PALAEOPELAGOS SPECIAL PUBLICATION 1, 1994, Roma. Proceedings of the 3rd Pergola International Symposium: 367 - 381.

A new ammonite fauna from the Tithonian (Semiformiceras/Verruciferum Zone) of the Lessinian Alps, Verona Province, Northern Italy

Arnold Zeiss*, Attilio Benetti** & Nicola Pezzoni**

* Paläontol.Institut d. Univ., Loewenichst. 28, D-8520 Erlangen.

** Museo dei fossili della Lessinia, Camposilvano, I-37030 Velo Veronese.

ABSTRACT - The new ammonite fauna has been discovered in 1987 when a house was constructed in the western surrounding of Bosco Chiesanuova in the centre of the Lessinian Alps. The material has been collected bed-by-bed and the section is well documented.

The beds from which the ammonites have been collected belong to a series of stromatolithic limestones intercalated between nodular limestones.

The most characteristic guide fossil of this fauna is *Haploceras verruciferum* representin 24% of the whole fauna. In contrast the clasic guide fossil *Semiformiceras semiforme* deliversonly 3%.

The fauna consists of 248 specimens of the following families: Perisphinctidae (68), Haploceratidae (83), Lytoceratidae (44) and Phylloceratidae (53).

The fauna is rather similar to that described by Cecca (1986) from the Ardeche department of SE France. There is also some similarity with forms described from the Apennines by Cecca (1990), from Southern Spain (Oloriz, 1978) and from Southern Germany (Schneid 1915, Zeiss 1968). The composition of the fauna agrees also ruther well with the list given by Sarti (1988) for the Monte Pasubio area (Trentino): but only some of the forms have been described by this author (1984). Therefore here a full documentation of a carefully bed-by-bed collected faunal assemblage of the Verruciferum/Semiforme Zone in the middle part of the northern European Tethys is presented. Only in this way more clearness will be obtained about the faunal composition of this zone and its correlation potential.

KEY WORDS: ammonites, Tithonian, Southern Alps, Northern Italy.

INTRODUCTION

The ammonites have been collected in a site wich is named "Piccola Mantova"; this is the centre of a new settlement in the western district of the town of Bosco Chiesanuova, which is situated in the centre of the Lessinian Alps (northern part of Verona Province, see fig. 1).

In the Year 1987 during the excavations for the foundation of a new building a section in the "Rosso Ammonitico Veronese" could be measured containing also sediments of Lower and Middle Tithonian age.

In the Lessinian Mountains Benetti & Pezzoni (1983) already recognized the zonation,which has been proposed by Oloriz (1978) for the Betic Cordillera (Southern Spain). Only the "Zona a Burckhardticeras" has not been proved in the Lessinian Alps, but equivalents (Volanense Zone) are present farther north in the Trentino, see Sarti (1988). The zonal index "*H. (V.) verruciferum*" is used mostly now instead of the older index "*Semiformiceras semiforme*"; following Sarti (1988) we use here the term Verruciferum/Semiforme Zone; in our material the recently proposed index species (Oloriz, 1978) is represented by 23%, but the older only by 3,6% (cf. Fig. 2).

In some other sections of the Monti Lessini Benetti & Pezzoni (1983, 1985) and Benetti *et alii* 1990 found the following species of the Verruciferum/ Semiforme Zone:

Haploceras tithonium (Oppel), *H. verruciferum* Zittel, *H. tomephorum* Zittel, *H. carachtheis* (Zeuschner), *Pseudolissoceras bavaricum* Barthel, *Semiformiceras semiforme* (Oppel), *Simocosmoceras adversum* (Oppel), *Biplisphinctes tithoni* Oloriz, *Pachysphinctes robustus* Spath, *Discosphinctoides* (*Pseudodiscosphinctes*) *geron* (Zittel), *Virgatosimoceras rothpletzi* (Schneid), *Simoceras* (*S.*) *volanense* (Oppel), *Physodoceras cyclotum* (Oppel) *Aspidoceras rogocznicense* (Zeuschner).

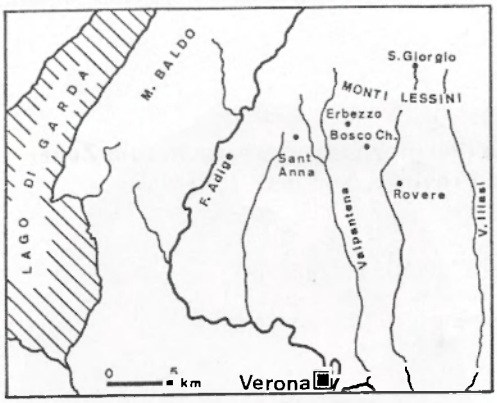


Fig. 1 - General situation of the town of Bosco Chiesanuova in the northern part of the province of Verona (northern Italy)

The rocks displaying the Verruciferum/Semiforme Zone at the locality Piccola Mantova are Thinly-bedded with stromatolithic "tappeti" (fig. 1); this may be observed also at other localities of Lessinia, where this zone occurs (Massari 1979, Massari *et alii*, 1988).

Nearly all ammonites come from the middle part of the section (beds B-C-D), while they are rare or badly preserved in the lower and upper beds (A and E). The ammonites of the three above mentioned layers are sometimes completely preserved with both sides, thus one has to consider an early lithification process. Also some of the "Steinkerns" exhibit an ornamentation with very fine ribs.

The nodular limestones below the Verruciferum/Semiforme-Zone delivered *Aspidoceras rafaeli* and *A.* sp. cf. gr. *longispinum* and those above a single specimen of *Simoceras admirandum*.

The ammonite fauna of the Verruciferum/Semiforme-Zone consists of 248 specimens; 83 belong

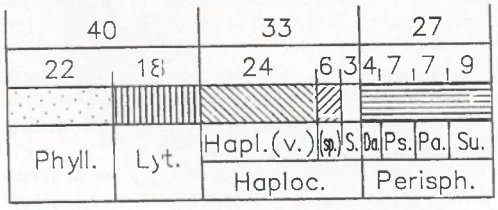


Fig. 3 - Percentage of ammonite groups in the fauna of middle Tithonian age from "Piccola Mantova" near Bosco Chiesanuova (Phyll. = Phylloceratidae, Lyt. = Lytoceratidae, Haploc. = Haploceratidae and Oppeliidae, Hapl. = *Haploceras*, V. *Volanites*, sp. = sp. div., 5. = *Semiformiceras*, Da. = *"Danubisphinctes"*, Ps. = *Pseudodiscosphinctes*, Pa. = *Parapallasiceras*, Su. = *"Subplanitoides"*).

