

3. PALEONTOLOGIE

PALEOZOOLOGIE



Project 58 : Mid-Cretaceous events

LOWER TURONIAN AMMONITE ASSEMBLAGE IN THE MARAMUREȘ MOUNTAINS (EAST CARPATHIANS — ROMANIA)¹

BY

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Ammonoidea. Lower Turonian. Faunal assemblage. Paleontological systematics. Fauna list. Biometry. Fossil morphology. New species. Stratigraphic distribution. Geographic distribution. East Carpathians — Crystalline-Mesozoic Zone — Maramureș Mountains.

Abstract

The Lower Turonian deposits from Maramureș have been known so far by their inoceramid assemblages. Lately they have provided a very interesting ammonite assemblage, collected from several fossil sites in the vicinity of the Baia Borșa locality. Species belonging to the genera *Baculites*, *Pachydesmoceras*, *Spathites* (*Jeanrogericeras*), *Choffaticeras*, *Paramammites*, *Fagesia*, *Neoptychites* etc. were determined. Most of the genera and species are listed for the first time in Romania. It is worth noting that the assemblage consists prevalingly of genera known up to the present only from the circum-Mediterranean regions. The fauna described in the paper is of special interest both by the fact that it is the first rich assemblage in the Lower Turonian of Romania and due to its importance for the correlation of the Turonian in the northern regions of Europe with the Mesogean province.

Résumé

L'association d'Ammonites du Turonien inférieur des Monts Maramureș (Carpathes Orientales, Roumanie). Le Turonien inférieur de Maramureș était connu jusqu'à présent par ses associations d'Inocérames. Le dernier temps les

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dépôts du Turonien inférieur ont fourni une association très intéressante d'Ammonites prélevées de quelques gisements fossilifères situés dans la proximité de Baia Borșa. Ont été déterminées des espèces d'Ammonites appartenant aux genres *Paculites*, *Pachydesmoceras*, *Spathites* (*Jeanrogericeras*), *Choffaticeras*, *Paramammites*, *Fagesia*, *Neoptychites* et d'autres. La majorité des genres et d'espèces sont citées pour la première fois en Roumanie. A remarquer que dans l'association abondent les genres qui jusqu'à présent étaient connus seulement dans les régions circumméditerranéennes. La faune décrite présente un intérêt particulier, d'une part parce qu'elle est la première association plus riche du Turonien inférieur de Roumanie, d'autre part, elle est très importante pour la corrélation du Turonien des régions septentrionales de l'Europe avec la province mésogéenne.

Introduction

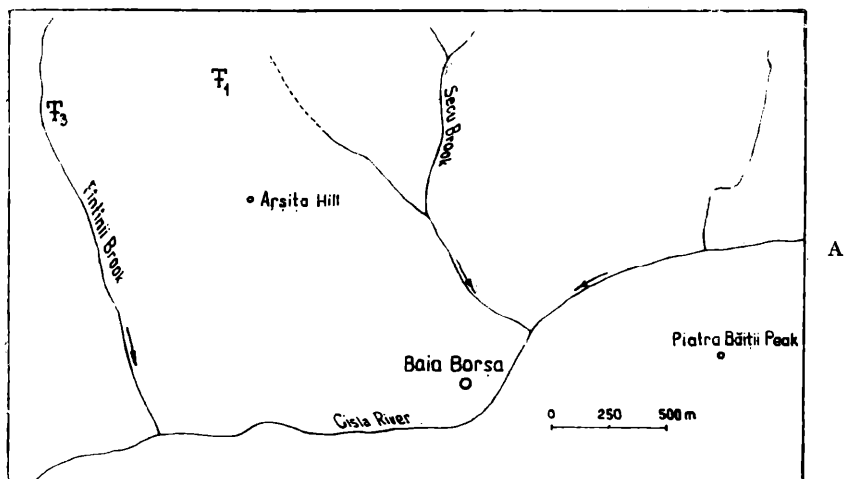
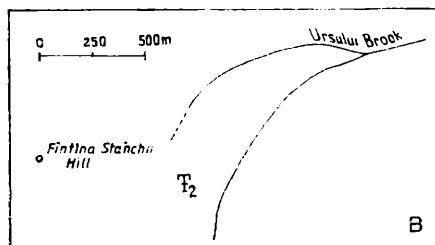
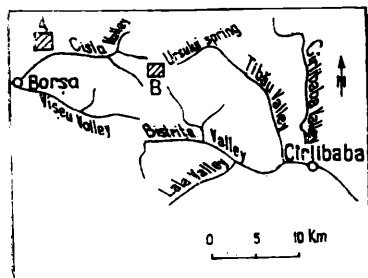
The existence of a Lower Turonian fauna in the Borșa Basin (Maramureș) was first mentioned by Iliescu et al. (1967), who found specimens of *Inoceramus labiatus* in the vicinity of the Baia Borșa locality (on the right bank of the Secu Brook). Unfortunately the fauna was not figured, and the fossil site was not indicated on the map. Iliescu et al. (1968) described and figured specimens assigned to *I. labiatus*, but the *Inoceramus* assemblage in which these specimens are cited does not allow us to establish the exact age of the respective deposits as the exact succession of these species is not mentioned.

In a previous work (Szász, 1974), the author of the present paper supposed that the upper part of the pile of the deposits representing the first post-Austrian sedimentation cycle of the Crysalline-Mesozoic Zone in the northern part of the East Carpathians might be assigned to the Lower Turonian. Later (Szász, 1982), having described and figured several specimens that belonged to the *I. labiatus* group, provided the first valid arguments in favour of this idea.

Our subsequent investigations led to some relevant results. Firstly it was found that *Inoceramus* specimens of Lower Turonian age occur in several places of the marginal zones of the Borșa Basin, in the Tibău Valley Basin and in the Birgău Mountains. Secondly new fossil sites were identified in the vicinity of the Baia Borșa locality (Fig.), which provided a relatively rich ammonite assemblage; the latter is important both for establishing the precise age of the deposits in which the ammonites were found and for long distance correlations. It is in fact the first rich Lower Turonian ammonite assemblage of Romania.

The paleontological material comes from two fossil sites close to the Baia Borșa locality and from the fossil site at Fintina Stanchii from which we (Szász, 1982) described an *Inoceramus* fauna. This fauna comes from the upper part of a succession of deposits starting with polygenous conglomerates and continuing with quartz conglomerates, quartz sandstones, calcareous sandstones with *Exogyra columba* (this

succession is of Upper Cenomanian age). Three follow fine sandstones and greenish or blackish gritty siltites with inoceramids and ammonites of Lower Turonian age. There is a gradual passage from fine to coarse



Location of fossil sites with ammonites from the Maramureș Mts. A: Baia Borșa sector. (F₁ fossil site on the southern side of the Toroiața Mountain with fossils *in situ*; F₃: the block with ammonites on the right side of the Fintina Valley). B: Fintina Stanchii sector (F₂: fossil site location).

detrital deposits. The whole succession is maximum 50 m thick with local variations and its upper part is assigned to the Lower Turonian.

The main ammonite genera and species identified in the three fossil sites are

Baculites aff. *undulatus* Roman et Mazeran (ex d'Orbigny)

Baculites sp.

Pachydesmoceras denisonianum (Stoliczka)

Puzosia spp.

Fagesia peroni Pervinquièr

Fagesia spp.

Neoptychites sp.

Spathites (Jeanrogericeras) reveliereanum (Courtyllier)

Paramammmites polymorphum (Pervinquierè)

Choffaticeras pavillieri Pervinquierè:

Choffaticeras n. sp. aff. *Ch. pavillieri* Perv.

Choffaticeras aff. *quaasi* Peron

Kamerunoceras (Schindewolfites) inaequicostatus Wiedmann.

Mammmites ? spp.

Spathites (Jeanrogericeras) toroiagaensis Szász n. sp.

In addition to the mentioned genera and species there are others, quite numerous, that could not be identified owing to their bad preservation (several specimens without ornamentation might belong to the Vascoceratidae) or to the scarcity of relevant literature (some specimens show affinities to *Watinoceras*). Anyway it is obvious that the ammonite association is richer than suggested by the above list.

It is very important for correlations the fact that the ammonites in the mentioned fossil sites are associated with a varied *Inoceramus* fauna, therefore some remarks on the compared chronological value of the two groups of organisms can be made. We do not insist on these aspects as they have been analysed in another paper (Szász, in press). It is worth noting that most ammonite genera and species are characteristic of the Lower Turonian, a single subgenus (*Jeanrogericeras*) having representatives also in the Latest Cenomanian. The mode of occurrence of the ammonite fauna in Maramureş is to a certain extent peculiar as at the same fossiliferous level there occur ammonite genera and species which, in other regions of Europe and in other continents occur in successive zones representing the Late Cenomanian and the whole Lower Turonian. This fact suggests a stratigraphic condensation which, however, is not reflected in the lithostratigraphy of the deposits as well. Several explanations could be suggested but no one is satisfactory.

