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LATE BARREMIAN-EARLY APTIAN AMMONITES FROM THE MAIOLICA FORMATION NEAR CESANA BRIANZA (LOMBARDY BASIN, NORTHERN ITALY)

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Riassunto. Sono descritte le faune ad Ammoniti di tre livelli marnosi della Maiolica affiorante presso Cesana Brianza (CO). I primi due livelli sono del Barremiano superiore: il primo è dubitativamente attribuito alla zona a *sartousi* ed il secondo ad un intervallo fra le zone a *feraudi* e *giraudi*. È istituita la nuova specie *Toxoceratoides sudalpinus* sp. n. rinvenuta nel secondo livello. La fauna del livello più recente è caratterizzata dalla presenza di Leptoceratoidinae che, finora, non erano mai state segnalate in livelli così alti. Pur non potendo attribuirle ad una precisa zona ad Ammoniti, tale fauna è forse collocabile attorno al limite Barremiano-Aptiano o nell'Aptiano basale.

Abstract. The ammonite faunas collected in three marly interbeds of the Maiolica limestone exposed near Cesana Brianza (Como province, Lombardy) are described in this paper. The age of the first and second interbeds is Late Barremian. In particular the first is tentatively ascribed to the *sartousi* zone and the second to the *feraudi/giraudi* zones. The new species *Toxoceratoides sudalpinus* sp. n. has been collected in the second level. The fauna of the youngest interbed does not allow us to recognize a specific ammonite zone, although it can be ascribed to the Barremian-Aptian boundary or even the basal Aptian. It is characterized by the occurrence of Leptoceratoidinae which were not reported before from this stratigraphic level.

Introduction.

Checking the literature on Mesozoic ammonites from Italy, one can conclude that the Cretaceous faunas are still poorly known and certainly less frequent than the Jurassic ones. This is due to the general development, in Italy and in most of the Tethyan areas (Fourcade et al., 1991), of the Maiolica limestone during the Late Tithonian-Barremian time. This facies is not suitable for preservation of ammonite

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- The text has been written by F. Cecca except the "Previous works" and "Geological setting" chapters, written by G. Landra. The biostratigraphic conclusions have been treated by F. Cecca, while the other topics have been treated by both authors. The field work has been carried out by G. Landra.

fossils which are usually rare and badly preserved in the Maiolica, making the taxonomic identifications sometimes very difficult.

However, some ammonite faunas (Parona, 1896; Desio, 1929; Vialli, 1949; Rieber, 1977) occur in some pelitic interbeds of the upper part of the Maiolica Formation of the Lombardy Basin (Fig. 1a).

Similarly, the ammonites described in this paper have been collected in some marly levels cropping out in the upper part of the Maiolica Formation quarried near Cesana Brianza (Como province) (Fig. 1b).

Previous works on Barremian ammonites from the Lombardy Basin.

Unlike the Umbria-Marche Apennines, where some Lower Cretaceous ammonite faunas have been reported only recently (Cecca, 1985; Cecca et al., 1994a, b; Cecca & Pallini, in press), Barremian ammonites from the Maiolica of the Lombardy Basin have been known since the Parona (1896) paper. This author cited in the southern part of the M. Albenza area the discovery of the ammonite species *Lytoceras* cf. *phestum* Matheron, *Silesites seranonis* (d'Orbigny) and *Costidiscus reticostatus* (d'Orbigny) in the upper part of the Maiolica. This subject was also discussed by Mariani (1900). This level corresponds to the transitional facies from the Maiolica and Marne di Bruntino - Scaglia Variegata Formations (Barberis et al., 1992).

In his work on the geology of M. Albenza, Desio (1929) reported from Barremian levels the occurrence of *S. seranonis* (d'Orbigny) and *Hoplites* cf. *epimeloides* Parona. These species were found in the bed of the Malanotte river on the southern flank of the mountain.

The richest ammonite fauna reported until now from the Maiolica of the Lombardy Basin was studied by Vialli (1949) and was found in the surroundings of Burligo (near Bergamo), in the M. Albenza area. Vialli identified 37 species which certainly were collected from different levels: *Holcodiscus vandenbeckei* (d'Orbigny) is characteristic of the Lower Barremian whilst *Heteroceras astieri* (d'Orbigny) and *Macroscephalites yvani* (Puzos) indicate the Upper Barremian. This fauna allowed Vialli to infer an Early Aptian age for the so-called "scisti neri barremiani", which overlie the top of the Maiolica.

Bernoulli (1964) cited the occurrence of *Beudanticeras parandieri* (d'Orbigny) and *Hamiticeras* sp. in a marly level of the upper part of the Maiolica which crops out at the Breggia river near Balerna, North of Chiasso (Switzerland). These identifications, originally established by O. Renz, were corrected by Rieber (1977) in a specific study on the ammonites collected from the same level. This Author created the new species *Karsteniceras balernaense* and identified *Holcodiscus caillaudi* (d'Orbigny), *Crioceratites emerici* (Léveillé), *Heinzia (Pulchellia)* cf. *lindigi* (Karsten) which allowed him to ascribe the fauna to the Lower Barremian.

Ceriotti et al. (1984) described a new Late Barremian fauna from the quarry of the "Cementeria Merone" near Cesana Brianza (Como province). Among the iden-