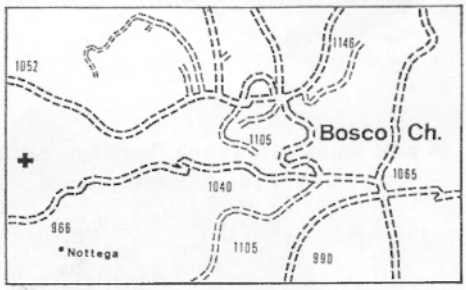


Fig. 2 - Topographical map of the locality "Piccola Mantova" near Bosco Chiesanuova.

to the superfamily Haploceratacea, 68 to the Perisphinctaceae, 63 to the Phylloceratacea and 44 to the Lytoceratacea. The percentage of each group is given in fig. 3.

SISTEMATIC PART

The Authors have not intended to give here a monographic description of all the ammonites that have been found. In many cases already good descriptions exist and it seems not necessary to repeat them; this is valid especially for Phylloceratidae, Lytoceratidae, Haploceratidae and Aspidoceratidae. Therefore the species of these groups, which we could determine, are only mentioned and figured.-We concentrate our studies on the perisphinctids, which is the most difficult and interesting group. Also in this group exist already many good descriptions; therefore we handle only with those characteristics, which are woth to mention as deviating differentiations in one or another direction, as compared with already described material.- Always we provide one good quotation from the literature, thus the reader has the possibility to obtain further informations if necessary.

Family Phylloceratidae Zittel, 1884

Genus *Phylloceras* Suess, 1865
Phylloceras serum (Oppel), Pl. 2. Fig. 2
(cf. Rossi, 1984, p. 81; pl. 30, fig. 7).

Genus *Adabofoloceras* Joly, 1978
Adabofoloceras consanguineum (Gemmellaro), Pl. 1, Fig. 2
(cf. Sarti, 1984, p. 484; pl. 1, fig. 3)

Genus *Ptychophylloceras* Spath, 1927
Ptychophylloceras ptychoicum (Quenstedt), Pl. 2, Fig. 5
(cf. Cecca *et alii* 1983, p. 111; pl. 1, figs. 1, 2)

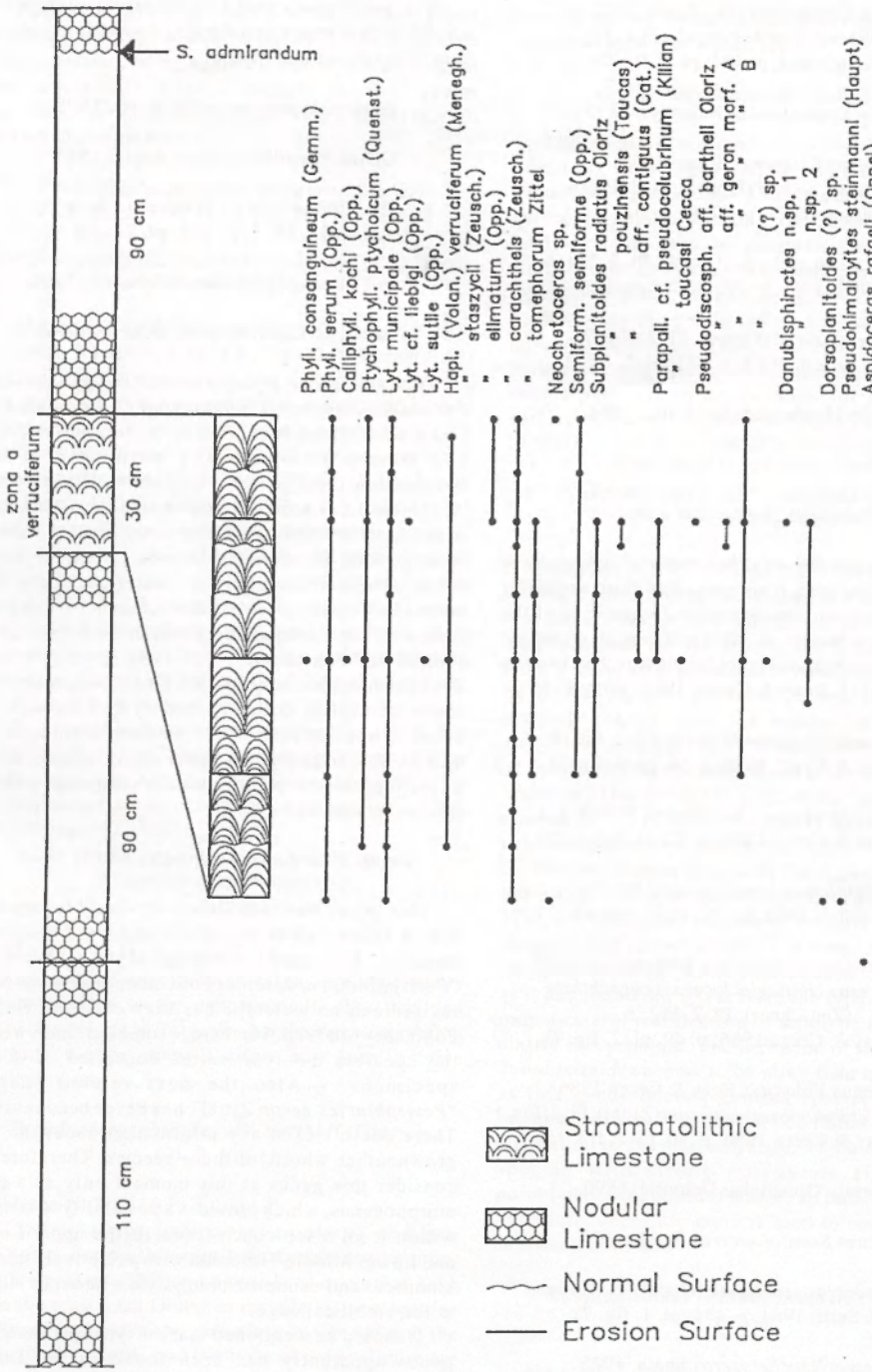


Fig. 4 - Stratigraphic column of the section "Piccola Mantova" with indication of lithofacies and vertical distribution of ammonites.

