

TITHONIAN AMMONITES (OPPELIIDAE, HAPLOCERATIDAE AND SIMOCERATIDAE) FROM THE TRANSDANUBIAN CENTRAL RANGE, HUNGARY

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Abstract

Rich Upper Jurassic ammonite faunas have been collected recently from several profiles in the Transdanubian Central Range. The present paper gives the first results of the taxonomic work on these faunas from the Bakony Mts, the western part of this range. The Tithonian representatives of three families: Opeeliidae, Haploceratidae and Simoceratidae are described as a first step in the systematic treatment of the ammonite faunas. Genera *Semiformiceras* (with 5 forms), *Neochetoceras*, *Haploceras* (9 species, incl. one new: *H. cassiferum* nov. sp.), *Pseudolissoceras* (with a single, new species: *P. olorizi* nov. sp.), *Simoceras* (with two species), *Volanoceras* (with 6 forms and a new, unnamed subgenus), *Simolytoceras* (with 3 forms, incl. one new species: *S. vighi* nov. sp.) and *Lytogyroceras* (with two species) are described and figured. The morphological descriptions are completed with discussions on dimorphism, stratigraphic and paleogeographic distribution.

Introduction

The Upper Jurassic of the Transdanubian Central Range is very rich in fossils, especially in ammonites. The here studied and described material contains 2 specimens from the Kálvária Hill of Tata and from the Margit Hill of the Gerecse Mts., but the main sources of ammonites are Bakony Mountains localities: Rendkő, Eperkés Hill, Sümeg, Lókút Hill, Hárskút and Szilasárok. The latter four localities, which yielded the majority of the studied specimens, were described by VIGH (1984) and FÓZY (1987, 1988).

The collected huge material (several thousands of specimens) serves as basis for future monographic treatment. The aim of the studies is to reduce the difference now exists between the faunistic knowledge of the Lower, Middle and Upper Jurassic.

Working out the whole Upper Jurassic ammonite fauna of the Transdanubian Central Range, one may expect not only a precise biostratigraphic subdivision of a wide temporal interval, but a paleobiogeographically based paleoenvironmental reconstruction and an evolutionary evaluation also.

Systematic descriptions

The suprageneric categories are used in the system suggested by DONOVAN et al. (1981). The description of the majority of the taxa was ordered as follows:

Material. All mentioned or figured specimens are deposited in the collections of the Hungarian Geological Survey (Budapest), inventory numbers refer to this collection.

Measurements. The majority of the material consists of poorly-preserved, fragmentary specimens, thus the measurements are occasionally uncertain (marked with "?") or incomplete in several cases. The numbers refer to the following dimensions: diameter; whorl-height; whorl-width and umbilical width; the last three in the percentage of the diameter. Whorl-height means the value of the vertical projection of the height. Height and width in the ribbed *Simoceratids* refer to parameters measured between the ribs. All measurements (or the first ones in the cases of more than one measurements on the same specimens) refer to dimensions measured at the maximal diameter of the specimen.

Description. Here the given taxon or occasionally a single specimen is described.

Remarks. Here comparison to related taxa or specimens are given.

Distribution. This paragraph gives both the stratigraphic and the geographic distributions of the taxon.

Dimorphism. Because of the incompleteness of the material and of some other factors, the identification of dimorphic pairs on the specific level would meet some difficulties. Thus the present work follows the solution suggested by CALLOMON (1969, p. 116) distinguishing micro- and macroconch forms on subgeneric level, where it is possible.

Order Ammonoidea ZITTEL, 1884
 Suborder Ammonitina HYATT, 1889
 Superfamily Haplocerataceae ZITTEL, 1884
 Family Oppeliidae DOUVILLÉ, 1890
 Subfamily Streblitinae SPATH, 1925

Genus *Semiformiceras* SPATH, 1925

Type species. *Ammonites Fallauxi* OPPEL, 1865, p. 547 by original designation of SPATH (1925, p. 115).

Diagnosis. Small size, more or less excentrically-coiled body chamber with deep ventral furrow, ventrolateral tubercules, from where ribs arise occasionally. All these features are strongly variable.

Observations. This genus unites forms which have been described under the following names: *S. darwini* (NEUM.), *S. semiforme* (OPP.), *S. gemellaroi* (ZITT.), *S. domoplicata* (ZITT.). Nevertheless, on the basis of ENAY's work (1983) on the infraspecific variability of the *Semiformiceras* species, it seems sufficient to keep only three names, because the two forms described by ZITTEL seem as varieties of *S. fallauxi*.

ENAY and GEYSSANT (1975), realising the stratigraphic significance of the *Semiformiceras* species, introduced a new zonation for the Mediterranean Tithonian. As zonal indices, they suggested *S. darwini* (then included into the genus *Neochetoceras*), *S. semiforme* and *S. fallauxi*.

The first to draw attention to the infraspecific variability of *Semiformiceras* was OLÓRIZ (1978). Based on studies on the rich material from the Betic Cordilleras, he introduced three new subspecies.

ENAY (1983) reviewed and treated the previously described species and subspecies within a comprehensive phylogenetic framework. He enlarged the sphere of the related zonal indices, with ranging NEUMAYR'S "darwini" into the genus. As a result, *Semiformiceras* attained a distinguished role in the biostratigraphy of the Tithonian.

Semiformiceras is an important element in the Hungarian faunas, too: VIGH (1984) recorded *S. fallauxi* and *S. semiforme* from the Bakony Mts.

One should bear in mind, that this genus, despite its relatively rich documentation, poses also numerous unanswered questions. Especially in the light of ENAY'S work (1983) it is curious, that the small *S. gemmellaroi* (a close ally of *S. fallauxi*) occurs in the base of the Semiforme Zone of the Rogoznik Beds (KUTEK and WIERZBOWSKI 1979, p. 201). CECCA et al. (1985) recorded a specimen very similar to *S. gemmellaroi* from similar horizon in the Apennines. These latter authors regarded this "fallauxi-related" *S. gemmellaroi*, and the stratigraphically older form similar to the zonal index as two independent species. It is noteworthy, that a small-sized, *S. fallauxi* - like ammo nite was found in a similar stratigraphic position in the Hárskút II. profile, Bed 62.

Occurrence. The genus is a characteristic element in the Mediterranean Lower and Middle Tithonian. *S. darwini*, *S. semiforme* and *S. fallauxi* are consecutive indices of the respective zones.

Dimorphism. *Semiformiceras* comprises of microconch forms of a probably dimorphic group. This is suggested by the small size and the anomalously coiled body chamber of the species. The macroconchs were supposedly found within the genus *Neochetoceras* by ENAY (1983). It is noteworthy, that the *Semiformiceras*-bearing beds of the Bakony profiles commonly yield *Neochetoceras* specimens, though unfortunately in bad preservation, so undeterminable.

Semiformiceras sp.

Text-figure 1.

Material. A single specimen (J-10867) from Bed 94 of the Szilasárok profile.

Description. The whorl-section, the rapidly flattened ribs arising at the umbilical seam, and the fine ventral crenulation of this fragmentary internal mould shows close similarity to the forms described by DONZE and ENAY (1961) as *S. aff. semiforme*. The Szilasárok ammonite shows additionally the very delicate ribbing confining to the outer lateral edge and the venter.

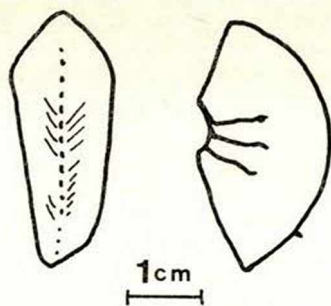


Figure 1. *Semiformiceras* sp. (J-10807).
Szilasárók, Bed 94. Semiforme Zone.

Semiformiceras semiforme (OPPEL, 1865)

Plate I, figs. 1, 2, 3.

- 1865 *Ammonites semiformis* OPP. — OPPEL, p. 547.
 1870 *Oppelia semiformis* OPP. — ZITTEL, p. 59, pl. 28, figs. 7, 8.
 1956 *Semiformiceras semiforme* (OPP.) — ARKELL, pl. 43, fig. 1.
 non 1961 *Semiformiceras* aff. *semiforme* (OPP.) — DONZE and ENAY, p. 60, figs. 11–13.
 1978 *Semiformiceras semiforme semiforme* (OPP.) and subspp. — OLÓRIZ, pp. 68–74, pl. 3, figs. 1–7.
 1983 *Semiformiceras semiforme* (OPP.) — ENAY, p. 120, figs. 3/5–14.
 1984 *Semiformiceras semiforme* (OPP.) — VIGH, p. 143, pl. 1, fig. 6.
 1986 *Semiformiceras semiforme* (OPP.) — SARTI, p. 494, pl. 1, fig. 7.
 1987 *Semiformiceras semiforme* (OPP.) — FÓZY, pl. 1, fig. 2–3.

Material. Six internal casts (J-10867–J-10873; J-10171) from the Bakony profiles.

Measurements.

J-10871	?61	?31 (50.8)	—	10 (16.3)
J-10872	64	31 (48.4)	—	8 (12.5)
J-10869	73	35 (47.9)	—	10 (13.6)

Description. The specimens from Bed 59 of the Hárskút, Közöskút ravine, profile II (J-10869, J-10870: Pl. I, fig. 1), with the conspicuously excentric coiling and tubercles on the body chamber resemble most closely the subspecies *S. semiforme tuberosum* OLÓRIZ. One specimen shows a part of the crenulation on the venter of the phragmocone, which is so clearly visible on the lectotype. It is conspicuous, that in the Hárskút specimens the ventral furrow becomes unusually wide, and this resembles rather the species *S. darwini* (NEUMAYR) than the narrow ventral groove of ZITTEL's species.

The here figured specimen (Pl. I, fig. 1), on the basis of its comparatively big size, more excentric coiling, may come from the lower or middle part of the biozone.

The specimen from Bed 53 of the Szilasárok profile (Pl. I, fig. 2) is of medium-size and moderately excentric in coiling. The phragmocone is largely gone by dissolution. At the beginning of the body chamber, near to the ventrolateral margin, well-visible are the strong tubercules, the characteristic feature of the species. The ventral furrow is narrow. The flank of the body chamber is smooth, without tubercules or stronger ribs. The few tuberculelike swellings can be probably due to preservational causes. All these features indicate the upper part of the biozone.

The Sümeg profile also yielded several specimens of this species. However, the majority of the material is fragmentary. These *S. semiforme* specimens were mentioned in the faunal lists of VIGH (1984), and he figured one example. This specimen (J-10171) is refigured here (Pl. I, fig. 3). This is a medium-sized form with moderately excentric coiling. Its features: sculpture, strong grooves on the flank of the body chamber are typical to *S. semiforme* (at least to the lectotype), thus indicate the middle part of the biozone.

Another Sümeg specimen (Pl. I, fig. 4) is closer to the subspecies *tuberosum* of OLÓRIZ.

Remarks. The specimens from the Bakony, similarly as those from the Subbetics, show great variability in coiling, sculpture and size.

Distribution. This species is the index form of the Semiforme Zone in the Mediterranean Tithonian.

Dimorphism. This species comprises of probable microconchiate forms.

Semiformiceras fallauxi (OPPEL, 1865)

Plate, I, figs. 5 and 6

1865 *Ammonites Fallauxi* OPP. — OPPEL, p. 547.

1870 *Oppelia Fallauxi* OPP. — ZITTEL, p. 179, pl. 28, figs. 4, 5 and 6.

1870 *Oppelia Gemmellaroi* ZITT. — ZITTEL, p. 180, pl. 28, figs. 10 and 11.

1870 *Oppelia domiplicata* ZITT. — ZITTEL, p. 181, pl. 28, figs. 13 and 14.

1890 *Ammonites (Oppelia) Fallauxi* OPP. — TOUCAS, p. 578, pl. 13, fig. 8.

1928 *Oppelia Gemmellaroi* ZITT. — BLANCHET, p. 270, pl. 1, fig. 3.

1976 *Semiformiceras* sp. ex gr. *S. fallauxi* (OPP.) — PATRULIUS and AVRAM, p. 18, pl. 9, fig. 5.

1978 *Semiformiceras fallauxi* (OPP.) — OLÓRIZ, p. 74, pl. 13, fig. 8.

1978 *Semiformiceras gemmellaroi* (ZITT.) — OLÓRIZ, p. 76, pl. 3, fig. 9.

1983 *Semiformiceras fallauxi* (OPP.) — ENAY, p. 120, figs. 3/14–20.

Material. A single, partly fragmentary specimen (J-10874) from the Sümeg profile.

Measurements.

J-10874	?32	11 (34.3)	8 (25)	12 (37.5)
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Description. VIGH (1984) mentions several specimens of *S. fallauxi* in his faunal list from Sümeg. The here figured well-preserved but fragmentary specimen came also from his material. The swellings at the umbilical margin and the arising ribs, as well as the external furrow and the elongated, marginal tubercles are well visible.

Remarks. The specimen has a somewhat broader umbilicus as compared to that on the forms figured by ZITTEL, and its size and sculpture resembles the specimen of TOUCAS.

Distribution. The species is the index form of the Fallauxi Zone of the Mediterranean Tithonian.

Dimorphism. This species apparently unites microconchiate forms.

Semiformiceras cf. *fallauxi* (OPPEL, 1865)

Material. A single fragmentary specimen (J-10875) from Bed 54 of the Hárskút, Közöskút ravine profile II.

Remarks. The relatively big size, broad umbilicus and the lateral swellings of the specimen suggest the form described by OLÓRIZ as subspecies *S. semiforme rotundus*. The ventral part cannot be studied. The specimen probably indicates the lowermost part of the biozone.

Genus *Neochetoceras* SPATH, 1925

Type species. *Ammonites steraspis* OPPEL, 1863, by original designation of SPATH 1925, p. 115.

Neochetoceras div. sp.

Text-figs. 2, 3, 4 and 5.

Material. 12 badly-preserved, fragmentary specimens (J-10876 - J-10887) from the Bakony profiles.

Measurements.

J-10876	116	63 (54.3)	-	?16 (?13.7)
J-10882	49	25 (51.0)	-	? 8 (?16.3)

Remarks. The exceptionally fragile, thin shell of *Neochetoceras* may have been less resistant to mechanical effects, thus all collected specimens are very badly preserved, subsolved, fragmented. All are insufficient for closer determination. Nevertheless, these strongly oxycone shells are so characteristic elements in the Tithonian faunas, that their short description seems to be justified.

The single feature shown in numerous fragments is the whorl-section around the venter. Most common are forms with broadly flattened venter, with partial traces of the conella (Text-figs. 2 and 3). In some specimens the convergent, flat flanks meet in well-defined, marked keel (Text-fig. 4).



Figure 2. *Neochetoceras* sp. (J-10876).
Cross-section. Lókút Hill, Bed 48. Middle
Tithonian, (?) Fallauxi Zone.

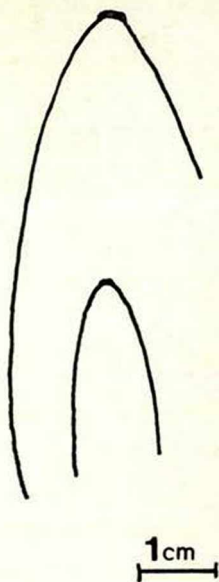


Figure 3. *Neochetoceras* sp. (J-10878).
Cross-section. Lókút Hill, Bed 26.
Microcanthum Zone.

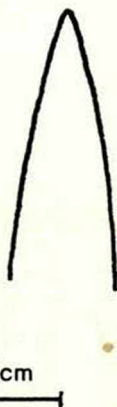


Figure 4. *Neochetoceras* sp. (J-10881).
Cross-section. Szilasárok, Bed 95.
Semiforme Zone.

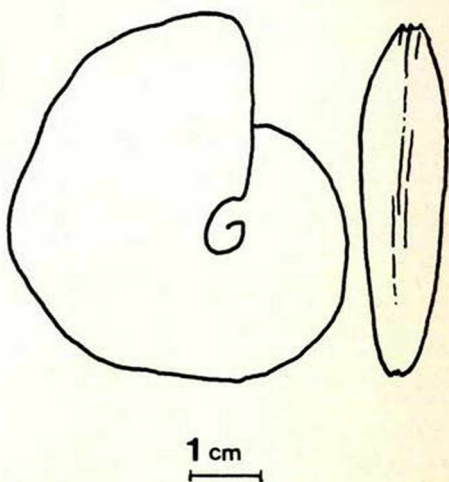


Figure 5. *Neochetoceras* sp. (J-10882).
Cross-section, Szilasárok, Bed 99.
Semiforme Zone.

In one small, but probably adult specimen the venter of the body chamber shows characteristic tricarination (Text-fig. 5). This is similar to that on *N. steraspis* forma *mucronata* of BERCKHEMER and HÖLDER (1959, p. 106).

Distribution. *Neochetoceras* species are characteristic elements in the Mediterranean Tithonian (mainly in the lower and middle parts).

Dimorphism. ZEISS (1968) suggested infrageneric dimorphism in *Neochetoceras*. ENAY (1983) assumed, that the macroconchiate *Neochetoceras* species are the pairs of microconchs ranged into the genus *Semiformiceras*.

Family Haploceratidae Zittel, 1884

Genus *Haploceras* ZITTEL, 1868

Type species. *Ammonites elimatus* OPPEL, 1865, by subsequent designation of SPATH 1923, p. 14.

Observations. Identifications of the related species is greatly hampered by wide variability, especially in faunas of great specimen number, where transitory forms with transitional size, whorl-section and coiling appear between species with statistically well-established features. Additional problem is that the different *Haploceras* species of relatively simple morphology show great similarity in their inner whorls, thus fragmentary specimens are especially difficult or impossible to identify specifically.

Because of its common occurrence, this group needs special attention. The Szilasárok ammonite fauna of 3,500 specimens has 24%, while in the Hárskút, Közöskút ravine profile II the nearly 3,000 specimens has 30% representation of *Haploceras*. It is worth mentioning, that commonly only a single species, *H. (H.) elimatum* shows extremely high dominance.

Occurrence. *Haploceras* and very close allies occur in the Mediterranean areas and in Mexico, Cuba and in India.

The earliest *Haploceras* is probably *H. toulai* from the Lower Kimmeridgian of Bulagria (SAPUNOV 1979, p. 44). The genus is known mainly from the Tithonian. Its Lower Tithonian representation is subordinate, but great quantities appear from the Semiforme Zone onwards. *Haploceras* evolved with moderate rate, with substage ranges of most species, however within the Tithonian some forms are useful as stratigraphic tools.

Dimorphism. Several attempts have been made to demonstrate dimorphism or establish dimorphic pairs in the species groups of *Haploceras*. BARTHEL (1962) suggested sexual dimorphism surprisingly between the species *H. elimatum* and *H. staszycii*. PATRULIUS and AVRAM (1976) indicated that the microconchiate *Neoglochiceras* is the dimorphic pair of the genera *Haploceras* and *Neolissoceras* macroconchs. However, the name *Neoglochiceras* is an objective synonym, as pointed out by ENAY and CECCA (1986, p. 49), and cannot be used in the interpretation of PATRULIUS and AVRAM.

ENAY and CECCA (1986) interpreted the 9 classic species and the here described *H. (H.) cassiferum* nov. sp. as macroconch and microconch forms of two species altogether. They applied (M) and (m) for dimorphs and they defined morphologically well-distinguished forms (earlier species) with the word "morphé".

In this present work the microconch *Haploceras* forms are treated — according to the rule of priority — under subgenus name *Hypolissoceras* BREISTROFFER, 1947, while the macroconchs are discussed in the nominate subgenus.

Subgenus *Haploceras* (*Haploceras*) ZITTEL, 1868

Remarks. This subgenus comprises the big, microconchiate species of *Haploceras*.

Haploceras (*Haploceras*) *elimatum* (OPPEL, 1865)

Plate II, figs. 1 and 2, 3.; Text-fig. 6

- 1865 *Ammonites elimatus* OPP. — OPPEL, p. 549.
 1868 *Ammonites elimatus* OPP. — ZITTEL, p. 79, pl. 13, figs. 1–7.
 1870 *Haploceras elimatum* OPP. — ZITTEL, p. 169, pl. 27, fig. 7.
 1890 *Haploceras elimatum* OPP. — TOUCAS, p. 576, pl. 13, fig. 4.
 1925 *Haploceras elimatum* OPP. — SPATH, p. 153, pl. 1, fig. 1.
 1960 *Haploceras elimatum* OPP. — COLLIGNON, pl. 142, figs. 536 and 537.
 1962 *Haploceras elimatum* OPP. — BARTHEL, p. 11, pl. 1, figs. 12–17.
 1966 *Haploceras elimatum* OPP. — PEJO, p. 97, text-fig. 4.
 1976 *Haploceras elimatum* OPP. — VIGH in FÜLÖP, p. 72, pl. 25, fig. 4.
 1978 *Haploceras elimatum* OPP. — OLÓRIZ, p. 12, pl. 1, figs. 2 and 3.
 1979 *Haploceras elimatum* OPP. — SAPUNOV, p. 42, pl. 7, figs. 1 and 2.
 1984 *Haploceras elimatum* OPP. — ROSSI, p. 88, pl. 31, figs. 11 and 12.
 1986 *Haploceras* (*Haploceras*) *charactheis* (M) (Z.) *morphe elimatum* — ENAY and CECCA, pl. 4, figs. 1–5.