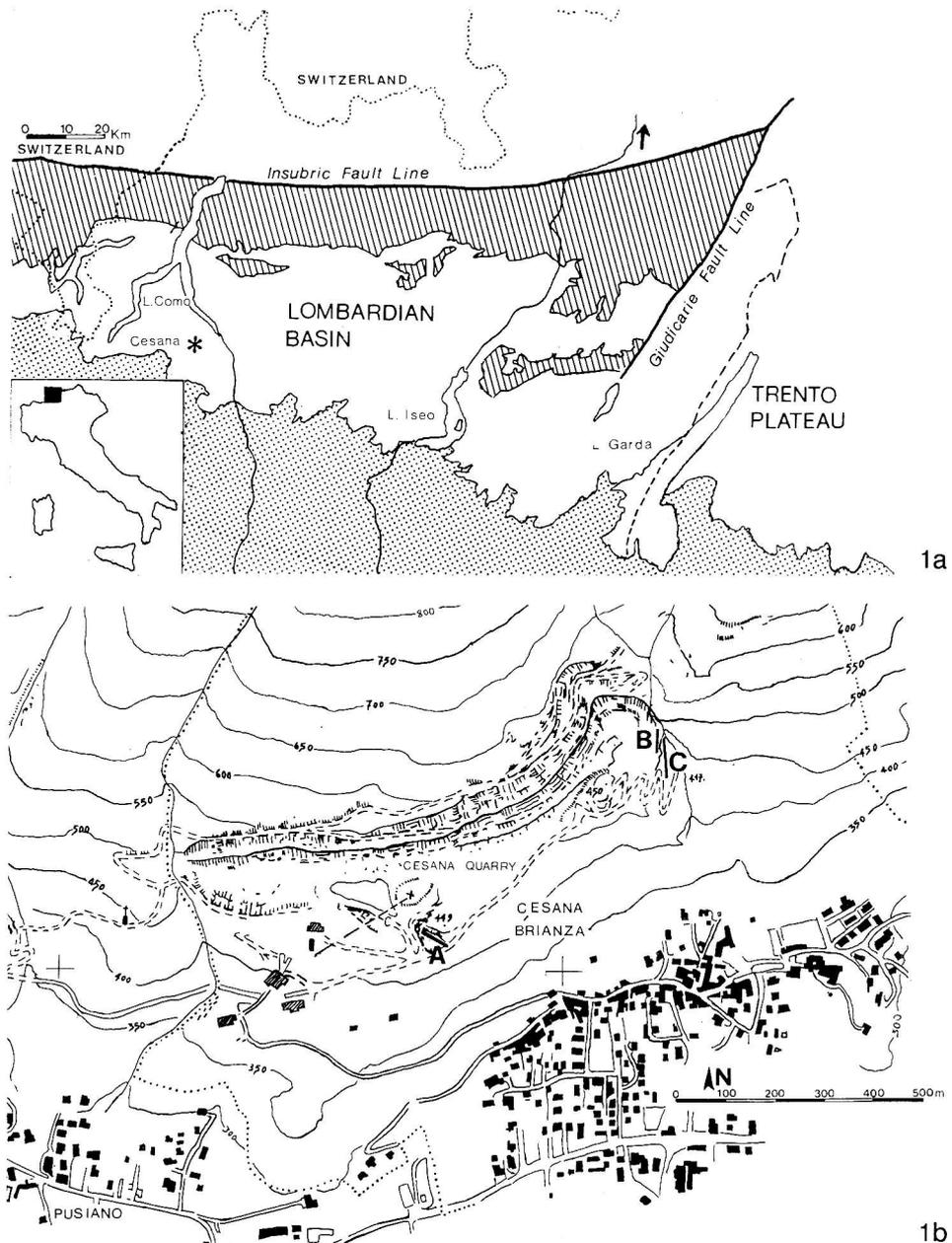


Fig. 1 - Location map for the study area. a) Geological setting of the study area. Stippled area) limit of Quaternary sediments of the Po Plain; oblique dash ornament) predominantly igneous and metamorphic rocks; area without ornament south of the Giudicarie-Insubric Line) predominantly Permian and Mesozoic sediments; dashed lines) approximate limits of mesozoic paleogeographic zones (Trento Plateau and Lombardian Basin). b) Location of the studied sections (A, B, C) in the Cesana Brianza area.

tified species the most significant are: *Costidiscus recticostatus* (d'Orbigny), *Macroscaphites* cf. *yvani* (Puzos), *Silesites seranonis* (d'Orbigny), *Heteroceras* cf. *astieri* (d'Orbigny).

Geological setting.

The Maiolica Formation consists of pelagic calcilutites with cherts. Its thickness is extremely variable, from some tens of metres to more than 200 metres. This variation is related to the Jurassic palaeogeography, which was characterized by N-S oriented structural highs and basins (Bernoulli, 1964; Gaetani, 1975; Winterer & Bosellini, 1981; Sarti et al., 1992).

The thickest successions are stratigraphically continuous and display transitional features with the underlying and overlying formations. Between the top of the Maiolica and the base of the Scaglia/Marne di Bruntino a transitional facies has been recognized (Barberis et al., 1992; Bersezio, 1993). This is characterized by a rhythmic alternation of limestones and marls whose terrigenous fraction increases upwards.

In the Cesana Brianza quarry the Maiolica shows a nearly complete succession because it formed on a flank of a Jurassic paleohigh. Here the transitional facies is 30 metres thick.

The studied sections.

The ammonite faunas described in this paper have been collected in some pelitic interbeds of two sections. The first one (section A, Fig. 2), where the material studied by Ceriotti et al. (1984) was collected, is a 25.5 m thick portion of Maiolica. It consists of grey or light brown well bedded calcilutites with chert lenses which mainly occur at the base of the succession. The beds are frequently bioturbated at the top and their thickness is about 10 cm. Some black pelitic interbeds also occur and their frequency increases in the upper part of the section. Their thickness is generally 2 cm at the base of the succession and increases upwards. The two fossiliferous interbeds, LG 20a and LG 21, are respectively located at 21.75 and 24.4 metres from the base of the section. Both consist of grey or black laminated marls.

The specimens are preserved as internal moulds crushed and deformed. The suture lines are only occasionally visible. The faunas are listed below.

Level LG 20a - Only two specimens have been found: *Melchiorites* sp. and *Heinzia* sp.

Level LG 21 - The richest fauna has been collected from this level. We have recognized the following forms: *Phyllopachyceras* sp., *Lytoceras* sp., *Ptychoceras meyrati* Ooster, *Anahamulina* sp., *Costidiscus recticostatus* (d'Orbigny), *Toxoceratoides sudalpinus* sp. n., *Spinocrioceras trachyomphalus* (Uhlig), *S. polyspinosum* Kemper, *Barremites* sp., *Melchiorites* sp., *Silesites seranonis* (d'Orbigny), ?*Paraspiticeras* sp., ?*Heteroceratidae* gen. et sp. ind.

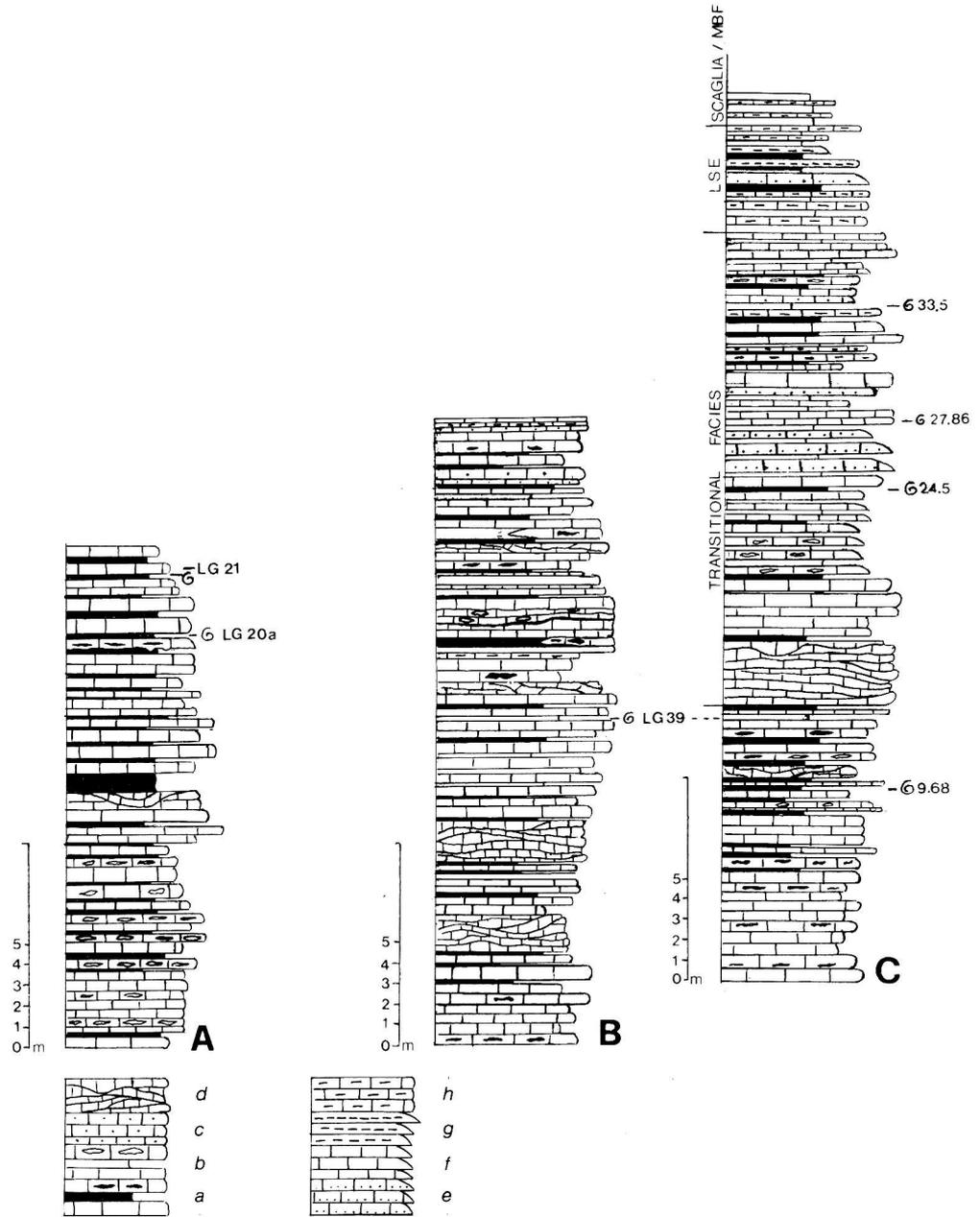


Fig. 2 - Stratigraphic logs of the studied sections. Legend: a) pelagic calcilutites with interbedded black shales and black cherts; b) pelagic calcilutites with interbedded grey/olive green shales and grey cherts; c) fine grained calcisiltites; d) slumping; e) turbiditic calcisiltites; f) turbiditic calcilutites; g) turbiditic marlstones; h) marly calcilutites. Sections A entirely corresponds to the upper part of the Maiolica, whilst in section C is reported the lithostratigraphic subdivision according to Bersezio (1994): LSE) Livello Selli equivalent; Scaglia/MBF) Scaglia/Marne di Bruntino Formation.