Genus *Calliphylloceras* Spath, 1927
Calliphylloceras kochi (Oppel), Pl.1, Fig. 5
(cf. Sarti, 1984, p. 484; pl. 1, fig. 2)

Family Lytoceratidae Neumayr, 1875

Genus *Lytoceras* Suess, 1865
Lytoceras cf. *liebigi* (Oppel), Pl. 2, Fig. 4
(cf. Sapunov, 1979, p. 37, pl. 5, figs. 1,2)

Lytoceras cf. *municipale* (Oppel), Pl. 2, Fig. 6
(cf. Zittel, 1868, p. 72, pl. 8, figs. 1-5)

Lytoceras sutile (Oppel), Pl. 2, Fig. 7
(cf. Cecca *et alii* 1983, p. 113; pl. 2, fig. 2)

Family Haploceratidae, Zittel, 1884

Genus *Haploceras* Zittel, 1870

Subgenus *Haploceras* s. str.

By investigations on other material, which have not yet been finished, it appears to us more useful for the present to maintain the original separation of the species H. carachtheis, H. staczycii, and H. elimatum as well as the subgenus Hypoglochiceras than to unite all this form (cf. Enay & Cecca 1986, Fozy 1988).

Haploceras elimatum (Oppel), Pl. 1, Fig. 4
(cf. Enay & Cecca 1986, p. 50, pl. 4, fig. 1)

Haploceras staczycii (Zeuschner), Pl.1, Fig. 1
(cf. Enay & Cecca 1986, p. 50, pl. 4, fig. 2)

Haplocers tomephorum Zittel
(cf. Zittel, 1870, p. 172, pl.28, fig. 9)

Subgenus *Hypoglochiceras* Breistroffer, 1947
Haploceras (*Hypoglochiceras*) *carachtheis*
(Zeuschner), Pl. 2, Fig. 3
(cf. Enay & Cecca 1986, p. 49, pl. 2, fig. 4)

Subgenus *Volanites* Enay & Cecca 1986
Haploceras (*Volanites*) *verruciferum* (Zittel), Pl. 2, Fig. 1
(cf. Enay & Cecca 1986, p. 40, pl. 2, fig. 15)

Family Oppeliidae Douvillé, 1890

Genus *Semiformiceras* Spath, 1925

Semiformiceras semiforme (Oppel) Pl. 1, Fig. 3
(cf. Sarti, 1984, p. 484; pl. 1, fig. 7)

Genus *Neochetoceras* Spath, 1925

Neochetoceras sp.

Well preserved is only a third of the outher part of a whorl with distant curved main ribs and intercalated very fine subordinate ribs.

Family Aspidoceratidae Zittel, 1895

Genus *Pseudhimalaytes* Spath, 1925

Pseudhimalaytes steinmanni (Haup)
(cf. Oloriz, 1978, p. 328; pl. 22, fig. 4)

Family Perisphynctidae Steinmann, 1890

Subfamily Lithacoceratinae Zeiss, 1968

This subfamily is represented by five genera: *Pseudodiscosphinctes*, *Subplanitoides*, *Danubisphinctes* (incl. "*Pseudokatroliceras*"), *Parapallasiceras* and *Dorsoplanitoides*. The attribution of the specimens to these genera is only tentatively possible. At present the systematic position of the perisphinctids of the mediterranean area is in many casas not clear. Nearly all of the above mentioned genera have ben used originally only for material from the submediterranean areasbut the relations between the faunas of these areasand the mediterranean sea are at present difficult to interprete. Only if we have well documented, precisely studied faunal sequences in a series of sectins collected bed-by-bed through all zones in various parts of the mediterranean area we will be able to recognize better the relationships by migrations, and the phylogenetic development of these groups in time and space.

Genus ***Pseudodiscosphinctes*** Oloriz 1978

This genus was established by Oloriz for species with a rather narrow umbilicus and a rather simple (mostly biplicate) ribbing style. The type "*Perisphinctes ardescicus* Fontannes" has never been revised and no lectotype has been choosen. Due to Fontannes (1879, p. 54) there is some variation within the species; the type series consisted of seven specimens. - Also the next related species "*Perisphinctes geron* Zittel" has never been revised. There doesn't exist any information about the full grownouther whorls of these species. Therefore we consider this genus at this moment only as a pure morphogenus, which provides a possibility to arrange within it all macroconch forms of the upper Lower and Lower Middle Tithonian with a relatively narrow umbilicus and a simple ribbing style without swellings at the umbilical edge.

It should be mentioned that the type species of the genus apparently has been found in the Lower Tithonian, while Ps. geron and Ps bartheli come from the Middle Tithonian.

Forms included by Cecca 1986 in this genus (*Chalmasi* Group) belong in our opinion due to their characteristic coiling and sculpture (e. g. swellings at the umbilical edge). rather to the genus *Sublithacoceras* Spath, s. l. (see Vigh 1984) than to *Pseudodiscosphinctes*.

Pseudodiscosphinctes aff. ***geron*** (Zittel)
(Pl. 3, Figs. 3, 4; Pl. 4, Fig. 5; Pl. 5, Fig. 2

1984 *Discosphinctoides* (*Pseudodiscosphinctes*) *geron* (Zittel), Sarti, p.503, pl. 5, fig. 2a, b.

Material: T 1495 P (A); A 337, T 1519 P, T 1593 P, T1600 P, T 1618 P, T 1638 P, T 1639 P, T 1669 P (B)

There are two morphotypes within the material, one with a rather narrow umbilicus and densely ribbed whorls (morphotype A),while the other (morphotype B) is not thus densely ribbed and reminds more the specimens figured by Oloriz (1978, Pl. 41, fig. 1, non 5), Sarti (1984), Zittel (1870). The number of morphotype B specimens exeeds those of morphotype A considerably (8:1). From the olotype differ all specimens in the higher values for the umbilicus, but this may be due to intraspeciphic variation. Also the ribs of the holotype seem to be weakly curved, while our specimens have more or less redial sculpture elements. These are all minor differences and we consider our material as related to the species group of *Ps. geron*; the locality of the type specimens has not been revaluated. There are also specimens similar to the type, but coming from lower horizons, like "*Lithacoceras subburckhardti* Donze & Enay" in Vigh (1984, pags. 121,122).

Pseudodiscosphinctes sp.
(Pl. 3, Fig.1)

Material: T 1518 (= PM 1 T)

The unique specimen is large one, but badly preserved. Due to the measurements the specimen could also belong to *Ps. geron*, but the bad preservation of the sculpture doesn't allow any more precise determination.