Even under these conditions the ammonite association of Maramureş is of certain value for long distance correlations, especially for the correlation of the northern regions of Europe, rich in inoceramids, but poor in characteristic ammonites, with the Mesogean province, where the ammonites of the *Vascoceratid* group prevail, the latter being associated with inoceramids only in certain regions as, for example, in Spain.

SYSTEMATIC PALEONTOLOGY

Ammonoidea

Superfamily Turrilitaceae Meek, 1876

Family Baculitidae Meek, 1876

Genus Baculites Lamarck, 1799

Baculites aff. *undulatus* Roman et Mazeran (ex d'Orbigny)

Pl. I, Figs. 1, 2

Compare to :

1964 *Baculites undulatus* Roman & Mazeran, Matsumoto et Obata, p. 28, Pl. 8, Fig. 4; Pl. 9, Figs. 1-5; Pl. 11, Figs. 2, 3; text-Figs. 62-71.

Two adjoining fragments, coming probably from a single specimen, show an ornamentation resembling very much that of the specimens figured by Matsumoto and Obata. The fragmentary state of this material as well as the different stratigraphic levels in which the specimens of *B. undulatus* were known in western Europe and Japan (Upper Turonian) as well as in Maramureș (Lower Turonian) do not enable us to assign them with certainty to the species *B. undulatus*. Another fragment exhibiting a more vigorous ornamentation (Pl. VII, Fig. 6) may also belong to the genus *Baculites*, but it cannot be specifically determined.

Superfamily **Desmocerataceae** Zittel, 1895

Family **Desmoceratidae** Zittel, 1895

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Subfamily **Puzosiinae** Spath, 1922

Genus **Pachydesmoceras** Spath, 1922

Pachydesmoceras denisonianum (Stoliczka)

Pl. I, Fig. 3

1865 *Ammonites denisonianus* Stoliczka, p. 133, Pl. 66, Fig. 2.

1898 *Puzosia denisoniana* (Stoliczka), Kossmat, p. 121 (186), Pl. 14 (20), Figs. 5a, b, 6; Pl. 15 (21), Fig. 5a, b.

1961 *Pachydesmoceras denisoni* Stol., Collignon, p. 39. Pl. 8, Fig. 1a.

Material a single specimen (about half a whorl), strongly deformed, comes from the fossil site (1) at Baia Borșa.

Dimensions D=115 mm; Wh=50 mm; Wb=?; U=34 mm.

The ornamentation of our specimen is almost identical to that of the specimen figured by Kossmat (Pl. 15 (11), Fig. 5a, b) in the middle growth stage, presenting relatively strong, straight, slightly proverse main ribs, several of them bifurcating in the middle of the flank, whence all the ribs are strongly curved forward. The intercalated ribs, 1-4 in number between the two main ribs, are generally weaker than the latter, sometimes also bifurcating. No constrictions are visible in this specimen.

Geographic and stratigraphic distribution India — Cenomanian and probably Lower Turonian; Madagascar — Lower Cenomanian and Lower Turonian; Japan — Upper Albion, Cenomanian etc.

Superfamily **Acanthocerataceae**. Hyatt, 1900

Family **Acanthoceratidae** Hyatt, 1900

Subfamily **Euomphaloceratinae** Cooper, 1978

Genus **Kamerunoceras** Reyment, 1954

Subgenus **Schindewolfites** Wiedmann, 1960

Kamerunoceras (*Schindewolfites*) *inaequicostatus* Wiedmann

Pl. IV, Figs. 1a, 1b

- 1900 *Schindewolfites inaequicostatus* Wiedmann, p. 736, Pl. 2, Figs. 5, 6; text-Figs. 2, 3.
- 1964 *Schindewolfites inaequicostatus* Wiedmann, p. 125, Figs. 5a, b, 6, 7.
- 1965 *Schindewolfites* cf. *inaequicostatus* Wiedmann, Collignon, p. 39, Pl. 392, Fig. 1673.
- 1979 *Kamerunoceras inaequicostatus* Wiedmann, Kennedy & Wright, p. 1166, Pl. 1, Figs. 1-3.

Material: a single undeformed but incomplete specimen (somewhat more than half a whorl). The mold preserves the impression of the preceding whorl. The specimen comes from the southern side of the Toroiaga Mount (fossil site 1).

Dimensions (mm): D=47; Wh=20 (0.42); Wb=21 (0.45); U=16 (0.34)

Ammonite with a slight coiling, the last whorl overlaps the precedent one only up to the level of the lower lateroventral tubercles, leaving their impressions on the overlying whorl. The umbilicus is large and quite deep. The coastal section of the whorl is almost square, slightly wider than high, with its ventral part large, slightly arched. The ornamentation of the preceding (inner) whorl, judging by the impression left on the last whorl, consists of irregularly spaced ribs and furrows as well as of five rows of tubercles on the ventral side, of which the lower, ventro-lateral ones are spine-shaped and perpendicular to the flanks. The three ventral rows of tubercles are less developed. This ornamentation is still visible at the beginning of the preserved whorl, where one can also see the not too strong umbilical tubercles as well as some thin ribs present only on the external side of the whorl. Up to this growth stage the ornamentation is of *Euomphaloceras* type. The ornamentation on the last portion of the fragment preserved consists of unequal and irregularly spaced ribs which are slightly rursi-radiate on the flanks, then suddenly projected forward from the level of the lower ventrolateral tubercles, being arched on the ventral side of the whorl, with convexity towards aperture. In this stage the umbilical tubercles are small, the lower ventrolateral ones get also smaller; instead, the three ventral rows of tubercles are more developed (the siphonal row inclusive) — characters typical of *Schindewolfites*. This specimen does not show lateral tubercles.

Remarks The similarity of the specimen described to *Schindewolfites inaequicostatus* is obvious, the irregularity of the ribs being less obvious than with the specimen from Spain, probably due to differences in size; our specimen seems to have not reached a definitive ornamentation. Of the other species of *Schindewolfites*, recently assigned to *Kamerunoceras* (Kennedy & Wright, 1979) the species *S. schindewolfi* Collignon (Collignon, 1965, Pl. 389, Fig. 1665) of Madagascar resembles the most our specimen, but it has a larger whorl, denser ribs and well-developed umbilical tubercles.

Geographic and stratigraphic distribution: *S. inaequicostatus* is known from the upper part of the Lower Turonian of Spain and probably from the same stratigraphic level of Madagascar. Other related species are known from Tunisia, Madagascar, Spain, North America also in the Lower Turonian.

Subfamily **Mammitinae**, 1900Genus **Spathites** Kummel & Decker, 1954Subgenus **Jeanrogericeras** Wiedmann, 1960*Spathites (Jeanrogericeras) toroiagaensis* Szász, n. sp.

Pl. II, Fig. 1a-c; Pl. III, Fig. 1a-c, 2a-b; Pl. VI, Fig. 2; Pl. VII, Fig. 1a, b.

Material five relatively well-preserved but deformed specimens; all of them come from the fossil site no. 3 (allochthonous block) on the Fintîna Valley — Baia Borsă.

<i>Dimensions</i> (mm)	I (holotype)	II	III	IV
D =	90	95	54	70
Wh =	35(0.39)	38(0.40)	25(0.46)	35(0.50)
Wb =	28(0.31)	30(0.31)	20(0.37)	?
U =	18(0.20)	18(0.19)	9(0.17)	16(0.23)

Their general aspect indicates that they belong to two distinct groups: three of them (Pl. II, Fig. 1; Pl. III, Figs. 1, 2) show a more vigorous ornamentation, a relatively large umbilicus, whorl higher than wide with trapezoidal section and convergent flanks. Ornamentation consists of main ribs starting from the strong umbilical tubercles, which are conical or slightly elongated in a radial sense. There are 1-2 shorter intercalated ribs between two main ribs. All the ribs have a conical or claviform ventrolateral tubercle as well as a ventral (upper ventrolateral) one, quite elongated in a spiral sense. The siphonal region is concave between the ventral tubercles. Ornamentation changes on the body chamber: the umbilical tubercles are less developed, then disappear, the ribs are also less clear and divide into fascicles of ribblets, some of them still preserving the external tubercles. The spire gets narrower on the last visible portion of the body chamber.

By their ornamentation and general aspect these specimens resemble very much those described in various papers under the name of *Metoicoceras gourdoni* Gross, included recently in the synonymy of *M. geslinianum* (Kennedy et al., 1981, p. 62, Pl. 9, Figs. 1, 2; Pl. 12, Figs. 1-3; Pl. 15, Figs. 1-3) as well as some specimens figured by Stephenson (1952, Pl. 51, Figs. 1, 2) under the name of *Metoicoceras swallovi* (Shumard). However, there are differences from the mentioned specimens, which should be pointed out. First, the specimens of Maramureș are smaller in size than most specimens assigned to *M. gourdoni* which are 140-150 mm in size in mature stage, while our specimens seem to reach maturity when they are below 100 mm in size. Second, the specimens of Maramureș have a less high whorl than in most specimens of *M. "gourdoni"*. By these characters the specimens under discussion are closer to the representatives of the subgenus *Jeanrogericeras*, recently included in the genus *Spathites* (Kennedy et al., 1980). The evolution of ornamentation and shape of the spire in adult stage differs from that of the so far known representatives of the subgenus *Jeanrogericeras* or *Spathites* s. str. (cf. Kennedy et al., 1980). However, I think that our specimens belong to a primitive, new species of *Jeanrogericeras*, which might be the direct descendant of

Metoicoceras "gourdoni". Such an interpretation is supported by the fact that these specimens are associated with genera typical of the Turonian (*Paramammites*, *Choffaticeras*), but they still show characters which are closer to *Metoicoceras*.