The second section (section B, Fig. 2) is located East of the first one and shows younger stratigraphic levels. The transitional facies (lithozone VI in Bersezio, 1993) between the Maiolica and Scaglia/Marne di Bruntino Formations crops out on a flank of a small hill. White or grey calcilutites with chert lenses and frequent dark, thin, marly interbeds are exposed. The ammonitiferous level, LG 39, is a light brown marly interbed 2 cm thick. It is located at 15.75 metres from the base of the section. On the other flank of the hill the succession is more complete because above the top of the Maiolica are exposed the transitional facies, the equivalent of the "Livello Selli" (Bersezio, 1994), the Scaglia/Marne di Bruntino and Sass de la Luna Formations. This succession (section C, Fig. 2) has already been studied by Bersezio (1993, 1994). On the basis of the correlation established in the field between the two flanks of the hill, i. e. sections B and C, the ammonitiferous level LG 39 is located at 29,5 metres below the base of the Scaglia/Marne di Bruntino, i. e. at the top of lithozone 5 (Bersezio, 1993), just below a mass gravity deposit distinguished as interval 1 by Bersezio (1994).

The ammonites are usually incomplete and preserved as internal moulds, crushed and pyritized. In the level LG 39 we have identified the following forms:

Phylloceratina gen. et sp. ind., *Lytoceras* sp., ?*Melchiorites* sp., ?*Anabamulina* sp., *Eoheteroceras* cf. *norteyi* (Myczynski & Triff), *E.* cf. *silesiacum* Vašicek & Wiedmann, ?*Hamulinites* cf. *parvulus* (Uhlig), *Manoloviceras* aff. *saharievae* (Manolov), *Silesites seranonis* (d'Orbigny).

We have sampled the section C too and we have found some other fossiliferous beds. Unfortunately the ammonites are very rare and incomplete. At metre 24.5 a *Costidiscus* cf. *recticostatus* (d'Orbigny) specimen was found. At metre 33.5 (=interval 25 in Bersezio, 1994), in a black marly level we collected a richer fauna with abundant *Silesites seranonis* (d'Orbigny) specimens, *Ptyhoceras emerici* d'Orbigny, *P.* cf. *minimum* Rouchadze, *Melchiorites* sp., ? *Costidiscus* sp. The faunas from these levels are not described in this work.

Biostratigraphy and conclusions.

Making reference to the recent zonal scheme (Hoedemaeker & Company, 1993) established by the Working Group on the Lower Cretaceous Cephalopods (Fig. 3), we will discuss the biostratigraphic indications provided by the studied faunas.

Level LG 20a. Only two specimens have been found. *Melchiorites* sp. does not provide fine biostratigraphic information; *Heinzia* sp. indicates the Upper Barremian, although its affinities with the group of *H. sartousi* (d'Orbigny) could tentatively indicate that this level belong to the *sartousi* zone.

Level LG 21. There are no zonal markers in this level but its fauna might indicate the *feraudi* or *giraudi* zones. Some specimens of *S. polyspinosum* Kemper have been found in the *feraudi* zone of some sections of South-East France (Delanoy & Féraud, in press), where the mediterranean zonation is recognized. However in Georgia, Kotetichvili (1970) reported a *S. polyspinosum* specimen from the younger *giraudi* zone. Specimens of *Toxoceratoides karsteni* (Uhlig) and *T.* aff. *silesiacus* (Uhlig) also occur in

AGES		AMMONITE ZONES
APTIAN	EARLY	<i>Dufrenoyia furcata</i>
		<i>Deshayesites deshayesi</i>
		<i>Deshayesites weissii</i>
		<i>Deshayesites tuarkyricus</i>
BARREMIAN	LATE	<i>Martelites sarasini</i>
		<i>Imerites giraudi</i>
		<i>Hemihoplites feraudi</i>
		<i>Heinzia sartousi</i>
		<i>Ancyloceras vandenheckei</i>
EARLY	<i>Holcodiscus caillaudi</i>	
	<i>Subpulchellia nicklesi</i>	
	<i>Spitidiscus hugii</i>	

Fig. 3 - Ammonite zonal scheme for the Barremian-Early Aptian interval as defined by the Lower Cretaceous Working Group (Hoedemaeker & Company, 1993).

the area between Angles and Barrême (South-East France) at the top of the *feraudi* zone and at the base of the *giraudi* zone respectively (Delanoy, pers. comm., march 1994).

Level LG 39 - According to the literature (see the discussion on Leptoceratoidinae in the "Systematic descriptions"), the occurrence of forms very similar to *Eoheteroceras*, *Hamulinites* and *Manoloviceras* should indicate an Early Barremian age. Actually the age of the type levels of the species *Eoheteroceras northeyi* and *E. silesiacum* is unknown, although it is believed to be Early Barremian (Vašiček & Wiedmann, 1994) without direct proof. However, *S. seranonis* appears in the upper part of the Upper Barremian *vandenheckei* zone (Hoedemaeker, pers. comm., june 1993).

Furthermore, 10 metres below the level LG 39 (Erba, pers. comm., june 1994), the calcareous nannofossil *R. irregularis* occurs and its FO correlates with the latest Barremian *sarasini* zone (Cecca et al., 1994 b). The whole nannofossil flora indicates unambiguously a Late Barremian to Early Aptian age.

In conclusion, there is no doubt that this fauna is younger than the Early Barremian but it is impossible to recognize a precise ammonite biozone. Possibly its age has to be sought in the *sarasini* (latest Barremian) - *tuarkyricus* (earliest Aptian) zones interval.

About 20.5 metres above this fauna, the Early Aptian is positively documented by the occurrence of *Ptychoceras emerici* in the level with abundant *Silesites seranonis* which has been mentioned in the description of the studied sections.

Although the mediterranean character of our faunas is clear, there are differences with the faunas from Czechoslovakia, South-East France and Southern Spain. In the Upper Barremian levels *Emericiceras*, *Ancyloceras*, Hemihoplitidae and Heteroceratidae are lacking. In the Lower Aptian levels the absence of Deshayesitidae representatives is probably related to the Boreal character of this family, which is very rare in South-East France and Southern Spain too. However, in these regions the FO of genus *Prochelonicer* indicates the beginning of the Aptian but it is lacking in our faunas.

Systematic descriptions

We follow the classification of the Cretaceous Ammonoidea by Wright (1981). The standard dimensions for normally coiled ammonites are given in millimetres and as percentages of the diameter. The following abbreviations, all explained in Fig. 4, have been used:

D = maximum diameter;

d = the measurements of the characters are related to a diameter lower than D;

Uw = umbilical width;

Wh = whorl height;

K = number of ribs per half whorl.