Material. 7 numbered (J-10888–J-10894) and several hundred unnumbered, mainly badly-preserved, thus uncertainly identified specimens from the Bakony profiles.

Measurements.

J-10888	?117	?58 (?49.5)	—	?23 (?19.6)
J-10889	?134	?60 (?44.7)	38 (?28.3)	?36 (?26.8)
J-10893	73	34 (46.5)	22 (30.1)	14 (19.1)

Description. Large *Haploceras* with moderately narrow and not too deep umbilicus. The umbilical wall is low and steep, the ventrolateral edge is rounded and the venter is slightly arched. The whorls are compressed with oval whorl-section, the maximal thickness lies near the umbilical margin. The aperture is evenly arched, sinuous.

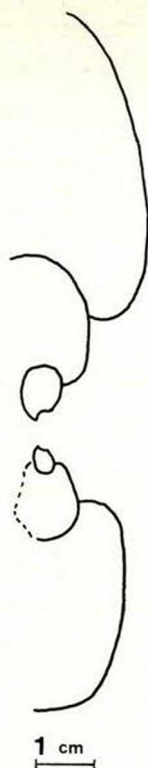


Figure 6. *Haploceras (Haploceras) elimatum* (OPPEL) (J-10889).
Cross-section. Rendkő, a specimen collected from the loose material.

The shell is unsculptured, but some rare specimens show very weak, slightly curved rib-like elements on the upper part of the flanks of the body chamber. Fine growth-lines are shown on the shell of some fairly preserved portions.

The suture-line is well-divided with developed, high first lateral saddle.

Remarks. The closest ally of *H. (H.) elimatum* is *H. (H.) staszycii*. On the basis of the whorl-section, however, the two species are usually easily distinguishable: the compressed whorls of *H. (H.) elimatum* are oval in section, while the other species has less-compressed, subquadrangulate whorls.

H. (H.) elimatum is distinguished from *H. (H.) wohleri* with its narrower and smooth venter, while from *H. (H.) cassiferum* with the lack of the characteristic protrusion.

Distribution. This OPPEL's species is a very common form in the Mediterranean Tithonian. Accordingly, this is a very frequent element all in the Bakony profiles.

Dimorphism. The forms ranged into this species are macroconchs.

Haploceras (Haploceras) staszycii (ZEUSCHNER, 1846)

Text-fig. 7

- 1846 *Ammonites Staszycii* Z. — ZEUSCHNER, pl. 4, fig. 3.
 1868 *Haploceras Staszycii* Z. — GEMMELLARO, p. 34, pl. 7, figs. 1–3.
 1870 *Haploceras Staszycii* Z. — ZITTEL, p. 168, pl. 27, figs. 2–6.
 1879 *Haploceras Staszycii* Z. — FONTANNES, p. 11, pl. 2, fig. 4.
 1960 *Haploceras staszycii* Z. — COLLIGNON, pl. 142, fig. 539.
 1976 *Haploceras staszycii* (Z.) — HIMSHIASHVILI, p. 67, pl. 2, fig. 2.
 1978 *Haploceras staszycii* (Z.) — OLÓRIZ, p. 15, pl. 1, fig. 1.
 1979 *Haploceras staszycii* (Z.) — SAPUNOV, p. 43, pl. 7, fig. 3.
 1984 *Haploceras staszycii* (Z.) — ROSSI, p. 89, pl. 31, fig. 8.
 1986 *Haploceras (Haploceras) carachtheis* (M.) (Z.) *morphe staszycii* — ENAY and CECCA, pl. 4, fig. 2.

Material. A single numbered specimen (J-10895) from Bed 50 of Hárskút, Közöskút ravine profile II, and some other fragments of unceratin identification.

Measurements.

J-10895	103	50 (48.5)	44 (42.7)	20 (19.4)
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Description. Medium-sized forms with relatively narrow umbilicus and quadrangulate whorl-section.

Remarks. The "typical", morphologically well-restricted *H. (H.) staszycii* is a rare ammonite. As is was suggested by previous authors, this species of ZEUSCHNER shows transitions toward other, big *Haploceras* species. Most of the specimens figured in the literature are fragmentary or immature. Thus the specific interpretation is uncertainly based.

For distinguishing *H. (H.) staszycii* from *H. elimatum*, *H. tithonium* and *H. cassiferum*, see the remarks of these species, respectively.

Distribution. This species, usually together with *H. elimatum*, is mentioned by several authors from the Mediterranean Tithonian.

Dimorphism. The species unites macroconch forms.

Haploceras (Haploceras) tithonium (OPPEL, 1965)

Text-fig. 8

- 1865 *Ammonites tithonius* OPP. — OPPEL, p. 549.
 1868 *Ammonites tithonius* OPP. — ZITTEL, p. 82, pl. 14, figs. 1–3.
 1976 *Neolissoceras (?) tithonius* (OPP.) — VIGH in FÜLÖP, p. 72, pl. 25, fig. 5.
 1976 *Haploceras tithonius* Opp. — HIMSHIASHVILI, p. 67, pl. 2, fig. 1.
 1978 *Haploceras tithonium* (OPP.) — OLÓRIZ, p. 20, pl. 1, figs. 4 and 5.
 1984 *Haploceras tithonium perumbilicatum* nov. ssp. — VIGH, p. 69, pl. 1, fig. 1.

Material. A single, badly preserved specimen (J-10896) from Bed 42 of the Szilasárok profile.

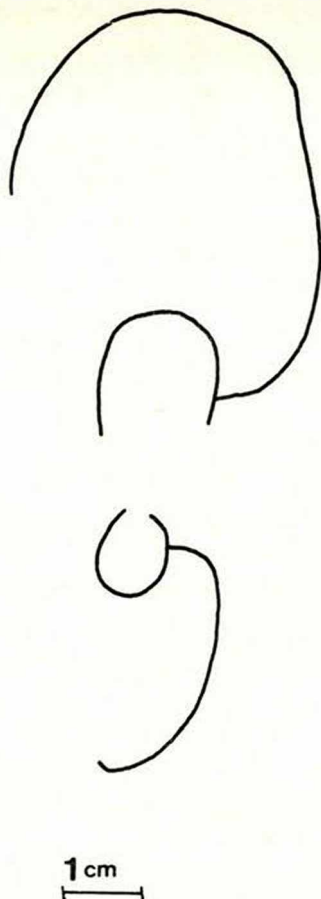


Figure 7. *Haploceras (Haploceras) staszycii* (ZEUSCHNER) (J-10895).
Cross-section, Hárskút, Közöskút ravine, profile II, Bed 50. Fallauxi Zone.

Measurements.

J-10896	60	30 (50.0)	20 (33.3)	?7 (?11.6)
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Description. The figured specimen is a wholly septate, slightly corroded fragmentary internal mould. The umbilicus is narrow and shallow. The umbilical wall is low, without definite umbilical edge. The ventrolateral margin is rounded, the flanks are flattened. The whorl-section is compressed, nearly angular.

Remarks. *H. tithonium* is close to *H. staszycii* in its size and whorl-section. This similarity was recognized also by OLÓRIZ (1978) and VIGH (1984). Forms with whorl-section and umbilical width transitional between the two species were described by OLÓRIZ as *Haploceras staszycii* (Z.)

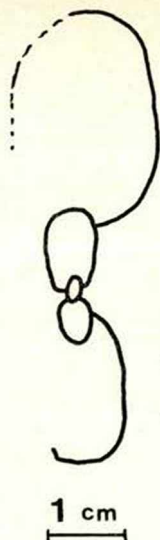


Figure 8. *Haploceras (Haploceras) tithonium* (OPPEL) (J-10896).
Cross-section. Szilasárok, Bed 42. Upper Tithonian.

transiens tithonium (OPP.), and by VIGH as *Haploceras tithonium perumbilicatum* nov. ssp.

On the other hand, *H. tithonium* is close to forms ranged into the genus *Neolissoceras* SPATH, 1923. This is why KILIAN (1869, p. 644) mentioned an ammonite as *Haploceras Grasi* D'ORB. sp. *tithonium* OPP. sp. BLANCHET (1928, p. 292), similarly, cited the species *tithonium* as a variety of the species of D'ORBIGNY.

Distribution. This species is characteristic, but not too common in Mediterranean Tithonian faunas. The here figured specimen came from the Upper Tithonian of the Szilasárok profile.

Dimorphism. The species unites macroconch forms.

Haploceras (Haploceras) wohleri (OPPEL, 1865)

Plate III, figs. 1 and 2; text-fig. 9

1865 *Ammonites Wöhleri* OPP. — OPPEL, p. 549.

1868 *Ammonites Wöhleri* OPP. — ZITTEL, p. 84, pl. 14, fig. 4.

Material. 4 specimens (J-10897—J-10899, J-10149) from the Hárskút 12, Eperkéshegy and Sümeg profiles.

Measurements.

J-10897	105	—	36 (34.2)	—
J-10898	130	64 (49.2)	?54 (?41.5)	?26 (?20.0)
J-10899	146	70 (47.9)	?62 (?42.4)	?35 (?23.9)

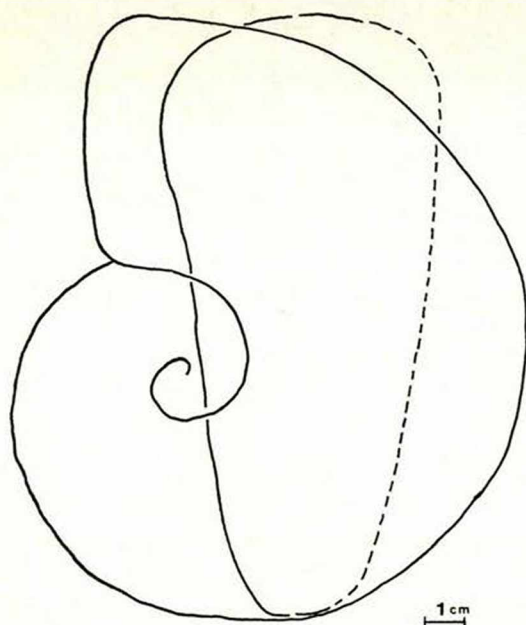


Figure 9. *Haploceras (Haploceras) wohleri* (OPPEL) (J-10899).
Eperkéshegy, Bed 6. Lower Tithonian.

Description. This is the biggest *Haploceras* species. The umbilicus is narrow, moderately deep, the umbilical and ventrolateral margins are rounded. The lateral sides are slightly convex, the venter is arched. The whorl-section is compressed oval. The body chamber occupies more than the half of the last whorl. The venter of the last half whorl of the adult specimen is sculptured by characteristic ribs.

Remarks. This rare species has been not figured since ZITTEL (1868) and even its citations are scarce in the literature.

The Hárskút specimen (Pl. II, figs. 1-2), with its ribs on the external side of the body chamber and the outline of the aperture matches well the specimen from Stramberg. Whether the strong ribs are continuous down on the flanks (as on ZITTEL's ammonite) cannot be decided because of the corrosion of the Hárskút specimen. On the other hand, the outline of the upper part of the aperture is clearly visible, with the elongated ventral and the deeply sinuous lateral part. The strong lappet shown on ZITTEL's figure is only guessed. There are some conspicuous differences, too: the specimen from Stramberg is bigger, accordingly its body chamber is wider and its ventral ribbing is stronger.

The "typical appearance" (i. e. bigger size, wide venter) is better approached by the specimen from the Eperkéshegy profile. However, these specimens, probably due to the lack of the shell and to subsolution, do not show the characteristic ventral ribs.

Distribution. This species has been cited by TOUCAS (1890) from Ardèche, with Upper Tithonian – Lower Cretaceous ammonites. OLÓRIZ (1978) described two specimens from the lower part of the Richter Zone of the Sierra Gorda. VIGH (1984) mentioned numerous specimens from the Middle Tithonian of the Sümeg profile. The Hárskút specimen came from an Upper Tithonian assemblage, while the Eperkéshegy specimen was yielded by a bed ranged into the Lower Tithonian.

Dimorphism. The species comprises of macroconch forms.

Haploceras (Haploceras) cassiferum nov. sp.

Plate IV, figs. 1 and 2, Plate V, figs. 2 and 3,
text-fig. 10

1978 *Haploceras* sp. 1. – OLÓRIZ, p. 30, pl. 1, figs. 9 and 10.

1986 *Haploceras (Volanites) verruciferum* (ZITTEL) (M) – ENAY and CECCA, p. 48, pl. 1, figs. 1 and 9.

Derivatio nominis: cassis (Lat.) = helmet; fero (Lat.) = to bear. The name refers to the protrusion appearing on the ventral termination of the adult body chamber.

Locus typicus: Lókút Hill, Transdanubian Central Range.

Stratum typicum: Bed 56 of Lower Tithonian age.

Diganosis: Relatively big and moderately evolute *Haploceras* with compressed, quadrangular whorls. Behind the adult aperture there is a strong ventral flare resembling that on *H. (Hy.) verruciferum*.

Material. Besides the holotype (J-9672) there are two good and three poorly-preserved sapecimens from the Bakony profiles and from the Kál-vária Hill of Tata (J-10900-J-10903, J-8048).

Measurements.

J-9672 (Holotype)	102	?45 (?44.1)	?36 (?35.2)	?23 (?22.5)
J-8048	105	45 (42.8)	32 (30.4)	26 (27.4)
	83	38 (45.7)	—	20 (24.0)
J-10900	100	42 (42.0)	—	28 (28.0)
J-10901	102	43 (42.1)	?43 (?33.3)	?28 (?27.4)

Description. Big *Haploceras* with ca. 10 cm adult diameter. A moderately evolute form, with excentrically coiled body chamber. The umbilicus is shallow, the umbilical wall is steep, leaning back inside, both on specimens with shell and on the casts. The umbilical margin is rounded, the flanks are slightly convex, nearly flat, and meet the arched venter with rounded ventrolateral edge. The whorls are compressed, their section is quadrangular or trapezoidal.

The body chamber occupies about the half of the last whorl. At its termination, behind the aperture, there is a very characteristic ventral flare. This is clearly shown on the shelly specimen (see that from Tata, Pl. V, fig. 3) and on the internal cast as well. Following the flare, there is a

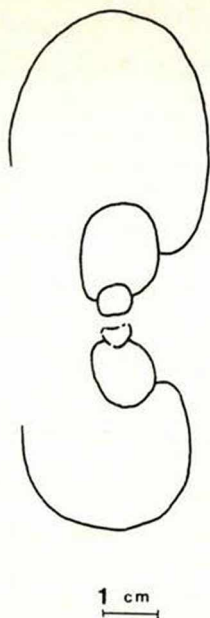


Figure 10. *Haploceras (Haploceras) cassiferum* nov. sp. (J--10902).
Cross-section. Hárskút. Közöskút ravine, profile II, Bed 63. Darwini Zone.

moderately protruded extension with rounded margin. The lip-like rostrum — as far as it shown on the partly broken specimen — continues laterally in a slightly undulating apertural margin.

The internal moulds are completely smooth. The shelly specimen from Tata shows faint growth-lines.

The suture-line is strongly divided, as it is general in *Haploceras*. The first lateral saddle is highly elevated.

Remarks. This new species is similar to *H. (Hy.) verruciferum*: both have the terminal flare on the body chamber. However, *H. (H.) cassiferum* can be easily distinguished from ZITTEL's species by the smaller size of this latter. The adult specimens with preapertural flare have ca. 60 mm maximal diameter in *H. (Hy.) verruciferum*, while this adult feature appears at ca. 100 mm diameter in *H. (H.) cassiferum*. The shape of the preapertural flare is also different, and the whorl-section of the two species are also dissimilar. In this latter feature *H. (H.) cassiferum* is close to *H. (H.) staszycii* (ZEUSCHNER). Nevertheless, previously published data suggest, that ZEUSCHNER's species is more involute. The pre-apertural flare, as distinguishing feature needs further considerations. The original of ZEUSCHNER is a relatively young specimen, so lacks the flare, an adult character. ZEUSCHNER did not mention its presence in the description. This is the same with most of the subsequent authors (KILIAN 1889, DEL CAMPANA 1905, BLASCHKE 1911, JEKELIUS 1916, RAMACCIONI 1939, DONZE and

ENAY 1961). Most figured specimens are young or incomplete — thus without flare. Only ZITTEL (1870) and OLÓRIZ (1978) mentions, that ZEUSCHNER's species shows a weak protrusion behind the aperture. OLÓRIZ (loc. cit., p. 33) even gave a drawing of this feature. However, it is probable, that the specimen figured as *H. staszycii*, similarly as that described as *H. sp. 1.* by OLÓRIZ, can be ranged into *H. (H.) cassiferum*.

The form described here as new species, was regarded by ENAY and CECCA (1986) as conspecific and macroconch of the *verruciferum* of ZITTEL. According to their studies, this "species" was separated even in the top-most Darwini Zone. Those forms with pre-apertural flare are ranged by these authors into their subgenus *Haploceras (Volanites)*.

Distribution. The holotype came from the Lower Tithonian of the Lókút profile, other specimens were yielded by the Hárskút, Közöskút ravine profile II, Beds 63 and 64, Darwini Zone.

The *Haploceras sp. 1.* specimens of OLÓRIZ from the Subbetics came from the Lower Tithonian (upper Hybonotum Zone — basal *Verruciferum* Zone). According to the studies of ENAY and CECCA, who interpreted the species in wide sense, gave a distribution from the top of the Darwini Zone to the base of the Fallauxi Zone.

Dimorphism. *H. (H.) cassiferum* includes probably macroconch forms. It is possible, that this new species is the dimorph pair of the microconchiate *H. (Hy.) verruciferum*.

Subgenus *Haploceras (Hypolissoceras)* BREISTROFFER, 1947

Type species. *Ammonites carachtheis* ZEUSCHNER, 1847, by original designation of BREISTROFFER.

Observations. This subgenus includes the microconch pairs of the macroconchiate *Haploceras*.

Haploceras (Hypolissoceras) carachtheis (ZEUSCHNER, 1846)

Plate III, figs. 3 and 4

- 1846 *Ammonites carachtheis* Z. — ZEUSCHNER, pl. 4, fig. 1.
 1868 *Ammonites carachtheis* Z. — ZITTEL: p. 84, pl. 15, figs. 1–3.
 ? 1970 *Ammonites carachtheis* Z. var. *subtilior* Z. — Zittel, p. 172, pl. 27, fig. 11.
 1877 *Ammonites (Haploceras) carachtheis* Z. — FAVRE, p. 24, pl. 3, fig. 5.
 1879 *Haploceras carachtheis* Z. — FONTANNES, p. 10, pl. 2, fig. 3.
 1880 *Ammonites (Haploceras) carachtheis* Z. — FAVRE, p. 29, pl. 2, fig. 10.
 ? 1890 *Haploceras carachtheis* Z. — TOUCAS, p. 577, pl. 13, fig. 5, pl. 15, figs. 7 and 8.
 ? 1893 *Haploceras carachtheis* Z. — RETOWSKI, p. 242, pl. 9, figs. 10 and 11.
 1939 *Lissoceras carachtheis* (Z.) — RAMACCIONI, p. 196, pl. 13, fig. 13.

- 1962 *Glochiceras carachththeis* (Z.) — BARTHEL, p. 17, pl. 2, fig. 1–4, pl. 3, figs. 1–7.
- non 1970 *Haploceras* (*Haploceras*) *carachtheis* (Z.) — BERNOULLI and RENZ, p. 597, pl. 5, fig. 2.
- 1976 *Haploceras* (*Neoglochiceras*) *carachtheis* (Z.) — PATRULIUS and AVRAM, p. 168, pl. 3, fig. 8.
- 1978 *Glochiceras* (*Lingulaticeras*) *carachtheis* (Z.) — OLÓRIZ, p. 124, pl. 10, figs. 6–8.
- 1979 *Glochiceras* (*Glochiceras*) *carachthais* (Z.) — SAPUNOV, p. 64, pl. 14, fig. 2.
- 1983 "*Haploceras*" *carachtheis* (Z.) — CECCA et al., p. 114, pl. 1, fig. 3.
- non 1984 "*Haploceras*" *carachtheis* (Z. Z.) — ROSSI, p. 91, pl. 31, fig. 3.
- 1984 *Haploceras* (*Neoglochiceras*) *carachtheis* (Z.) — VIGH, pp. 145 and 146.
- 1986 *Haploceras* (*Haploceras*) *carachtheis* (m) (Z) morphe *carachtheis* — ENAY and CECCA, p. 49, pl. 2, figs. 3 and 4, pl. 3, figs. 1, 2, 10–14 (only)

Material. 6 numbered specimens (J–10904–J–10909) and numerous fragments from the Bakony profiles.