The other two specimens (Pl. VI, Fig. 2; Pl. VII, Fig. 1) differ from the first ones by the slightly higher spire, the less vigorous ornamentation, especially in the case of the umbilical tubercles which rapidly disappear. The sides of the whorl are slightly convex and less convergent than in the previously described specimens. These specimens show quite great similarities to various small-sized specimens included in the genus *M. geslinianum* (cf. Kennedy et al., 1981), but which are closer to *Jeanrogericeras* (Kennedy, in lit., 1983) by the persistence of lower latero-ventral tubercles.

Distribution: The species of the subgenus *Jeanrogericeras* are found in Europe from Latest Cenomanian to Middle Turonian. Our specimens occur in the Lower Turonian.

Spathites (Jeanrogericeras) reveliereanus (Courtiller)

Pl. V, Figs. 1, 2; Pl. VII, Figs. 2, 3a-c.

1980 *Spathites (Jeanrogericeras) revtlireanus* (Courtiller), Kennedy, Wright & Hancock, p. 826, Pl. 105, Figs. 1-12, Pl. 106, Figs. 1-2; text-Figs. 3-6 (with synonymies).

Material: five specimens of various size (50-80 mm) and preservation, found both in the fossil sites at Baia Borşa and in that at Fintina Stanchii.

The most interesting specimen (Pl. VII, Fig. 3a-c) was probably of about 60 mm in diameter, but the external side of the whorl is destroyed and the characters of the spire can only be seen up to the diameter of 45 mm. The whorl is trapezoidal in cross section, higher than wide, with the sides convergent and slightly concave between the umbilical and lower latero-ventral tubercles. The maximal width of the whorl is at the level of the umbilical tubercles. The ventral side of the whorl is narrow and excavated between the two rows of external tubercles. The umbilicus is relatively narrow and deep. Ornamentation consists in a rim of strong umbilical tubercles which are conical or slightly elongated radially, from which start one or two ribs, slightly attenuated in the middle of the sides. One can notice in the specimen described a grouping of the umbilical tubercles and of the main ribs in pairs, between them relatively large spaces existing, in which intercalary ribs occur that do not reach the umbilicus. All the ribs have a lower ventrolateral tubercle, which is conical or slightly elongated in a spiral sense, and an upper claviform ventrolateral tubercle. There are eight umbilical tubercles on whorl and about 16 tubercles in the external rows. The suture line visible in this specimen is similar to those figured by Kennedy et al. (1980, text-Fig. 6).

By the characters described this specimen resembles the most the smallest specimen figured by Petrascheck (1902, Pl. 7, Fig. 6a, b) under the name of *Mammites binicostatus*, which has been recently included

together with other two specimens figured by him under the same name in the synonymy of *Spathite* (*Jeanrogericeras*) *revelioreanus* (Kennedy et al., 1980, p. 827, 832).

Of the other figured specimens assigned to *Spathites* (*J.*) *revelioreanus* (Court.), one (Pl. V, Fig. 1) is strongly deformed, but shows the characters of the species in its young ontogenetic stage, with few, strong umbilical tubercles from which 2-3 wide ribs start. The lower lateroventral tubercles are less developed in comparison with the tubercles of the ventral rows.

Another specimen (Pl. V, Fig. 2), which is about 80 mm in diameter exhibits ornamentation only on one side, with less developed umbilical tubercles from which wide but very low ribs start. The two rows of external tubercles on the sides can be noticed at the beginning of the whorl. This specimen is quite similar to various specimens of *J. revelioreanus*, but especially to the only specimen known from the collection of Courtiller, figured by several authors (Fabre, 1940, Pl. 10, Figs. 5, 6; Kennedy & Hancock, 1978, Pl. 27, Fig. 2; Kennedy et al., 1980, text-Fig. 5a, b).

Finally a last figured specimen (Pl. VII, Fig. 2) of about 50 mm in diameter has 7 umbilical tubercles to which about 20 claviform, tubercles from the external rows correspond. The ribs are much attenuated, almost effaced, on the last portion of the whorl. This specimen resembles some other specimens assigned to *Mammites nodosoides*, which are generally small-sized (Collignon, 1966, Pl. 20, Fig. 11; Powell, 1963, Pl. 33, Figs. 1, 3, 4, 10, 11), but has more tubercles in the external rows, while the lower lateroventral tubercles are claviform, not conical as with *Mammites*.

Occurrence France, Spain, Czechoslovakia and probably India in the upper part of the Lower Turonian and in the Middle Turonian.

Genus *Mammites* Laube & Bruder, 1886

Mammites ? spp.

Pl. II, Fig. Pl. IV, Fig. 3a, b; Pl. V, Fig. 7; Pl. VI, Fig. 4a-c; Pl. VII,
Figs. 4a, b, 5a, b.

The material collected from the fossiliferous block on the Fintinii Valley (Baia Borșa) contains several relatively small specimens (35-55 mm) whose genetic assignation is rather uncertain as it resembles the young specimens of at least three genera *Metoicoceras*, *Spathites* and *Mammites*, which are difficult to separate without knowing the adult stage, especially when all of them occur at the same stratigraphic level, as in the present case. The specimens differ from one another, too and probably belong to several species of the same genus or possibly to various genera. One of the specimens (Pl. VII, Fig. 4a, b) has a relatively narrow umbilicus, high spire, convergent whorl sides, relatively narrow ventral part. The umbilical tubercles are strong, conical, probably 6-7 in number (only 4 of them are visible), to which 16-18 tubercles correspond in each external row. The tubercles of the external rows (lower and upper ventro-lateral) are also well developed and more or less claviform. This specimen is quite similar to some small speci-

mens figured by various authors (Collignon, 1966, Pl. 20, Fig. 11; Powell, 1963, Pl. 33, Figs. 1, 3, 4, 10) under the name of *Mammites nodosoides* Schloth. Other two specimens are more involute, the sides of the whorl being convex, the umbilical tubercles weakly developed, the ribs flattened, slightly attenuated on the sides and slightly curved backwards. It is difficult to state whether these specimens belong to the genus *Mammites* or *Metoicoceras*.

Another fragment (Pl. V, Fig. 7) shows a vigorous ornamentation especially on the external side of the whorl, its general aspect resembling the genus *Mammites*.

Another specimen (Pl. II, Fig. 2) shows a vigorous ornamentation, but it is strongly deformed, so that we cannot state whether it is a young specimen of the genus *Mammites* or of the genus *Jeanrogericeras*.

A last specimen (Pl. VI, Fig. 4a-c) shows a spire wider than higher, the whorl is trapezoidal in cross section, reaching the maximal width in front of the umbilical tubercles. Ornamentation is vigorous, formed of rigid ribs, the main ones starting from the well developed umbilical tubercles. The intercalary ribs, which are 1-2 in number between two main ribs, show a different vigour. The external tubercles are well developed, slightly claviform. This specimen shows some similarities to *Metoicoceras latoventer* (Stephenson, 1952, Pl. 53; Pl. 54, Figs. 9-11; Pl. 58, Figs. 6-8), but its size is different.

Family Vascoceratidae Spath, 1925

Genus Paramammites Furó, 1935

Paramammites polymorphum (Pervinquierè)

Pl. IV, Fig. Pl. VI, Fig. 6

1907 *Vascoceras polymorphum* Pervinquierè, p. 336, Pl. 21, Figs. 2-6 (incl. var. *grucilis semi-pinguis*, *pinguis*).

1931 *Vascoceras polymorphum* Perv., Basse, p. 37, Pl. 5, Fig. 10, 11; Pl. 12, Fig. 4a, b.

Material 4 specimens of which the best preserved one is disassembled, allowing to see the change in ornamentation along the ontogenetic development, a fragment of an adult specimen, another strongly crushed specimen of vigorous ornamentation and a small-sized specimen, all of them coming from the two sites in the vicinity of the Baía Borsá locality.