Pseudodiscosphinctes aff. ***bartheli*** (Oloriz)
(Pl. 5, Fig.1)

Material: T 1715 P, T 1614 P.

The figured specimen is very similar to the figure of Oloriz, but on this rare trifurcating (polygyrate) ribs are present. This and themode of evolution have been the reason for Oloriz to include his new species in *Danubisphinctes*. Nevertheless in our opinion the shape of the whorls and the style of the sculpture are more typical for *Pseudodiscosphinctes*, to which we place this species. All species of *Danubisphinctes* have on the outer whorl a completely different type of ornamentation (see Zeiss 1968).

Genus ***Subplanitoides*** Zeiss, 1968

The genus *Subplanitoides*, which has been originally established for the microconches of the genus *Usseliceras* Zeiss, 1968 has been considerably enlarged by authors dealing with ammonites from the mediterranean area to comprise morphologically similar forms of that taxon occurring in beds of upper Lower and Middle Tithonian age (e. g. Oloriz 1978). In this sense the genus can be only considered as a morphogenus (see also Cecca 1990); the relations between the different forms and their macroconch counterparts are in many cases not clear. Further studies on bed-by-bed collected material are necessary to obtain a better picture of these affinities.

"***Subplanitoides***" aff. ***contiguus*** (Catullo)
(Pl. 6, Fig. 5)

Material: A 856, T 1451 P, T 1505 P, T 1521 P

The figured specimen is identical with the holotype (cf. Sarti 1984, p. 502 and Cecca 1990, p. 58-61), what concerns the measurements; it differs slightly from it in the arrangment of the rib-bundles of the last quarter of the ultimate whorl, where they are more distantly placed; thus, the number of primaries is only 11 with respect to 14 in the holotype. The style of the ribbing on the other hand is the same as in the holotype. On the inner half of the last whorl the number of ribs is nearly identical (28-29). A shallow sulcus is present on the ventral side.

The very similar species "*S.*" *pouzinensis* (Toucas) has a different cross-section (cf. Cecca 1986, p. 170-171), and a smaller number of primary ribs (26) on the inner half of the last whorl. It seems probable that our specimen belongs to the variation of "*S.*" *contiguus* as it has found not so far from the type locality. But only a careful recollection of topotype material may clarify this problem. The inclusion of this species in *Subplanitoides* seems to be more than questionable, as this genus doesn't contain species whith such broad whorl shape; this would be rather a hint for an attribution to *Parapallasiceras*, which also contains species with strong polygyrate ribs (see *P. paraconcorsi* Zeiss) or it may be an indication that all the microconchs are more related to one anothes as supposed until now.

"***Subplanitoides***" cf. ***pouzinensis*** (Toucas)
(Pl. 6, Fig. 1)

Material: T 1499

This specimen is somewhat similar to the biplicate variants of "*S.*" *pouzinensis* (cf. Cecca 1986, Pl. 13,

figs 1-3), but doesn't completely correspond to one of these specimens. It seems that there are transitions between these forms and species of "*Parapallasiceras*" described below.

"***Subplanitoides*" *radiatus*** Oloriz
(Pl. 4, Fig. 1 and Pl. 6, Fig. 3)

1978 *Subplanitoides radiatus* n. sp. Oloriz, p. 533, pl. 50, fig. 4.

Material: A 238, PM 2 T, PN 282, T 1479 P, T 1522/3 P, T 1595-97 P, T 1683, T1669 P.

There is good correspondance of our specimens with the form figured from Southern Spain by Oloriz. A certain variation in size is observable. The smaller specimen (Pl. 6, Fig. 3) is somewhat more coarsely ribbed and thus reminds the very similar species "*S.*" *zeissi* Oloriz. Perhaps all the specimens figured by Oloriz (1978, pl. 50, fig. 2, 4-6) belong into the variation of one species; in this case the earlier desribed species "*S.*" *zeissi* would get priority.

Genus ***Danubisphinctes*** Zeiss 1968

The same eme,ndations as in the case of Subplanitoides have evoked an enlargement of the scope of this genus, which originally has been established by its author to comprise the macroconch partners of the genus *Parapallasiceras* Spath. Therefore a further usage of this genus as a subgenus of *Parapallasiceras* is not useful. The true relationship of the macroconch forms of the mediterranean area as well to thr macroconchs of the submediterranean area as to their microconch partners and to other macroconch genera can only cleared up by better preserved material. All specimens of our material have not so high whorl-sections as in the type specimen. The nearest match seems to be with forms from SE-France (cf Donze & Enay 1961, Cecca 1986) and those of Southern Spain, named "*Pseudokatroliceras*" by Oloriz 1978.

"***Danubisphinctes***" n. sp. 1
(Pl. 5, Fig. 3)

Material: T 1466 P/D, T 1639 P

The form has some similarity with forms figured by Cecca (1986, pl. 16), but there is no close affinity. The inner whorls are rather densely ribbed; biplicate and polygyrate ribs are present. On the last quarter of the ultimate whorl the recticostate ribbundles are more distant and the number of secondaries is three. Thera are broad intercostal spaces.

It should be mentioned that there is some resemblance of this form to "*Perisphinctes exornatus* Catullo sp." (Zittel, 1970, p. 106, pl. 34, fig. 3, Del Campana 1905, p. 62) put into "*Pseudokatroliceras*" by Sarti (1988, p.470). As this species has never been revised and different forms have been described under this name from different horizons we hesitate to use it in this context.

"***Danubisphinctes***" n. sp. 2
(Pl.4, Fig. 2; Pl.6, Fig. 2, 4)

Material: A-240, T 1420 VPl, T 1468 P, T 1537 P, T 1598 P.

The specimens are characterized by their evolute shells, rather low whorl hight, and sharp, biplicate ribs on the inner whorls and on the two smaller specimens up to the outer half of the ultimate whorl. The primaries are direct redial, while the secondaries are somewhat prorsocostate.The whorl section is more or less square, the outer whorlshape somewhat rounded; some specimens are broader than high. Especially, the two smaller specimens (Pl. 6) show resemblance to *Pseudokatroliceras* sp. (Oloriz, 1978, pl. 46, fig. 4), but the secondaries strong polygyrate like in the "*S.*" *contiguus* group. Also "*Subplanites concorsi*" Donze et Enay may belong to this group, as already recognized by Oloriz. As already mentioned by this author more material is necessary to make any reasonable decision about the taxonomic status of the "genus *Pseudokatroliceras*", for which no type specimens has been proposed.