As far as regards uncoiled ammonites the terms used in the descriptions and the abbreviations of the dimensional characters are:

H = maximum height of the specimen;

Lh = hook length;

Ls1, Ls2 = 1st and 2nd shaft length;

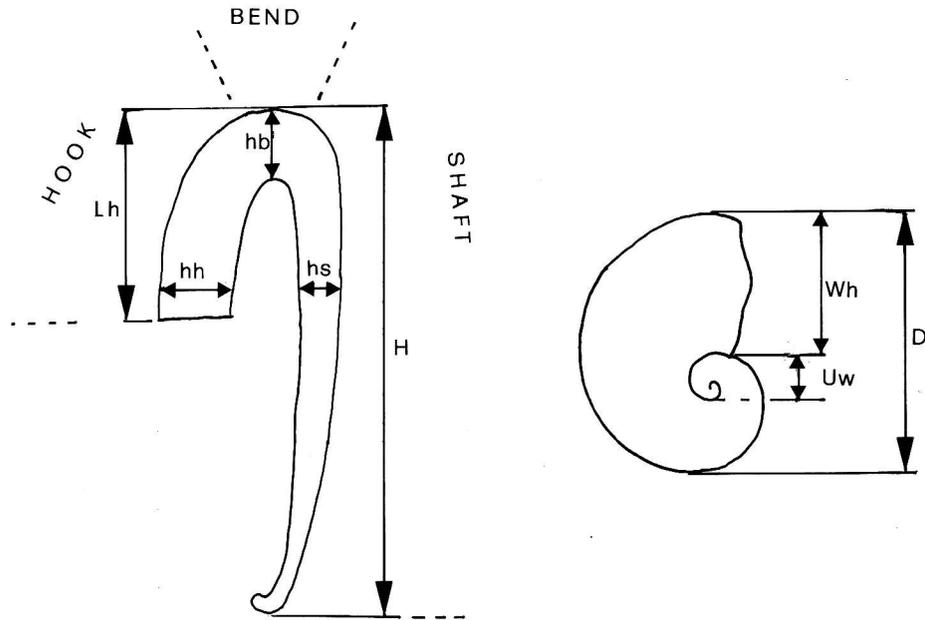


Fig. 4 - Abbreviations of the dimensional parameters used in the systematic descriptions.

- hb = whorl height at the bend;
 hh = whorl height at the hook;
 hs = whorl height at the shaft;
 α = angle between the hook and the shaft.

Due to the poor preservation of our specimens it has been impossible to obtain measurements of the whorl breadth and, generally, to observe the sutures. The specimens are housed in the "Museo di Paleontologia" of the University of Milan (MPUM), numbers 7153 to 7195, followed in brackets (ex. 7153 (K5)) by our own numbers. In fact, a MPUM number can include more than one specimen of the same species, whilst our own numbers indicate single specimens and are useful to distinguish the different specimens in the tables of measurements.

Class *Cephalopoda* Leach, 1817

Order *Ammonoidea* Zittel, 1884

Suborder *Lytocerotina* Hyatt, 1889

Superfamily *Lytocerataceae* Neumayr, 1875

Family *Macroscaphitidae* Hyatt, 1900

Genus *Costidiscus* Uhlig, 1883

Type species: *Ammonites recticostatus* d'Orbigny, 1841

***Costidiscus recticostatus* (d'Orbigny, 1841)**

Pl. 1, fig. 1, 2

- 1841 *Ammonites recticostatus* d'Orbigny, p. 134, pl. 40, fig. 3, 4.
 1883 *Lytoceras (Costidiscus) recticostatum* - Uhlig, p. 193, pl. 2, fig. 2; pl. 5, fig. 15; pl. 7; pl. 8, fig. 1-3.
 1898 *Costidiscus recticostatus* - Simionescu, p. 62.
 1919 *Costidiscus recticostatus* - Rodighiero, p. 79, pl. 9, fig. 1, 3.
 1949 *Costidiscus recticostatus* - Vialli, p. 48, pl. 1, fig. 9-11.
 1967 *Costidiscus recticostatus* - Dimitrova, p. 32, pl. 11, fig. 4.
 1967 (?) *Costidiscus recticostatus* - Baccelle & Lucchi Garavello, p. 133, pl. 2, fig. 4.
 1970 *Costidiscus recticostatus* - Kotetichvili, p. 61, pl. 5, fig. 1.
 1972 *Costidiscus recticostatus* - Vašicek, p. 43, pl. 3, fig. 1.
 1976 *Costidiscus recticostatus* - Avram, p. 23, pl. 2, fig. 12.
 1982 *Costidiscus recticostatus* - Braga, Company, Linares, Rivas & Sandoval, pl. 1, fig. 10.
 1984 *Costidiscus recticostatus* - Ceriotti, Salmoiraghi & Gentili, p. 34, fig. 3.
 1984 *Costidiscus recticostatus* - Avram, p. 68, fig. 1b.
 1987 *Costidiscus recticostatus* - Immel, p. 64, pl. 2, fig. 9.
 1992 *Costidiscus recticostatus* - Delanoy, p. 132, pl. 39, fig. 1.

Material. Four specimens. 7153 (K5) is an impression on the sediment; 7154 (K50) is a deformed fragment corresponding to a half whorl; 7155 (K58) is an impression with a fragment of the corresponding internal mould which is crushed at the end of the first half of the last whorl; 7155 (K59) is a crushed and badly preserved internal mould.

Dimensions:

specimen	D	Uw	Wh	K
7153 (K5)	≈50	25 (0.50)	≈15 (0.33)	44
7154 (K50)	32	16 (0.50)	9 (0.28)	48
7155 (K58)	≈28	12.5 (0.44)	6.5 (0.28)	39
7155 (K59)	27	13.5 (0.50)	-	-

Description. Evolute shell with fine, straight, regular and dense ribbing. There are three constrictions per whorl which are accompanied by enlarged ribs in front and behind. The ribs are generally simple and rare bundles made of two ribs, which branch near the umbilical edge are observed. In specimen 7154 (K50) the point of branching is thickened, although it cannot be considered as a true tubercle.

Discussion. *C. olcostephanoides* Uhlig, 1883 is considered by Avram (1984, p. 6) as an extreme variant of *C. recticostatus* but its sculpture is mainly characterized by frequent bundles of ribs. *C. grebenianus* Uhlig, 1883 bears a finer ribbing, more bundled ribs and rare, weak constrictions.

Avram (1984, p. 68) observed that many specimens referred in the literature to *C. recticostatus* are characterized by constrictions. In this sense our specimens show affinities with those depicted by Rodighiero (1919) and Baccelle & Lucchi Garavello (1967) from NE Italy.

Kilian (1888) recognized the dimorphic character of the pair *Macroscephites yvani* (Puzos)/*Costidiscus recticostatus* (d'Orbigny). In fact, it is hard to know what form we are dealing with when we have fragments or small sized immature specimens (see also discussion in Rodighiero, 1919, p. 79). The dimorphism in the *Macroscephites/Costidiscus* pair has been further analyzed by Avram (1984) who proposed the identification of the different dimorphic pairs. Nevertheless, in spite of the opinion about the sexual nature of the ammonite dimorphism, it has not yet decided to include under a single specific name the "species" splitted in these two genera.

Level. LG 21.

Suborder Ammonitina Hyatt, 1889

Superfamily *Desmocerataceae* Zittel, 1895

Family *Pulchelliidae* Douvillé, 1890

Genus *Heinzia* Sayn, 1891

Type species: *Ammonites provincialis* d'Orbigny, 1850

Heinzia sp.

Pl. 2, fig. 4

Material. 7160 (K48).

Description. We have an incomplete specimen, crushed and deformed of an involute ammonite. The sculpture is made of strong spatula-like ribs. These are prominent, prorsiradiate and strongly projected forward when they reach the ventro-lateral area.

Discussion. Because of the poor preservation, this specimen cannot be identified at the specific level. However it might belong to the group of *H. sartousi* (d'Orbigny, 1841). Its ribbing recalls some characters of *H. sellei* (Kilian, 1888) although this species is characterized by a wider umbilicus and a larger size.

Level. LG 20a.

