 (S1110). Respectively side and venter; x 1.
Fig. 10 - *Arpadites dichotomus* sp. n. Val Parina, Gredleri Zone. Paratype, N. 9225 (S1110). Side; x 1.
Fig. 11 - *Arpadites cinensis* Mojsisovics. Val Parina, Archelaus Zone. N. 9222 (S746). Side; x 1.
Fig. 12a,b - *Argolites fortis* sp. n. Val Parina, Archelaus Zone. Holotype, N. 9148 (S746). Respectively venter and side; x 1.
Fig. 13a,b - *Arpadites bracki* sp. n. Val Parina, Archelaus Zone. Paratype, N. 9228 (S746). Respectively side and venter; x 1.
Fig. 14 - *Arpadites bracki* sp. n. Val Parina, Archelaus Zone. Holotype, N. 9227 (S746). Side; x 1.
Fig. 15a,b - *Arpadites pulcher* sp. n. Val Parina, Archelaus Zone. Holotype, N. 9230 (S746). Respectively side and venter; x 1.
Fig. 16a,b - *Argolites mojsisovicsi* (De Lorenzo). Val Parina, Archelaus Zone. N. 9235 (S746). Respectively venter and side; x 1.
Fig. 17a,b - *Argolites mojsisovicsi* (De Lorenzo). Val Parina, Archelaus Zone. N. 9236 (S746). Respectively side and venter; x 1.

PLATE 12