Dimensions (mm)	I	II (the last but one whorl of the same specimen)
D =	65	35
Wh =	20(0.31)	13(0.37)
Wb =	32(0.49)	20(0.57)
U =	25(0.38)	11(0.30)

The disassembled specimen is medium-sized, with whorl half-moon in shape, much wider than high, with wide, deep umbilicus and abrupt umbilical wall. The maximal width of shell is at the level of the umbilical tubercles. Ornamentation could be followed from the diameter of 12 mm; at this dimension the umbilical tubercles are already out-

lined, the shell presents rather deep constrictions, forming a sinus whose convexity is directed towards the aperture. When the diameter reaches 20 mm ornamentation is already characteristic, weak ribs, interrupted in the siphonal region occurring. They start from the umbilical tubercles and have a less developed lateral tubercle and a larger external one. Siphonal tubercles do not occur either in this stage or later. At this size intercalary ribs already exist. Up to the diameter of 35 mm ornamentation is quite vigorous, the spire is low and large, practically without sides; the main ribs appear on the umbilical wall, but do not reach the suture with the precedent whorl; on the margin of the umbilicus they show a very strong umbilical tubercle, followed by a less developed median tubercle and an also strong ventral tubercle. The ribs are interrupted between the ventral tubercles, there existing a well-marked concavity in the siphonal region. At this dimension shorter intercalary ribs or ribs bifurcating beyond the umbilical tubercles as well as furrows seeming to split some of the main ribs can be also seen. In a more advanced growth stage the tubercles lose their vigour, while the ribs become stronger, the lateral tubercles especially being mere swollen parts of ribs; the umbilical and the external tubercles are still relatively well developed. The ribs are also interrupted in the siphonal region in this stage. It is noticed that the sides become higher especially after the last visible suture line. At this dimension a spiral furrow can be noticed on the umbilical wall, where the ribs stop. The suture-lines cannot be well followed. Generally there are few elements on the external side of the whorl: after a relatively deep and narrow ventral lobe follows a first massive, rounded, not too deep incised saddle. The first lateral lobe is large, situated between the lateral and umbilical tubercles and seems to be asymmetrical, trifid. A second rather large and slightly incised saddle is situated at the level of the umbilical tubercle, followed by a relatively narrow lobe, already situated on the umbilical wall. Up to the suture with the precedent whorl a part of a rounded saddle can be seen as well.

Remarks: *P. polymorphum* is a little known species, judging by the fact that, beside the specimens figured by Pervinquier, only one specimen surely assigned to this species was illustrated from Madagascar. The specimens from Maramureș are typical, showing a remarkable change in ornamentation during their ontogenetic development and from one specimen to another. The largest figured fragment (Pl. VI, Fig. 6) is quite similar to the specimen figured by Basse from Madagascar as well as to the largest specimen figured by Pervinquier (Pl. 21, Fig. 3) which, contrary to Wiedmann's (1960, p. 752, 1964, p. 136) opinion, belongs also to *P. polymorphum*, there existing no notable differences between the suture-line of the respective specimen and of the typical specimen from Maramureș.

Concerning the disassembled specimen, the fragment of the last whorl is identical to the holotype of the species (Pervinquier, Pl. 21, Fig. 2a, b), while the previous whorl resembles very much the "varieties" *semipinguis* and *pinguis* (Pervinquier, Pl. 21, Figs. 5, 6); therefore they are mere morphological varieties or growth stages.

Similarities to other species of *Paramammmites* (some of them probably erroneously assigned to it, are very slight, so that we do not insist on them.

Occurrence. Lower Turonian of Tunisia, Madagascar, southern France and probably Spain.

Genus **Fagesia** Pervinquière, 1907

Fagesia peroni Pervinquière

Pl. V, Fig. 5a, b

1907 *Fagesia peroni* Pervinquière, p. 329, Pl. 20, Figs. 7a, b, 8a, b

Material a single specimen coming from the fossiliferous block on the Fintîni Valley, Baia Borşa.

Dimensions (mm) D=15 ; Wh=6 (0.4) ; Wb=10 (0.66); U=4 (0.36)

The specimen under discussion resembles very much the small one figured by Pervinquière (Pl. 20, Fig. 7), having a spire much wider than high, relatively large and deep umbilicus, a tubercle rim on the margin of the umbilicus, weak but relatively dense ribs and two constrictions parallel to the ribs. Except for the difference in size the similarity is almost perfect. There are some similarities also to the small specimen of *F. tunisiensis* (Pervinquière, Pl. 20, Fig. 2) but the latter shows a much more vigorous ornamentation at comparable dimensions.

Occurrences So far *F. peroni* has been quoted from North Africa (Tunisia) and Central Asia (Luppov et Druschits, 1958, Pl. 61, Fig. 4).

Fagesia spp.

Pl. I, Fig. 4 ; Pl. V, Fig. 6

Two ammonite specimens collected from the Fintîna Stanchii fossil site belong to the genus *Fagesia*, but are strongly deformed or fragmentary and cannot be specifically determined. One of them, which is rather crushed, shows a costation similar to the internal whorls of the species *Fagesia rudra* figured by Kennedy & Wright (1979, Pl. 82, Figs. 1, 2) or to *F. boucheroni*, figured in the same paper (text, Figs. 1a, b).

The second specimen is not deformed but consists only of a fragment, partially separated from the very hard rock. Ornamentation, which is rather vigorous, consists of simple or bifurcated ribs, slightly bent forwards, showing some tubercle-shaped protuberances on the umbilical margin. There are also shorter intercalary ribs. Umbilicus is large and the whorl section is half moonlike, the maximal thickness is at the level of umbilical tubercles. There are great similarities to the specimens of *Fagesia thevestensis* Peron figured by various authors (Peron, 1896, Pl. 7, Figs. 2, 3 ; Pervinquière, 1907, Pl. 20, Figs. 5, 6 ; Matsumoto, 1973, Pl. 8, Fig. 2).

Genus **Neoptychites** Kossmat, 1895

Neoptychites sp.

Pl. V, Fig. 8a, b

Only one small-sized ($D=23$ mm) specimen is available, coming from the Fintînii Valley (Baia Borșa). The specimen is involute, has a small umbilicus, whorl higher than wide, maximal width near the umbilical margin. Flat ribs, slightly attenuated in the siphonal region can be seen on the external part of the mold.

Family **Tissotiidae** Hyatt, 1900

Subfamily **Pseudotissotiinae** Hyatt, 1903

Genus **Choffaticeras** Hyatt, 1903

Choffaticeras pavillieri Pervinquier

Pl. II, Fig. 3; Pl. V, Figs. 3, 4; Pl. VI, Figs. 1a, b, 3a, b

- 1907 *Pseudotissotia* (*Choffaticeras*) *pavillieri* Pervinquier, p. 353, Pl. 23, Figs. 4, 5a, b, 6a, b.
 1931 *Pseudotissotia* (*Choffaticeras*) *pavillieri* Pervinquier, Basse, p. 40, Pl. 9, Fig. 23, Pl. 13, Fig. 12.
 1939 *Pseudotissotia* (*Leoniceris*) *pavillieri* Pervinquier, Basse, p. 51, Pl. 3, Fig. 13; text-Fig. 6a-c).
 1969 *Choffaticeras pavillieri* Pervinquier, Freund & Raab, p. 56, Pl. 9, Figs. 3, 4; text-Fig. 11b-d.
 1972 *Choffaticeras pavillieri* (Pervinquier), Cobban & Scott, p. 92, Pl. 34, Figs. 3-6, 8, 9; Pl. 35, Figs. 1-3; text-Fig. 52.

Material 7 specimens of various size and preservation, all of them deformed, collected from all the three fossil sites of Maramureș.

<i>Dimensions</i> (mm)	I	II	III
D = 85		70	40
Wh = 48(0.56)		39(0.56)	22(0.55)
Wb = 20(0.235)		?	10(0.25)
U = 8(0.09)		8(0.11)	?

The largest specimen (Pl. VI, Fig. 1a, b) is relatively well-preserved, except for the terminal part of the last whorl which lacks. The section of the whorl is lanceolate, high, the sides are slightly convex and convergent, umbilicus is narrow. Ventral region shows a well defined keel visible up to the end of the whorl, and two lateral keels, crenellated due to some claviform tubercles developing at the end of some proverse ribs which do not usually reach the umbilical margin. Towards the terminal part of the spire a few large but very low ribs are noticed, some of them reaching the margin of the umbilicus. Another, relatively small specimen (Pl. VI, Fig. 3a, b), resembles very much the holotype (Pervinquier, Pl. 23, Fig. 5a, b), but the latter is larger. The specimen under discussion shows a sharp, crenellated median keel, bordered by two rows of claviform tubercles forming the two marginal keels, as the holotype. Judging by the differences in size our specimen has a smaller number of tubercles on a whorl, but these are stronger than with the holotype. Another specimen (Pl. V, Fig. 4) shows similar characters. Other two specimens, of which one is figured (Pl. V, Fig. 3), show smooth sides, and ventral region ornated

with three entire, not crenellated keels, resembling some specimens figured by Cobban & Scott (Pl. 34, Figs. 5, 6, 8) of North America.

A last specimen (Pl. II, Fig. 3) shows an incipient whorl with low ribs and claviform marginal tubercles, then four spaced, relatively strong ribs appear on the side. Out of the three ventral keels, the marginal ones are slightly crenellated, the siphonal one being sharp. This specimen differs from most of the specimens assigned to *Ch. pavillieri* and might belong to a new species of the same group.