Measurements.

J–10909	45	17 (37.4)	12 (26.6)	13 (28.8)
	35	11 (31.4)	?10 (?28.5)	8 (22.8)

Description. Small to medium-sized species with 60 to 65 mm maximal diameter. The umbilicus is moderately wide and shallow. The umbilical wall is rather low and steep, with rounded umbilical margin towards the hardly convex, almost flat flanks. The ventrolateral edge is rounded, the venter is slightly convex. Accordingly, the whorl-section is nearly rectangular. More than half of the last whorl is occupied by the body chamber. On the ventral side of the body chamber numerous folds appear, which are conspicuous on subsolved specimens only behind the aperture. In exceptional cases even the internal moulds show the aperture, which is very similar to that of the specimens figured by ZITTEL and BARTHEL. The terminal ventral protrusion can be seen in several specimens, and occasionally the lateral lappets are also indicated.

This is a rather variable species. Coiling, form of the umbilical margin and depression of the venter show some differences, which were noticed previously by OLÓRIZ. However, those narrowly-umbilicated forms which were figured by BERNOULLI and RENZ (1970) and ROSSI (1984) are probably not conspecific.

Remarks. Except the verruciferum group, all classic *Haploceras* species have been regarded by ENAY and CECCA (1986) as the macro- and microconchs and their infraspecific forms of a single species. Accordingly, the name of this so widely interpreted species is *H. carachtheis* (ZEUSCHNER), by priority.

H. (Hy.) carachtheis is most closely allied to *H. (Hy.) leiosoma*. The adults of ZEUSCHNER's species, however, are well distinguished by their smaller size, narrower umbilicus and more oblique umbilical wall. Further difference is that *H. (Hy.) carachtheis* has more ventral folds.

Distribution. *H. (Hy.) carachtheis* is a characteristic element in Mediterranean Tithonian faunas. Accordingly, it occurs in all Bakony profiles.

Dimorphism. The group of ZEUSCHNER's species unites microconchiate forms, a fact suggested previously by other authors, too.

Haploceras (Hypolissoceras) leiosoma (OPPEL, 1865)

Plate III, figs. 5, 6, 7, text-fig. 11

1865 *Ammonites leiosoma* OPP. — OPPEL, p. 550.

1870 *Ammonites leiosoma* OPP. — ZITTEL, p. 86, pl. 14, figs. 5 and 6.

1890 *Haploceras leiosoma* OPP. — TOUCAS, p. 594, pl. 15, figs. 9 and 10.

1960 *Haploceras leiosoma* (OPP.) — RAILEANU et al., p. 17, pl. 6, fig. 16.

1978 "*Haploceras*" *leiosoma* (OPP.) — OLÓRIZ, p. 29, text-fig. p. 33.

1986 *Haploceras (Haploceras) carachtheis* (m) (Z.) *morphe leiosoma* — ENAY and CECCA, pl. 2, fig. 9, pl. 3, figs. 3–5.

1986 *Haploceras (Haploceras) carachtheis* (m) (Z.) — ENAY and CECCA, pl. 2, figs. 1, 8, pl. 3, fig. 6.

Material. Six numbered internal mould (one with partially preserved shell) (J-10910–J-10915), and numerous uncertainly determined fragments from the Bakony profiles.

Measurements.

J-10191	39	19 (48.7)	14 (35.8)	7 (17.9)
	?32	17 (?53.1)	12 (?37.5)	6 (?18.7)

Description. Small form with 40 mm maximal diameter. The umbilicus is narrow, the umbilical wall is slightly oblique and rounds evenly into



1 cm

Figure 11. *Haploceras (Hypolissoceras) leiosoma* (OPPEL) (J-10910).
Cross-section. Hárskút, Közöskút ravine, profile II, Beds 45. Fallauxi Zone.

the completely flat lateral side. The ventrolateral margin is rounded, the venter is almost flat. The whorls are higher than wide, their section is quadrangular. The external anterior part of the body chamber in adult specimens bears some (10 to 12) fine ventral grooves, which are deepest in the middle of the venter. The folds between the grooves are hardly elevated above the periphery. One shelly specimen shows, that these folds are continued as slightly curved and weakening riblets onto the ventrolateral margin and somewhat beyond. The body chamber occupies about the terminal half of the last whorl.

Remarks. The closest ally of *H. (Hy.) leiosoma* is *H. (Hy.) carachtheis*. The differences are discussed above, in the description of this latter species.

Distribution. *H. (Hy.) leiosoma* is a characteristic element in the Mediterranean Middle and Upper Tithonian. The Bakony specimens came from beds of Semiforme, Fallauxi, Ponti and Microcanthum Zone ages.

Dimorphism. This species includes microconch forms.

Haploceras (Hypolissoceras) rhinotomum ZITTEL, 1870

Plate III, figs 8 and 9, text-fig. 12.

1870 *Haploceras rhinotomum* ZITT. — ZITTEL, p. 171, pl. 28, fig. 1.

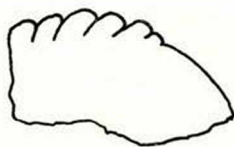
1928 *Lissoceras rhinotomum* ZITT. — BLANCHET, p. 270, pl. 1, fig. 1.

1978 *Haploceras rhinotomum* ZITT. — OLÓRIZ, p. 22, pl. 1, fig. 12.

1986 *Haploceras (Haploceras) carachtheis* (m) (Z.) morphe *rhinotomum* — ENAY and CECCA, p. 51, pl. 2, fig. 6.

Material. Three fragmentary internal moulds (J-10916-J-10919 from the Hárskút, Közöskút ravine profile II).

Description. Each specimen is fragmentary body chamber of adult individuals, thus the periumbilical parts cannot be studied. The flanks are flat, the ventral part is rounded. The whorls are compressed. On the terminal part of the body chamber 5 to 6 strong, rectiradiate ventral folds appear. These folds are hardly elevated from the venter, and are separated



1 cm

Figure 12. *Haploceras (Hypolissoceras) rhinotomum* ZITTEL (J-10918). Ventral folds appearing on the adult body chamber. Hárskút, Közöskút ravine, profile II, Bed 45. Fallauxi Zone.

by deep grooves. Deepest grooves and strongest folds appear anteriorly, the folds gradually merge into the venter posteriorly.

Remarks. The ventral folds of the adults are so characteristic, that this is a solid base in distinguishing this species from the other congeneric forms.

Distribution. This species is a characteristic, but not too common element in the Mediterranean province. ZITTEL (1870) and BLANCHET (1928) and TOUCAS (1890) mentions this species from the Upper Tithonian, while OLÓRIZ ranged his material into the "Admirandum - Biruncinatum Zone". The Bakony specimens came from Beds 45 and 47, i. e. from the Fal-lauxi Zone of the Hárskút profile.

Dimorphism. The forms ranged into this species are microconchs.

Haploceras (Hypolissoceras) verruciferum (ZITTEL, 1869)

Plate IV, figs. 3 and 4, Plate V, fig. 1, Pl. VI, figs. 3 to 6,
text-figs. 13 and 14.

- 1869 *Ammonites verruciferus* MENEGHINI - ZITTEL, p. 145.
 1870 *Haploceras verruciferum* MGH. - ZITTEL, p. 52, pl. 27, figs. 8-10.
 1890 *Haploceras verruciferum* MGH. - TOUCAS, p. 577, pl. 13, fig. 7.
 1905 *Haploceras verruciferum* MGH. - DEL CAMPANA, p. 46, pl. 1, figs. 10 and 11.
 1939 *Lissoceras verruciferum* MGH. - RAMACCIONI, p. 197, pl. 13, fig. 14.
 1978 *Haploceras verruciferum* MGH. - OLÓRIZ, p. 23, pl. 1, figs. 6-8.
 1983 *Haploceras verruciferum* (MGH.) in ZITTEL - CECCA et al., p. 116, pl. 1, fig. 4.
 1984 *Hapliceras verruciferum* MGH. - ROSSI, p. 90, pl. 31, fig. 7.
 pars 1986 *Haploceras (Volanites) verruciferum* (ZITTEL) (m) - ENAY and CECCA, p. 48, pl. 1, figs. 2-8, pl. 2, figs. 11-15. (only)
 1986 *Haploceras verruciferum* (ZITT.) - SARTI, p. 490, pl. 1, fig. 6.
 1987 *Haploceras verruciferum* (ZITT.) - FÖZY, pl. 2, fig. 4.

Observations. The first reference to this species is that of ZITTEL (in BENECKE 1869, p. 145). His short description mentions, that one specimen of this characteristic species, kept in that time in the collections in Pisa, had been labelled as "Ammonites verruciferus" by MENEGHINI. On the label there was written - with the very apt name - some remarks only. The first published description and figures, maintaining the name given originally by MENEGHINI, are those of ZITTEL. Consequently, he should be regarded as the author of the species.

Material. 23 numbered specimens (J-10919-J-10940, J-10210) and some further, fragmentary specimens from the Bakony profiles.

Measurements

J-10210	43	13 (30.2)	?12 (?27.9)	?16 (?37.2)
J-10919	61	21 (34.4)	?18 (?29.5)	20 (32.7)
	46	21 (45.6)	?16 (?34.7)	15 (32.6)
J-10920	64	—	18 (28.1)	21 (32.8)
	51	20 (39.2)	16 (31.3)	17 (33.3)
J-10927	41	12 (29.2)	12 (29.2)	13 (31.7)
J-10933	62	—	22 (35.4)	22 (35.4)
J-10934	45	15 (33.3)	?12 (?26.6)	15 (33.3)
J-10935	68	22 (32.3)	18 (26.4)	21 (30.8)
	54	21 (38.8)	?16 (?29.6)	16 (29.6)
J-10938	53	20 (37.7)	16 (31.0)	22 (41.5)

Description. Medium-sized, rather evolute form. The adult diameter is 41 to 68 mm. The umbilicus is broad and shallow, the umbilical margin is rounded. The whorls are slightly higher than wide, with nearly angular section. The usually somewhat excentrically coiled body chamber occupies about 2/3 of the last whorl. The aperture, seen rarely in internal casts, matches well that on the specimens of ZITTEL. The very characteristic

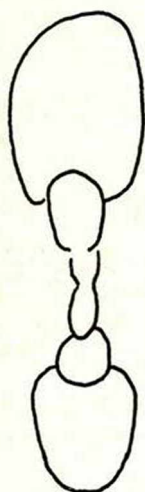


Figure 13. *Haploceras* (*Hypolissoceras*) *verruciferum* (ZITTEL) (J-10920).
Cross-section. Lókút Hill, Bed 53.
Semiforme Zone.

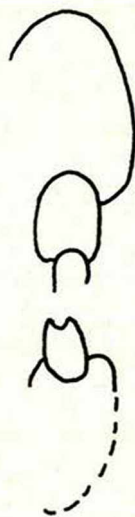


Figure 14. *Haploceras* (*Hypolissoceras*) *verruciferum* (ZITTEL) (J-10933).
Cross-section. Szilasárok, Bed 94.
Semiforme Zone.

wart, or verruca on the external side of the end of the body chamber is shown by several specimens clearly. This small, 3 to 5 mm flare is protruded above the venter, it is slightly curved backward, then abruptly cut or gradually slopes into the venter.

The suture-line is strongly divided, but cannot be traced exactly on the corroded internal casts.

Remarks. This species is easy to recognize but rather difficult to distinguish. The original figures of ZITTEL show two adult specimens of rather different size: the bigger is 65 mm, the smaller is 43 mm. The large material of OLÓRIZ, just as the Bakony specimens, shows variation within distant extremes, thus the species is rather variable.

Closest form to *H. (Hy.) verruciferum* is that described here as *H. (H.) cassiferum* nov. sp. However, ZITTEL's species differs in smaller size and in the outline of the characteristic terminal flare on the body chamber.

Distribution. *H. (Hy.) verruciferum* is a characteristic element in Mediterranean Lower Tithonian faunas. The species is recorded from the whole Alp-Carpathian area. Being an easily recognizable and common form, which occurs in a well-defined horizon in the Lower Tithonian, OLÓRIZ (1978) choosed it as a zonal index. However, the Verruciferum Zone corresponds more or less to the previously introduced Semiforme Zone of ENAY and GEYSSANT (1975). The priority of this latter name is not influenced by the fact, that *H. (H.) verruciferum* is usually more common than *S. semiforme* in the fauna.

Dimorphism. ENAY and CECCA (1986) described the forms of the *H. verruciferum* group as microconchs. According to these authors, the macroconch pair is the form what described here as *H. (H.) cassiferum* nov. sp. The dimorphic relation of the two forms is quite reasonable.

Genus *Pseudolissoceras* SPATH, 1925

Type species. *Neumayria zitteli* BURCKHARDT, 1903, by original designation of SPATH (1925, p. 113).

Occurrence. The genus is recorded outside the Mediterranean region, too. It is also known from Argentina, Cuba and Kurdistan.

Dimorphism. No dimorphism is proved within this genus.

Pseudolissoceras olorizi nov. sp.

Plate IV, figs. 1 and 2, text-fig. 15

Derivatio nominis: Referring to Dr. FEDERICO OLÓRIZ, Spanish paleontologist.

Locus typicus: Hárskút, Közöskút ravine, profile II, Bakony Mountains, Transdanubian Central Range.

Stratum typicum: Bed 66, i. e. Middle Tithonian, Pálhálás Limestone Formation.

Diagnosis: Medium-sized, rather evolute form. Ventral part in middle whorls is characteristically fastigate. Suture-line is *Pseudolissoceras*-type, but conspicuously reduced.

Material. The holotype (J-10941) and three additional fragmentary specimens (J-10942, J-10943, J-9769).

Measurements.

J-10941 (Holotype)	89	29 (32.5)	?32 (?35.9)	32 (35.9)
	61	28 (45.9)	?22 (?36.0)	16 (26.2)
J-10942	57	19 (33.3)	13 (22.8)	20 (35.0)

Description. A medium-sized form with relatively broad and shallow umbilicus. The umbilical wall is steep, but not too high. The umbilical margin rounds into the slightly convex flanks. Maximal width is situated around the middle of the compressed whorls. The whorl-section is characteristic: the venter is fastigate in the middle, and rounded on the outer whorls. The internal moulds do not show sculpture or growth-lines. The aperture is unknown. The holotype shows crowded last sutures. The slightly excentric body chamber occupies nearly the half of the last whorl. All these indicate adult, nearly complete specimen. On the middle whorl the first lateral lobe is clearly visible: it has characteristic, simply-serrated side. The periumbilical elements of the suture-lines are hardly discernible, because of subsolution.

Remarks. This new species is clearly distinguished from the *P. rasile* group [*P. rasile* (OPPEL, 1865), *P. planisulcum* (ZITTEL, 1870), *P. pseudo-oliticum* (HAUPT, 1907)]. These show subcircular whorl-section or rounded venter, while *P. olorizi* has relatively high, compressed, slightly convex whorls.

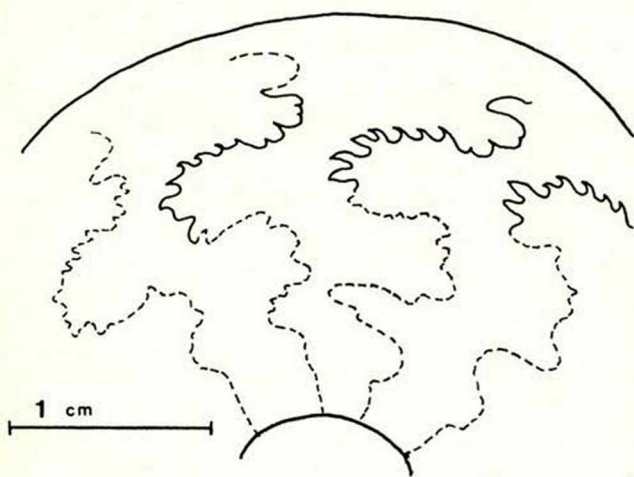


Figure 15. *Pseudolissoceras olorizi* nov. sp. (Holotype, J-10904). Suture-line. Hárskút, Közöskút ravine, profile II, Bed 66. Lower Tithonian, (?) Hybonotum Zone.

The species of the *P. zitteli* group [*P. zitteli* (BURCKHARDT, 1903), *P. concorsi* DONZE et ENAY, 1961, *P. advena* SPATH, 1950, *P. bavaricum* BARTHEL, 1962] are similar in many characters. The relatively high whorl-section is a common feature. However, *P. olorizi* is distinguished by its wider umbilicus and conspicuously fastigate middle whorls.

The suture-line of this new species is similar to that of *P. bavaricum*. This latter, however, has different, narrower whorl-section. The Bakony specimens ranged into the new species are very near to *Pseudolissoceras* sp. 2. of OLÓRIZ (1978, pl. 2, fig. 4).

Distribution. The holotype came from Bed 66 (probably Hybonotum Zone) of the Hárskút, Közöskút ravine, profile II. Other specimens were yielded by Beds 106 and 93 (Hybonotum and Semiforme Zones) of the Szilasárok profile and Bed 54 of the Lókút Hill profile. *Pseudolissoceras* sp. 2 of OLÓRIZ came from the Verruciferum Zone.

Dimorphism. To trace the possible dimorphic nature of this form needs further studies.

Superfamily Perisphinctaceae Steinmann, 1890

Family Simoceratidae Spath, 1924

Observations. The name *Simoceras* was originally introduced by ZITTEL in 1870 for some Tithonian ammonites. Subsequently certain Kimmeridgian forms from the several dozens of species ranged into this genus have been grouped into numerous newly designated genera. The same tendency can be followed in the case of the Tithonian forms. Thus the current Tithonian genera of the family are as follows:

— *Simoceras* ZITTEL, 1870. Medium-sized, shallowly-umbilicated forms with oval whorl-section. The nucleus is ribbed, the middle and outer whorls have an umbilical and a ventrolateral tubercule-row, with denser tubercules in the latter.

— *Virgatosimoceras* SPATH, 1925. Medium-sized forms with subrectangular whorl-section. Ribbing is formed mainly by bifurcating ribs with intercalated simple or rarely trifurcating ones.

— *Lytogyroceras* SPATH, 1925. Medium- and small-sized, extremely evolute forms with oval whorl-section. The inner whorls bear fine ribs fading out on the middle whorls.

— *Simolytoceras* OLÓRIZ, 1978. Medium-sized forms with oval whorl-section, dense ribbing on the inner whorls, ribs and tubercules on the middle whorls and with smooth outer whorl.

— *Baeticoceras* GEYSSANT, ENAY et BUSNARDO, 1979. Medium- and big-sized, extremely evolute forms with quadrangular-trapezoidal whorl-section. The shell is ribbed throughout, characteristic is the appearance of split, doubled ribs. The middle and outer whorls bear an umbilical tubercule row and an outer row of well-developed, clavus-like tubercules.

— *Volanoceras* GEYSSANT, 1985. Middle- to big-sized forms with oval-quadrangular whorl-section. The entirely ribbed shell shows an umbilical and a better developed ventrolateral tubercule-row throughout, from early ontogenetic stages.

Recently several works have been published on the stratigraphic and geographic distribution of *Simoceras*. The new results suggest, that the detailed outlining of phylogenetic connections may help to arrange the several arbitrary genera into a refined system of fewer categories.

Occurrence. The available data indicate, that the group forms a characteristic element in Mediterranean and Submediterranean faunas. Earliest Simoceratids appear in the Lower Tithonian (Darwini Zone, SANTANTONIO 1985), and the last representatives are *Baeticoceras* described from the Upper Tithonian Microcanthum Zone. Phylogeny within the family seems to follow a trend of size increase and of reduction of dimorphic size ratio.

Dimorphism. Many groups within the family show dimorphism. GEYSSANT (1979) suggested the presence of dimorphic pairs within the genus *Baeticoceras*, while SANTANTONIO (1985) recognized micro- and macroconchs in the species *S. aesiense* and *S. volanense*.

Genus *Volanoceras* GEYSSANT, 1985

Type species. *Ammonites Volanensis* OPPEL, 1869, by original designation of GEYSSANT 1985, p. 679.

Observations. AS GEYSSANT (1985) pointed out, several uncertainties arised from the improper designation of *Simoceras* and its type. She restricted the original *Simoceras* name to the *S. biruncinatum* — *S. admirandum* group, and introduced generic name *Volanoceras* for the "S." *volanense*, "S." *schwertschlagerei* and "S." *aesinense* species.