Family *Silesitidae* Hyatt, 1900Genus *Silesites* Uhlig, 1883Type species: *Ammonites seranonis* d'Orbigny, 1841***Silesites seranonis* (d'Orbigny, 1841)**

Pl. 1, fig. 3-5

- 1841 *Ammonites seranonis* d'Orbigny, p. 361, pl. 109, fig. 4, 5.
 1872 *Ammonites trajani* Tietze, p. 140, pl. 9, fig. 1a-c, 2a, b.
 1883 *Silesites trajani* - Uhlig, p. 234, pl. 18, fig. 4, 7, 10, 11, 15.
 1888 *Silesites seranonis* - Kilian, p. 666, pl. 1a, b.
 1891 *Silesites seranonis* - Sayn, p. 178, pl. 2, fig. 15a, b.
 1898 *Silesites seranonis* - Simionescu, p. 76, pl. 4, fig. 5.
 1919 *Silesites seranonis* - Rodighiero, p. 81, pl. 9, fig. 4, 6.
 1949 *Silesites seranonis* - Vialli, p. 47, pl. 1, fig. 5, 6.
 1967 *Silesites seranonis* - Dimitrova, p. 162, pl. 80, fig. 10.
 1972 *Silesites seranonis* - Vašicek, p. 80, pl. 14, fig. 2, 3.
 1976 *Silesites seranonis* - Avram, p. 49, pl. 5, fig. 1.
 1978 *Silesites seranonis trajani* - Avram, p. 18, pl. 4, fig. 6, 7.
 1982 *Silesites seranonis* - Braga, Company, Linares, Rivas & Sandoval, pl. 1, fig. 6, 7.
 1984 *Silesites seranonis* - Ceriotti, Salmoiraghi & Gentili, p. 35, fig. 8.
 1987 *Silesites seranonis* - Immel, p. 84, pl. 7, fig. 4, 7.
 1987 *Silesites seranonis* - Autran & Delanoy, pl. 1, fig. 5.
 1989 *Silesites seranonis* - Michalik & Vašicek, p. 513, pl. 1, fig. 5.
 1992 *Silesites seranonis* - Delanoy, p. 33, pl. 7, fig. 1-3, 4.

Material. Seven deformed and crushed specimens, sometimes incomplete, coated with oxides: 7156 (K47), 7157 (K51), 7158 (K35), 7159 (K7, K62, K63, K65).

Dimensions:

specimen	D	Uw	Wh	K
7156 (K47)	≈ 21			
	at d=19.5	9 (0.46)	6.5 (0.34)	-
7157 (K51)	42	21 (0.50)	12.5 (0.29)	-
7159 (K7)	12.5	5.5 (0.44)	4 (0.32)	-
7159 (K62)	17.5	7.5 (0.42)	6 (0.34)	-
7159 (K63)	29.5	12 (0.40)	10.5 (0.35)	36
7159 (K65)	20	9 (0.45)	7 (0.35)	33

Description. The species shows an evolute shell with fine and dense ribbing. The ribs are prorsiradiate, simple and very rarely biplicate. There are generally four constrictions per whorl. On the ventro-lateral margin the ribs become projected forward.

Discussion. This is a well known species in the literature on Lower Cretaceous ammonites. Among the six specimens collected in a same level (LG 21) four of them reach a diameter of about 20 mm whilst two others reach 42 and 30 mm respectively. Similar observations have been made by one of us (F. C.) on specimens from Umbria-Marche Apennines. In our opinion this size difference may be related to the dimorphism because both groups come from the same bed.

Level. LG 21. Specimen 7158 (K35) from LG 39.

Suborder Ancyloceratina Wiedmann, 1960
 Superfamily *Ancylocerataceae* Gill, 1871
 Family *Ptychoceratidae* Meek, 1876
 Genus *Ptychoceras* d'Orbigny, 1842
 Type species: *Ptychoceras emerici* d'Orbigny, 1842

***Ptychoceras meyrati* Ooster, 1860**

Pl. 2, fig. 3

- 1860 *Ptychoceras Meyrati* Ooster, p. 82, pl. 59, fig. 1-4.
 1898 *Ptychoceras inornatum* Simionescu, p. 66, pl. 2, fig. 5, 6.
 1902 *Ptychoceras Meyrati* - Sarasin & Schöndelmayer, p. 173, pl. 25, fig. 1, 2.
 1907 *Ptychoceras Meyrati* - Karakasch, p. 155, pl. 4, fig. 5; pl. 25, fig. 7.
 1938 *Ptychoceras Meyrati* - Rouchadze, p. 138, pl. 1, fig. 4.
 1982 *Euptychoceras meyrati* - Braga, Company, Linares, Rivas & Sandoval, pl. 1, fig. 5.
 1987 *Ptychoceras meyrati* - Immel, p. 127, pl. 14, fig. 9.

Material. 7161 (K3).

Dimensions:

specimen	Ls1	hs1	hb1	Ls2	hs2	hb2	Ls3	hs3
7161 (K3)	62	3.5	4.5	105	6	7.5	90	10

Description. Heteromorph ammonite characterized by three shafts. The second shaft does not touch the first one whilst the third shaft touches the second, but only after the first 2 cm from the 2nd bend, and finally it overlaps the first shaft. The ammonite is nearly smooth but some regular, distant and weak ridges are developed from the 2nd bend. They are thickened near the ventral area and disappear at the mid-side of the whorl.

Discussion. Compared to the original specimens figured by Ooster (1860) our specimen is smaller and does not show the overlap of the 2nd shaft on the 1st one. However, the weak ridges on the 3rd shaft recall the specimen figured by Ooster (1860, pl. 59, fig. 2). *P. meyrati* is often cited from Lower Hauterivian (*nodosoplicatum* zone in Bulot et al., 1993) or Upper Hauterivian levels (Breistroffer, 1952; Immel, 1978). On the basis of the literature which we know, this species is rare in Upper Barremian levels. Only Rouchadze (1938) and Braga et al. (1982) cite it from Lower Aptian, although Rouchadze's specimen could come from levels with uppermost Barremian Heteroceratidae.

Level. LG 21.

Genus *Anahamulina* Hyatt, 1900

Type species: *Hamulina subcylindrica* d'Orbigny, 1849

***Anahamulina* sp.**

Material. 7162 (K57).

Description. The specimen consists of a long shaft and a shorter hook which are completely smooth. Although the generic identification is clear, it is impossible to recognize any specific characters, the ribbing being not preserved.

Level. LG 21.

? *Anahamulina* sp.

Pl. 1, fig. 9, 10

Material. Seven incomplete specimens: 7163 (K42), 7164 (K 12), 7165 (K18, K20, K33, K38, K40).

Description. The studied specimens correspond to fragments of straight shafts bearing strong, simple, regularly spaced ribs. The interval between two ribs corresponds to the thickness of a single rib. Because of the incomplete preservation of the material it was impossible to obtain a reliable determination.

Discussion. The aspect of the shaft recalls the genus *Anahamulina*. Although the ribbing is quite strong it recalls *A. rothi* Vašicek, 1972. The slow increase of the whorl height recalls *A. paxillosa* (Uhlig, 1883) which has a weaker ribbing than our specimens. These forms are not incomplete specimens of *Manoloviceras* Vašicek & Wiedemann, 1994 because in this genus the shaft is gently curved and the ribs are sharper and slightly oblique.

Level. LG 39.

Family *Ancyloceratinae* Gill, 1871

Subfamily *Ancyloceratinae* Gill, 1871

Genus *Spinocrioceras* Kemper, 1973

Type species: *Spinocrioceras polyspinosum* Kemper, 1973

***Spinocrioceras trachyomphalus* (Uhlig, 1883)**

Pl. 2, fig. 1a, b

1883 *Acanthoceras trachyomphalus* Uhlig, p. 257, pl. 23, fig. 4.

1992 *Spinocrioceras trachyomphalus* - Delanoy, p.82, pl. 14, fig. 1.

Material. A single specimen, 7166 (K53), which is crushed and slightly deformed. The internal mould is incomplete whilst the impression on the sediment shows the evolution of the ribbing at all stages.