Fig. 1a,b - *Protrachyceras irregulare* sp. n. Val Parina, Archelaus Zone. Holotype, N. 9213 (S746). Respectively venter and side; x 1.
Fig. 2 - *Protrachyceras irregulare* sp. n. Val Parina, Archelaus Zone. Paratype, N. 9214 (S746). Side; x 1.
Fig. 3a-c - *Protrachyceras irregulare* sp. n. Val Parina, Archelaus Zone. Paratype, N. 9215 (S746). Respectively venter and sides; x 1.
Fig. 4 - *Protrachyceras irregulare* sp. n. Val Parina, Archelaus Zone. Paratype, N. 9216 (S746). Side; x 1.
Fig. 5a,b - *Chieseiceras* sp. n. A. Val Parina, Curionii Zone. N. 9006 (S754). Respectively venter and side; x 1.
Fig. 6a,b - *Argolites* aff. *paronai* (Mariani). Val Parina, Gredleri Zone. N. 9247 (S1059). Respectively venter and side; x 1.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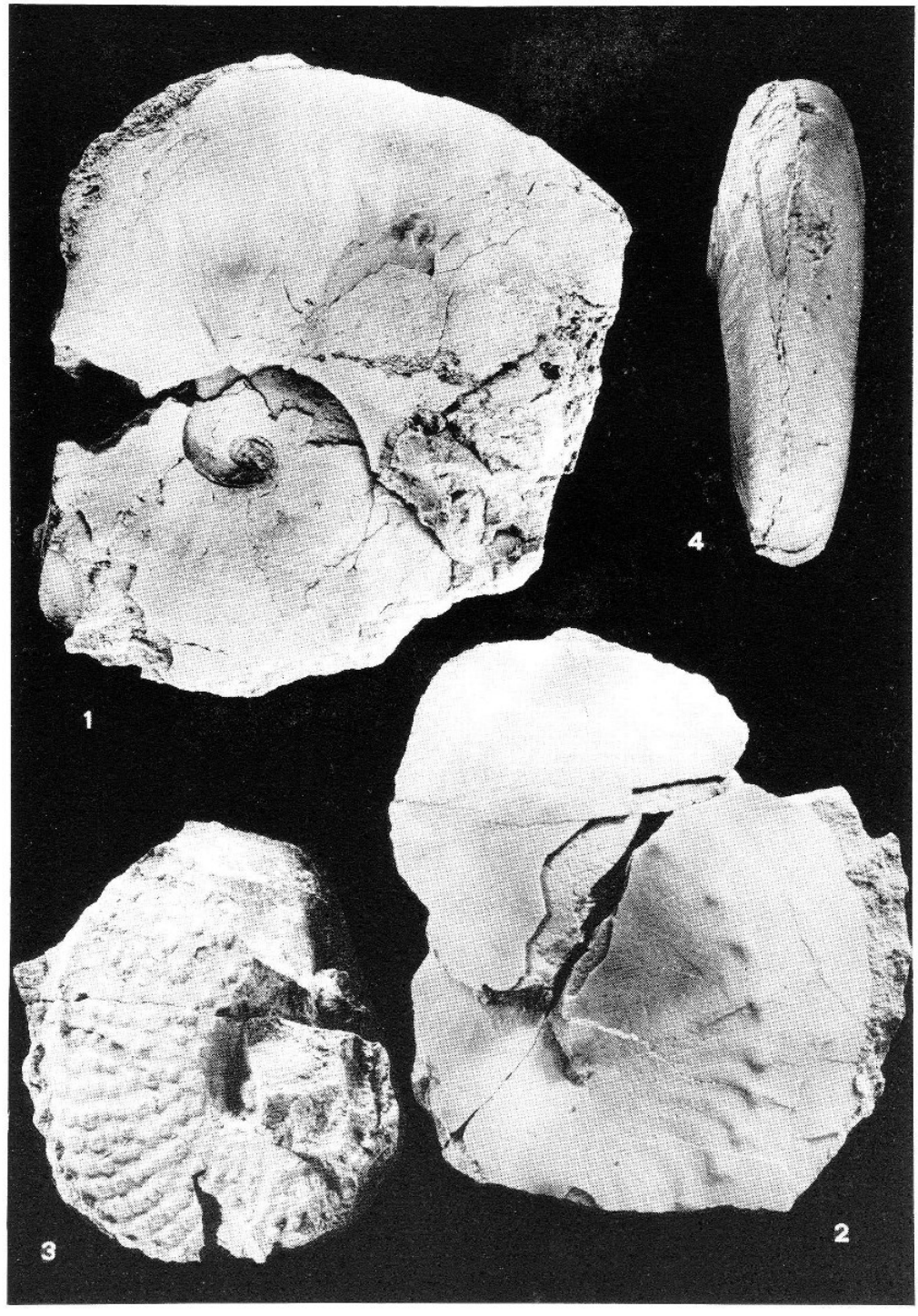
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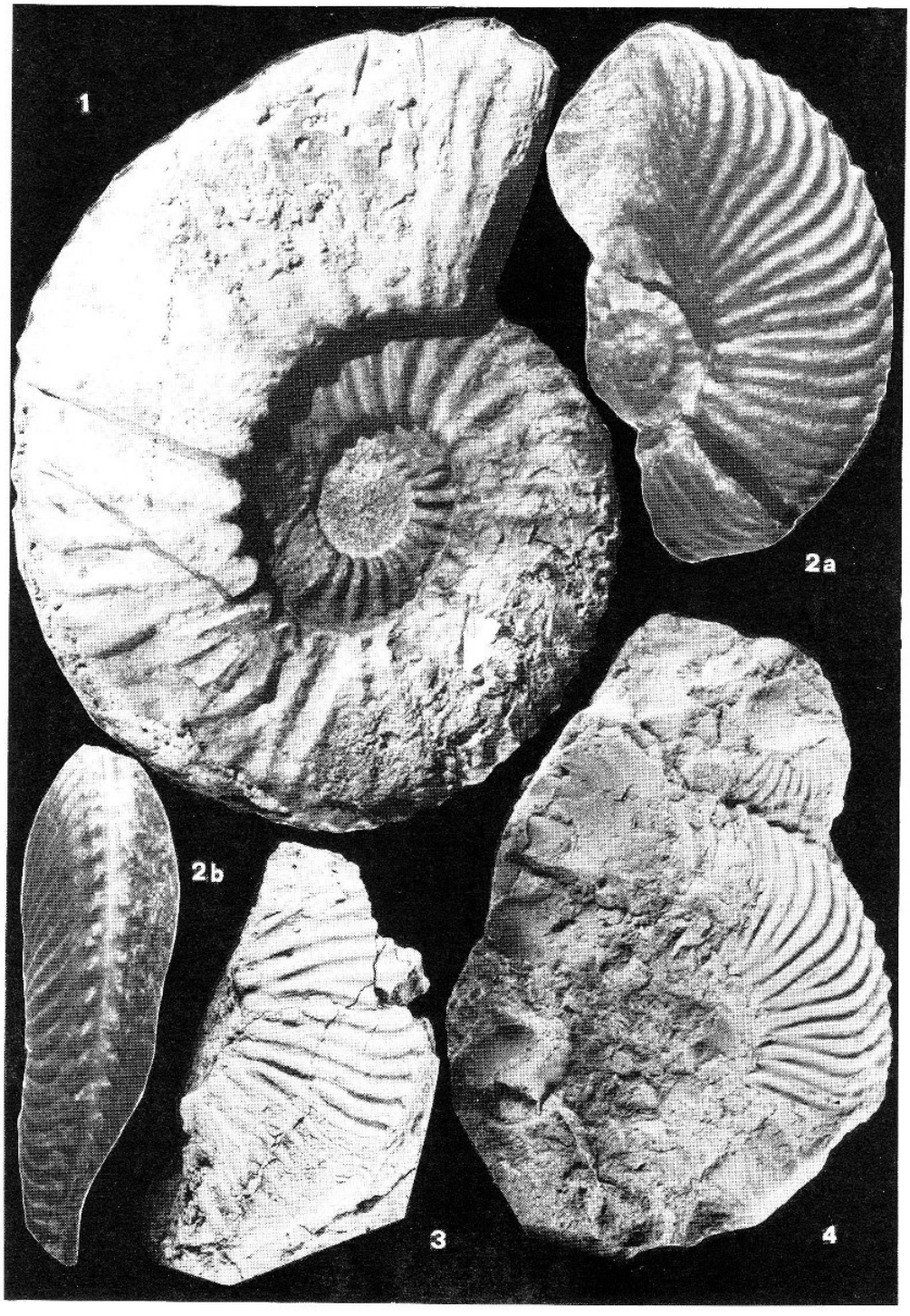
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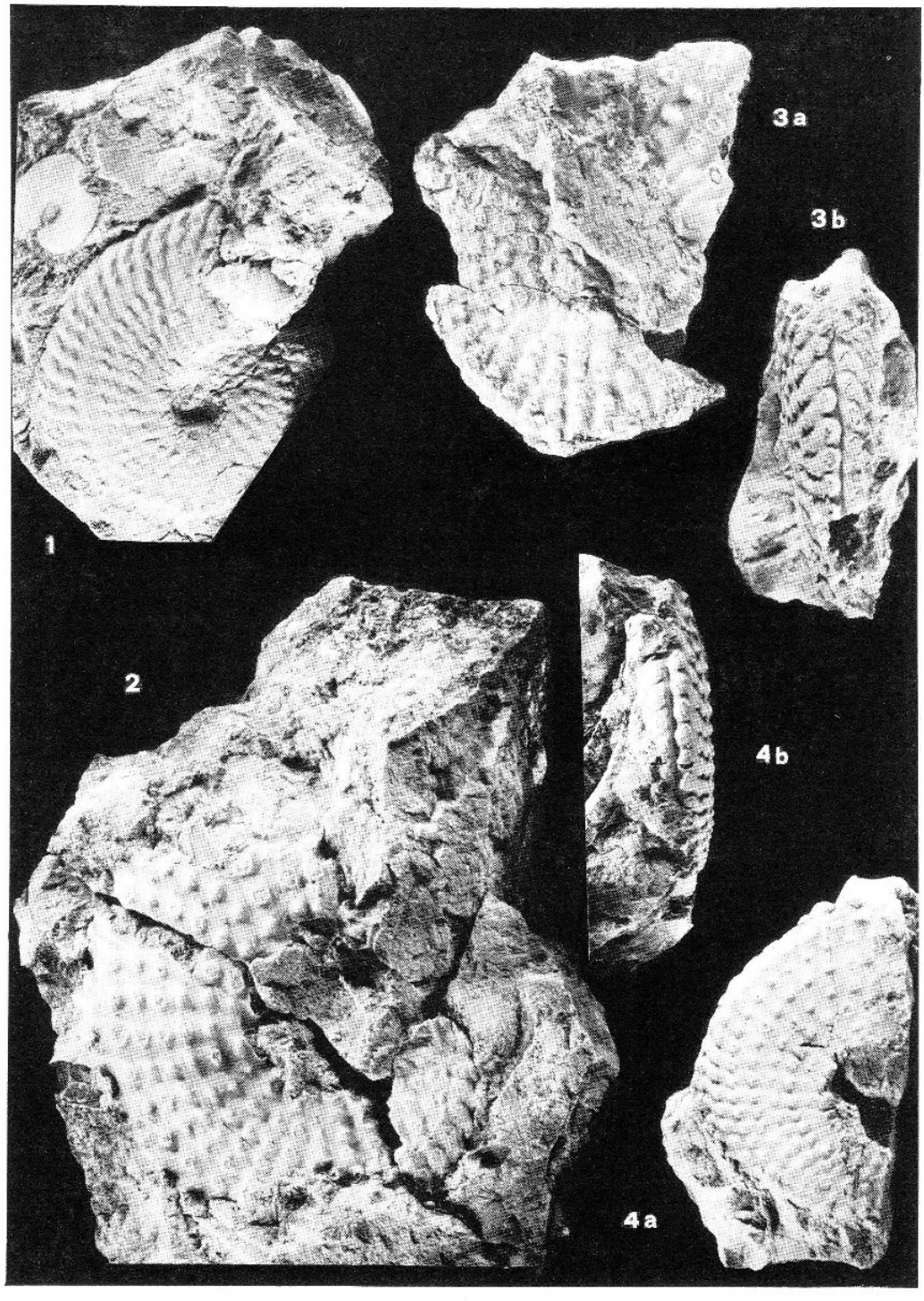
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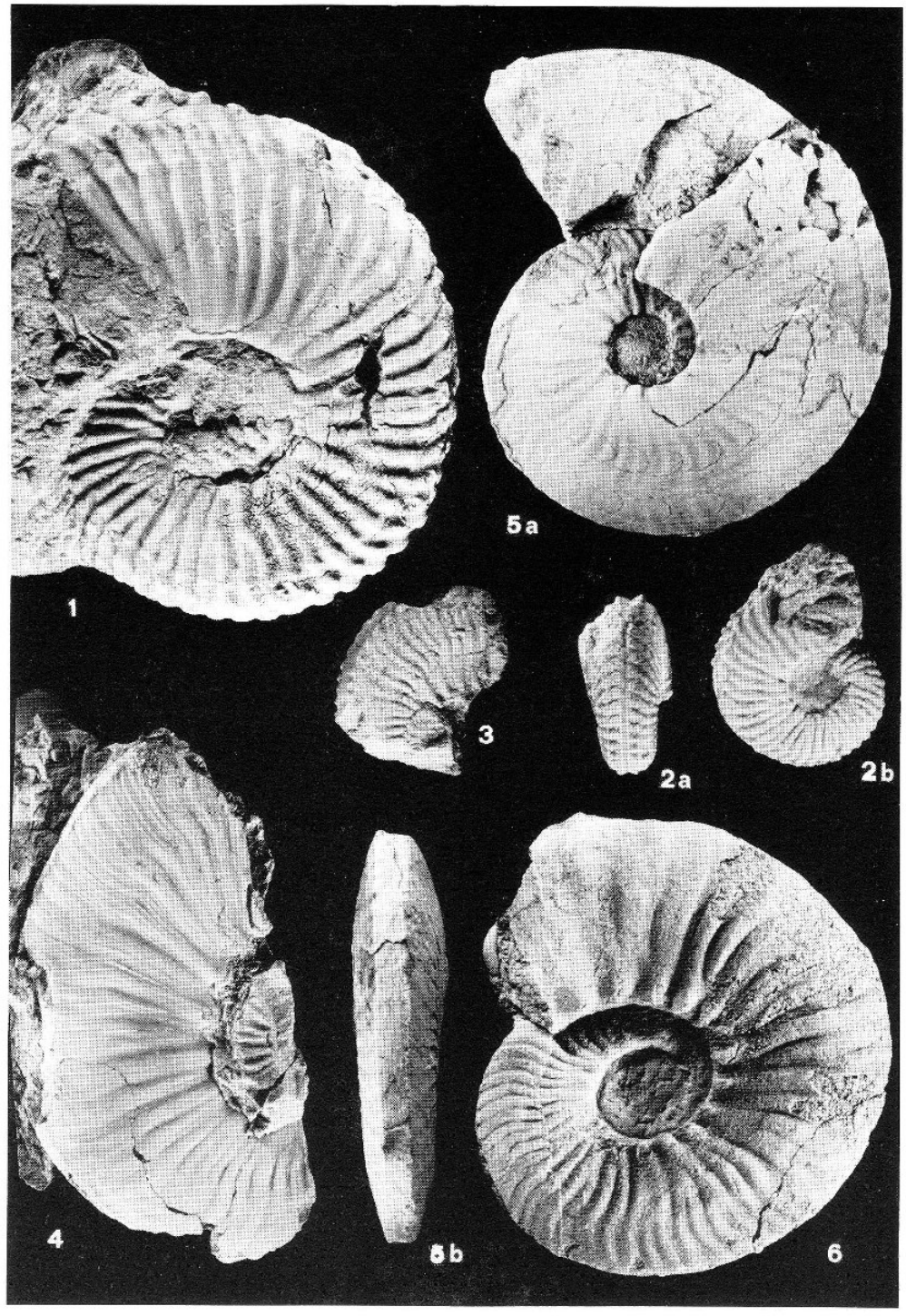