Remarks *Ch. pavillieri* shows several similarities to species of the same group, such as *Ch. quaasi* or *Ch. sinaiticum*. The former species is more massive than *Ch. pavillieri*, while the latter loses rapidly its lateral keels. The specimens of Romania generally show a more vigorous and persistent ornamentation than most specimens of *Ch. pavillieri* figured so far.

Geographic and stratigraphic distribution: *Ch. pavillieri* is the most widespread species of the genus, being known in North Africa (Tunisia, the Sahara), Central Africa, Madagascar, the Middle East, southern France, Spain and North America. Everywhere it occurs in the upper part of Lower Turonian.

Choffaticeras aff. *quaasi* (Peron)

Pl. VI, Fig. 5a, b

A single small-sized ($D=34$ mm), strongly deformed specimen shows some similarities to the specimens of *Ch. quaasi* (Freund & Raab, 1969, Pl. 9, Figs. 5, 6) having relatively thick whorl, quite narrow umbilicus and an ornamentation which consists of relatively strong ribs ending in well developed ventral tubercles. Median keel is slightly crenellated. The specimen comes from the Fintina Stanchii fossil site.

Ch. quaasi is known from the upper part of the Lower Turonian of North America, the Middle East and Spain.

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ASOCIAȚIA DE AMONIȚI DIN TURONIANUL INFERIOR DIN MUNȚII MARAMUREȘULUI (CARPAȚII ORIENTALI, ROMÂNIA)

(Rezumat)

Existența Turonianului inferior în Maramureș a fost dovedită pînă în prezent numai pe baza unor asociații de inocerami din grupul *I. labiatus* puse în evidență în mai multe locuri din această regiune.

Cercetările din ultimii ani au relevat existența amoniților aparținînd Turonianului inferior în apropierea localității Baia Borșa pe versantul sudic al masivului Toroiaga și pe creasta ce separă bazinul riului Vișeu de cel al Bistriței, în apropierea vîrfului Fîntîna Stanchii.

Asociația de amoniți este relativ bogată în genuri și specii, unele specii fiind reprezentate de mai multe exemplare. Importanța acestei faune este deosebit de mare atît pentru stabilirea exactă a vîrstei depozitelor în care este cuprinsă, pentru trasarea limitei Cenomanian/Turonian în această regiune, cît și pentru corelări interregionale, avînd în vedere că în asociație există atît genuri și specii cunoscute în provincia boreală, cît și genuri și specii mesogeene. Este de remarcat de asemenea că în regiunea studiată amoniții se găsesc împreună cu o bogată faună de inocerami, ceea ce permite formularea unor aprecieri privind valoarea cronostatigrafică a diferitelor tipuri morfologice din cadrul grupului *I. labiatus*.

Speciile de amoniți determinate și descrise în lucrare aparțin genurilor *Spathites* (*Jeanrogericeras*), *Paramammites*, *Choffaticeras* (aceste genuri fiind cel mai bine reprezentate prin numărul de indivizi), *Kamerunoceras* (*Schindewolfites*), *Fagesia*, *Puzosia*, *Baculites*, etc. Majoritatea genurilor și speciilor sînt citate pentru prima dată în România iar o specie [*Spathites* (*Jeanrogericeras*) *toroiagaensis*] este nouă.

Este de subliniat de asemenea că asociația de amoniți descrisă în prezenta lucrare reprezintă pînă în prezent cea mai bogată asociație aparținînd Turonianului inferior din România, singura cu o certă valoare pentru corelări la distanțe mari.

EXPLANATION OF PLATES

Plate I

Figs. 1, 2. — *Baculites* aff. *undulatus* Roman et Mazeran (ex d'Orbigny). Southern side of the Toroiağa Mountain-Baia Borșa, fossil site no. 1.

Fig. 3. — *Pachydesmoceras denisonianum* (Stoliczka) — Southern side of the Toroiağa Mountain — Baia Borșa, fossil site no. 1.

Fig. 4. — *Fagesia* sp. (aff. *F. rudra* Stol.) — Fintîna Stanchii fossil site.
All the specimens are figured natural size and belong to the Collection of the Institute of Geology and Geophysics (the author's collection).

Plate II

Fig. 1a-c. — *Spathites* (*Jeanrogericeras*) *toroiagaensis* Szász n. sp. (Holotype).

Fig. 2. — *Mammites* ? sp.

Fig. 3. — *Choffaticeras* n. sp. ? (aff. *Ch. pavillieri* Pervinquier).

All the specimens come from the fossiliferous block on the Fintîni Valley — Baia Borșa (fossil site no. 3); they are figured natural size and belong to the collection of the Institute of Geology and Geophysics (the author's collection).

Plate III

Figs. 1a-c, 2a-b. — *Spathites* (*Jeanrogericeras*) *toroiagaensis* Szász n. sp.

The specimens come from the fossil site on the Fintîni Valley — Baia Borșa (fossil site no. 3), are figured natural size and belong to the Collection of the Institute of Geology and Geophysics (the author's collection).

Plate IV

Fig. 1a-b. — *Kamerunoceras* (*Schindewolfites*) *inaequicostatus* Wiedmann. Southern side of the Toroiağa Mountain — Baia Borșa (fossil site no. 1).

Fig. 2a-e. — *Paramammites polymorphum* (Pervinquier). Two successive whorls from the same specimen are figured. — Southern side of the Toroiağa Mountain — Baia Borșa (fossil site no. 1).

Fig. 3a-b. — *Mammites* ? sp. — Fossiliferous block on the Fintîni Valley — Baia Borșa (fossil site no. 3).

All the specimens are figured natural size and belong to the Collection of the Institute of Geology and Geophysics (the author's collection).

Plate V

Fig. 1. — *Spathites* (*Jeanrogericeras*) *reveliereanus* (Courty). Southern side of the Toroiağa Mountain — Baia Borșa (fossil site no. 1).

Fig. 2. — *Spathites* (*Jeanrogericeras*) *reveliereanus* (Courty) — Fintîna Stanchii fossil site.

Fig. 3. — *Choffaticeras pavillieri* Pervinquier — Fintîna Stanchii.

Fig. 4. — *Choffaticeras pavillieri* Pervinquier — Fintîni Valley, Baia Borșa (fossil site no. 3).

Fig. 5a-b. — *Fagesia peroni* Pervinquièrè — Fintînii Valley, Baia Borşa.

Fig. 6. — *Fagesia* sp. (aff. *F. thevestensis* Peron) — Fintîna Stanchii (fossil site no. 2).

Fig. 7. — *Mammites* ? sp. — Fintînii Valley, Baia Borşa (fossil site no. 3).

All the specimens are figured natural size and belong to the Collection of the Institute of Geology and Geophysics (the author's collection).

Plate VI

Fig. 1a-b. — *Choffaticeras pavillieri* Pervinquièrè.

Fig. 2. — *Spathites (Jeanrogericeras) toroiagaensis* Szász, n. sp.

Fig. 3a-b. — *Choffaticeras pavillieri* Pervinquièrè. Specimen resembling very much the species holotype.

Fig. 4a-c. — *Mammites* ? sp. The specimen shows some similarities to some *Metoicoceras* species (*M. latoventer* Stephenson) from North America.

Fig. 5a-b. — *Choffaticeras* aff. *quaasi* (Peron).

Fig. 6. — *Paramammites polymorphum* (Pervinquièrè).

The specimen from Figure 5 comes from Fintîna Stanchii, all the other ones come from the fossiliferous block on the Fintînii Valley, Baia Borşa (site no. 3).

All the specimens are figured natural size and belong to the Collection of the Institute of Geology and Geophysics (the author's collection).

Plate VII

Fig. 1a-b. — *Spathites (Jeanrogericeras) toroiagaensis* Szász, n. sp.

Fig. 2, 3a-c. — *Spathites (Jeanrogericeras) reveliereanus* (Courtillet).

The specimens are similar to the small „*Mammites binicostatus*“ specimen figured by Petrascheck, 1902.