Certainly *Katroliceras somalicum* (Valduga) doesn't belong to this group as claimed by Oloriz: it is an older species of Upper Kimmeridgian age and the microconch partner of true *Katroliceras* (cf. Zeiss, 1969, p. 157).

Genus ***Parapallasiceras*** L.F. Spath, 1925

The specimens of this genus described from the mediterranean area are rather similar to those of the submediterranean area. This may be due to the very few characteristics of this biplicate taxon. One point might be the strong radial arrangement of the ribbundles in the mediterranean forms contrasting the more projected secondaries of the submediterranean species.

Parapallasiceras (aff.) ***toucasi*** Cecca, 1986
(Pl. 4, Fig. 4; Pl. 5, Figs. 3, 4)

1986 *Parapallasiceras* aff. *toucasi* n. sp., Cecca, p. 175, pl. 13, fig. 4; pl. 14, figs. 1-3, 5,6.

Material: T 1524 P, T 1537 P, T 1698 P; (aff.): T 1428 P, T 1469 P, T 1503 P, T 1520 P, T 1592 P, T 1594 P, T 1613 P, T 1637 P, T 1713 P, T 1723 P, T 1730 P, T 1746 P.

A specimen rather well corresponding with the

holotype is N° 1524. The other two specimens can more or less well identified with other specimens figured by Cecca under this name. The variability is not so small for such simple forms as Cecca assumes, if one is considering his measurements (l. c. tab. p. 177), especially for whorl shape and density of ornamentation. A difference of our aff. - forms is, that they in general don't exhibit a ventral groove or "sillon", whatsoever this may mean. The presence of such a sulcus for systematics should not be overemphasized (cf. *Subplanitoides* in Zeiss, 1968).

Genus *Dorsoplanitoides* Zeiss, 1968

Dorsoplanitoides (?) sp., aff. *bassanii* (Del Campana)
(Pl. 3, Fig. 2)

aff. 1905 *Perisphinctes bassanii* sp. n., Del Campana, p. 72, pl. 4, fig. 4.

Material: PM 6 T.

A single specimen belongs with some doubt to this genus. The inner whorls are rather densely ribbed, biplicate while the outer whorl displays strong trifurcate ribs, which are comb-like marked above the umbilical edge.

There is some resemblance to *D. triplicatus*, Zeiss, 1968 (p. 95, pl. 15, fig. 4), but this species has higher values for the whorl hight, is altogether much larger and as somewhat curved ribs. Also on the inner whorls the splitting of the ribs is easily recognizable what is not the case in our specimen. Too the stratigraphic occurrence is different. The new species is to some degree already transient to *Virgatosimoceras* but the ribbing is denser and more regular on inner and outer whorls. Nevertheless there is some similarity to V. broilii (inner whorls) and to *V. rothpletzi* (outer whorls). To decide if there are true relationships more material would be necessary.

On the other hand one can rather well compare the specimen with "*Perisphinctes bassanii*" Del Campana (1905, p. 72, pl. 4, figs. 5, 6), which has been tranfered to *Dorsoplanitoides* by Sarti (1988). This species somewhat larger and the ribbing is prosocostate on the inner whorls and somewhat curved on the inner two quarter of the outer whorl; but the general view of coiling, shape and sculpture is similar. Sarti mentions this form from the Verruciferum Zone from of the M. Pasubio area (Trentino); thus the stratigraphic evidence supports the match.

N° Cat.		D	H	L	O	h	l	o
T1757P	Adabofoloceras consanguineum	75	41	28	6,5	0,55	0,31	0,09
T1721P	Phylloceras serum75	45	24	4	0,60	0,32	0.05	
T836P	Calliphylloceras kochi	88	51	28	7,5	0,58	0.32	0,08
T1940P	Ptychophylloceras ptychoicum	90	51	—	7	0,57	—	0,08
T1453P	" "	37	20,5	14,5	2,5	0,55	0,35	0,07
T1724P	Lytoceras cf. liebi~i	67	28	30	23,5	0,42	0,45	0,35
T883P	Lytoceras sutile	84	34	32	30	0,40	0,38	0,36
T1475P	Lytoceras cf. municipale	86	26,4	28	42,6	0,31	0,33	0,45
T1736P	Semiformiceras semiforme	68	33,6	18	6	0,45	0,26	0,09
T1692P	Haploceras verruciferum	72	27	15	23	0,37	0,26	0,32
TISOIP	Haploceras staszycii	79	38	22	16	0,48	0,28	0,20
PM3T	Haploceras elimatum	114	55	32	24	0,48	0,28	0,21
T1707P	Haploceras carachtheis	29	11	8,4	9	0,38	0,25	0,31
T1668P	Haploceras tomephorum	26	12,4	13,2	5,6	0,48	0,51	0,21
T1535P	Neochetoceras sp. 1	20	71	26	5	0,55	0,22	0,04
T1596P	Subplanitoides radiatus	80	27	24	33	0,34	0,30	0,41
T 1696P	" "	92	30	24	43	0,33	0,26	0,47
T1479P	" "	87	29	30	38	0,33	0,34	0,44
T 1683P	" "	88	32	26	37	0,36	0,30	0,42
T 1522P	" "	70	22,5	22	31,5	0,32	0,31	0,45
T1 479P	" "	88	29,4	28,6	38	0,33	0,33	0,43
T1499P	Subplanitoides cf. pouzinensis	74	24	20	34	0,32	0,27	0,46
T1521P	Subplanitoides aff. contiguus	80	25	24	39	0,31	0,30	0,45
T1520P	Parapallasicerasa M. toucasi	65	21	20	34	0,32	0,31	0,52
T1428P	" "	67	21	22	31	0,31	0,33	0,46
T1524P	Parapallasiceras toucasi	61	16,5	18,5	32	0,27	0,30	0,52
T1698P	" "	56	16	14	27,5	0,25	0,25	0,45
T1715P	Pseudodiscosphinctes aff. bartheli	78	30	18	28	0,38	0,23	0,36
T1495P	Pseudodiscosphinctes aff. geron, morp. A	142	53	44	49	0,37	0,31	0,34
T1519P	Pseudodiscosphinctes aff. geron, morp. B	132	46	34	49	0,35	0,26	0,37
T 1669P	" "	92	30	30	43	0,33	0,33	0,47
T 1593P	" "	84	30	30	32	0,36	0,36	0,38
PMIT	Pseudodiscosphinctes sp.	181	72	52	59	0,40	0,29	0,33
T1466P	Danubisphinctes n. sp. 1	137	43	50	67	0,31	0,36	0,49
T1420VPI	" " 2	108	28	34	59	0,26	0,31	0,55
T 1598P	" " 2	75	21	28	37,2	0,28	0,37	0,50
A240	" " 2	60	17	18	31	0,28	0,30	0,52
PM6T	Dorsoplanitoides (?) sp. aff. bassanii	134	39	40	64	0,29	0,30	0,48
A232	Pseudhimalayites steinmanni	79	30	45	27	0,38	0,57	0,34

Table 1 - Measurement of the specimens studied in this paper.