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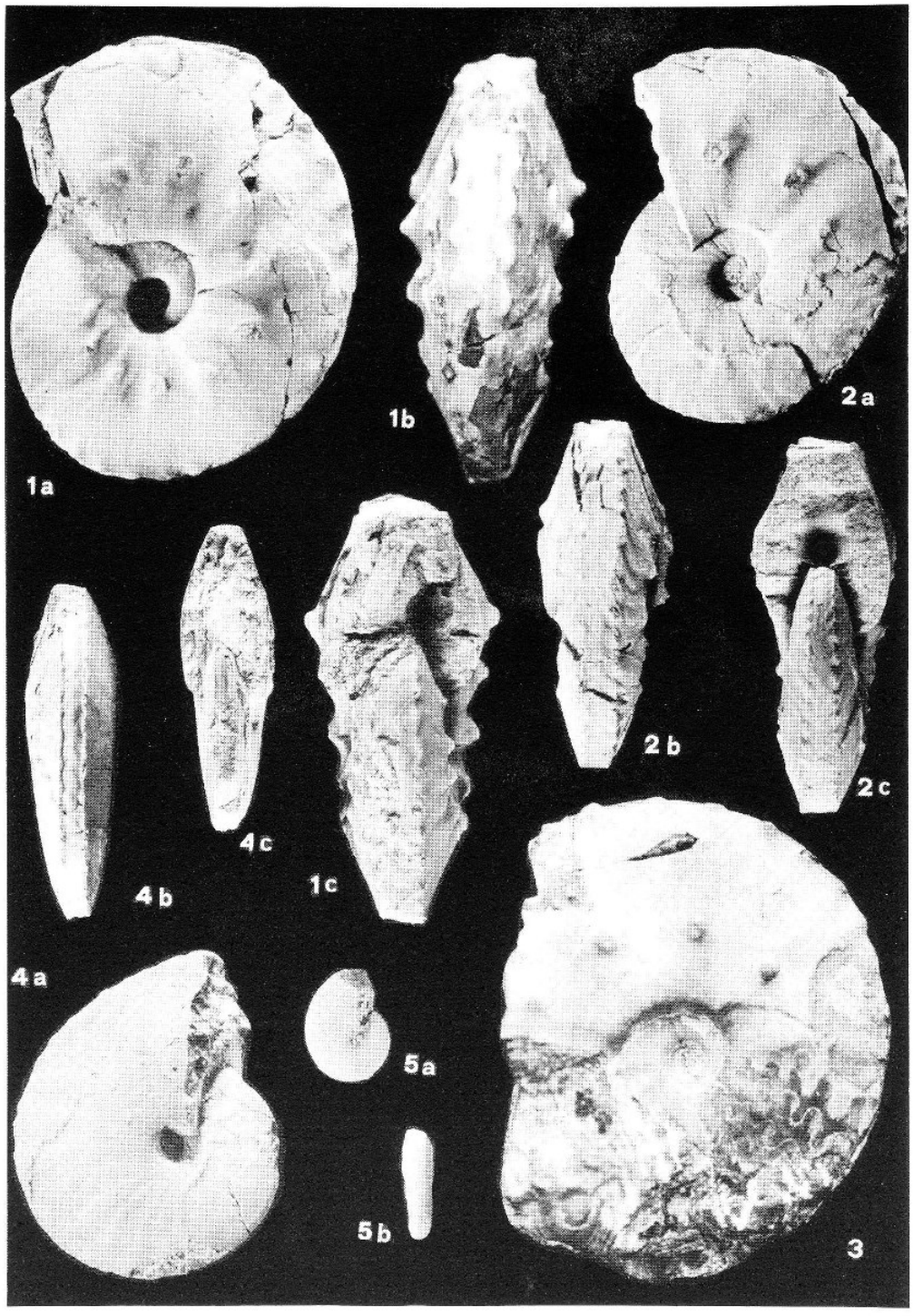
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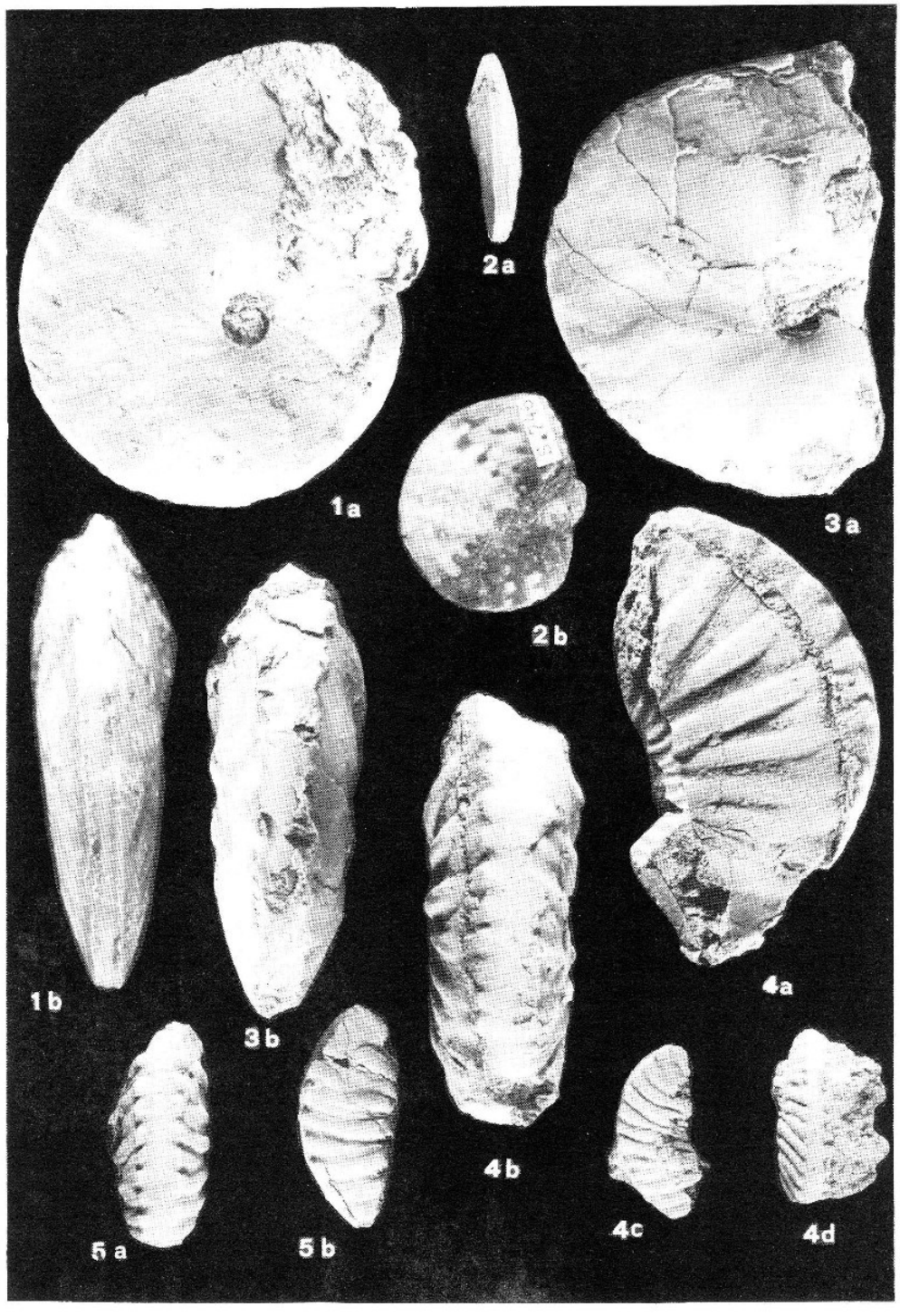
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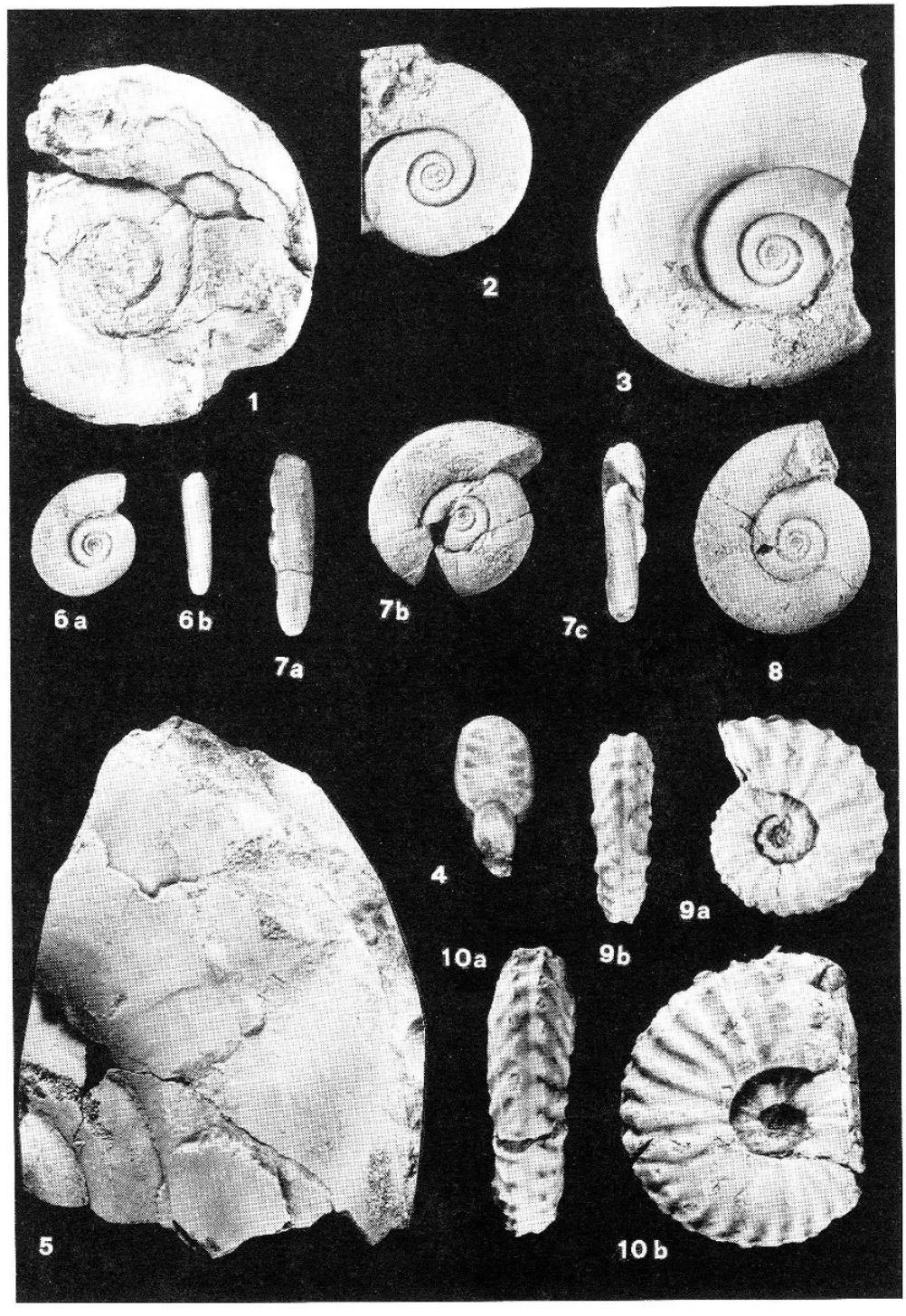
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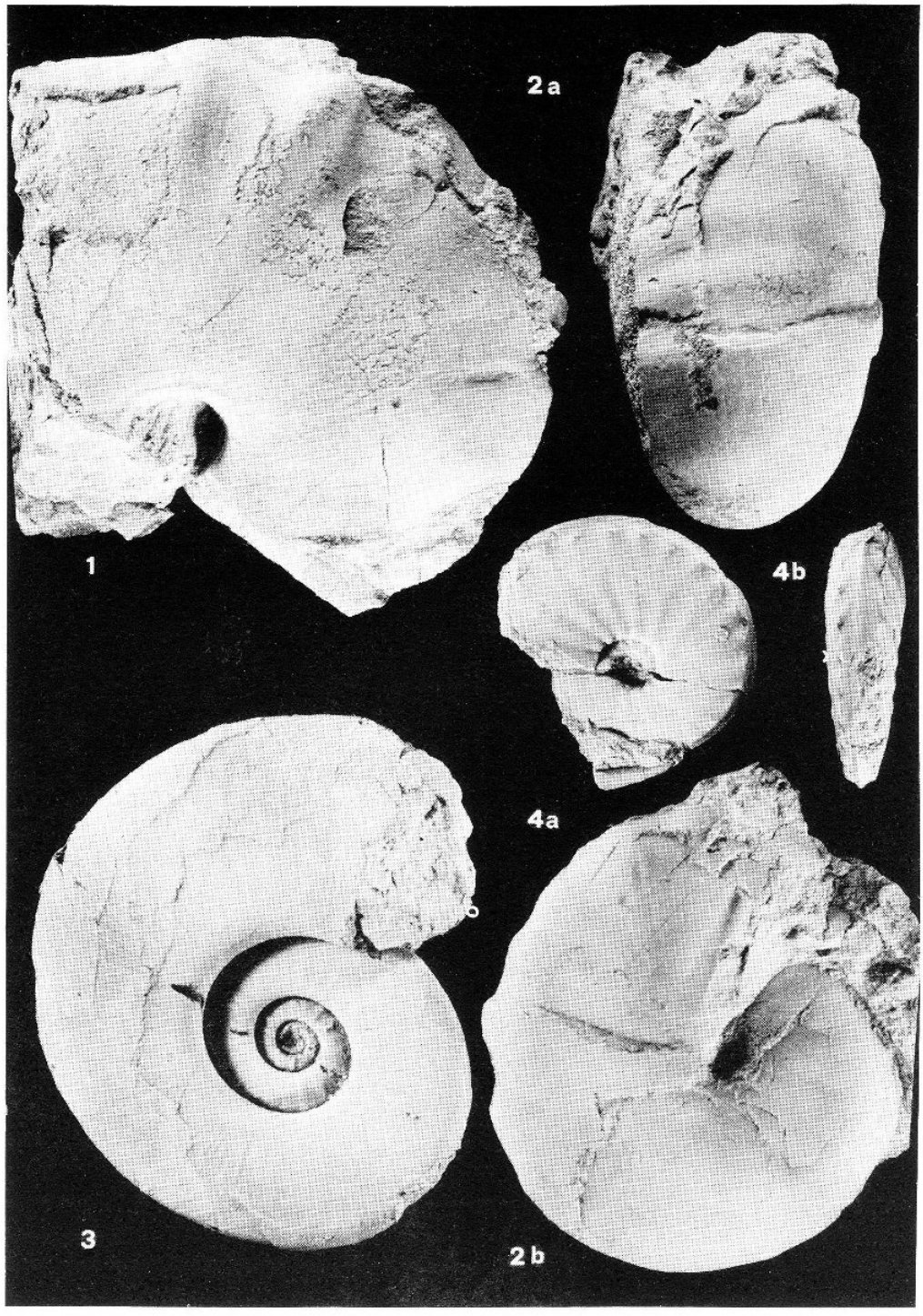