Diagnosis. Medium-sized, widely-umbilicated forms with nearly rectangular whorl-section. The inner whorls bear simple or bifurcating ribs, the middle and outer whorls have strong, radial, simple ribs with well developed umbilical and ventrolateral tubercules. The umbilical tubercules are stronger than the outer ones. The whorls bear strong, slightly prorsiradiate constrictions. The aperture is probably simple, the suture-line is rather simple, *Simoceras*-type.

Occurrence. The *Volanoceras* species are characteristic elements in Mediterranean and Submediterranean Lower and Middle Tithonian faunas.

Dimorphism. The genus shows distinct dimorphism. SANTANTONIO (1985) recognized microconch-macroconch pairs within the species "S." *volanense* and "S." *aesinense*. However, the specific pairing of dimorphs especially in the case of poorly-preserved material, is uncertain. Accordingly, in this present work the larger (macroconchiate) forms are ranged into the nominate subgenus, while the small (microconchate) forms are grouped in *Volanoceras* nov. of subgeneric rank.

Subgenus *Volanoceras* (*Volanoceras*) GEYSSANT, 1985

Volanoceras (*Volanoceras*) *volanense volanense* (OPPEL, 1863)

Plate VII, figs. 1, 2 and 3, Plate VIII, fig. 2, text-fig. 16

- 1863 *Ammonites Volanensis* — OPPEL, p. 231, pl. 58, fig. 2.
 non 1870 *Simoceras Volanense* OPP. — ZITTEL, p. 213, pl. 32, fig. 7 (?syntetized drawing? — see GEYSSANT, 1985)
 non 1870 *Simoceras Volanense* OPP. — ZITTEL, p. 213, pl. 32, figs 8 and 9 [= probably *V. (V.) magnum* (OLÓRIZ)]
 ? 1871 *Simoceras Volanense* OPP. — GEMMELLARO, p. 40, pl. 9, fig. 5.
 non 1885 *Simoceras Volanense* OPP. — MENEGHINI, p. 376, pl. 20, fig. 9 [= *V. (V.) aesinense* (MGH.)]
 non 1905 *Simoceras Volanense* OPP. — DEL CAMPANA, p. 110, pl. 6, fig. 9 J = *V. (V.) magnum* (OLÓRIZ)]
 non 1928 *Simoceras* aff. *Volanense* OPP. — KRANTZ, p. 13, pl. 3, fig. 7. (Probably different genus)
 1939 *Simoceras volanense* OPP. — RAMACCIONI, p. 231, pl. 58, fig. 2.
 ? 1942 *Simoceras* sp. juv. cf. *S. volanense* OPP. — IMLAY, p. 1445, pl. 3, figs. 2 and 3.
 ? 1966 *Simoceras* aff. *volanense* OPP. — LINARES and VERA, pl. 3, fig. 5.
 non 1970 *Simoceras* cf. *volanense* OPP. — BERNOULLI and RENZ, p. 600, pl. 6, figs. 4–6.
 non 1973 *Simoceras* cf. *S. volanense* (OPP.) — VERMA and WESTERMANN, p. 196, pl. 32, fig. 2.
 1978 *Simoceras (S.) volanense volanense* (OPP.) — OLÓRIZ, p. 219, pl. 20, fig. 5.
 non 1983 *Simoceras (S.) volanense* (OPP.) — CECCA et al., p. 119, pl. 3, fig. 1 [= *V. (V.) aesinense* (MGH.)]
 non 1984 *Simoceras (S.) volanense* (OPP.) — ROSSI, p. 115, pl. 35, fig. 12 [= *V. (V.) aesinense* (MGH.)]
 1986 *Simoceras volanense* (OPP.) — SARTI, p. 508, pl. 6, fig. 7.
 non 1987 *Simoceras* aff. *volanense* (OPP.) — FÓZYZ, p. pl. 1, fig. 1 [= *V. (V.) aesinense* (MGH.)]

Material. Five fairly preserved specimens (J-10944–J-10947, J-10206) and some additional fragments from the Transdanubian Central Range.

Measurements.

J-10944	114	24 (21.0)	?18 (?15.7)	69 (60.5)
	96	19 (19.7)	—	59 (61.4)
	91	18 (19.7)	—	55 (60.4)
J-10206	62	12 (19.3)	?12 (?19.3)	39 (62.9)

Description. Medium-sized forms with wide umbilicus, and whorl-section circular in the beginning and compressed-subangular later. The sculpture of the innermost whorls is a fine, dense, bifurcating ribbing, which

becomes rarer, nearly radial with umbilical and ventrolateral tubercles in the middle and outer whorls. The rounded then longitudinally elongated outer tubercles appear earlier, while the later-appearing, somewhat weaker umbilical tubercles show slight radial elongation. The whorls bear strong constrictions. The aperture is apparently simple. The suture-line is similar to that in other *Volanoceras* species, with wide external saddle and less-indented, rather narrow lateral lobe.

A well-preserved specimen (Pl. VII, figs. 1–3) from Bed 25 of the Hárskút, profile 12, though big (maximal diameter 114 mm), is immature, because does not show sutural crowding. Its suture line drawn at 97 mm diameter is shown in Text-fig. 16. An individual peculiarity is that the proximal part of the body chamber shows traces of a repaired shell damage on both the lateral and ventral sides. Unfortunately the inner parts of the cast are strongly corroded, thus the contemporary sutures cannot be seen.

One specimen from the Sümeg profile (Pl. VIII, fig. 2) shows inner tubercle row of gradual differentiation, and attains full development at ca. 16 mm umbilical width. At about 28 mm umbilical width these umbilical tubercles appear on the lower third of the slightly convex flank. The inner tubercles remain weaker than the outer ones. The ribs between the tubercles are slightly arched, prorsiradiate, and reach the umbilical seam.

Remarks. This OPPEL species, as a characteristic form in Tithonian faunas is commonly recorded from Mediterranean areas. Nevertheless, concerning this classic species, and especially its stratigraphic distribution, numerous problems arise. Explanation was needed to interpret the fact, that this species, member of a rapidly evolving group, “disappears” at the end of the Middle Tithonian Semiforme Zone, and “reappears” and becomes relatively common again one zone later. The solution, as it was suggested by CECCA et al. (1985) and SANTANTONIO (1985) is that the specimens

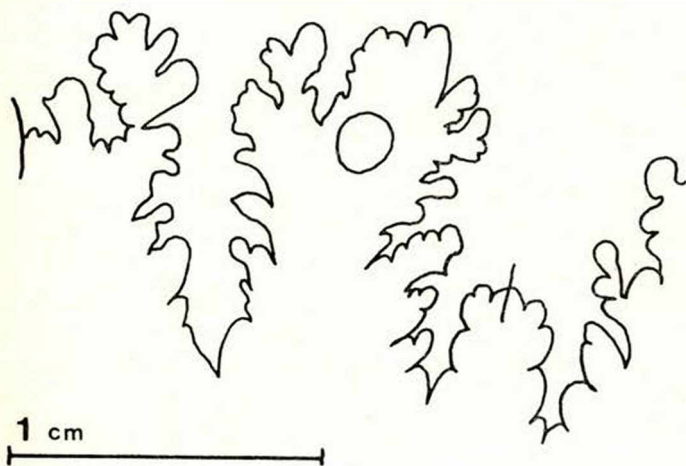


Figure 16. *Volanoceras (Volanoceras) volanense volanense* (OPPEL) (J-10944). Suture-line. Hárskút, Közöskút ravine, profile 12, Bed 25. Ponti Zone.

previously described uniformly as "*volanense*", belong actually into different species. This problem is reflected in several earlier works as applied open nomenclature, uncertain determinations or interrupted distributions in faunal lists or range tabulations.

GEYSSANT (1982) regarded the Semiforme Zone forms (her *Simoceras* n. sp. gr. *volanense*) as the indirect ancestors of the "true" *volanense* occurring in the Ponti Zone. She based the infraspecific evolutionary connections on the punctuated equilibrium model, and understood the areal distribution of the species by allopatric speciation.

CECCA et al. (1985) called the attention to a species, which was figured as a variety of *volanense* and described as "*aesinense*" by MENEGHINI (1885). According to CECCA et al., who interpreted this form as independent species, this is a *volanense* ally, appearing in the Semiforme Zone.

SANTANTONIO (1985) grouped and described similarly his material from the Central Apennines. He gave detailed descriptions on the species of OPPEL and MENEGHINI. He recognized the associated appearance of small and big forms in the Tithonian beds, he applied microconch and macroconch expressions and treated the dimorphism on species level.

On the basis of the studied Transdanubian material and in accordance with the opinions of authors cited above, the s. str. *V. (V.) volanense* is that form, which appears in the Ponti Zone. This can be separated from OPPEL's species both on morphological and stratigraphical grounds from the older form designated as species by MENEGHINI. It is worth mentioning, that the material of other sections suggests, that the specimens of *Volanoceras* species in this restricted sense (i. e. *Volanoceras (V.) volanense volanense*) are rather rare, while the ammonites of the *V. (V.) aesinense* group are more common.

V. (V.) volanense and the closely allied *V. (V.) aesinense* can be distinguished by the following features. The adult specimens of OPPEL's species are larger, their nuclei show bifurcate ribbing, while *V. (V.) aesinense* has simple ribs. The middle whorls of *V. (V.) volanense* bear weaker inner tubercles than the species of MENEGHINI. This distinction, however, is less clear in mature body chambers. The suture-line of *V. (V.) volanense* is incised with deeply elongated lateral lobe, while the suture is rather simple in *V. (V.) aesinense*. As it was mentioned above, the two species is separated also in stratigraphic range.

Another problem is the distinguishing of these two species from the form described by SCHNEID as *S. schwertschlagerei*. As a probably untenable solution, this latter form is treated here as subspecies of *V. (V.) volanense*. *S. schwertschlagerei* is characterized by prorsiradiate ribs and round-based, pointed tubercles, while s. str. *volanense* has nearly radial ribs and longitudinally elongated tubercles. However, the distinction between these forms needs further studies.

OPPEL's species is distinguished from *V. (V.) magnum* and *V. (V.) vicentinum* by its smaller size.

As it is clear from the discussion above, the specimens united previously under the name "*volanense*" can be ranged into some distinct species. Unfortunately the unfigured citations in the literature can be rarely evaluated correctly.

Of the citations mentioned in the synonymy the extra-European occurrences are of special interest. KRANTZ (1928) mentions a well-preserved, partly shelly specimen from Argentina. At it was pointed out by KRANTZ, this form differs from OPPEL's species by its whorl-section, special sculpture and in lack of the characteristic constrictions. Thus it is probably not a conspecific, or even not a congeneric form.

The related form figured by IMLAY (1942) from Cuba as a juvenile "*volanense*" is probably a microconch.

Distribution. This subspecies is characteristic in the Ponti Zone of the Mediterranean Tithonian.

Dimorphism. In this present work only the bigger, macroconchiate forms are ranged into OPPEL's subspecies. The small, probably microconch forms are described in *Volanoceras* nov. subgen. below.

Volanoceras (Volanoceras) volanense schwertschlagerei (SCHNEID, 1915)

Plate VIII, fig. 1

1915 *Simoceras Schwertschlagerei* n. sp. — Schneid, p. 92, pl. 4, fig. 6.

1978 *Simoceras (S.) volanense schwertschlagerei* (SCHNEID) — OLÓRIZ, p. 224, pl. 20, figs. 3 and 6.

1987 *Simoceras schwertschlagerei* (SCHNEID) — FÖZY, pl. 2, fig. 5.

Material. A single specimen (J-10948) from Bed 42 of the Hárskút, Közöskút ravine, profile II, and some uncertain fragments from other localities.

Measurements.

J-10948 ?77 14 (?18.1) ?14 (?18.1) 47 (?61.0)

Description. The specimen from the Hárskút profile shows the features described by SCHNEID, i. e. the slightly prorsiradiate ribs and the row of round-based, pointed outer tubercles. The constrictions, just as in all *Volanoceras*, are deep and prorsiradiate.

Remarks. GEYSSANT (1982) regarded SCHNEID's form as an independent species, which forms a transition between the allied species of the Semiforme and Ponti Zones.

The naming of the Hárskút specimen as *schwertschlagerei* may be curious, because the beds with *S. schwertschlagerei* of the Neuburg succession are better correlated with the Semiforme, than the Ponti Zone of the Mediterranean zonal scheme. Thus *schwertschlagerei*, as a subspecies, would be better ranged into the species *V. aesiense*. However, the Hárskút specimen came undoubtedly from the Ponti Zone, but shows the characteristics of SCHNEID's species. To solve this problem, one needs detailed study on the geographic and stratigraphic distributions of these forms.

Distribution. According to GEYSSANT (1982) the species is known only from the Briançonnais and Francony, but its presence in the s. str. Mediterranean areas is also presumable. GEYSSANT recorded the species from the Semiforme and Fallauxi Zones, the Hárskút specimen came from the Ponti Zone.

Dimorphism. This subspecies comprises of big forms only. The small forms are discussed together with other *Volanoceras* microconchs under the name *Volanoceras* nov. subgen.

Volanoceras (Volanoceras) cf. volanense (OPPEL, 1863)

Material. A single specimen (J-10949) from Bed 65 of the Szilasárok profile.

Remarks. This strongly corroded body chamber fragment shows, that the outer marginal tubercules of the slightly prorsiradiate rib endings are similar to those on OPPEL's species. The inner tubercules are undeveloped. The bed which gave the specimen can be ranged into the Ponti Zone.

Volanoceras (Volanoceras) aesinense (MENEHINI, 1885)

Plate VIII. fig. 3 and 4, plate IX, figs. 1, 2 and 3, Plate X, fig. 2, text-fig. 17

pars 1870 *Simoceras Volanense* OPP. — ZITTEL, p. 213, pl. 23, fig. 7. (probably only outer whorls)

1885 *Simoceras Volanense* OPP. — MENEHINI, p. 376, pl. 20, fig. 4. (Under the name *aesinense*, as a variety of *volanense* in the text)

1983 *Simoceras (Simoceras) volanense* (OPP.) — CECCA et al., p. 119, pl. 3, fig. 1.

1984 *Simoceras (Simoceras) volanense* (OPP.) — ROSSI, p. 115, pl. 35, fig. 12.

v. pars 1984 *Simoceras (Simoceras) volanense volanense* (OPP.) — VIGH, pp. 22, 29.

1985 *Simoceras aesinense* MENEHINI — SANTANTONIO, p. 15, pl. 1, figs. 2 and 3, pl. 2, figs. 2, 3 and 6. (only)

1987 *Simoceras aff. volanense* (OPP.) — FÖZYZ, pl. 1, fig. 1.

Material. Seven fairly-preserved specimens (J-10950-J-10955, J-9778) and some further fragments from the Transdanubian Central Range.

Measurements.

J-10950	91	17 (18.6)	?14 (?15.3)	56 (61.5)
J-10951	106	23 (21.6)	18 (16.9)	67 (63.2)
	86	?17 (?19.7)	?16 (?18.6)	54 (62.7)
	82	16 (19.5)	?14 (?17.8)	52 (63.4)
	75	16 (21.3)	?14 (?18.6)	44 (58.6)
J-10952	98	19 (19.3)	18 (18.3)	62 (63.2)
	80	15 (18.7)	14 (17.5)	49 (61.2)
J-10955	?112	24 (?21.4)	24 (?21.4)	75 (?66.9)

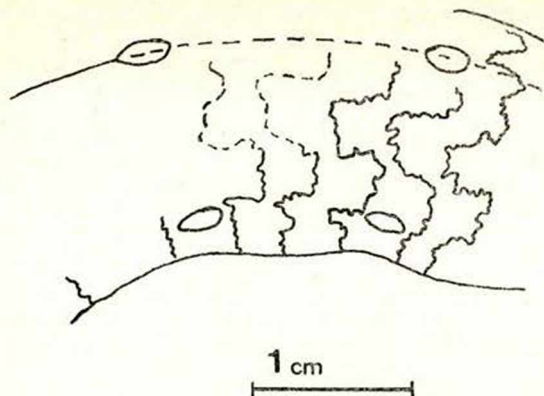


Figure 17. *Volanoceras (Volanoceras) aesinense* (MENEHINI) (J-10981).
Suture-line. Hárskút, Közöskút ravine, collected from loose material.

Description. The Hárskút specimen ranged here in this species was previously figured (FÓZY 1987) as *Simoceras* aff. *volanense* (OPP.). This ammonite (Pl. X, fig. 2) has been collected by A. GALÁ CZ from the loose material of the section. This is an almost entire specimen, and on the basis of sutural crowding (Text-fig. 17) it is an adult form. The body chamber occupies ca. 2/3 of the last whorl. At the end of the cast the body chamber is narrowed by a strong, constriction-like intercostal space, probably also indicating the ceasing of growth and forming the final aperture. The middle whorls of the specimen are corroded, the nucleus is missing. Though it can be ranged into the *aesinense* group described in detail by SANTANTONIO (1985), its rarer ribs in the middle whorls and longitudinally more elongated umbilical tubercles are somewhat different.

The *V. (V.) aesinense* specimen from Bed 53 of the Lókút profile (Pl. IX, figs. 1 and 2), with its very strong, cogged outer tubercles in the middle whorls, is very similar to the forms Rin. 1. and NS3 Col. 23. figured by SANTANTONIO (1985).

The specimens from Beds 92 and 93 of the Szilasárok profile (Pl. VIII, fig. 3 and 4) are strongly corroded internal mould fragments. Their identity with MENEHINI's species is proved by the strong inner tubercles and the well-developed ribs. The radial elongation of the inner ribs, as compared to that of the outer ones, is conspicuous.

The specimen (Pl. IX, fig. 3) from Bed 4 of the Margit Hill Upper Jurassic profile (Gerecse Mts.) is very near to that form which has been described by CECCA et al. (1981) as *S. (S.) volanense*, then subsequently re-figured by SANTANTONIO (1985) as *S. aesinense*. Both ammonites have a row of conspicuously elongated, strong umbilical tubercles.

Remarks. SANTANTONIO (1985) gave detailed description on the species. This form differs from the classic *volanense* of OPPEL by its smaller size, more robust sculpture, better-developed inner tubercle-row, single-ribbed nucleus and less-incised suture-line.

Distribution. *V. (V.) aesinense* is a characteristic element in the Semi-forme Zone of the Mediterranean Tithonian.

Dimorphism. This is a dimorphic species. SANTANTONIO (1985) distinguished the dimorphic pairs on specific level. In this present work only the big (macroconchiate) forms are ranged into MENEGHINI's species, the macroconchs are treated within *Volanoceras* nov. subgen.

Volanoceras (Volanoceras) magnum (OLÓRIZ, 1978)

Plate X, fig. 1, Plate XI, fig. 1

1905 *Simoceras Volanense* OPP. — DEL CAMPANA, p. 110, pl. 16, fig. 9.

1978 *Simoceras (S.) volanense magnum* subsp. nov. — OLÓRIZ, p. 19, pl. 20, fig. 2.

1984 *Simoceras (S.) volanense magnum* OLÓRIZ — VIGH, p. 16, pl. 2, fig. 1.

Material. There fairly-preserved fragmentary internal casts (J-10158, J-10956, J-9791).

Description. Large form with wide umbilicus. Th whorl-section is slightly compressed, subtrapezoidal with 33 to 44 mm height and 30 to 36 mm corresponding width. Inner whorls are unknown. The middle and outer whorls bear strong, radial ribs, which end on the umbilical and ventro-lateral margin in well-developed tubercules. The inner tubercules are thickened into bullae, while the outer tubercules are longitudinally elongated, usually slightly projected. The apertural features are incompletely known. The relatively simple suture-line is characterized by broad external saddle, narrower lateral lobe and strongly indented further sutural elements.

Ammonites ranged into this species were yielded only by the Sümeg profile. The here figured specimens, despite the strong subsolution, show the strong tubercules and the thick connecting ribs clearly. The whorl-section is of characteristically trapezoidal in outline. The beds yielding *V. (V.) magnum* specimens were ranged by VIGH (1984) into the Burckhardticerias Zone.

Remarks. This species attaining 25 cm diameter is hitherto known only by fragments. This is a rare form, and is extremely evolute shell breaks into fragments easily.

The specimens figured by SANTANTONIO (1985) as *Simoceras vicentinum* are very near to this species.

The *Baeticoceras* species of GEYSSANT (1979), with their peculiar doubled ribs and characteristic tubercules are well distinguished from the large-sized *Volanoceras*.

Distribution. This species is characteristic in the Mediterranean ?Middle — Upper Tithonian. The exact stratigraphic range remains to be cleared.

Dimorphism. *V. (V.) magnum* presumably comprises macroconchs of a dimorphis species. The microconchs are to be grouped in *Volanoceras* nov. subgen.