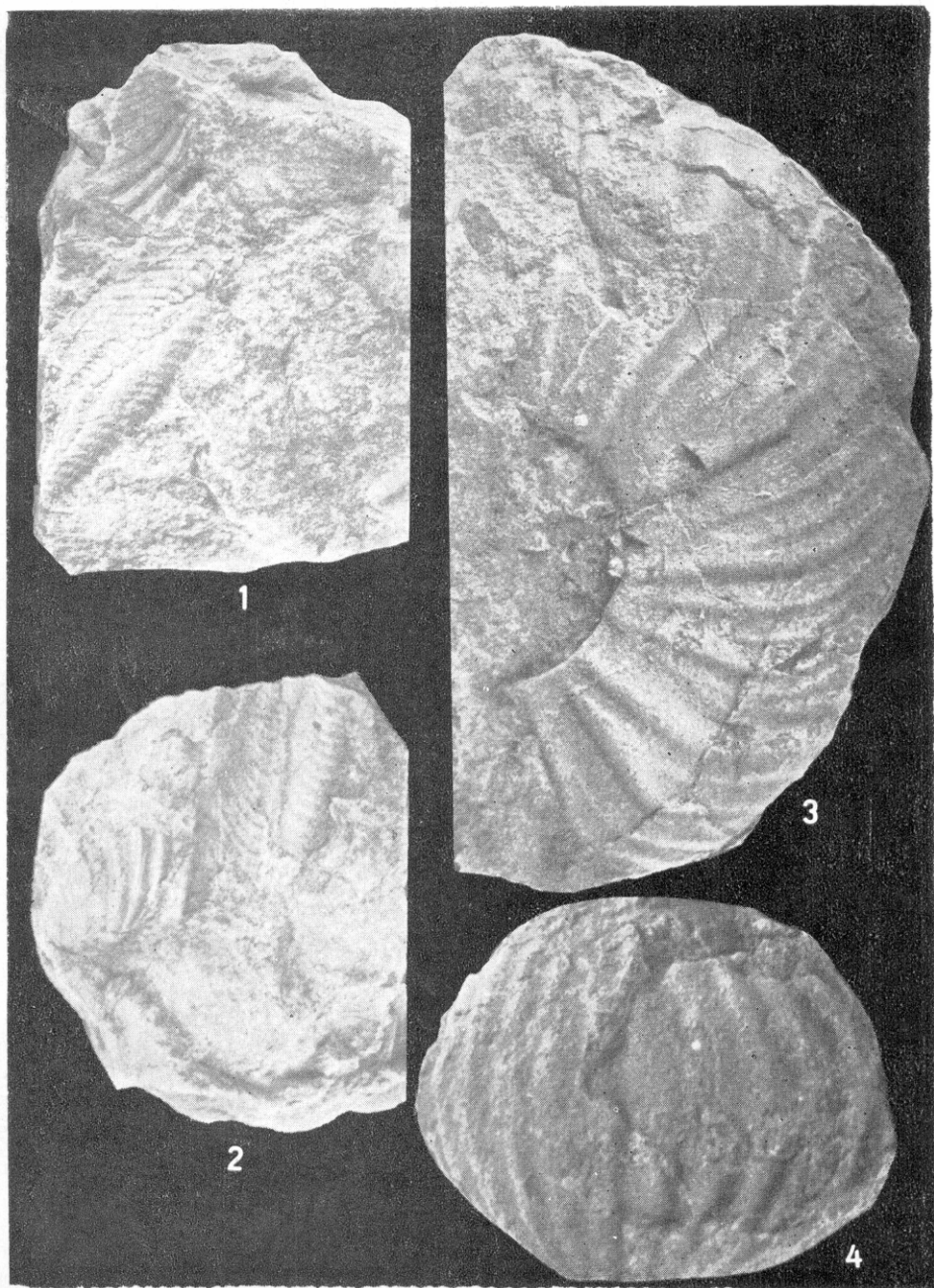
Fig. 4a-b. — *Mammites* ? sp. Specimen resembling the small specimens figured under the name of *M. nodosoides*.

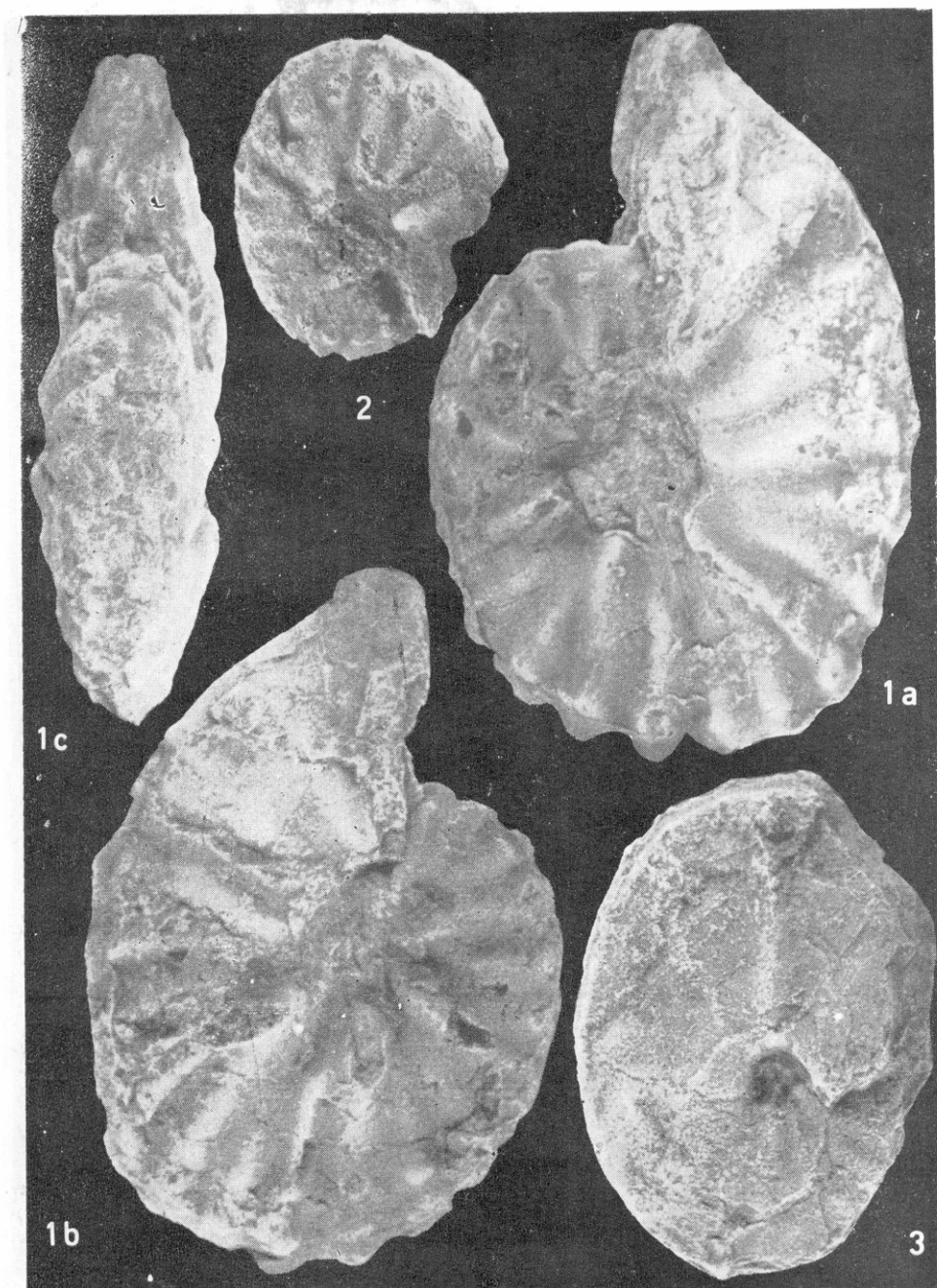
Fig. 5a-b. — *Mammites* ? sp.