Dimensions:

specimen	D	Uw	Wh	K
7166 (K53)	64	31 (0.48)	16.5 (0.26)	21

Description. The shell is evolute. The sculpture is strong with prominent ribs, regularly spaced. In the internal whorls, up to a diameter of about 40 mm, the ribs bear an elevated tubercle on their ventro-lateral end. The strength of the tubercles decreases in the following stage and weak tubercles begin to develop around the

umbilical edge. Around $d=55$ mm slight lateral tubercles tend to develop at the middle of the flank, whilst the ribs begin to be rursiradiate with an adapical concavity which is not linked to deformation. The sutures and the aperture are not preserved.

Discussion. The described specimen can be compared with the two specimens figured in the literature, i. e. the holotype (Uhlig, 1883) and that described by Delanoy (1992). Thus, the intraspecific variability of this species is not completely known. However, the main morphological differences are observed in the second half of the last whorl, i. e. the beginning of lateral tubercles and the adapical concavity of the ribs, although the latter character occurs in Delanoy's specimen. We believe that these differences are intraspecific.

S. amadei (Uhlig, 1883) differs from *S. trachyomphalus* for its rapid coiling and the shape of the tubercles, which are weaker and less persistent in the ontogeny.

Level. LG 21.

Spinocrioceras polyspinosum Kemper, 1973

Pl. 2, fig. 2

1970 *Emericiceras* (?) sp. Kotetichvili, p. 71, pl. 9, fig. 3a, b.

1973 *Spinocrioceras polyspinosum* Kemper, p. 47, pl. 1, fig. 2a, b.

1973 *Spinocrioceras* (?) sp. Kemper, p. 49, pl. 1, fig. 8a, b.

1992 *Spinocrioceras polyspinosum* - Delanoy, p. 83, fig. 4C, D; pl. 15, fig. 1.

in press *Spinocrioceras polyspinosum* - Delanoy & Féraud, pl. 1, fig. 1, 2; pl. 2, fig. 1; pl. 3, fig. 2, 3; pl. 4, fig. 1; pl. 5, fig. 1, 2.

Material. A single specimen, 7167 (K10), which is incomplete, crushed and deformed.

Description. The shell is evolute. Up to $d=25$ mm the ribs are strong, prominent, slightly rursiradiate and bear a tubercle in the middle of the flank and clavi at their ventro-lateral ends. About $d=30$ mm the ribs become rectiradiate and a third row of tubercles begins to develop on the umbilical edge. This sculpture remains unchanged up to $d=60$ mm, although starting at $d=55$ mm the peri-umbilical row of tubercles migrates slightly higher on the flank, closer to the mid-flank row. Due to the incomplete preservation of the specimen the complete evolution of the sculpture cannot be observed.

Discussion. In spite of the bad preservation of our specimen the typical characters of the species can be observed. It can be compared with the specimens figured by Kotetichvili (1970) from Georgia and Delanoy & Féraud (in press), particularly those depicted in pl. 1, fig. 2 and pl. 3, fig. 3, from Southern France.

Level. LG 21.

Subfamily *Helicancylinae* Hyatt, 1894

We follow the Aguirre-Urreta's (1986) conception of this subfamily. However, according to the recent revision by Delanoy & Poupon (1992) the genus *Lytocrioceras*

Spath, which Aguirre-Urreta (1986) included with doubt in the Helicancylinae, should be included in the Ptychoceratidae Family.

Genus *Toxoceratoides*, Spath, 1926

Type species: *Toxoceratoides royerianus* d'Orbigny, 1841

***Toxoceratoides sudalpinus* sp. n.**

Pl. 3, fig. 1; Text-fig. 5

Name derivation. The holotype comes from the Southern Alpine domain.

Holotype. MPUM 7168 (K4).

Type locality. Cesana Brianza near Como, Northern Italy.

Type level. Upper Barremian, *feraudi* or *giraudi* zone.

Depository. "Museo di Paleontologia" of the Earth Sciences Department of the University of Milan.

Diagnosis. Toxoceratid coiling. Sculpture with simple, dense ribs on the first part of the shaft; pairs of ribs buckled on a ventro-lateral tubercle and one simple rib intercalated between two pairs on the rest of the shaft, up to the initial part of the body chamber. On the hook the ribs are strong, simple or biplicate, branching from an umbilical tubercle.

Dimensions:						
specimen	H	Lh	hs	hb	hh	α
7168 (K4)	77.5	42.5	12	14	16	47°

Description. Ammonite with toxoceratid coiling (Aguirre-Urreta, 1986, fig. 7). The youngest part of the shell is not preserved and the first part of the shaft is only preserved as an impression on the sediment. The shaft is slightly arcuate and begins with a dense, simple and rectiradiate ribbing. The following ornamental stages are visible on the internal mould (Fig. 5a). The ribs become slightly oblique and a ventro-lateral tubercle develops. Two ribs are buckled on this tubercle thus originating 10 pairs of ribs. Between two pairs of buckled ribs one simple rib is intercalated. The body chamber begins at the seventh pair of tied ribs. Before the beginning of the bend the tied ribs disappear and become simple, prominent and slightly sinuous. After the last buckled rib a row of very weak tubercles begin to develop at the lower quarter of the whorl side. From the middle of the bend up to the end of the hook the elevation of these tubercles increases prominently and the ribs, which become stronger, can be simple or biplicate branching from it. Although the suture is eroded and incompletely visible (Fig. 5b), the first lateral lobe shows some similarities with *Toxoceratoides royerianus* (d'Orbigny, 1841).

Discussion. Our specimen shows morphologic affinities with *T. silesiacus* (Uhlig, 1883) and *T. karsteni* (Uhlig, 1883). On the bend of *T. karsteni* there are trituberculate ribs (see also Vašicek, 1973) and the buckled ribs are not developed. Although the

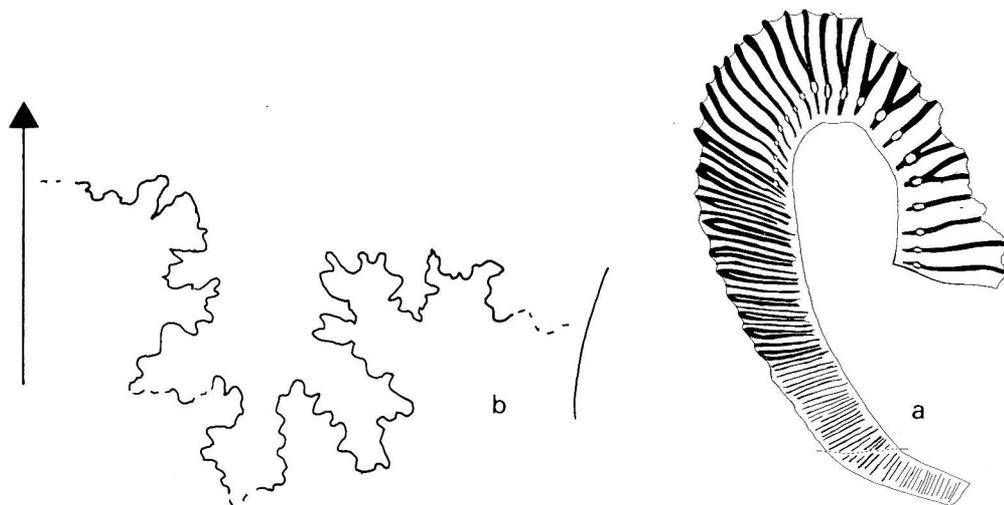


Fig. 5 - *Toxoceratoides sudalpinus* sp. n. Holotype, specimen 7168 (K4). a) Ornamental characters; the initial part of the shaft, below the dashed line, is preserved as impression on the sediment (x 1); b) suture line at H=12 mm.

holotype of *T. silesiacus* is poorly preserved, it seems that the buckled ribs are not developed and the ribs which bear a tubercle on the ventro-lateral edge are simple. The coiling of these species is slightly different from *T. sudalpinus* sp. n.