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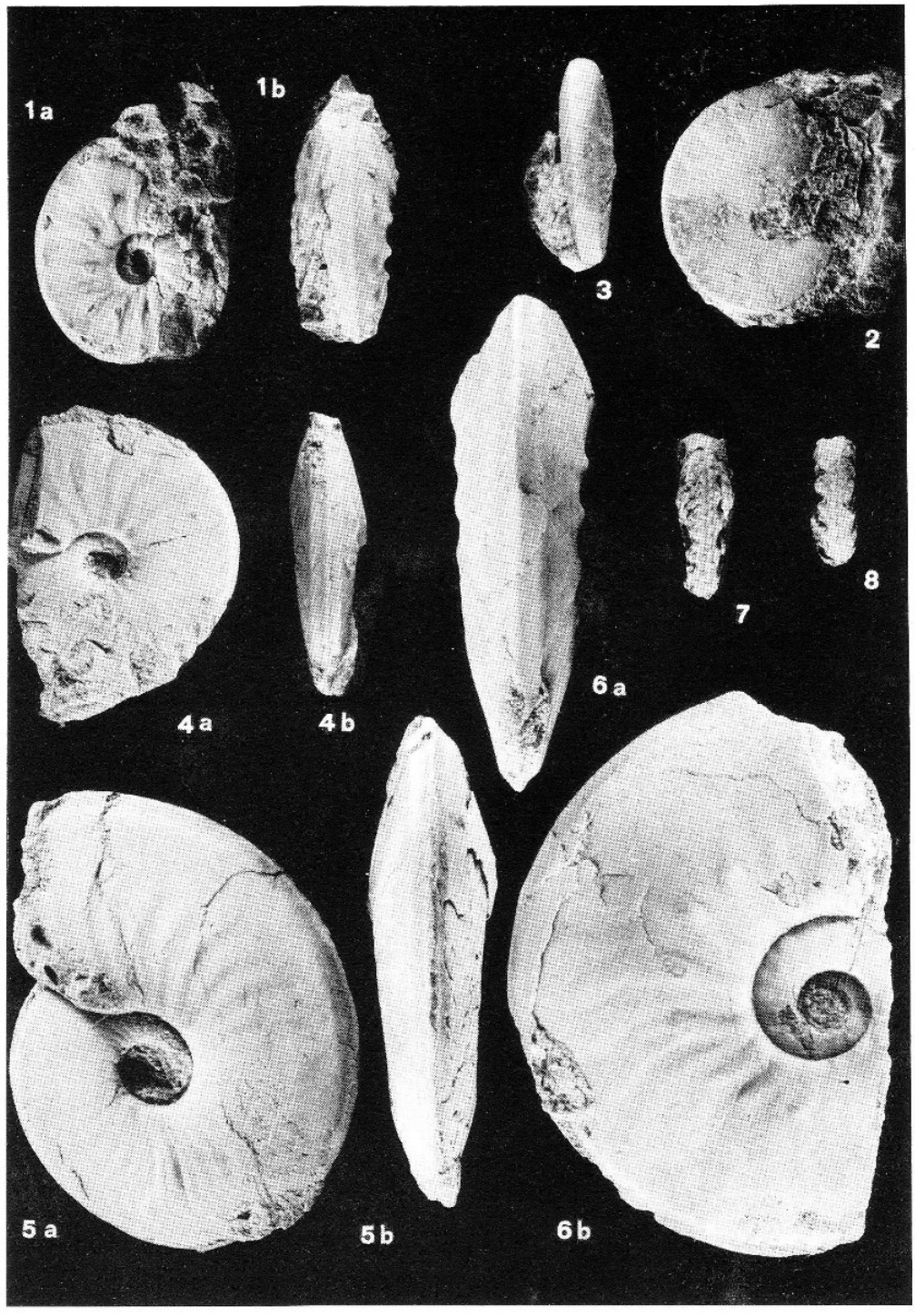
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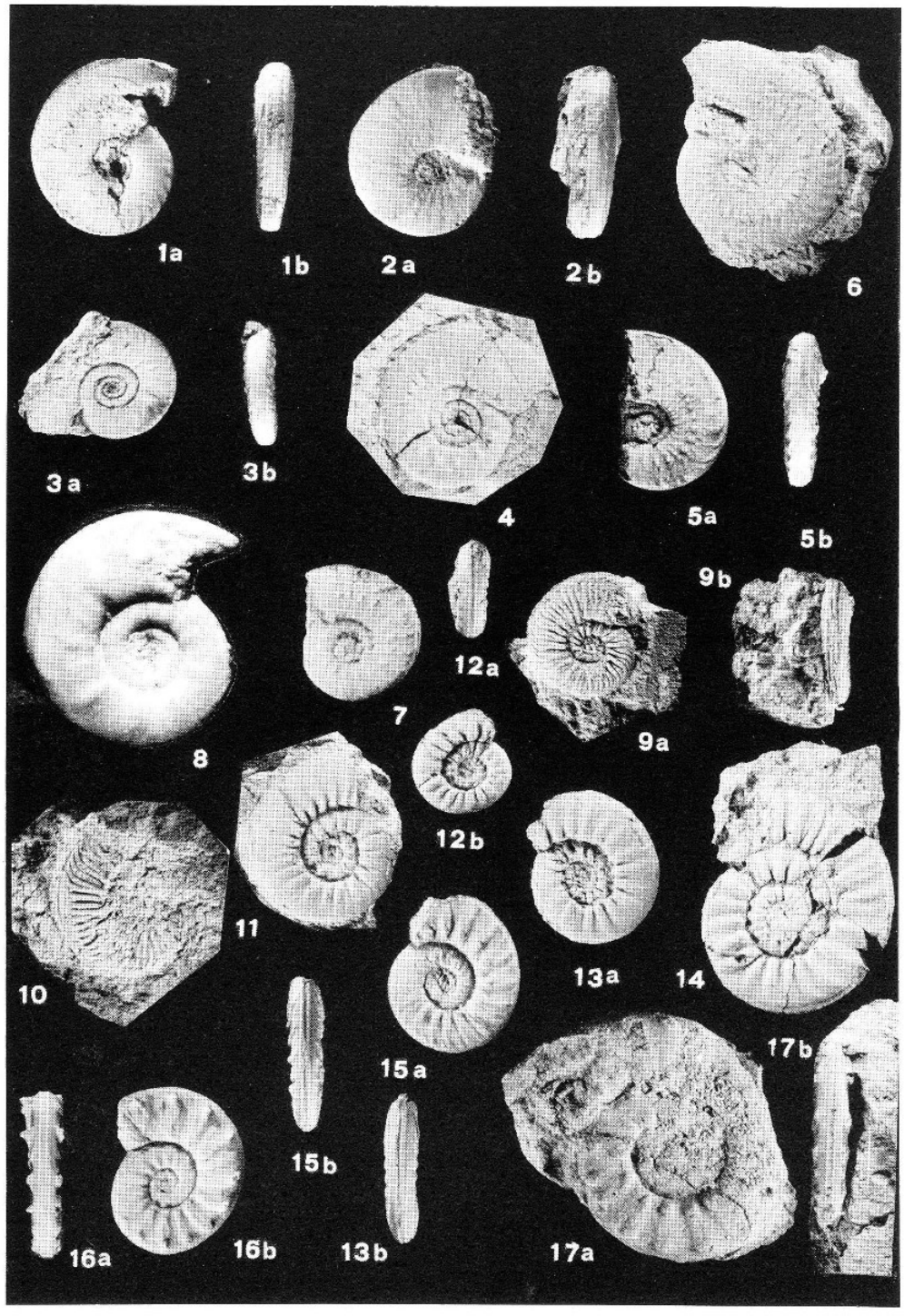
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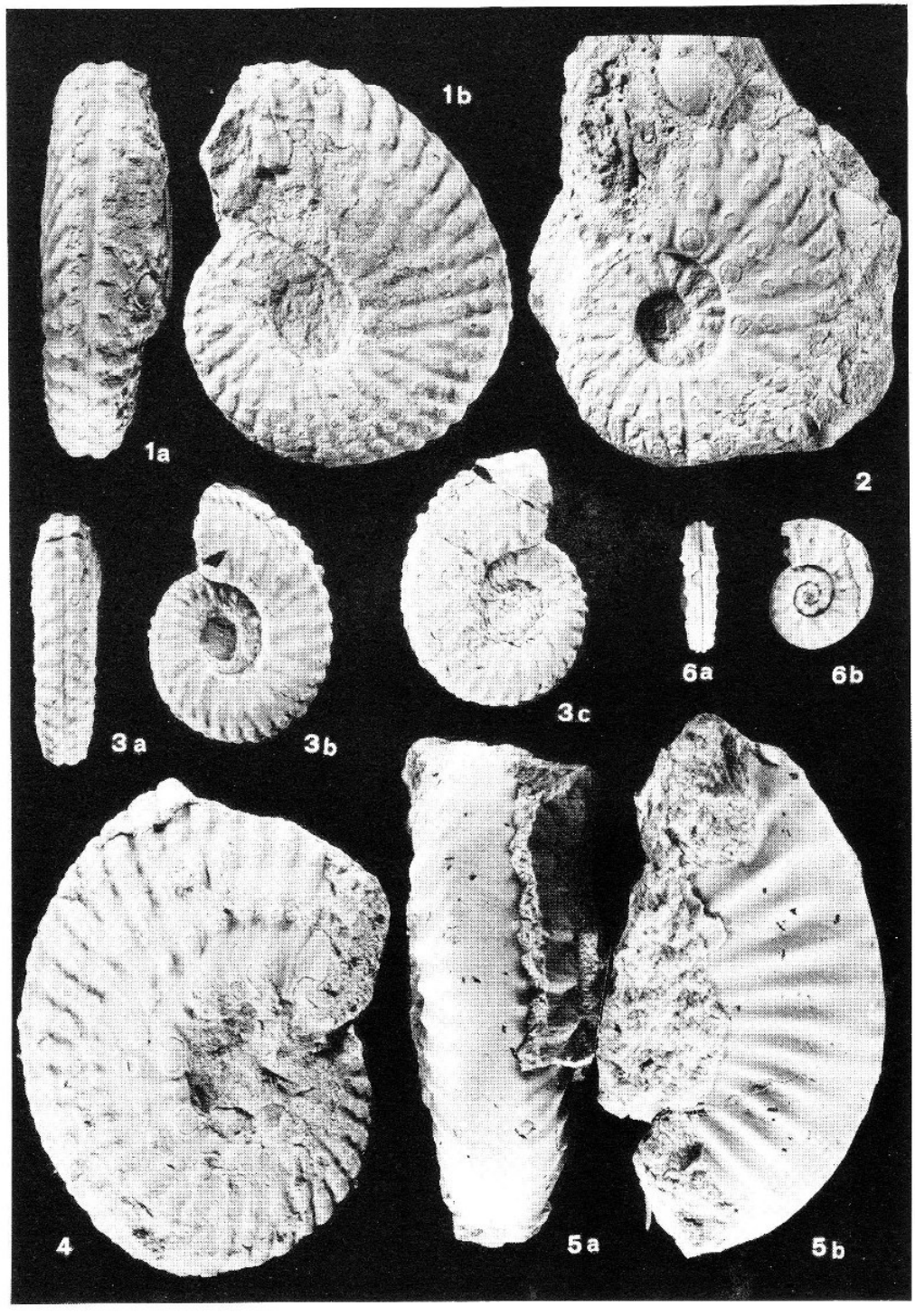
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