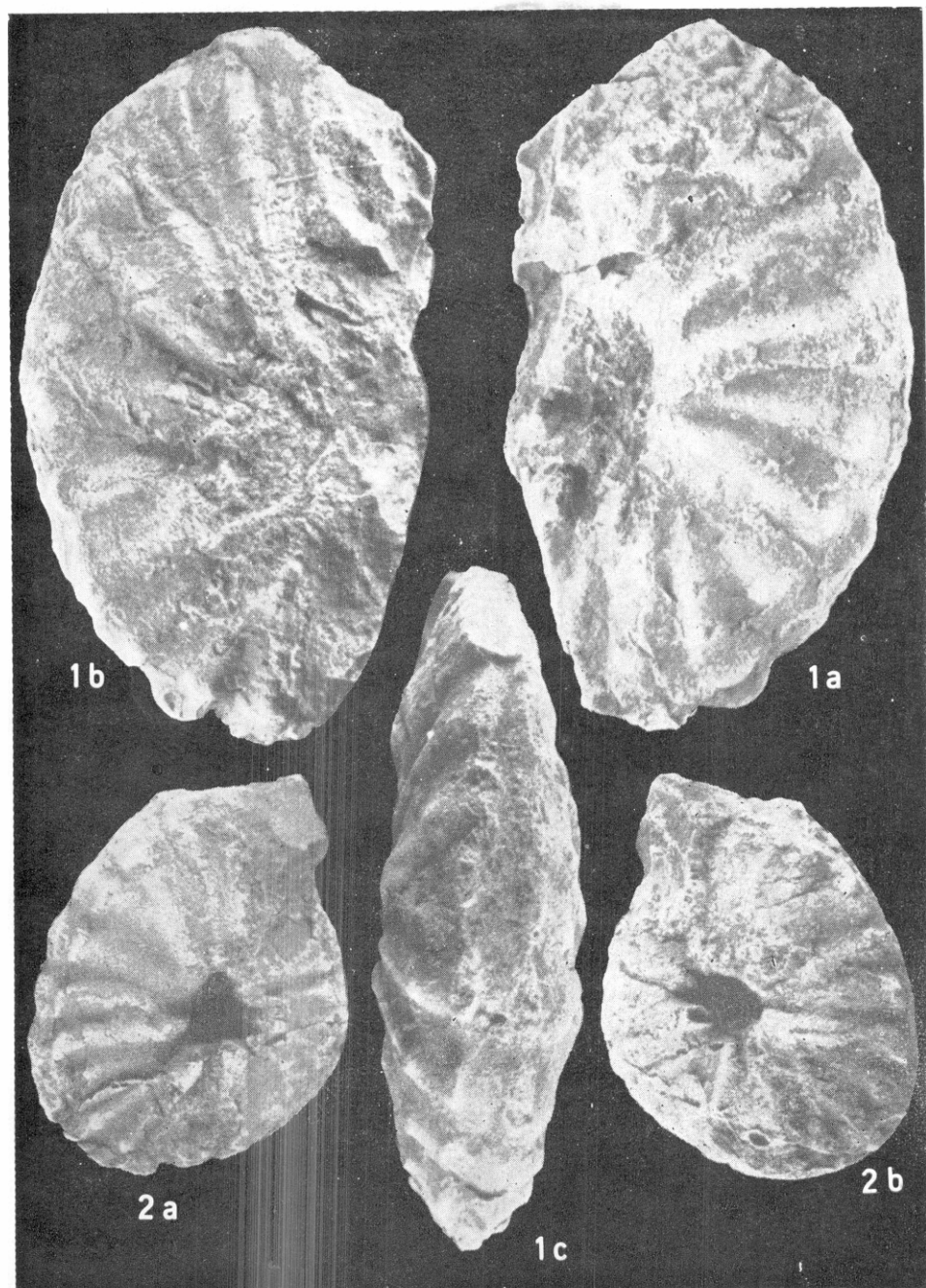
Fig. 6. — *Baculites* sp.

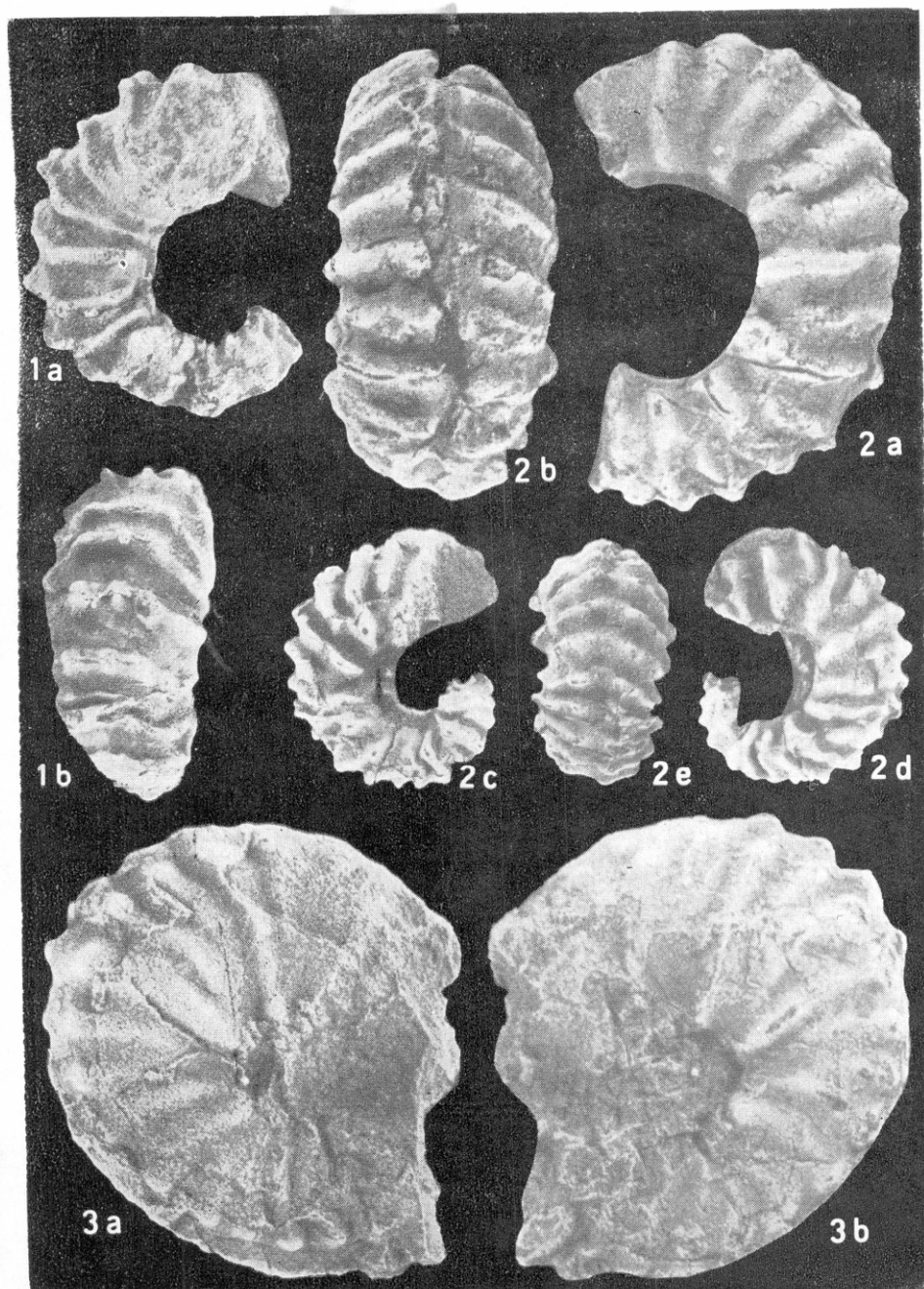
The first five specimens come from the Fintînii Valley, the last one comes from the southern side of the Toroiaga Mountain.

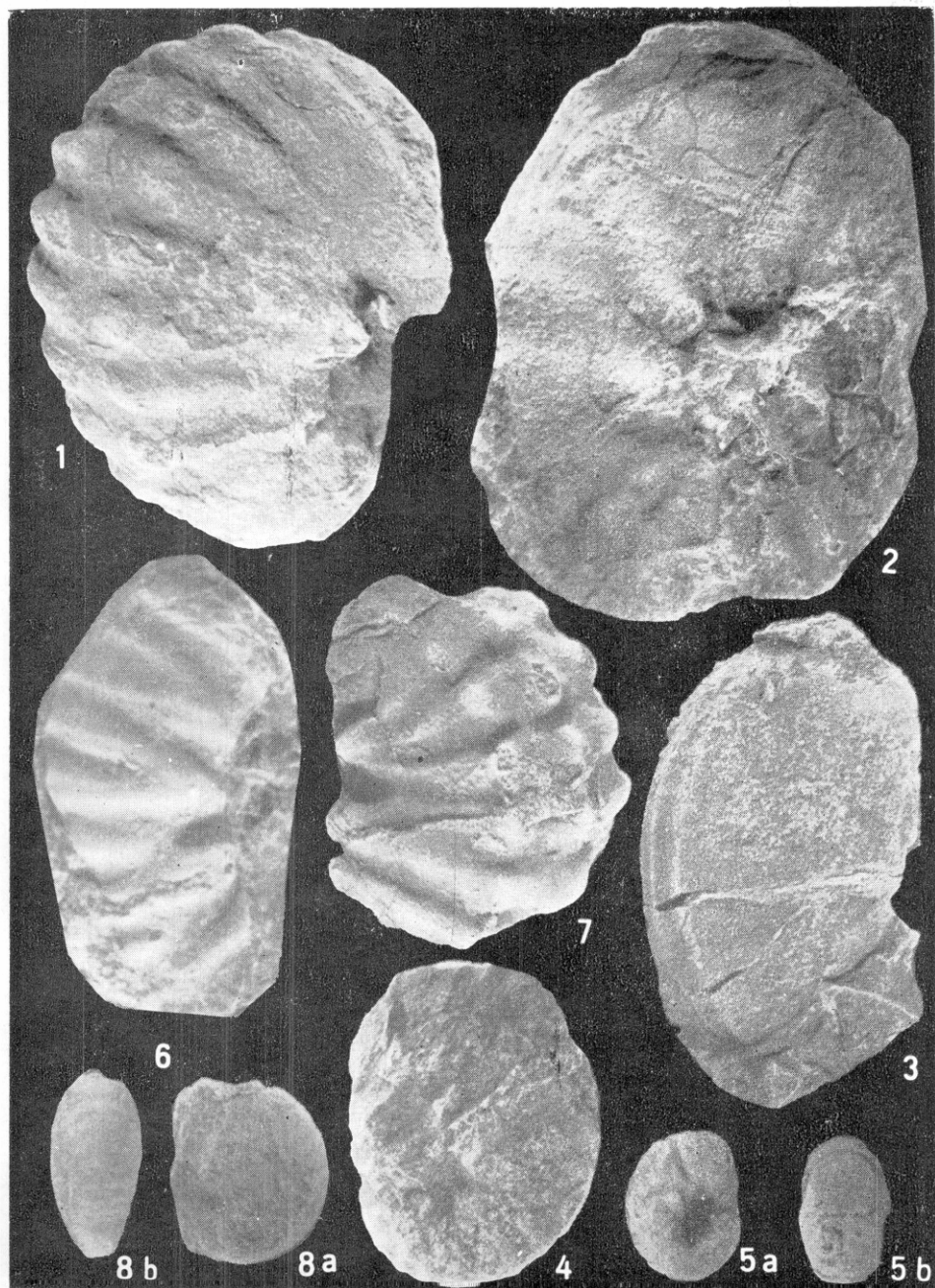
All the specimens are figured natural size and belong to the Collection of the Institute of Geology and Geophysics (the author's collection).