?*Volanoceras* (*Volanoceras*) sp. aff. *magnum* (OLÓRIZ, 1978)

Plate XI, fig. 2

Material. One single specimen (J-10957) from Bed 43 of Hárskút, Közöskút ravine, profile II.

Description. The figured specimen is a badly preserved body chamber fragment, with weak tubercule rows, dense, moderately strong ribs. These features differ from those of the species of OLÓRIZ so, that even the generic arrangement is uncertain. The specimen came from the Ponti Zone.

Subgenus *Volanoceras* nov. subgen.

Observations. Associated to the numerous big Middle Tithonian *Volanoceras*, there are several characteristically small, but similarly sculptured ammonites. Transitional forms are practically missing, thus the small specimens cannot be regarded as nuclei. Most probably these small ammonites are the microconch pairs of the big (macroconchiate) forms.

According to the proposal of CALLOMON (1969, p. 116) these small forms would need a subgenus of their own, however, in lack of stratigraphically well-controlled, rich material, designation of a new name seems impractical now. A possible solution is the application of open nomenclature. Thus the unnamed new subgenus used here below comprises of the microconchs of the above discussed *V. (V.) aesinense*, *V. (V.) volanense*, *V. (V.) magnum* and *V. (V.) praecursor* (SANTANTONIO, 1985) species.

Occurrence. The forms ranged in this subgenus (just as those of the nominate macroconchiate subgenus) are characteristic elements of the Mediterranean Lower and Middle Tithonian faunas.

Volanoceras nov. subgen. div. sp.

Plate IX, figs. 4, 5 and 6

Material. Three specimens (J-10958 - J-10960) from Bakony Mts. profiles.

Measurements.

J-10958	—	7 (?)	7 (?)	—
J-10960	21	5 (23.8)	?5 (?23.8)	11 (52.3)

Description. The specimen from Bed 25 of the Hárskút, Közöskút ravine, profile 12 (Plate IX, fig. 6) is an entirely chambered, fragmentary internal mould with preserved traces of shell on the venter. Inner whorls are missing. The ribs are strong, slightly prorsiradiate, ending in well-developed, longitudinally elongated tubercules on the ventrolateral margin.

The specimen from Bed 66 of the Szilasárok profile (Plate IX, fig. 5) is a moderately corroded internal cast. Because of the poor preservation, the style of ribbing is uncertainly deciphered, but simple ribs seem most

probable. The slightly projected ribs of the outer whorls end in longitudinally somewhat elongated tubercules.

One specimen (Plate IX, fig. 4) from the Tithonian beds of the Lókút Hill profile (exact horizon is unknown) has damaged inner whorls, but the inner parts seems to be sculptured with bifurcating ribs up to 10 to 15 mm diameter. The level of bifurcation is at the lower third of the flank. At ca. 20 mm diameter the simple ribs are slightly prorsiradiate, and are terminated in strong outer tubercules. Umbilical tubercules remain un conspicuous until the maximal diameter of the fragment. The end of the fragmentary internal mould bears a strong constriction probably showing the ceasing of shell-growth.

Genus *Simoceras* ZITTEL, 1870

Type species. *Ammonites biruncinatus* QUENSTEDT, 1845, by subsequent designation of FISCHER, 1882. For the problematics of interpretation of the type species see GEYSSANT 1985.

Occurrence. The genus is of index value in the Mediterranean Middle Tithonian.

Dimorphism. Dimorphism within this genus is hitherto undocumented.

Simoceras biruncinatum (QUENSTEDT, 1845)

Plate XII, figs. 3 and 4

- 1845 *Ammonites biruncinatus* Q. — QUENSTEDT, p. 683.
 1848 *Ammonites biruncinatus* Q. — QUENSTEDT, p. 260, pl. 19, fig. 14.
 pars 1870 *Simoceras biruncinatus* Q. — ZITTEL, p. 92, pl. 32, fig. 6 (only)
 ? 1961 *Simoceras (Simoceras) biruncinatum* Q. forma *aegera calcar* (ZIETEN 1830) — HOLLMANN, p. 267, pl. 1, fig. 1.
 1978 *Simoceras (Simolytoceras?) biruncinatum* (Q.) — OLÓRIZ, p. 241, pl. 20, figs. 7 and 8.
 1983 *Simoceras (Simolytoceras) biruncinatum* (Q.) — CECCA et al., p. 120, pl. 2, fig. 2.
 1984 *Simoceras (Simolytoceras?) lokutense* nov. ssp. — VIGH, p. 180, pl. 1, fig. 6.
 1984 *Simoceras (Simolytoceras) biruncinatum* (Q.) — ROSSI, p. 117, pl. 35, fig. 6.

Observations. In spite being a "classic" species, this QUENSTEDT's form is in fact poorly known.

Of the specimens figured by ZITTEL (1870), that on pl. 32, fig. 3, with weak inner tubercules and two constrictions on the smoothed body chamber should be ranged into the species *Simolytoceras volanenoides* (VIGH).

The specimen of HOLLMANN (1961, pl. 1, fig. 1), as the author pointed out, is a sick, damaged individual.

One of the specimens of OLÓRIZ (1978, pl. 20, fig. 8), with conspicuously well-developed clavi, differs from all previously described specimens, and is most similar to the ammonite from Sümeg (see below).

Only one figure (CECCA et al., 1983, pl. 2, fig. 2) shows the inner whorls of the conspecific forms. This ammonite, however, as noticed by the authors also, differs from the type in having special tubercles on the outside of the body chamber.

In determining fragments, some problems arised from the fact, that the sculpture is changing with individual growth, even on the body chamber. Entire, adult specimens are extremely rare. One cannot consider unfeasible, that this apparently variable species will be subdivided by further studies.

Material. Two specimens (J-9792, J-10961) and few fragments from the Sümeg profile.

Measurements.

J-9762	?64	?17 (?26.5)	?13 (?20.3)	36 (?56.2)
	?54	?14 (?25.9)	?12 (?22.2)	29 (?53.7)

Description. The figured specimen has a shallow umbilicus, the umbilical margin rounds evenly into the slightly convex flanks. Inner whorls are missing, and the middle whorls are strongly corroded. The last whorl shows clearly the umbilical tubercles, which continue into the flanks as rib-like folds. At ca. 30 mm umbilical diameter the specific outer tubercles are visible. The tubercles are of medium-strength in the beginning, then change into very strong clavi. The well-developed, longitudinally flattened tubercles appear in pairs in each side of the venter of the body chamber. There is only a single constriction at the beginning of the penultimate whorl. The corrosion of the internal cast makes the end of the phragmocone only guessed, however the length of the body chamber can be estimated as a whole whorl. Suture-line cannot be seen, the aperture is missing.

Remarks. The Sümeg specimen cannot be matched exactly with QUENSTEDT's type. The former is somewhat more evolute, has rarer umbilical tubercles and unusually strengthened clavi on the body chamber. With this last feature it is close to one of the figured specimens of OLÓRIZ (1978, pl. 20, fig. 8). On the other hand, the rare inner tubercles and the few (one) visible constrictions are similar also to those on one of the forms figured by ZITTEL (1870, pl. 32, fig. 6).

Distribution. This species is characteristic in the Fallauxi Zone of the Mediterranean Tithonian. OLÓRIZ (1978) regarded this QUENSTEDT's species, together with *S. admirandum* as zonal index. His "Admirandum - Biruncinatum Zone" corresponds to the upper part of the Fallauxi Zone.

Dimorphism. This is undocumented for this species; this aspect needs further studies.

Simoceras admirandum (ZITTEL, 1869)

Plate XII, figs. 1 and 2, Plate XV, figs. 1, 2 and 3

- 1869 *Ammonites admirandus* ZITTEL — ZITTEL, p. 148.
 1870 *Simoceras admirandum* ZITTEL — ZITTEL, p. 212, pl. 31, fig. 6, pl. 32, figs. 1–3.
 1871 *Simoceras admirandum* ZITTEL — GEMMELLARO, p. 39, pl. 8, figs. 4 and 5.
 1885 *Simoceras admirandum* ZITTEL — MENEGHINI, p. 374: pl. 20, fig. 5.
 1978 *Simoceras (Simoceras) admirandum* ZITTEL — OLÓRIZ, p. 229, pl. 20, fig. 1.
 1984 *Simoceras (Simoceras) admirandum bakonyense* nov. ssp. — VIGH, p. 73, pl. 1, fig. 5.

Observations. This species is a very characteristic element of the Tithonian faunas, nevertheless it is poorly known because of rarity of inner whorls and entire specimens. Well-preserved and rich material may result in the splitting of the forms described until now as *S. admirandum*, and/or in the clearing of dimorphism suggested for this group.

Material. 11 fairly or badly-preserved specimens (J–10962–J–10970, J–9808, J–10272) and some further fragments from the Bakony profiles.

Measurements.

J–10272	?68	16 (?23.5)	18 (26.4)	34 (?50.0)
	59	15 (25.4)	16 (27.1)	31 (62.5)
J–10967	—	39	28	—

Description. Medium-sized, relatively widely-umbilicated form. The flanks are convergent, neither umbilical, nor sharp ventrolateral margin occur. The section of the inner whorls is subcircular, of the middle whorls is oval with maximal width in the lower part. The big-sized body chamber fragments belonging possibly to adult specimens show stronger compression.

As it has been pointed out even by ZITTEL (1869), the innermost whorls bear fine, simple ribbing. The poorly-preserved Bakony material includes only a single specimen (J–10962) showing this feature. From the second or third whorls onwards, the ribbing changes into rows of rarer umbilical and denser ventrolateral tubercules. This sculpture reminds that on the volanense group, but differs in the consequently alternating position of the tubercules on the venter.

The number of the inner tubercules is the half of the outer ones on the middle and outer whorls. The alternating position of the outer tubercules remains constant. On the middle whorls the ribs arising from the inner tubercules reach only the middle part of the flanks.

The Bakony profiles yielded numerous body chamber fragments of big specimens, which are very close to the similarly fragmentary examples figured by ZITTEL (1870, pl. 32, fig. 3). Though the internal casts from the

Bakony are strongly subsolved, the bifurcating, tuberculated ribs arising from the umbilical tubercules are shown clearly (Pl. XII, fig. 2). However, these big body chamber fragments came separated from inner whorls, thus their connections remain conditional.

There are one or two constrictions per whorl from early ontogenetic stages. Details of the suture-line and features of the aperture cannot be seen in either Bakony specimens.

Remarks. *S. admirandum* is most closely allied to *S. biruncinatum* and *S. andaluciense*. But its bigger size and different sculpture on its body chamber distinguishes from both.

Distribution. Characteristic in the Mediterranean Tithonian. OLÓRIZ (1978) suggested *S. admirandum* (with *S. biruncinatum*) as a zonal index. The "Admirandum - Biruncinatum Zone" of OLÓRIZ is equivalent to the upper part of the Fallauxi Zone.

Dimorphism. Though evidences from the hitherto known material are weak, this species is apparently dimorphic. The inner whorls of the micro- and macroconch form are seemingly very similar, while well-preserved adult specimens are missing. Probable macroconchs are the previously described big specimens (ZITTEL 1870, pl. 32, fig. 3; GEMMELLARO 1871, pl. 8, figs. 4, 5; OLÓRIZ 1978, pl. 20, fig. 1) and the majority of the Hungarian material. Possible microconch is the specimen of MENEGHINI (1885, pl. 20, fig. 5) and one form from Bed 79 of the Szilasárok profile (Pl. XV, fig. 2) Both ammonites have slightly excentric last whorl, thus despite their small size they are adults and consequently microconchs.

Genus *Simolytoceras* OLÓRIZ, 1978

Type species. *Simoceras* (*Simolytoceras*) *andaluciense* OLÓRIZ, 1978, by original designation.

Observations. *Simolytoceras* was introduced by OLÓRIZ as a subgenus of *Simoceras*. Besides the type species, he ranged — with question mark — only one species into this subgenus: *S. biruncinatum*. This present work ranges, additionally to the type species, two further forms from the Bakony as new species.

Occurrence. On the basis of data known until now this genus can be regarded as a characteristic faunal element in the Mediterranean Middle Tithonian.

Dimorphism. No dimorphism has been documented within this genus.

Simolytoceras cf. *andaluciense* OLÓRIZ, 1978

cf. 1978 *Simoceras* (*Simolytoceras*) *andaluciense* nov. sp. — OLÓRIZ, p. 238, pl. 20, fig. 4.

Material. A single, badly preserved fragmentary internal mould (J-10971) from Bed 65 of the Szilasárok profile.

Measurements.

J-10971	55	10 (18.1)	10 (18.1)	?32 (?58.1)
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Description. A relatively small form with wide umbilicus. The low umbilical wall rounds into the slightly convex flanks without umbilical edge. The whorl-section is circular, its width is nearly equal with its height at 56 mm diameter. The imprint of the fragmentary specimen shows, that it was ribbed up to about 22 mm diameter. With individual growth the ribs become rarer and end in the outer part in longitudinally elongated tubercles. There are 1 or 2 (?3) deep constrictions per whorl with projected outer parts. According to OLÓRIZ (1978) the fading of the sculpture becomes apparent usually from 55 mm diameter. This last state cannot be seen on the fragment from the Szilasárok profile.

Remarks. This species of OLÓRIZ is incompletely known. The single previously figured specimen (the type) is badly preserved, fragmentary.

S. andaluciense is very close to *S. volanensoides*. The distinguishing features are the wider umbilicus and the strong ventrolateral tubercles in the middle whorls of the former species.

Distribution. OLÓRIZ recorded his specimen from the Burckhardticerias Zone of the Subbetics. The Szilasárok specimen came from the same stratigraphic horizon (Ponti Zone).

Simolytoceras volanensoides (VIGH, 1984)

Plate XIII, figs, 1, 2 and 3, Plate XIV. fig. 3, text-fig. 18

- 1870 *Simoceras biruncinatum* QUENSTEDT - ZITTEL, p. 92, pl. 32, fig. 5.
 v 1984 *Simoceras (Lytogyroceras) subbeticum volanensoides* nov. ssp. -
 VIGH, p. 74, pl. 3, figs 1 and 2.

Material. Five well- or fairly-preserved specimens (J-10972-J-10974, J-9802, J-9803) from the Bakony profiles.

Measurements.

J-9803 (Holotype)	86	21 (24.4)	20 (23.2)	46 (53.4)
	67	16 (23.8)	16 (23.8)	36 (53.7)
J-9802	85	20 (23.5)	?14 (?16.4)	44 (51.7)
	65	17 (26.1)	?14 (?21.5)	33 (50.7)
J-10972	84	16 (19.0)	?14 (?16.6)	47 (55.9)
J-10973	82	22 (26.8)	18 (21.9)	47 (57.3)

Description. Medium-sized, evolute form. The umbilical wall is low and steep, the umbilical margin is rounded. The somewhat convergent flanks are slightly convex, the ventrolateral margin is arched. The whorl-section is subtrapezoidal in the middle whorls and suboval on the body chamber.

Nucleus is missing in all specimens. The visible inner whorls are densely ribbed up to ca. 20 mm diameter. Some of the slightly prorsiradiate ribs bear hardly-visible small swellings on the upper part. In one specimen from the Lókút Hill profile the ribbing is ceased abruptly with a strong constriction. On the middle whorls weak umbilical tubercles and oblique ventrolateral tubercles appear. These latter ones become gradu-



Figure 18. *Simolytoceras volanensoides* (VIGH) (J-10973).
Cross-section. Szilasárok, Bed 80, Fallauxi Zone.

ally more elongated, showing similarities to the ventrolateral tubercles of *S. biruncinatum*. The flanks bear feeble, vague ribs arising from the umbilical tubercles. The umbilical and ventrolateral tubercles fade out gradually on the end of the adult whorl, and the terminal part of the body chamber becomes completely smooth.

On each whorl there are 2–3 constrictions which curve slightly forward near the venter. Aperture is unknown, the suture-line, because of subsolution, cannot be studied in detail.

Remarks. VIGH (1984) ranged the Lókút specimens as subspecies of *S. (L.) subbeticum* OLÓRIZ. However, these ammonites are distinguished from the species of OLÓRIZ, because this latter lacks the ventrolateral tubercle row.

The Bakony specimens, especially the holotype, are very close in size and sculpture to that figured by ZITTEL as *S. biruncinatum* (1870, pl. 32, fig. 5). As it was mentioned above in the description of *S. biruncinatum*, ZITTEL's specimen, having a smoothed body chamber, differs from this group.

The here figured ammonites are very similar to those published by OLÓRIZ and TAVERA (1977). They ranged those specimens into their new genus *Simospiticeras*. The Bakony specimens are especially close to the species described as *S. lojenense* (p. 184, pl. 1, fig. 1 in OLÓRIZ and TAVERA 1977). Common features are in the umbilical tubercules and constrictions. But despite the obvious relations between the two forms, there are some differences, too: the species of OLÓRIZ and TAVERA has narrower umbilicus and higher whorls. The figure shows, that the outer tubercules of *S. lojenense* are weaker than those of *S. volanensoides*. However, the Spanish specimens are corroded, their inner whorls are missing, thus the relations between the two species remain problematic.

Distribution. The two specimens described by VIGH came from the *S. fallauxi*-bearing Beds 43 and 44 of the Lókút Hill profile. New collections yielded specimens from the same horizon in the Szilasárok section and from Hárskút, Közöskút ravine, profile II. The related *S. lojenense* has been described from "the base of the Upper Tithonian".

Dimorphism. No dimorphism has been evidenced in the case of this species.

Simolytoceras vighi nov. sp.

Plate XIV, figs. 1 and 2

Derivatio nominis: After the late GUSZTÁV VIGH, paleontologist, who made very important contributions to the knowledge of the Upper Jurassic faunas of the Transdanubian Central Range.

Locus typicus: Hárskút, Közöskút ravine, profile II; Bakony Mts., Transdanubian Central Range.

Stratum typicum: Bed 49 of the profile, i.e. Middle Tithonian (Fallauxi Zone); Pálihálás Limestone Formation.

Diagnosis: Medium-sized *Simolytoceras*, with rib-like, elongated umbilical tubercules and dense, alternating ventrolateral tubercules on the middle whorls, and dense, strong, projected constrictions at the end of the adult body chamber.

Material. A single, fairly-preserved specimen (J-10975).

Measurements.

J-10975 (Holotype)	104	28 (26.9)	?22 (?21.1)	53 (50.9)
	84	20 (23.8)	15 (17.8)	47 (55.9)
	72	19 (26.3)	—	40 (55.5)

Description. Medium-sized, moderately evolute form. The umbilical wall rounds into the almost flattened flank without sharp umbilical edge. The venter is rounded. The flanks are slightly convergent, the whorl-section is subtrapezoidal on the middle whorls and suboval on the adult body chamber.

The inner and middle whorls are partly missing. The tubercles at the umbilical margin are radially elongated and smoothed out at the upper part of the flanks. There are rows of dense alternating, slightly elongated tubercles on the ventrolateral margins. The sculpture reaches the proximal half of the body chamber. The apertural part of the body chamber bears three projected constrictions. The body chamber of the mature specimen occupies about three-quarter of the last whorl.

The aperture is unknown and the details of the suture-line are obscured by subsolution.

Remarks. On the basis of its sculpture, this species is near to *S. admirandum* and *S. volanensoides*. However, *S. vighi* has substantially denser ventrolateral tubercles in the middle whorls. Other difference is that the tubercles are much finer and elongated radially in this new species, while in *S. volanensoides* this elongation is oblique on the stronger tubercles. The closely-spaced constrictions on the adult body chamber are important specific characters, too.

Distribution. The species is hitherto known only from a single bed of the Fallauxi Zone of the Hárskút profile.

Dimorphism. Having only a single specimen, this aspect cannot be discussed.

Genus *Lytogyroceras* SPATH, 1925

Type species. *Ammonites fasciatus* QUENSTEDT, 1848 = *Am. strictus* CATULLO, 1846, pl. 6, fig. 2, by original designation of SPATH (1925, p. 131).

Observations. The genus has been based by SPATH on the species of QUENSTEDT, which is a senior synonym of *Lytogyroceras strictum* (CATULLO, 1846).

Occurrence. On the basis of the scattered data, this genus is a Middle Tithonian element in the Mediterranean region.

Dimorphism. No dimorphism has been shown in connection if this genus.

Lytogyroceras strictum (CATULLO, 1846)

Plate XV, fig. 4

1846 *Ammonites strictum* CATULLO — CATULLO, p. 132, pl. 6, fig. 2.

1848 *Ammonites fasciatus* QUENSTEDT — QUENSTEDT, p. 171, pl. 20, fig. 11.

1870 *Simoceras strictum* CAT. — ZITTEL, p. 90, pl. 32, fig. 4.

1876 *Simoceras strictum* CAT. — GEMMELLARO, p. 53, pl. 10, fig. 4.