COMPARISIONS AND CONCLUSIONS

The new ammonite fauna from the Lessinian Alps is rather well comparable with the fauna from the Betic range of Southern Spain (Oloriz 1978), whereas the fauna from the M. Pasubio Section (Trentino), mentioned by Sarti (1988, p. 470) has only partly been figured and described; therefore direct comparision are only possible with some species; but due to the list Sarti has provided there seems to be a close similarity in composition.

The only difference to both of these faunas is, that they are somewhat richer in diversity; thus we don't have any *Pseudolissoceras* in our fauna, neither a *Simoceras* nor a *Sublithacoceras* of the *chalmasi* group. The faunas of the Apennines and of the Ardeche are poorer in species, especially in perisphinctids (cf. Cecca *et alii* 1986, Cecca 1986).

Besides that it is very important to note, that now from two distinct localities in the Southern Alps species described by Catullo, Zittel and Del Campana in the last century like contiguus, exornatus, geron and bassanii, which often have been used, but with deviating age indication, have now been identified directly or by closely related forms from the same stratigraphic interval. Thus the stratigraphic value of those species could be clarified and improved.

REFERENCES

BENETTI A. & PEZZONI N. (1983) - Ammoniti della Lessinia Centrale. *Boll. Mus. Civ. St. Nat.*, **10**: 544-546, Verona

BENETTI A. & PEZZONI N. (1985) - I generi *Pseudhimalayites*, 1925, e *Hemispiticeras* Spath, 1925, nei Monti Lessini (Verona). *Boll. Mus. Civ. St. Nat.Verona*, **12**, 501-509, Verona.

BENETTI A., PEZZONI N. & ZEISS A. (1990) - A small, but interesting new ammonite fauna from the Western Lessinian Alps. In Atti II Conv. Int. F. E. A. Pergola, 1987, 33-37, 1 pl..

CECCA F. (1986) - Le Tithonique de la bordure Ardechoise dans la region du stratotype de l'Ardescien: Etude stratigraphique et paleontologique: Tesis Doctoral Univ. Lyon I. no. 20-86: 1-272, 26 pl., Lyon.

CECCA F. (1990) - "*Subplanitoides*" *mediterraneus*, nuova specie di Perisphinctide (Ammonitina) della Zona a Semiforme (Titonico inferiore) della provincia mediterranea. Atti II Conv. Int. F. E. A. Pergola, 87, p.57-62, 1 pl.

CECCA F., CRESTA S., PALLINI G. & SANTANTONIO M. (1986) - Biostratigrafia et ammoniti del Dogger-Malm di Colle Tordina (Monti della Rossa, Appennino Marchigiano). *Boll. Serv. Geol. It.*, **104**:177-204, 7 pl., Roma.

CECCA F., CRESTA S. & SANTANTONIO M. (1983) - Ammoniti del Malm dell'Appennino marchigiano conservate nel Museo del Servizio Geologico d'Italia. *Boll. Serv. Geol. It.*, **102**: 109-132, 5 pl., Roma.

DEL CAMPANA D., (1905) - Fossili del Giura Superiore dei Sette Comuni in provincia di Vicenza. *Pubbl. R. Ist. studi sup. Firenze, Sez. Sc. fis. e nat.*, **28**: 3-140, 7 pl., Firenze.

DONZE P. & ENAY R. (1961) - Les Céphalopodes du Tithonique inférieur de la Croix de Saint Concors, pres Chambery (Savoie). *Trav. Lab. Geol. Fac. Sc. Lyon, N. S.*, **7**: 7-236, 22 pl., Paris.

ENAY R. & CECCA F. (1986) - Structure et évolution des populations tithoniques du genre d'ammonites tethysien *Haploceras* Zittel. Atti I Conv. Int. F. E. A. Pergola **84**, 37-62, 6 pl..

FONTANNES F. (1879) - Description des ammonites des calcaires du chateau de Crussol, Ardeche: 'Georg' edit., 1-123, 13 pl . Lyon.

FOZY I. (1988) - Tithonian ammonites (Oppeliidae, Haploceratidae and Simoceratidae) from the Transdanubian Central Range, Hungary. *Ann. Univ. Sc. Budap. Rol. Eotv. Univ.*, **28**: 43-119, 25 pl ., Budapest.

MASSARI F. (1979) - Oncoliti e stromatoliti pelagiche nel Rosso Ammonitico Veneto. *Mem. Soc. Geol.*, **32**: 1-21, 1 pl. ,Padova.

MASSARI F., BENETTI A., CILIA E. & PEZZONI N. (1988) - Sedimentologia e faune ad ammoniti del Callovianano-Oxfordiano nei Monte Lessini Veronesi: la sezione della "Piccola Mantova" presso Bosco Chiesanuova. *Mem. Sc. Geol. Min. Univ. Padova*, **11**: 11-133, 1 pl., Padova.

OLORIZ F. (1978) - Kimeridgense-Titonico en el Sector Central de las Cordilleras Béticas (Zona Subbética). Paleontologica, Bioestratigrafia. Tesis doct. Univ. Granada, **184**: 1-758, 57 pl., Granada.

ROSSI F. (1984) - Ammoniti del Kimmeridgiano Superiore - Berriasiano inferiore del Passo del Furlo (Appennino Umbro-Marchigiano). *Mem. Soc. It. Sc. Nat. e Mus. Civ. St. Nat. Milano*, **23**/3: 75-136, 8 pl ., Milano.

SAPUNOV I. (1979) - Ammonoidea. In: Fossiles de Bulgarie, Jurassique superieur. *Acad. Bulg. Sc.*: 5-263, 59 pl ., Sofia.

SARTI C. (1984) - Fauna e Biostratigrafia del Rosso Ammonitico del Trentino Centrale (Kimmeridgiano - Titoniano). *Boll. Soc. Pal. It.*, **23**: 473-514, 7 pl., Modena.