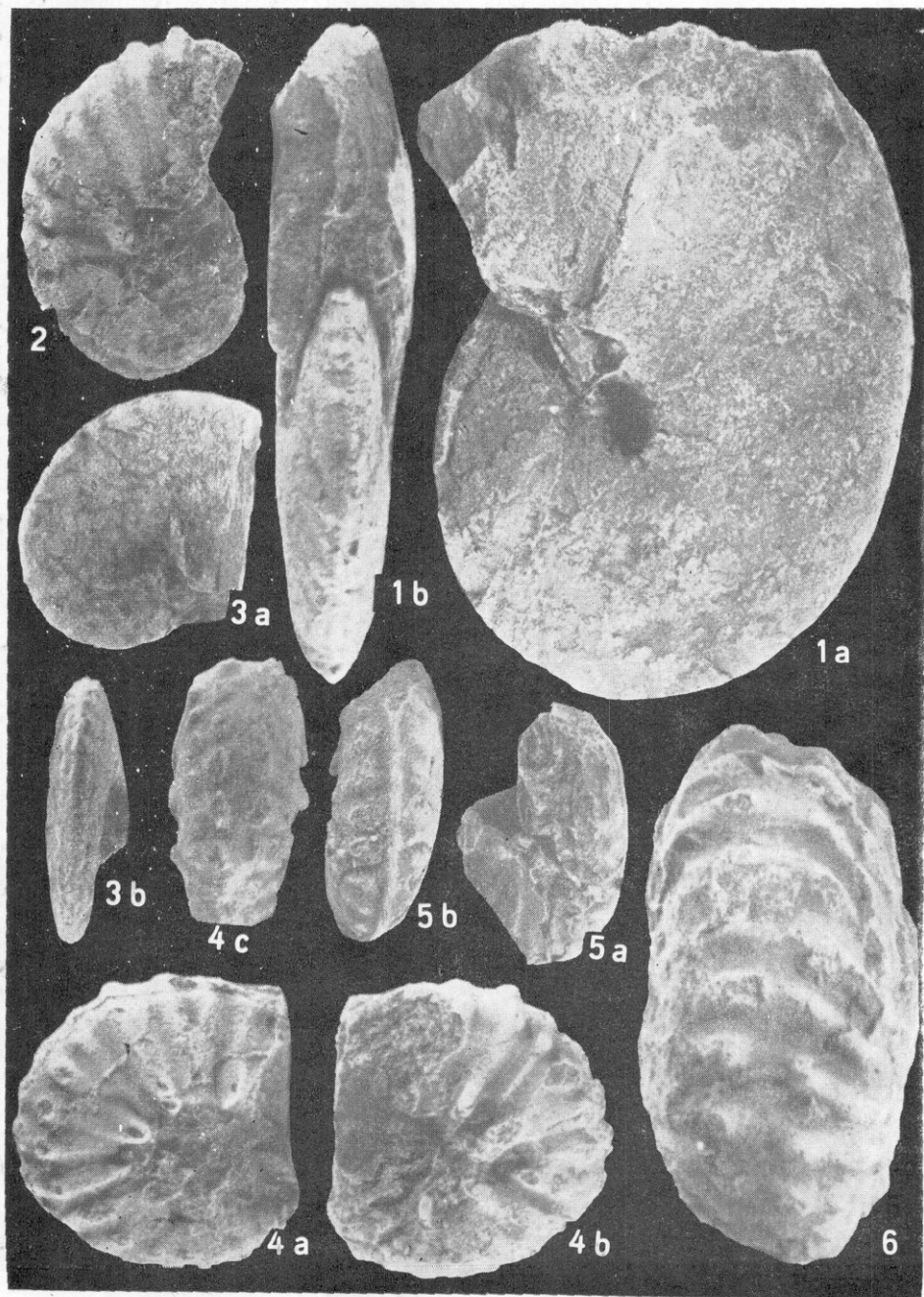


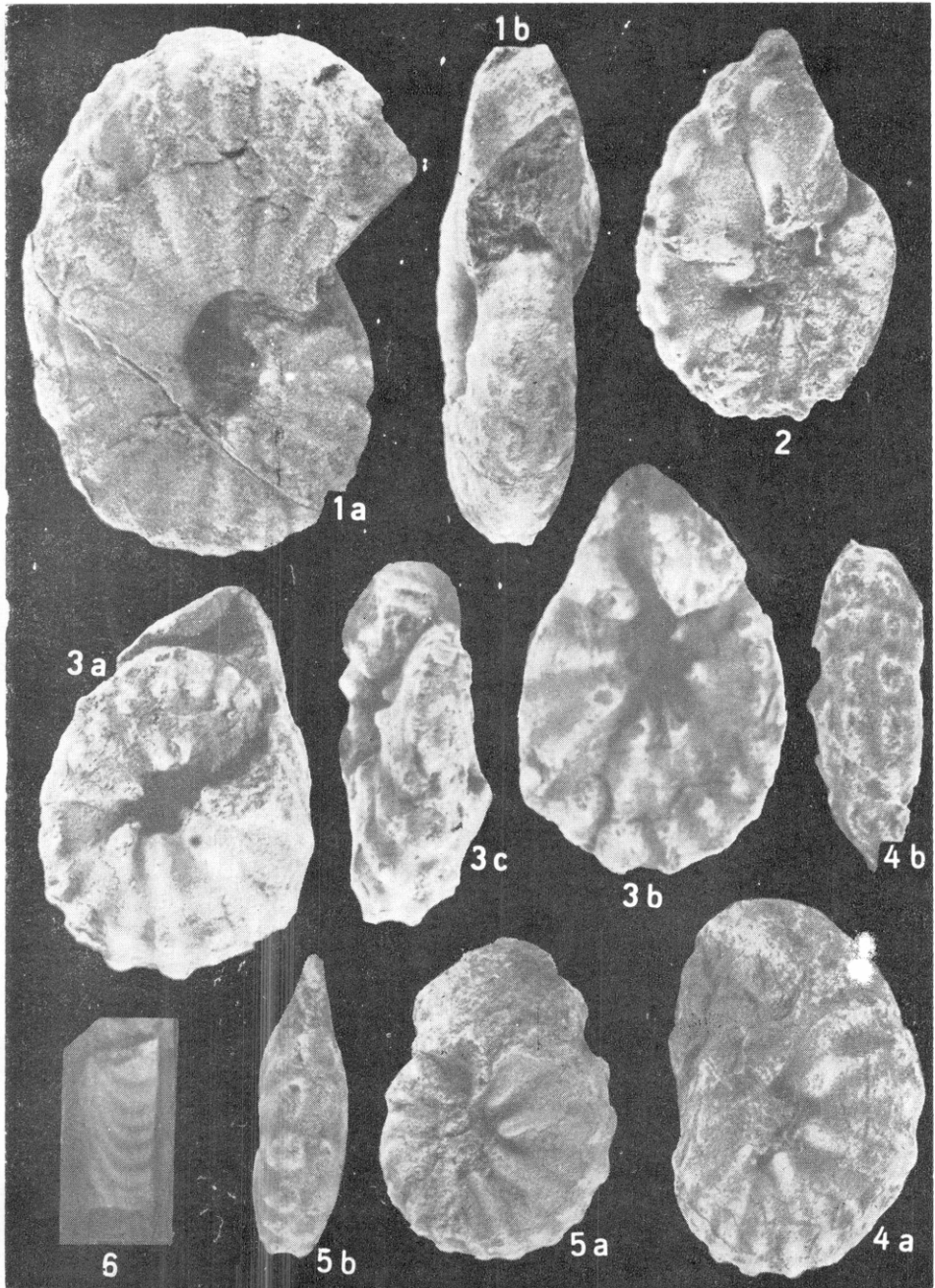












REPUBLICA SOCIALISTĂ ROMÂNIA

Regiunile la care se referă
lucrările cuprinse în volum

Emplacement sur la carte de la
Roumanie des régions étudiées

Location of the studied regions
on the map of Romania