Material. A single internal mould (J-10208) from the Sümeg profile.

Measurements.

J-10208	?88	?21 (?23.8)	—	?51 (?57.9)
	76	?18 (?23.6)	?14 (?18.4)	44 (57.8)

Description. Medium-sized, very evolute form with shallow umbilicus. The whorl-section is strongly compressed oval. The inner whorls of the specimen are missing, the body chamber is strongly corroded. The smooth shell has strong, slightly projected constrictions. The aperture is missing, suture-line cannot be studied.

Remarks. This species can be easily distinguished from the other congeneric forms by its strongly compressed whorl-section. The style of the constrictions is a further distinguishing feature from the similarly smooth *Protetragonites*.

The Sümeg specimen shows good agreements with the specimens figured by QUENSTEDT (1848) and ZITTEL (1870).

Lytogyroceras subbeticum OLÓRIZ, 1978

Plate XIII, figs. 4 and 5

- 1978 *Simoceras (Lytogyroceras) subbeticum* nov. sp. — OLÓRIZ, p. 232, pl. 19, figs. 2 and 3.
 non 1984 *Simoceras (Lytogyroceras) subbeticum* OLÓRIZ—ROSSI, p. 116, pl. 35, figs. 1 and 2.
 non 1984 *Simoceras (Lytogyroceras) subbeticum volanensoides* nov. ssp. — VIGH, p. 74, pl. 3, figs. 1 and 2.
 1987 *Lytogyroceras* sp. — FŐZY, pl. 2, fig. 3.

Material. One well-preserved specimen (J-10976), and two fragments from Bed 42 of the Hárskút, Közöskút ravine, profile II. All are internal casts.

Measurements.

J-10976	42	10 (23.8)	8 (19.0)	25 (59.5)
	38	9 (23.6)	7 (18.4)	21 (55.2)
	35	7 (20.0)	6 (17.1)	19 (54.2)

Description. Small form with wide and shallow umbilicus. The low, oblique umbilical wall rounds into the slightly convex flanks without forming sharp margin. The venter is rounded, the whorl-section is circular in the inner whorls and somewhat compressed in the outer whorls.

The inner whorls have fine ribbing. Most ribs bifurcate at the middle-height of the flanks, but some simple ribs also occur. The ribs are radial or slightly curved forward. At about 20 mm diameter the ribbing disappears, and the middle and outer whorls are completely smooth. The thirds whorl is damaged in the Hárskút specimen, thus the transition between these stages cannot be seen. There are 2-3 strong, ventrally projected constrictions per whorl.

Aperture and suture-line are not visible in the Bakony specimens.

Remarks. *L. subbeticum* is distinguished from *L. lytogyrus* by its bifurcating and finer ribs. A further difference is that the smooth stage appears earlier in *L. lytogyrus*. On the other hand *L. strictum* is characteristically bigger.

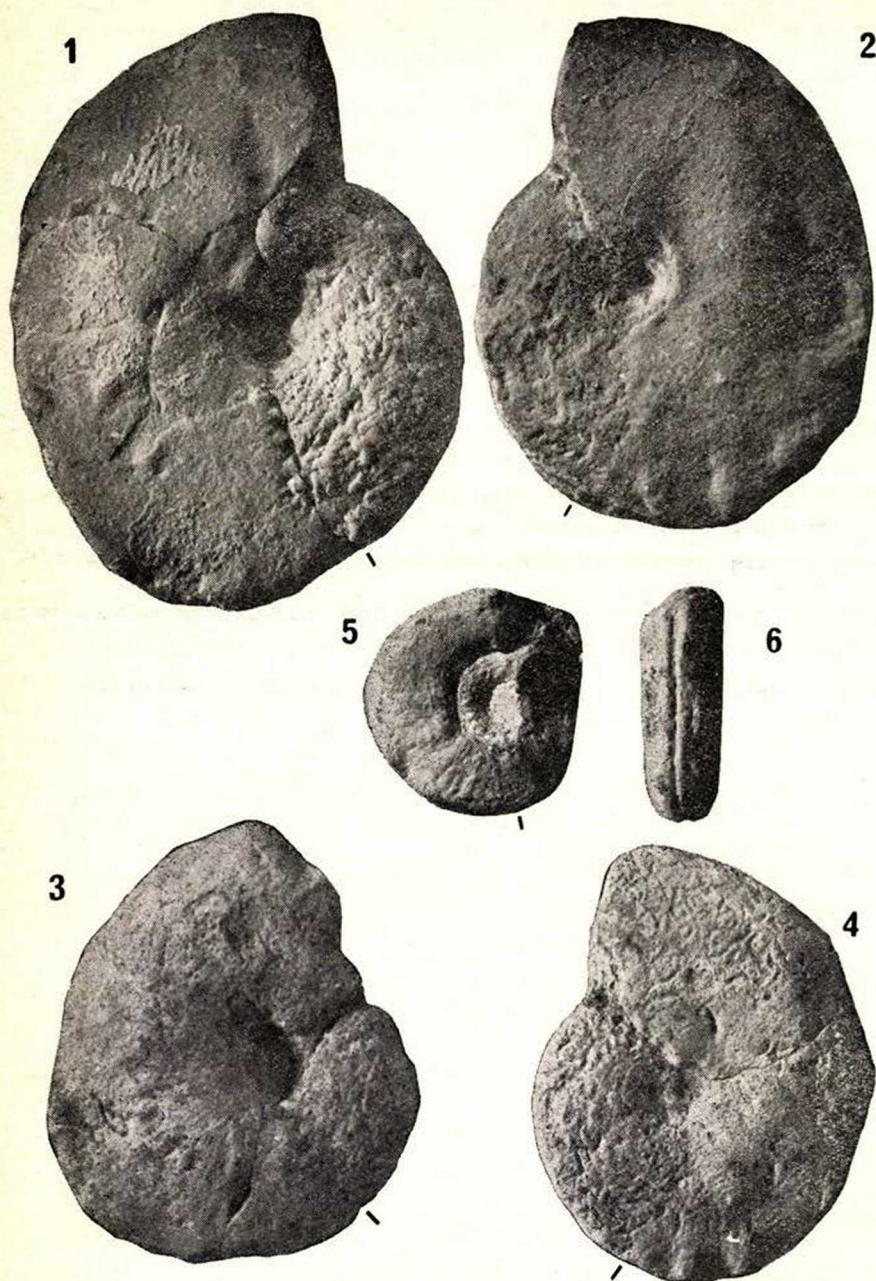


PLATE I.

- Fig. 1. *Semiformiceras semiforme* (OPPEL) (J-10869). Big, adult, nearly complete specimen. Hárskút, Közöskút ravine, profile II, Bed 59. The specimen was figured by Főzy (1987, Pl. 1, fig. 2.) as *Semiformiceras semiforme* (OPPEL). Semiforme Zone.
- Fig. 2. *Semiformiceras semiforme* (OPPEL) (J-10871). Medium - sized, adult, nearly complete specimen. Szilasárok, Bed 93. The specimen was figured by Főzy (1987, Pl. 1, fig. 3.) as *Semiformiceras semiforme* (Oppel). Semiforme Zone.
- Fig. 3. *Semiformiceras semiforme* (OPPEL) (J-10171). Medium-sized, adult specimen with fragmentary body chamber. Sümeg.
- Fig. 4. *Semiformiceras semiforme* (OPPEL) (J-10872). Medium-sized, adult, nearly entire specimen. Sümeg.
- Figs. 5, 6. *Semiformiceras fallauxi* (OPPEL) (J-10874). Medium-sized specimen, with fragmentary adult body chamber. Sümeg.

(Figures, except Pl. XIV. fig. 2. are in natural size. Arrows indicate beginning of body chamber.)

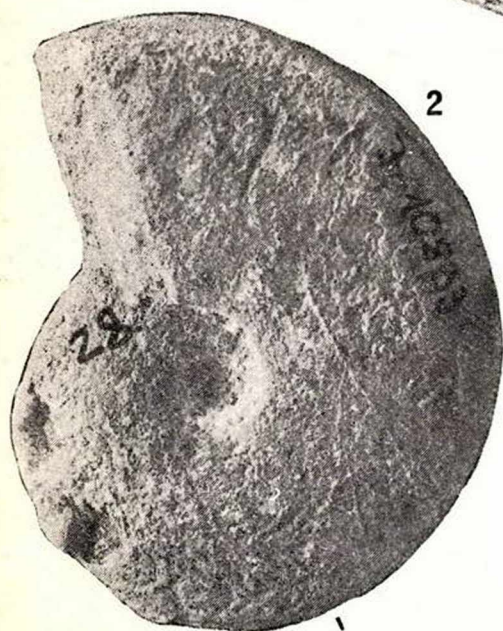
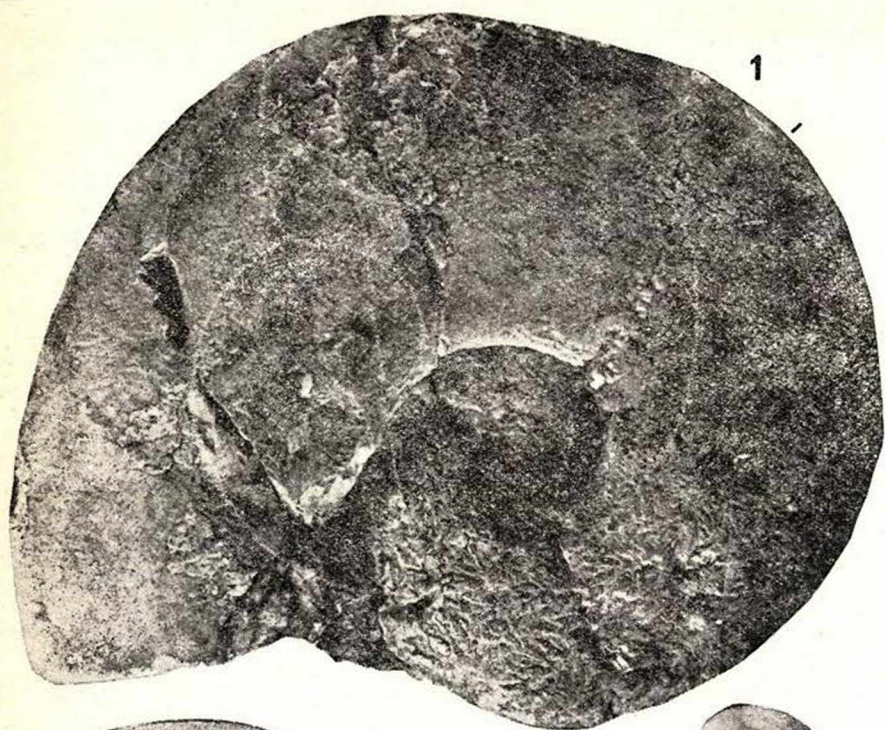


PLATE II.

- Fig. 1. *Haploceras (Haploceras) elimatum* (OPPEL) (J-10888). Medium-sized, probably adult, nearly entire specimen. Rendkő.
- Fig. 2, 3. *Haploceras (Haploceras) elimatum* (OPPEL) (J-10893). Small, young, nearly entire specimen. Hárskút, Közöskút ravine, profile II, Bed 51. Fallauxi Zone.

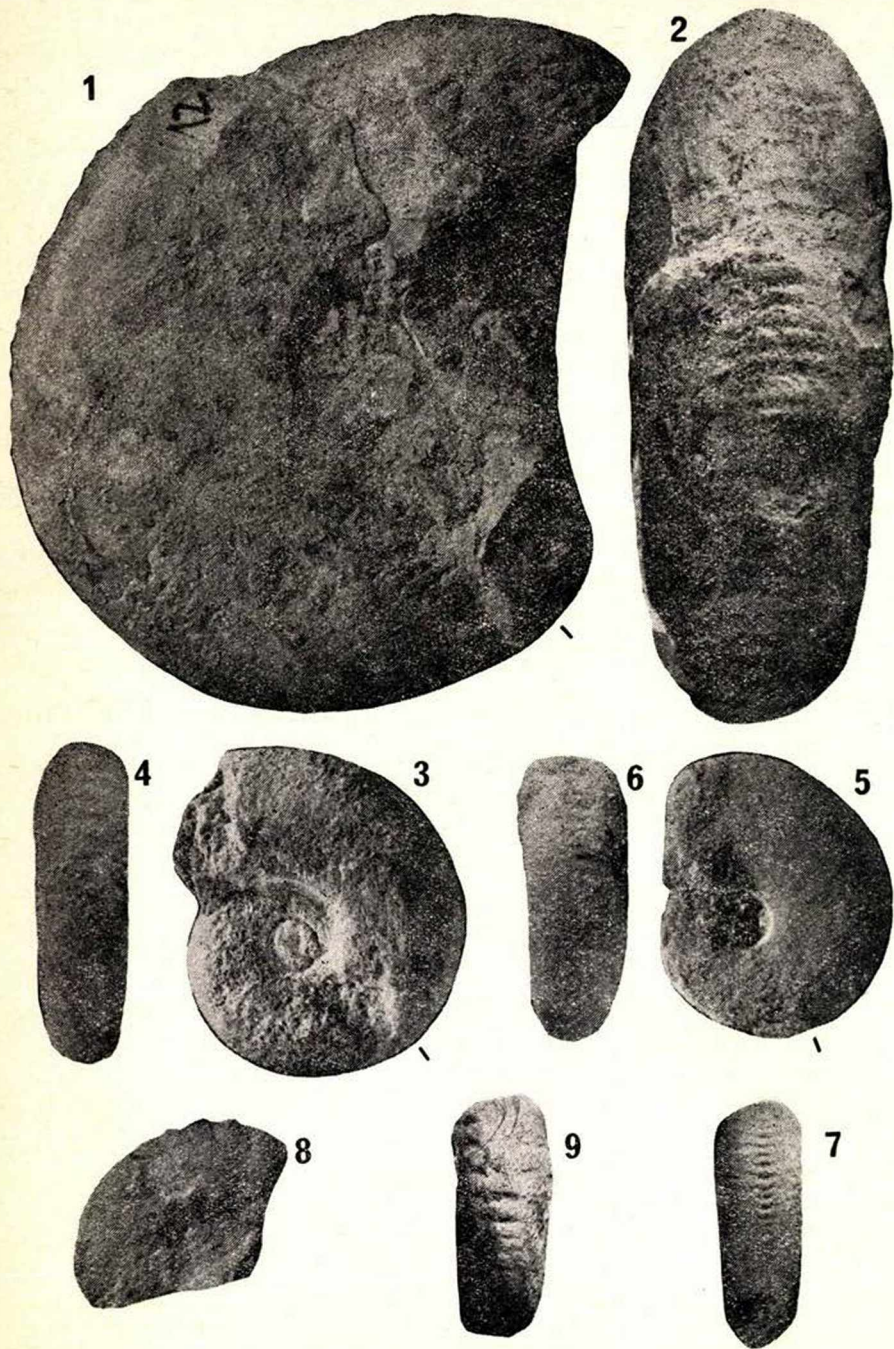


PLATE III.

- Figs. 1, 2. *Haploceras (Haploceras) wohleri* (OPPEL) (J-10897) Small, probably adult, nearly entire specimen. Hárskút, Közöskút ravine, profile 12, Bed 12. Upper Tithonian.
- Figs. 3, 4. *Haploceras (Hypolissoceras) carachtheis* (ZEUSCHNER) (J-10909). Medium-sized, probably adult, nearly entire specimen. Rendkő.
- Figs. 5, 6. *Haploceras (Hypolissoceras) leiosoma* (OPPEL) (J-10911). Medium-sized, adult, nearly entire specimen. Hárskút, Közöskút ravine, profile II, Bed 52. Fallauxi Zone.
- Figs. 7. *Haploceras (Hypolissoceras) leiosoma* (OPPEL) (J-10914). Fragmentary specimen. Rendkő.
- Figs. 8, 9. *Haploceras (Hypolissoceras) rhinotomum* ZITTEL (J-10918). Fragmentary body chamber of an adult specimen. Hárskút, Közöskút ravine, profile II, Bed 45. Fallauxi Zone.

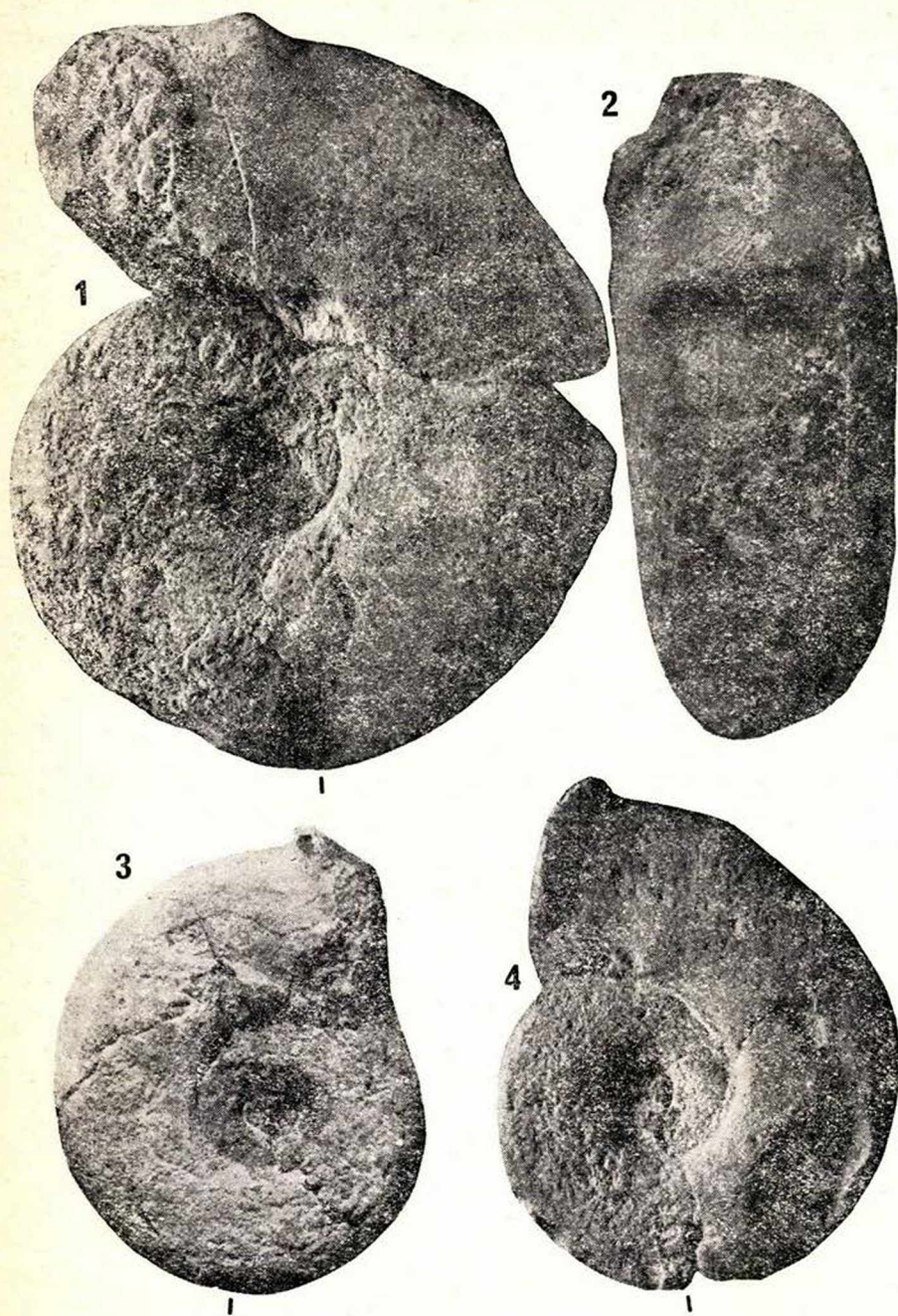


PLATE IV.

- Figs. 1, 2. *Haploceras (Haploceras) cassiferum* nov. sp. (Holotype, J-9672). Medium-size d adult, nearly entire specimen. Lókút Hill, Bed 56. Lower Tithonian, Darwini or Semiforme Zone.
- Fig. 3. *Haploceras (Hypolissoceras) verruciferum* (ZITTEL) (J-10919). Medium-sized, adult, nearly entire specimen. Lókút Hill, Bed 53. Semiforme Zone.
- Fig. 4. *Haploceras (Hypolissoceras) verruciferum* (ZITTEL) (J-10935). Medium-sized, adult, nearly entire specimen. Szilasárok, Bed 94. The specimen was figured by FÓZNY, (1987. Pl. II, fig. 4.) as *Haploceras verruciferum* (MGH. in ZITTEL). Semiforme Zone.