SARTI C. (1988) - Biostratigraphic subdivision for the Upper Jurassic of the Venetian Alps (Northern Italy) on the base of the ammonites: 2nd Int. Symp. Jur. Strat., Lisboa: 459-476, Lisboa.

SCHNEID TH. (1915) - Die Ammonitenfauna der oberthithonischen Kalke von Neuburg a. D. *Geol. Pal. Abh., N. F.*, **13**: 1-114, 13 pl., Jena.

VIGH, G. (1984) - Die biostratigraphische Auswertung einiger Ammoniten-Faunen aus dem Tithon des Bakonygebirges sowie aus dem Tithon-Berrias des

Gerecsegebirges. *Ann. Inst. Geol. Publ. Hung.*, **67**: 1-210, 14 pl., Budapest.

ZEISS A. (1968) - Untersuchungen zur Palaontologie der Cephalopoden des Unter-Tithon der Sudlichen Frankenalb. *Abh. Bayer. Akad. Wiss., N. F.*, **132**: 1-190, 27 pl., Munchen.

ZEISS A. (1969) - Dimorphismus bei Ammoniten des Unter-Tithon. In: Sex.Dimoph. in Foss. Metazoa and Tax. Implic..IUGS, Ser. A, no. 1: 155-164, Stuttgart.

ZITTEL A. (1868) - Die Cephalopoden der Stramberger Schichten. *Palaont. Mitt. Mus. K. Bayer. St.*, **2**: 1-118, 24 pl., Munchen. ,

ZITTEL A. (1870) - Die Fauna der Alteren Cephalopoden fuhrenden Tithonbildungen. *Palaeontogr.*, Suppl., **1**: 1-192, 14 pl., Cassel.

EXPLANATION OF THE PLATES

Plate 1

Fig. 1 *Haploceras staczycii* (Zeuschner), 1501, ca. 0,9 x. Fig. 2 *Adabolofoceras consanguineum* (Gemmellaro), 1757, ca.0,9 x. Fig. 3 *Semiformiceras semiforme* (Oppel), 1736, 0,9 x. Fig. 4 *Haploceras elimatum* (Oppel), PM 3 T, ca.0,7 x. Fig. 5 *Calliphylloceras kochi* (Oppel), 1836, ca.0,9 x.

Plate 2

Fig. 1 *Haploceras (V.) verruciferum* (Zittel), 1692, ca.0,9 x. Fig. 2 *Phylloceras serum* (Oppel), 1721, ca.0,9 x. Fig. 3 *Haploceras carachtheis* (Zeuschner), 1707, 2 x. Fig. 4 *Lytoceras* cf. *liebigi* (Oppel), 1724, ca.0,9 x. Fig. 5 *Ptychophylloceras ptychoicum* (Quenstedt), 1453, 2 x. Fig. 6 *Lytoceras* cf. *municipale* (Oppel), 1475, ca.0,9 x. Fig. 7 *Lytoceras sutile* (Oppel), 883, ca. 0,9 x.

Plate 3

Fig. 1 *Pseudodiscosphinctes* sp., 1518, 0,55 x. Fig. 2 *Dorsoplanitoides* (?), aff. *basssanii* (Del Campana), PM6T, ca.0,6 x. Fig 3 *Pseudodiscosphinctes* aff. *geron* (Zittel), morphotype B, 1669, ca.0,6 x. Fig. 4 *Pseudodiscosphinctes* aff. *geron* (Zittel), morphotype A, 1495, 0,6 x.

Plate 4

Fig. 1 *"Subplanitoides" radiatus* Oloriz, 1479, ca. 0,9 x. Fig. 2 *"Danubisphinctes"* sp.2, 1420, 0,8 x. Fig. 3 *Parapallasiceras toucasi* Cecca, 1524, ca. 1,1 x. Fig. 4 *Parapallasiceras* aff.*toucasi* Cecca, 1428, ca.0,9 x. Fig. 5 *Pseudodiscosphinctes* aff. *geron* (Zittel), 1529, ca.0,6 x.

Plate 5

Fig. 1 *Pseudodiscosphinctes* aff. *bartheli* (Oloriz), 1715, ca. 0,9 x. Fig. 2 *Pseudodiscosphinctes* aff. *geron* (Zittel), morphotype B, 1593, ca. 0,9 x.Fig. 3 *"Danubisphinctes"* sp. 1, 1466, ca.0,7 x.

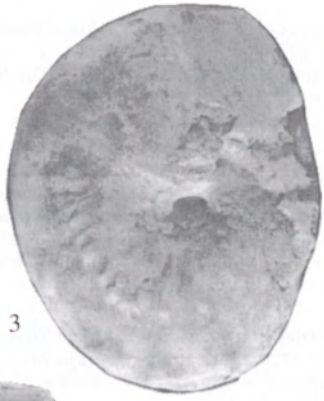
Plate 6

Fig. 1 *"Subplanitoides"* cf. *pouzinensis* (Toucas), 1499, ca.0,9 x. Fig. 2 *"Danubisphinctes"* sp.2, 1598, ca. 1, 2 x. Fig. 3 *"Subplanitoides" radiatus* Oloriz, 1522, ca. 0,9 x. Fig. 4 *"Danubisphinctes"* sp.2, 1598, ca. 1, 1 x. Fig. 5 *"Subplanitoides" contiguus* (Catullo), 1521, ca.0,9 x