Some incomplete heteromorphs included by Delanoy (1992) in *Toxoceratoides* show some similarities with *T. sudalpinus* sp. n., in particular ?*Toxoceratoides* sp. and *Toxoceratoides* sp. (forme 3) respectively figured by Delanoy in pl. 6, fig. 12 and pl. 14, fig. 2. However, the sculpture is different: *T.* sp. (forme 3) develops looped ribs up to the beginning of the bend and tubercles on the inner edge of the whorl; ?*T.* sp. bears two-three simple ribs between the ribs which have a ventro-lateral tubercle. Also the coiling seems to be different. These forms, in spite of their fragmentary preservation, can be easily compared with two other interesting specimens from SE France whose photographs have been kindly communicated us by Delanoy. These specimens, which are better preserved than those he figured in 1992, are depicted in the present paper Pl. 3, fig. 2, 3 and respectively identified as *T. karsteni* (Uhlig) and *T. aff. silesiacus* (Uhlig). They have been collected in two different sections (Méouilles-St. André les Alpes and Vallée de Morièz) of the area between Angles and Barrème at the top of the *feraudi* zone and at the base of the *giraudi* zone respectively.

Level. LG 21.

Subfamily *Leptoceratoidinae* Thieuloy, 1966

An exhaustive revision of this subfamily has been recently undertaken by Vašicek & Wiedmann (1994). We accept their classification and interpretations.

The problem of the stratigraphic position of the specimens from Cesana Brianza.

Most of the specimens which we have found at Cesana Brianza in level LG 39 (section B) show some similarities with the Leptoceratoidinae figured by Uhlig (1883), Manolov (1962), Vašicek (1973, 1990) and Myczyński & Triff (1986). This is the reason why we use the taxonomic nomenclature defined for these forms.

Although the exact stratigraphic level of the type-specimens of Uhlig (1883) is unknown, it is important to stress that in the literature all the Leptoceratoidinae species included in the genera *Hamulinites*, *Eoheteroceras* and *Manoloviceras* are usually reported from Lower Barremian levels (Manolov, 1962; Wiedmann, 1973; Vašicek, 1973, 1990; Vašicek & Wiedmann, 1994), except *Hamulinites assimilis* (Uhlig), which persists in the Upper Barremian as recently stated by Vašicek & Wiedmann (1994, fig. 7). It is worth noting that so far there is poor biostratigraphic information about these forms in terms of the ammonite zonation currently used for the Lower Cretaceous (Hoedemaeker & Company, 1993). The tectonic deformations or the bad exposure of the type-outcrops must be invoked: this is the problem of the type-level of "*Hamulinites*" *norteyi*, described by Myczyński & Triff (1986) from Cuba (see below).

All the Leptoceratoidinae specimens from Cesana Brianza have been collected in the level LG 39 which age is probably latest Barremian - earliest Aptian as discussed above.

It is difficult to state that we are dealing with an homeomorphy phenomenon. We can exclude that our forms belong to the Heteroceratidae family because they lack the young turriconic stage. However, in the case that further researches in other Tethyan areas prove that *Hamulinites*, *Eoheteroceras* and *Manoloviceras* became extinct in Early Barremian time, the taxonomic status of the specimens which we describe here must be revised.

Genus *Eoheteroceras* Vašicek & Wiedmann, 1994

Type species: *Eoheteroceras silesiacum* Vašicek & Wiedmann, 1994

***Eoheteroceras* cf. *norteyi* (Myczyński & Triff, 1986)**

Pl. 1, fig. 6-8

Material. Seven specimens badly preserved and incomplete: 7169 (K11), 7170 (K15), 7171 (K16), 7172 (K17, K54, K55, K56).

Dimensions:

specimen	H	Lh	hs	hb	hh	α
7169 (K11)	19.5	8.5	7	≈5	≈9.5	30°
7170 (K15)	18	5.5	3	3.7	4	≈61°
7172 (K17)	13.2	9.5	2.3	2.7	3	≈10°

Description. Small, arched shell which can develop three arms (see Pl. 1, fig. 8). From the young stage the sculpture is characterized by simple, rounded ribs which are

fine and dense on the young shaft and then become sharp and more spaced. Around the end of the shaft the sculpture becomes stronger and the interval between two ribs corresponds to the thickness of three ribs. This style of ribbing persists on the hook, which is never completely preserved in our specimens. Due to the compression, only one side of the whorl is visible. However, the ribbing seems to be continuous on the venter of our specimens.

Discussion. The specimens described are similar to the holotype and paratype of *E. northeyi* and to *E. cf. northeyi* (respectively depicted in pl. 1, fig. 8, pl. 3, fig. 6 and pl. 2, fig. 12 by Myczyński & Triff, 1986 under the genus *Hamulinites*), although the specific identification is uncertain because of their bad preservation.

The holotype of *E. northeyi* was collected in an outcrop with Lower Barremian ammonites although the authors (Myczyński & Triff, 1986, p. 116) indicate a Barremian - ?Aptian age because of the occurrence of a *Chelonicerus* specimen.

Level. LG 39.

Eoheteroceras cf. silesiacum Vašicek & Wiedmann, 1994

Pl. 2, fig. 5

Material. A single pyritized, incomplete and damaged specimen: 7173 (K13).

Dimensions:

specimen	H	Lh	hs	hb	α
7173 (K13)	21.5	16	5.5	6	$\approx 36^\circ$

Description. Small shell with three arms. The angle between the 1st and the 2nd shaft is obtuse; the angle between the 2nd shaft and the hook is acute although it is difficult to evaluate because at this point the specimen is crushed and damaged. The hook is incomplete. The sculpture is characterized by strong, sharp and simple ribs. The distance between two ribs is larger than the thickness of one rib. This distance slightly increases with the ontogenetic development. The ribbing seems to be continuous on the venter. The sutures and the aperture are not preserved in our specimen.

Discussion. In spite of the bad and incomplete preservation, our specimen is quite similar to the holotype of *E. silesiacum*, which was originally figured by Uhlig (1883, pl. 29, fig. 2) as *Leptoceras* n. f. ind.

This species is reported from the Lower Barremian, although the type level in Gorki Wielkie (Polish Outer Western Carpathians) is ascribed to this age only presumably (Vašicek & Wiedmann, 1994).

Level. LG 39.

Genus *Hamulinites* Paquier, 1901

Type species: *Hamulina munieri* Nicklès, 1894

?**Hamulinites cf. parvulus** (Uhlig)

Pl. 2, fig. 6a, b

Material. 7174 (K22).

Dimensions:

specimen	H	Lh	hs	hb	α
7174 (K22)	13.5	8	1.5	2	3.5

Description. The small specimen described here is compressed and visible only on one side. The young stage is preserved: it is characterized by a slightly open planispiral coiling (Pl. 2, fig. 6b). The sculpture is preserved starting on the last part of the shaft and on the hook. The ribs of the shaft are simple and gently prorsiradiate. The hook, which is shorter than the shaft, bears a sharper ribbing. Near the aperture the distance between the last and the fore-last ribs is much more greater than between the others ribs. The sutures are not preserved.

Discussion. Our identification is doubtful because the specimen is badly preserved. The lack of the sutures actually prevents the distinction of the Leptoceratoidinae, as *Hamulinites*, from other genera like *Anahamulina*. Nevertheless, the sculpture is much more similar to that of *Hamulinites*. In this case, our specimen can be compared with the lectotype of *H. parvulus* (Uhlig, 1883, pl. 29, fig. 3).

Level. LG 39.

Genus *Manoloviceras* Vašicek & Wiedmann, 1994

Type species: *Hemibaculites saharievae* Manolov, 1962

Manoloviceras aff. *saharievae* (Manolov, 1962)

Pl. 1, fig. 11-13a, b

Material. 7175 (K41), 7176 (K52), 7177 (K23), ? 7178 (K19).