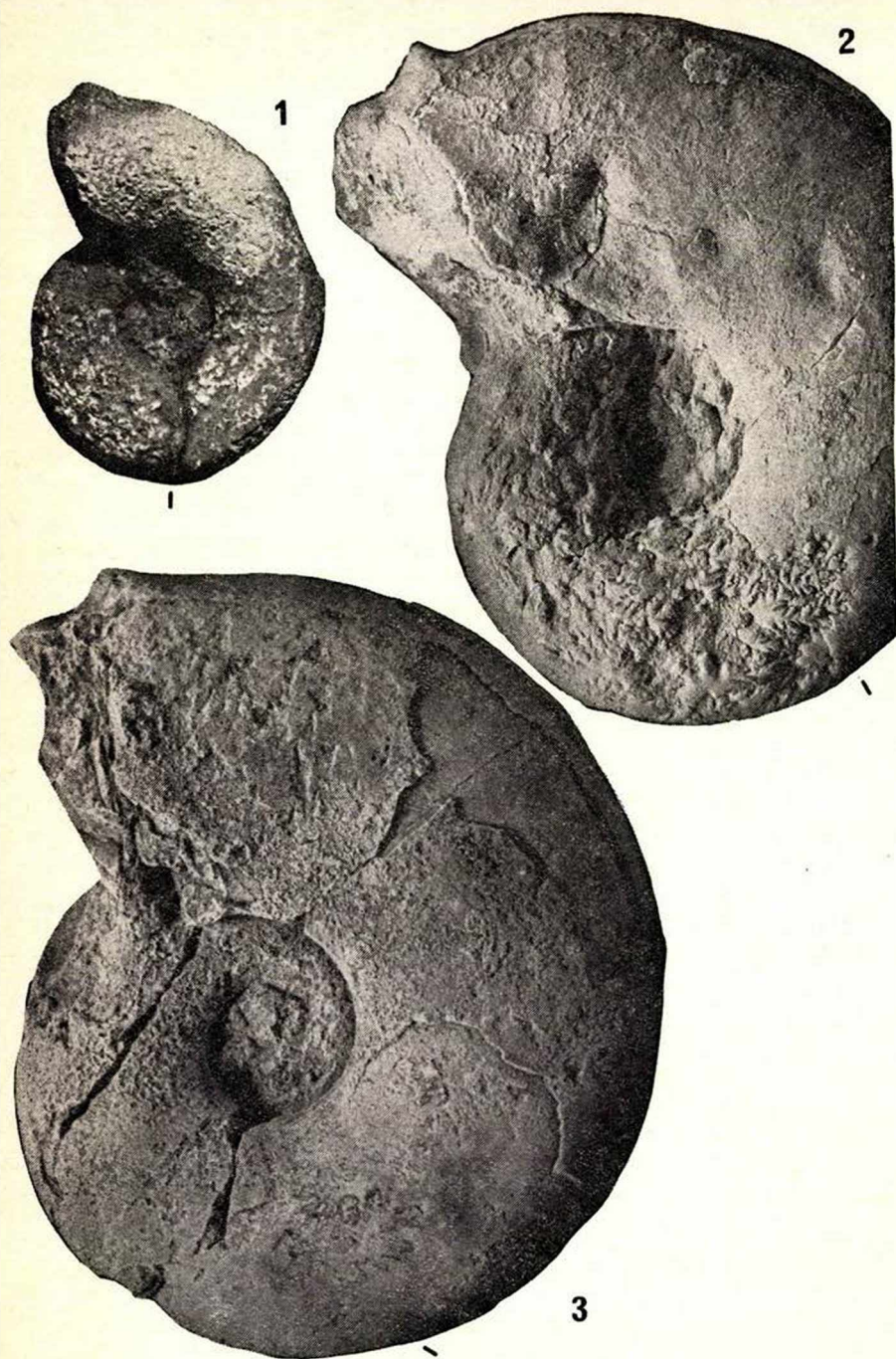


PLATE V.

- Fig. 1. *Haploceras* (*Hypolissoceras*) *verruciferum* (ZITTEL) (J-10938). Small, adult, nearly entire specimen. Szilasárok, Bed 93. Semiforme Zone.
- Fig. 2. *Haploceras* (*Haploceras*) *cassiferum* nov. sp. (J-10901). Medium-sized, adult specimen. Hárskút, Közöskút ravine, profile II, Bed 63. Darwini Zone.
- Fig. 3. *Haploceras* (*Haploceras*) *cassiferum* nov. sp. (J-8048). Medium-sized, adult, nearly entire specimen with remnants of shell on the body chamber. Tata, Kálvária Hill, Bed 12/1.

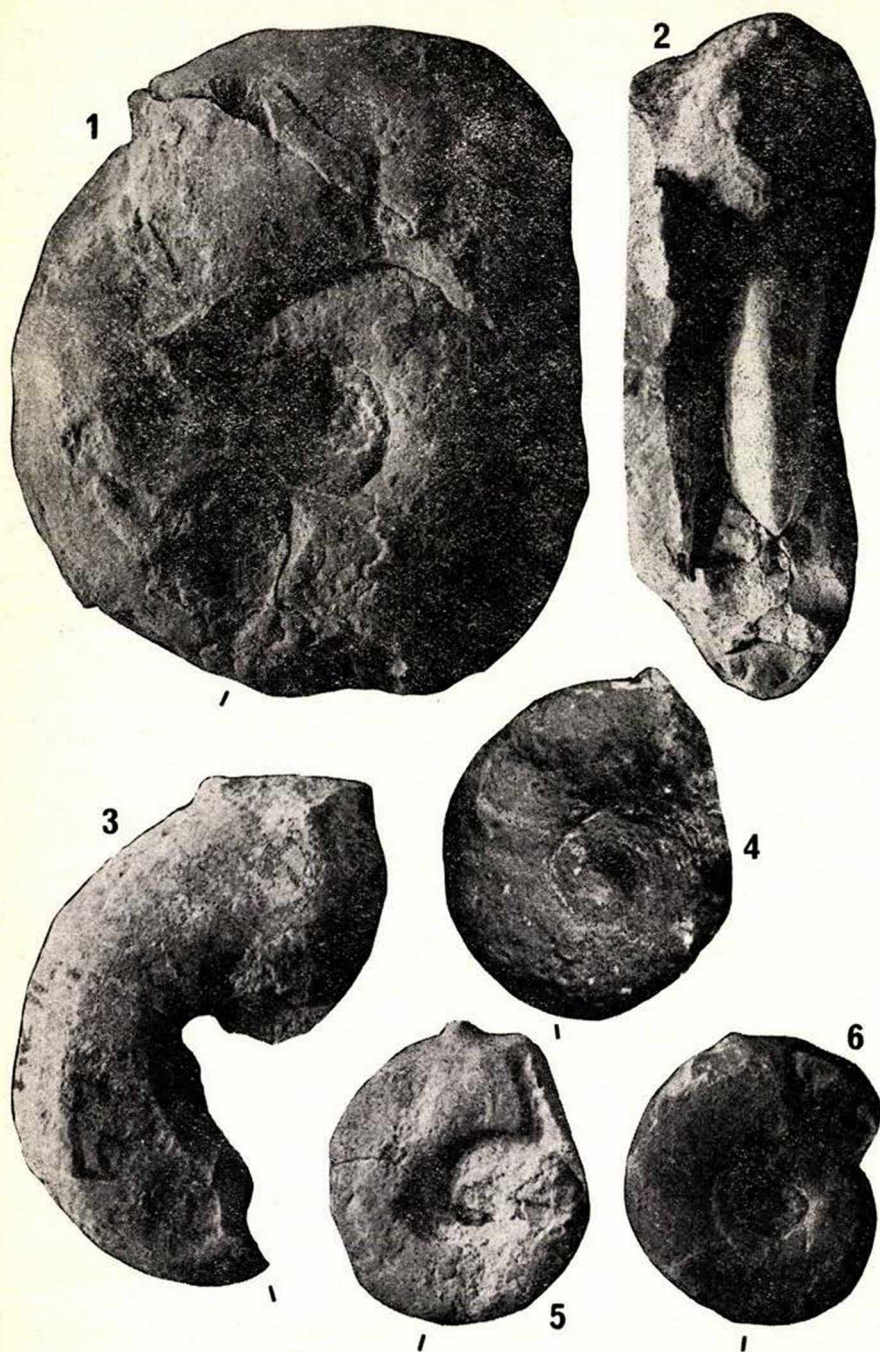


PLATE VI.

- Figs. 1, 2, *Pseudolissoceras olorizi* nov. sp. (Holotype, J-10941). Adult, nearly entire specimen. Hárskút, Közöskút ravine, profile II, Bed 66. ?Hybonotum Zone.
- Fig. 3. *Haploceras (Hypolissoceras) verruciferum* (ZITTEL) (J-10926). Big, adult specimen, a body chamber fragment. Hárskút, Közöskút ravine, profile II, Bed 57. Semiforme Zone.
- Fig. 4. *Haploceras (Hypolissoceras) verruciferum* (ZITTEL) (J-10934). Small, adult, nearly entire specimen. Szilasárok, Bed 94. Semiforme Zone.
- Fig. 5. *Haploceras (Hypolissoceras) verruciferum* (ZITTEL) (J-10210). Small, adult, nearly entire specimen. Sümeg.
- Fig. 6. *Haploceras (Hypolissoceras) verruciferum* (ZITTEL) (J-10927). Small, adult, nearly entire specimen. Hárskút, Közöskút ravine, profile II, Bed 55. Semiforme Zone.

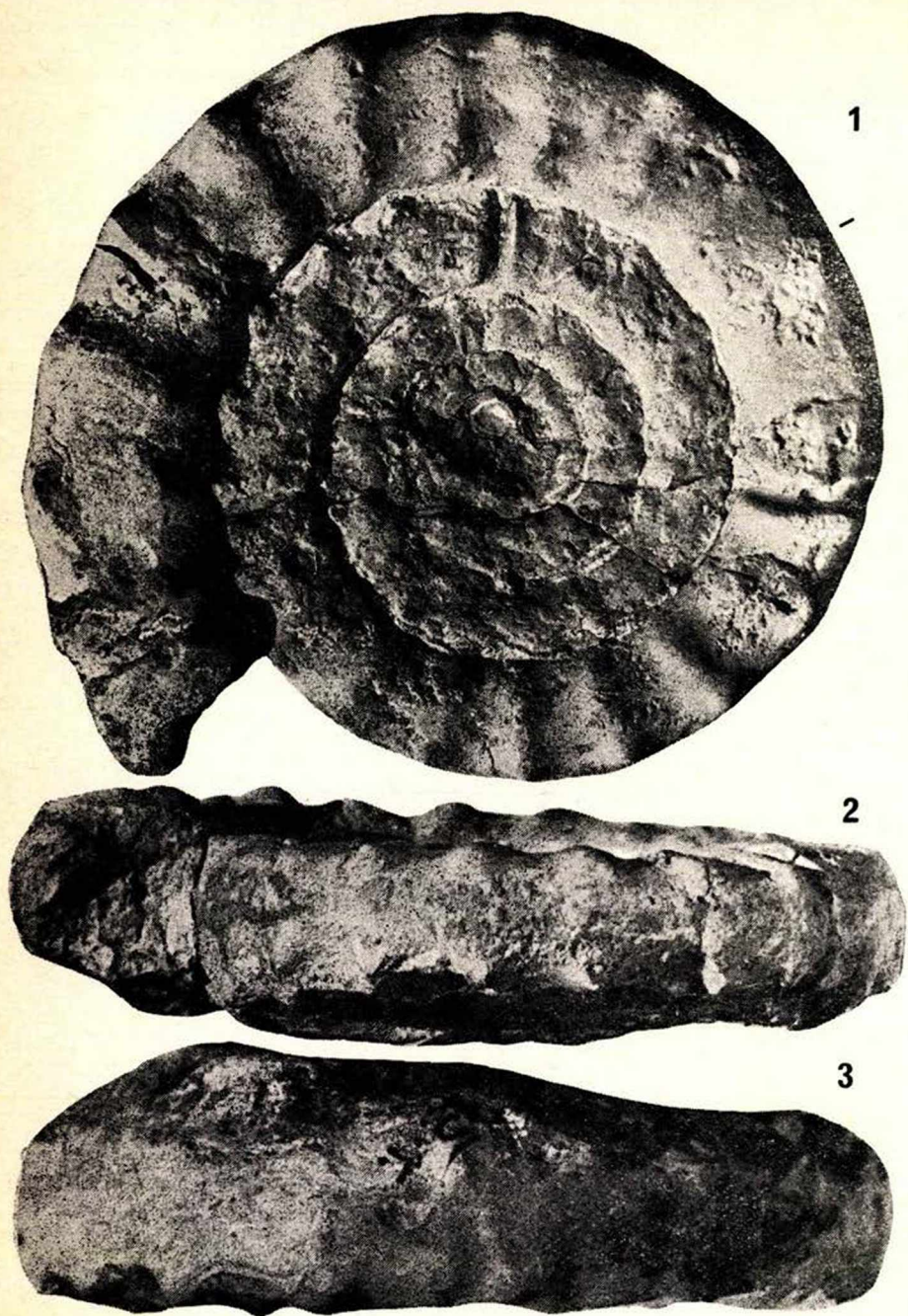


PLATE VII.

Figs. 1, 2, 3. *Volanoceras (Volanoceras) volanense volanense* (OPPEL) (J-10944). Subadult, nearly entire specimen with traces of damaged shell on the posterior part of the body chamber. Hárskút, Közöskút ravine, profile 12, Bed 25. Ponti Zone.

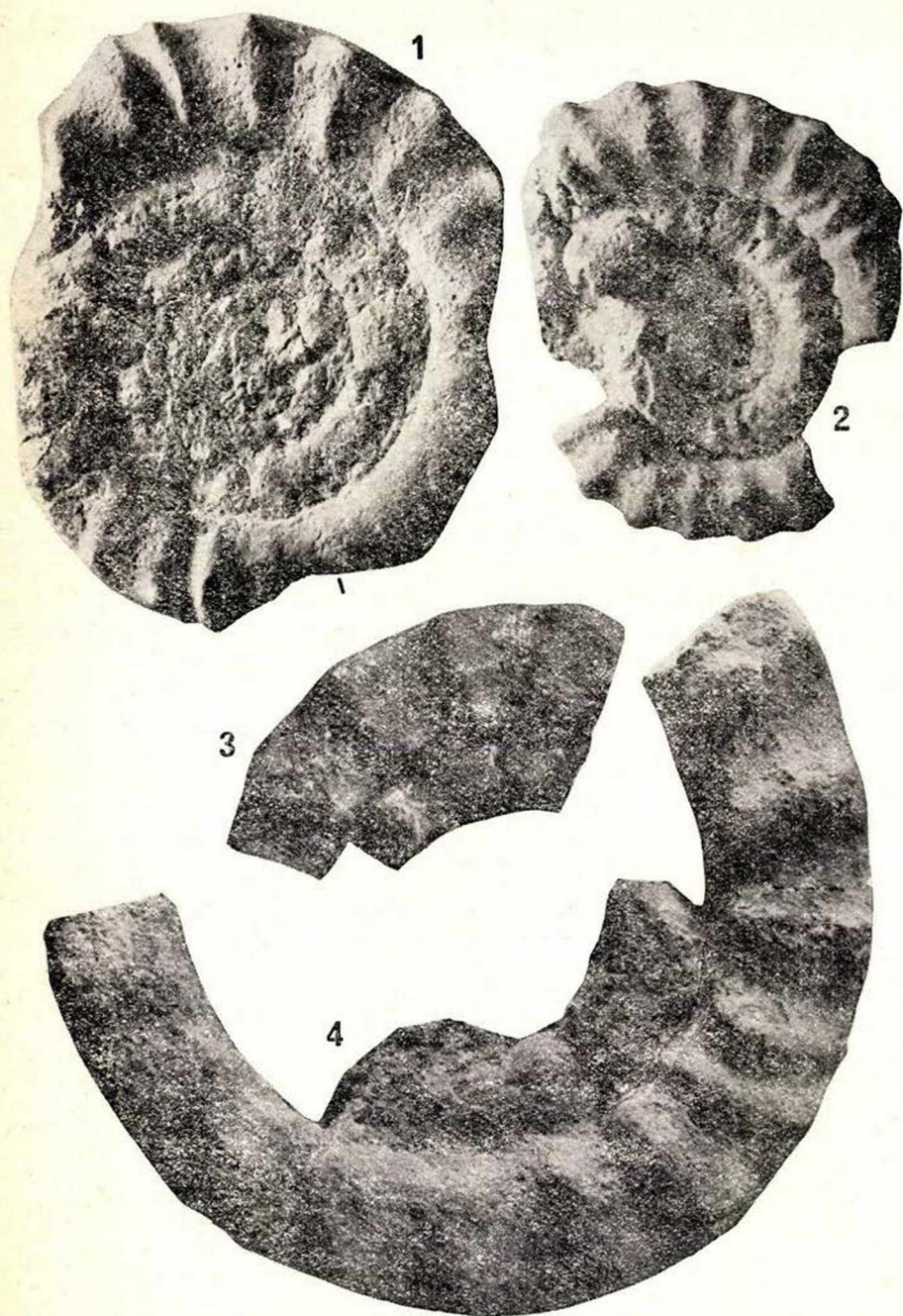


PLATE VIII.

- Fig. 1. *Volanoceras (Volanoceras) volanense schwertschlageri* (SCHNEID) (J-10948). Fragment of a young specimen. Hárskút, Közöskút ravine, profile II, Bed 42. The specimen was figured by FŐZY (1987, Pl. II. Fig. 5.) as *Simoceras schwertschlageri* (SCHNEID). Ponti Zone.
- Fig. 2. *Volanoceras (Volanoceras) volanense volanense* (OPPEL) (J-10206). Fragmentary young specimen. Sümeg.
- Fig. 3. *Volanoceras (Volanoceras) aesinense* (MENEHINI) (J-10954). Phragmocone fragment. Szilasárok, Bed 93. Semiforme Zone.
- Fig. 4. *Volanoceras (Volanoceras) aesinense* (MENGHINI) (J-10955). Fragment of a young specimen. Szilasárok, Bed 92. Semiforme Zone.

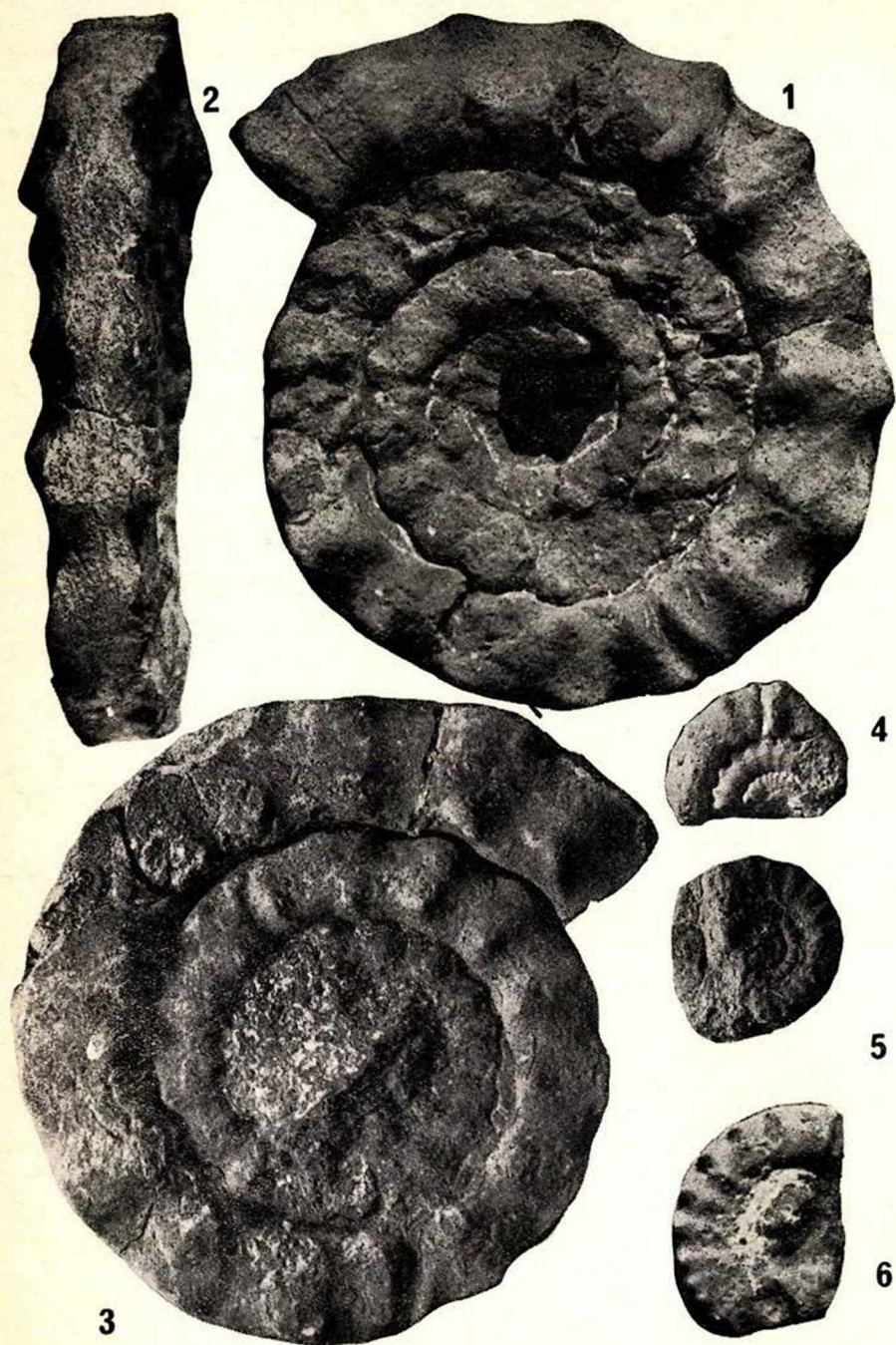


PLATE IX.