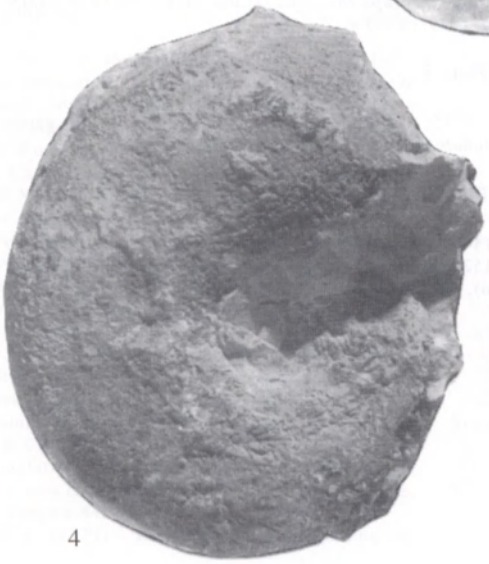
Plate 1

1

2



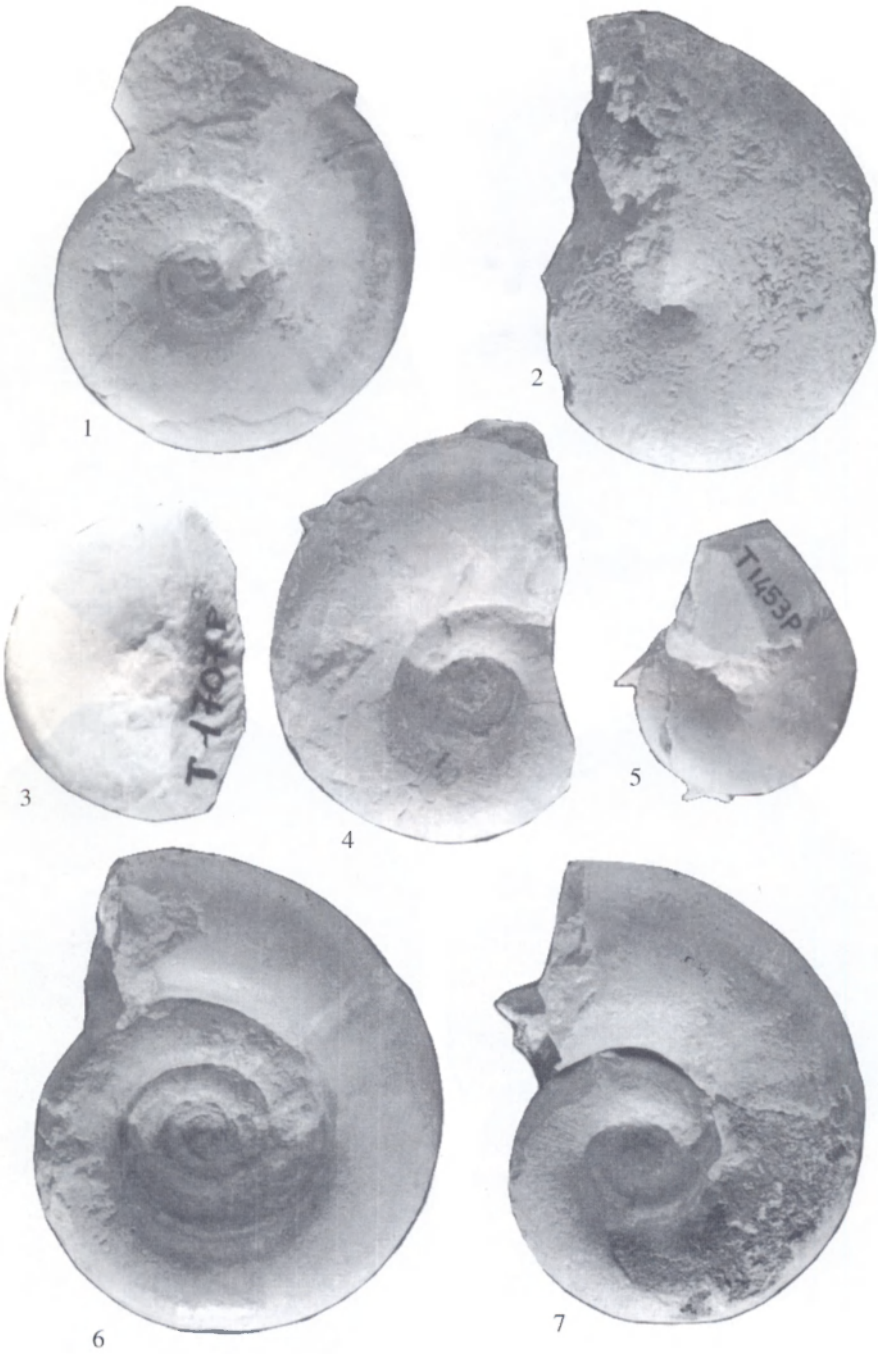
3



4

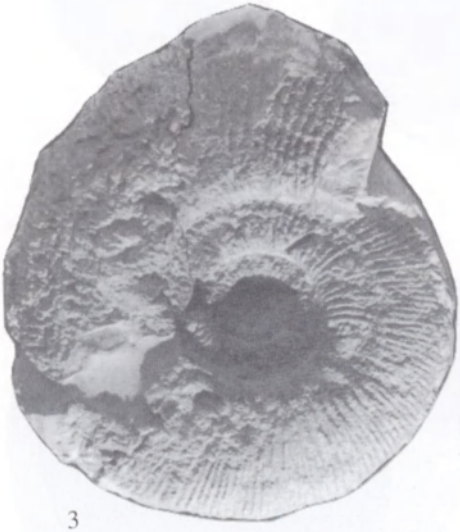
5

Plate 2

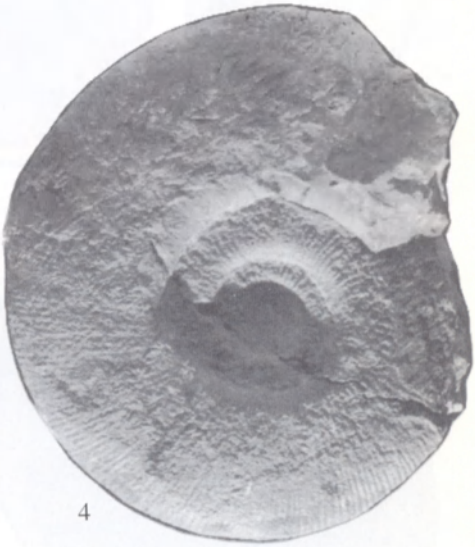


1

2



3



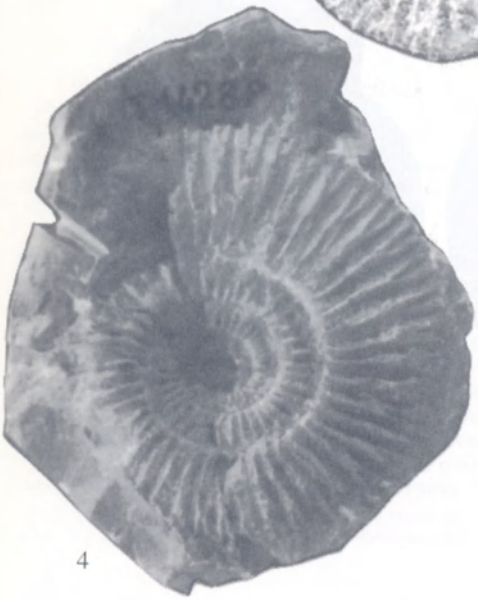
4

Plate 4

1

2

3



4

5

1

2

3

4