Dimensions:

specimen	H	hs
7175 (K41)	18.5	5
7176 (K52)	17	5

Description. Small shell whose young stage is visible on one side only in the specimen 7176 (K 52), which is depicted in Pl. 1, fig. 13. However, it is hard to judge whether this initial coil is a low and open-whorled trochospiral, as described by Vašicek & Wiedmann (1994), or planispiral. The shell becomes uncoiled and arched and the whorl height increases rapidly developing into a gently curved shaft. The ribs are simple, fine and dense before the beginning of the shaft; later on they become stronger and slightly prorsiradiate. The intervals between the ribs correspond to the thickness of one rib but they become larger with the growth.

All the specimens are compressed, deformed and visible on one side only. Thus, it is impossible to see the whorl section. The sutures and the terminal part of the shell are not preserved.

Discussion. Although it is difficult to recognize the characteristic juvenile coiling of *Manoloviceras*, as described by Vašicek & Wiedmann (1994), our specimens are similar to those described by Vašicek (1972, p. 56, fig. 17-19; pl. 6, fig. 1, 2) as *Veleziceras uhligi*. This author stressed the strong similarities of this species with *Hemibaculites sahariavae* Manolov (1962, pl. 73, fig. 4 and 5; fig. 6 probably does not belong to the species). Later on Vašicek (1990) considered *V. uhligi* as a synonym of *sahariavae* which was chosen by Vašicek & Wiedmann (1994) as the type species of their new genus *Manoloviceras*.

Specimen 7176 (K 52) differs from the Vašicek's ones by the earlier development of the uncoiled arched whorl before the shaft. It is also impossible to observe the growth-lines between the ribs described by Vašicek (1972) because they are developed on the shell and not on the internal mould. However, the growth of the whorl height of the holotype of *M. sahariavae* (Manolov) is much more rapid than in the Vašicek and our specimens.

M. sahariavae is reported from Lower Barremian by Manolov (1962), Vašicek (1990) and Vašicek & Wiedmann (1994).

Level. LG 39.

Family *Heteroceratidae* Hyatt, 1900

? *Heteroceratidae* gen. et sp. ind.

Pl. 2, fig. 7

Material. 7179 (K45).

Dimensions:

specimen	H	hs
7179 (K45)	27.5	7.5

Description. The young stage of this heteromorph ammonite is a tightly coiled spiral, eroded and crushed. Later on the spiral opens and develops a gently arched shaft with dense, simple, intercalatory and biplicate ribs.

Discussion. It has been impossible to compare this specimen with the Ancyloceratidae species which we know. There is no proof that it is the young stage of ancyloceratids like *Toxoceratoides*. The very doubtful identification with the Heteroceratidae is due to the aspect of the sculpture which recalls some Heteroceratidae representatives. However, because of the poor preservation, it is impossible to judge whether the coiling is helicoidal or not, i. e. to recognize the main characteristic of the Heteroceratidae family.

Level. LG 21.

Superfamily *Douvilleicerataceae* Parona & Bonarelli, 1897

Family *Douvilleiceratidae* Parona & Bonarelli, 1897

Subfamily *Cheloniceratinae* Spath, 1923Genus *Paraspiticeras* Kilian, 1910Type species: *Aspidoceras percevali* Uhlig, 1883? *Paraspiticeras* sp.

Pl. 3, fig. 4

Material. 7180 (K6).

Description. Fragment of a large ammonite with strong and distant ribs.**Discussion.** The identification of this specimen is doubtful because of the incomplete preservation. However, the ribbing together with the large size recalls the ventral area of forms related to *P. percevali* (Uhlig, 1883). Ceriotti et al. (1984, fig. 9) included in this species a fragment similar to ours.**Level.** LG 21.*Acknowledgements.*

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PLATE 1

- Fig. 1 - *Costidiscus recticostatus* (d'Orbigny). Cesana Brianza, section A, level LG 21. N. 7153 (K5); x 1.
 Fig. 2 - *Costidiscus recticostatus* (d'Orbigny). Cesana Brianza, section A, level LG 21. N. 7154 (K50); x 1.
 Fig. 3 - *Silesites seranonis* (d'Orbigny). Cesana Brianza, section A, level LG 21. N. 7156 (K47); x 1.
 Fig. 4 - *Silesites seranonis* (d'Orbigny). Cesana Brianza, section B, level LG 39. N. 7158 (K35); x 1.3.
 Fig. 5 - *Silesites seranonis* (d'Orbigny). Cesana Brianza, section A, level LG 21. N. 7157 (K51); x 1.
 Fig. 6 - *Eoheteroceras* cf. *norteyi* (Myczynski & Triff). Cesana Brianza, section B, level LG 39. N. 7169 (K11); x 1.
 Fig. 7 - *Eoheteroceras* cf. *norteyi* (Myczynski & Triff). Cesana Brianza, section B, level LG 39. N. 7171 (K16); x 1.
 Fig. 8 - *Eoheteroceras* cf. *norteyi* (Myczynski & Triff). Cesana Brianza, section B, level LG 39. N. 7170 (K15); x 1.1.
 Fig. 9 - ? *Anahamulina* sp. Cesana Brianza, section B, level LG 39. N. 7164 (K12); x 1.
 Fig. 10 - ? *Anahamulina* sp. Cesana Brianza, section B, level LG 39. N. 7163 (K42); x 1.
 Fig. 11 - *Manoloviceras* aff. *saharievae* (Manolov). Cesana Brianza, section B, level LG 39. N. 7175 (K41); x 1.
 Fig. 12 - *Manoloviceras* aff. *saharievae* (Manolov). Cesana Brianza, section B, level LG 39. N. 7177 (K23); x 1.
 Fig. 13a, b - *Manoloviceras* aff. *saharievae* (Manolov). Cesana Brianza, section B, level LG 39. N. 7176 (K52); a) x 1; b) x 2.

PLATE 2

- Fig. 1a, b - *Spinocrioceras trachyomphalus* (Uhlig). Cesana Brianza, section A, level LG 21. N. 7166 (K53). a) Internal mould; b) impression on the sediment. The arrow indicates the beginning of the body chamber; x 1.
 Fig. 2 - *Spinocrioceras polyspinosum* Kemper. Cesana Brianza, section A, level LG 21. N. 7167 (K10); x 1.
 Fig. 3 - *Ptychoceras meyrati* Ooster. Cesana Brianza, section A, level LG 21. N. 7161 (K3); x 1.
 Fig. 4 - *Heinzia* sp. Cesana Brianza, section A, level LG 20a. N. 7160 (K48); x 1.
 Fig. 5 - *Eoheteroceras* cf. *silesiacum* Vašicek & Wiedmann. Cesana Brianza, section B, level LG 39. N. 7173 (K13); x 1.
 Fig. 6a, b - ? *Hamulinites* cf. *parvulus* (Uhlig). Cesana Brianza, section B, level LG 39. N. 7174 (K22); a) x 1; b) x 3.
 Fig. 7 - ? *Heteroceratidae* gen. et sp. ind. Cesana Brianza, section A, level LG 21. N. 7179 (K45); x 1.

PLATE 3

- Fig. 1 - *Toxoceratoides sudalpinus* sp. n. Holotype. Cesana Brianza, section A, level LG 21. N. 7168 (K4). The arrow indicates the beginning of the body chamber; x 1.
 Fig. 2 - *Toxoceratoides karsteni* (Uhlig). Méouilles near St-André-les-Alpes, bed MEO 162, Angles-Barrême région (SE France). Coll. Delanoy; x 1.
 Fig. 3 - *Toxoceratoides* aff. *silesiacus* (Uhlig). Vallée de Morièz, Angles-Barrême région (SE France). Coll. Couillet; x 1.
 Fig. 4 - ? *Paraspticerias* sp. Cesana Brianza, section A, level LG 21. N. 7180 (K6); x 1.