- Figs. 1, 2. *Volanoceras (Volanoceras) aesinense* (MENEHINI) (J-10952). Nearly entire young specimen. Lókút Hill, Bed 53. Semiforme Zone.
- Fig. 3. *Volanoceras (Volanoceras) aesinense* (MENEHINI) (J-10950). Fragment of a young specimen with partially preserved shell. Margit Hill, Gerecse Mountains, Bed 4. Semiforme Zone.
- Fig. 4. *Volanoceras* nov. subgen. sp. (J-10958). Probably adult, fragmentary specimen. From the loose material of the Lókút Hill profile.
- Fig. 5. *Volanoceras* nov. subg. sp. (J-10960). Fragmentary specimen. Szilasárok, Bed 66. Ponti Zone.
- Fig. 6. *Volanoceras* nov. subgen. sp. (J-10959). Fragmentary young specimen. Hárskút, Közöskút ravine, profile 12, Bed 25. Ponti Zone.



PLATE X.

- Fig. 1. *Volanoceras (Volanoceras) magnum* (OLÓRIZ) (J-10158). Phragmocone fragment. Sümeg.
- Fig. 2. *Volanoceras (Volanoceras) aesinense* (MENEHINI) (J-10951). Adult specimen with damaged body chamber and nearly entire aperture. Hárskút, Közöskút ravine, from the loose material. The specimen was figured by FÓZY (1987, Pl. I. Fig. 1.) as *Simo-ceras* aff. *volanense* (OPPEL).



PLATE XI.

Fig. 1. *Volanoceras (Volanoceras) magnum* (OLÓRIZ) (J-9791). Body chamber fragment. Süneg.

Fig. 2. ? *Volanoceras (Volanoceras) sp. aff. magnum* (OLÓRIZ) (J-10957). Body chamber fragment, Hárskút, Közöskút ravine, profile II, Bed 43. Ponti Zone.

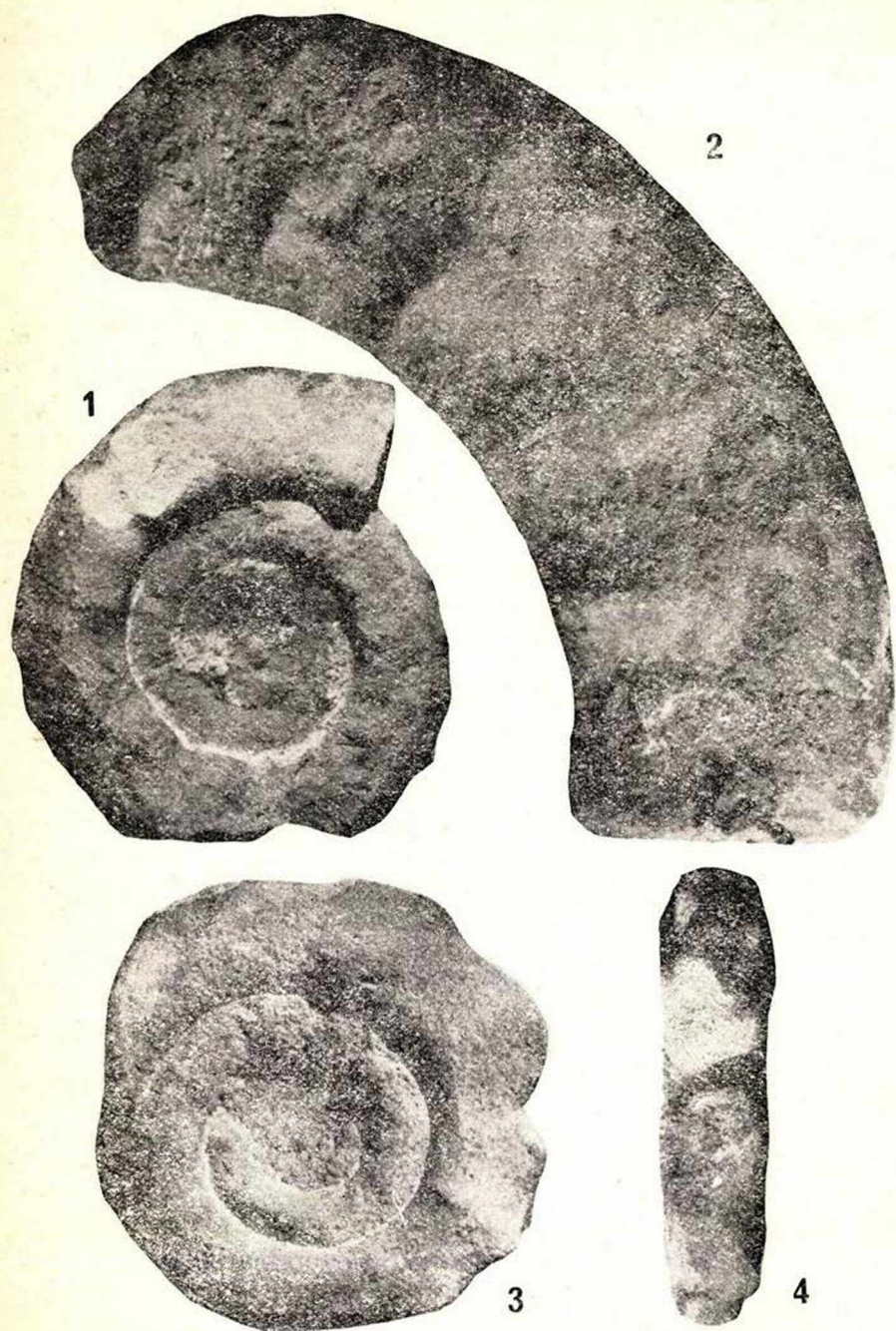


PLATE XII.

- Fig. 1. *Simoceras admirandum* (ZITTEL) (J-1097). Body chamber fragment of a young specimen. Figured by VIGH, G. (1984, pl. 1, fig. 5) as *Simoceras (Simoceras) admirandum bakonyense* nov. ssp. Lókút Hill, Bed 43. Fallauxi Zone.
- Fig. 2. *Simoceras admirandum* (ZITTEL) (J-10967). Fragment of the body chamber and a portion of the phragmocone of a big specimen. Hárskút, Közöskút ravine, profile II, Bed 47. Fallauxi Zone.
- Figs. 3, 4. *Simoceras biruncinatum* (QUENSTEDT) (J-5792). Relatively small, adult specimen with damaged body chamber and missing middle whorls. The strong, „V”-shaped incision is resulted by preparation mistake. Sümeg.

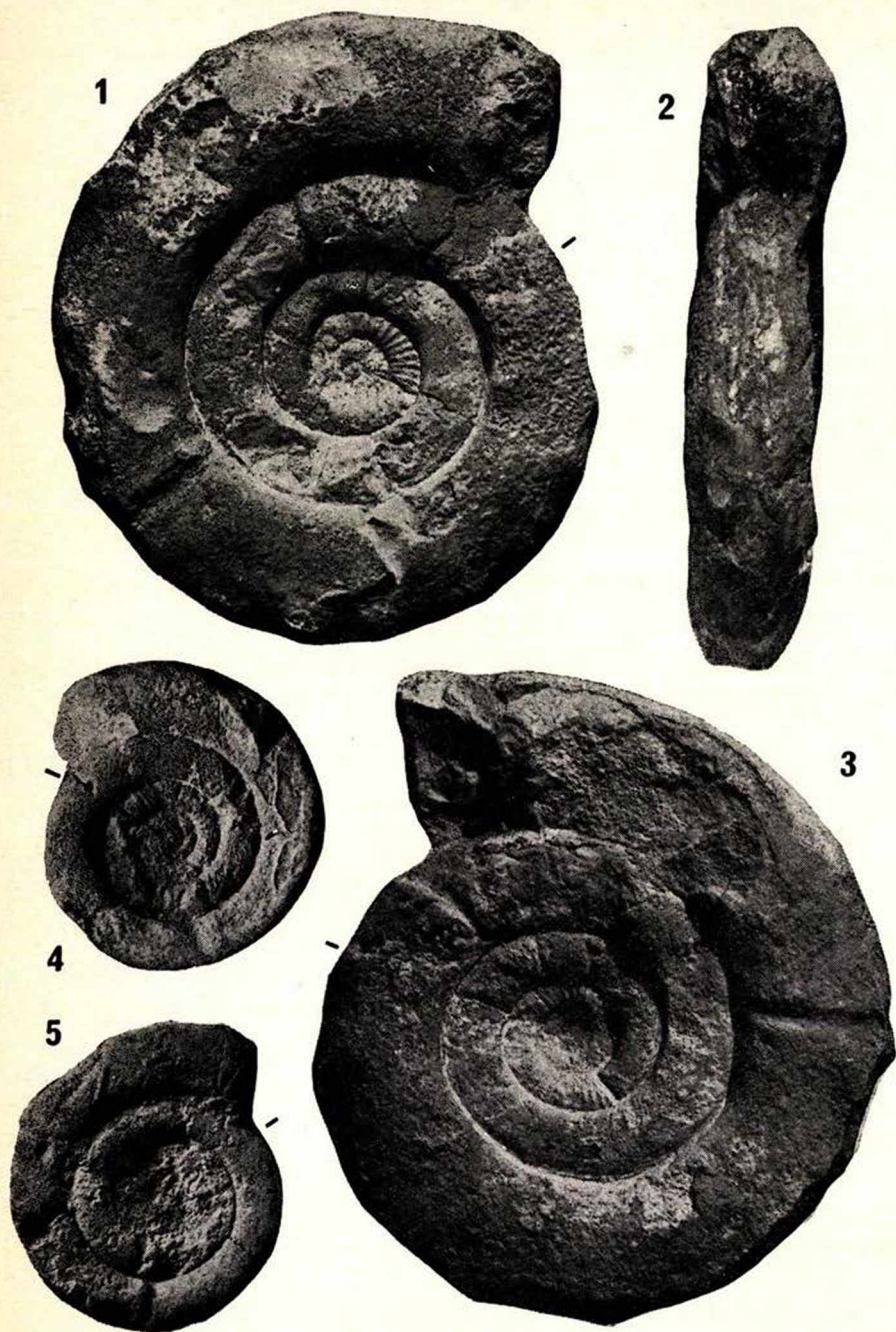


PLATE XIII.

- Figs. 1, 2. *Simolytoceras volanenoides* (VIGH) (J-9803). Adult, nearly entire specimen, figured by VIGH, G. (1984, pl. 3, fig. 1) as *Simoceras (Lytoogyroceras) subbeticum volanenoides* nov. ssp. Lókút Hill, Bed 44. Fallauxi Zone.
- Fig. 3. *Simolytoceras volanenoides* (VIGH) (Holotype, J-9802). Adult, nearly entire specimen, figured by VIGH, G. (1984, pl. 3, fig. 2) as *Simoceras (Lytoogyroceras) subbeticum volanenoides* nov. ssp. Lókút Hill, Bed 43. Fallauxi Zone.
- Figs. 4, 5. *Lytoogyroceras subbeticum* OLÓRIZ (J-10976). Young, nearly entire specimen. Hárskút, Közöskút ravine, profile II, Bed 42. Ponti Zone. The specimen was figured by FÖZY (1987, Pl. II. Fig. 3.) as *Lytoogyroceras* sp. Ponti Zone.

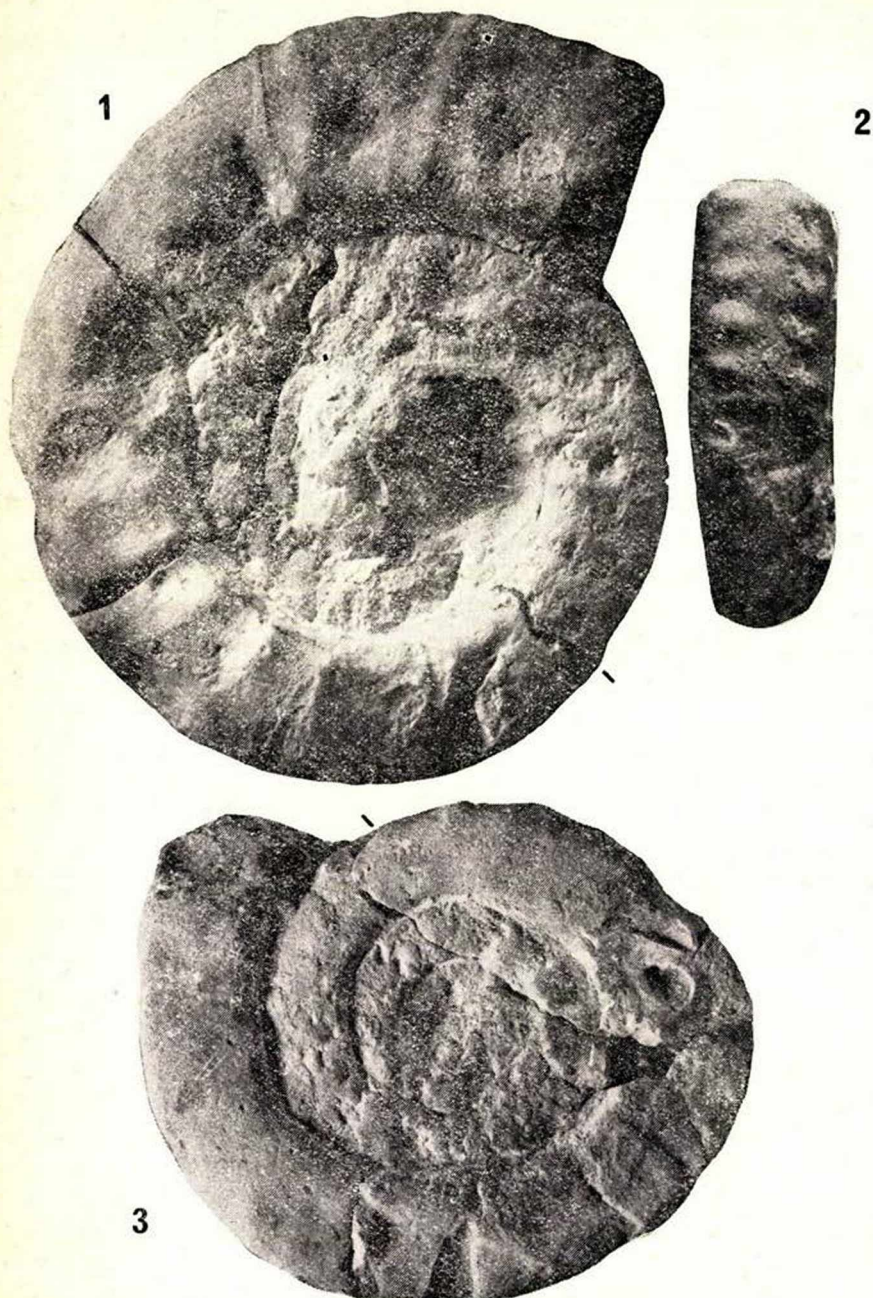
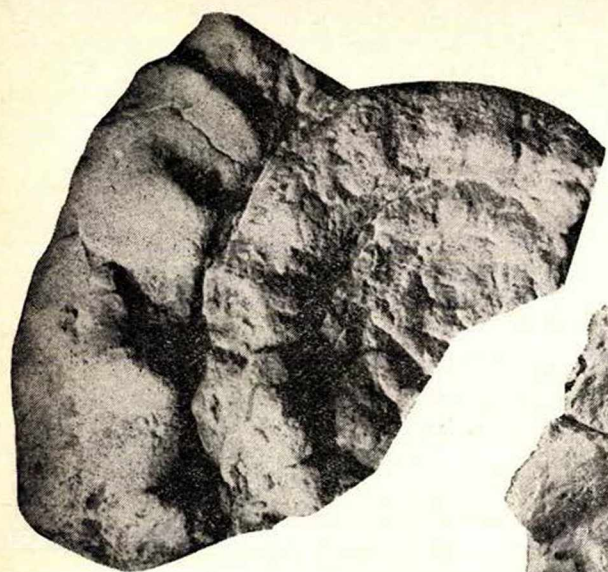


PLATE XIV.

- Figs. 1. *Simolytoceras vighi* nov. sp. (Holotype, J-10975). Adult specimen without inner whorls. Hárskút, Közöskút ravine, profile II, Bed 49. Fallauxi Zone.
- Fig. 2. *Simolytoceras vighi* nov. sp. (Holotype, J-10975). Ventral view of an inner whorl. About two times enlarged. Közöskút ravine, profile II, Bed 49. Fallauxi Zone.
- Fig. 3. *Simolytoceras volanensoides* (VIGN) (J-10972). Adult, nearly entire specimen. Hárskút, Közöskút ravine, profile II, Bed 50. Fallauxi Zone.



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PLATE XV.

- Fig. 1. *Simoceras admirandum* (ZITTEL) (J-10968). Fragment of a medium-sized specimen. Lókút Hill, Bed 43. Fallauxi Zone.
- Fig. 2. *Simoceras admirandum* (ZITTEL) (J-10963). Fragment of an adult (?), small specimen. Szilasárok, Bed 79. Fallauxi Zone.
- Fig. 3. *Simoceras admirandum* (ZITTEL) (J-10962). Inner whorl of a big specimen. Szilasárok, Bed 77. Fallauxi Zone.
- Fig. 4. *Lytogyroceras strictum* (CATULLO) (J-10208). Probably adult, nearly complete specimen. Sümeg.

The species of OLÓRIZ may be identical with that described by RAMACCIONI (1939) as *S. costaricciense*. However, the incomplete description and the photograph of the badly preserved specimen is insufficient for strict decision.

The ammonites figured by ROSSI (1984) are more tightly coiled, more rapidly grown than the type, and they have fewer constrictions. Further difference is that the ribs are more projected on Rossi's specimens than on the holotype.

Those forms described by VIGH (1984) as new subspecies, with characteristic sculpture (i. e. elongated tubercules on the ventrolateral margin) can be ranged into the genus *Simolytoceras* (see above).

Distribution. The species was hitherto known only from the Burckhardtceras Zone of the Betic Cordilleras. The Bakony specimens came from the same stratigraphic horizon (i. e. Ponti Zone).

Dimorphism. No indications are known in this context.

* * *

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REFERENCES

- ARHELL, W. J. (1956): *Jurassic Geology of the World*. Oliver and Boyd, 806 p. Edinburgh.
- BARTHEL, K. W. (1962): Zur Ammonitenfauna und Stratigraphie der Neuburger Bankkalke. Abh. Bayer. Akad. Wiss., mathem.-naturwiss. Kl., N. F. 105, pp. 1-30, pls. 5. München.
- BERCKHEMER, F., Hölder, H. (1959): Ammoniten aus dem oberen Weissen Jura Süddeutschlands. Beih. Geol. Jb., 35, pp. 1-135, pls. 27. Hannover.
- BERNOULLI, D., RENZ, O. (1970): Jurassic carbonate facies and new ammonite fauna from Western Greece. *Eclogae Geol. Helv.*, 63, 2, pp. 573-607, pls. 6, Basle.
- BLANCHET, F. (1928): Étude paléontologique d'une nouvelle gisement fossilifère dans le Tithonique intra-alpin entre Briançon et Château-Queyras (Hautes-Alpes). *Ann. Univ. Grenoble*, n.s. 2, pp. 259-295, pl. 1. Grenoble.
- BLASCHKE, F. (1911): Zur Tithonfauna von Stramberg in Mahren. *Ann. k.-k. Natur-hist. Hofmus.*, 25, pp. 1-143, pl. 1, Wien.
- BREISTROFFER, M. (1947): Notes de nomenclature paléozoologique. I. Ammonites jurassiques et crétacées. *Proc. Verbaux mens. Soc. Sci. Dauphiné*, 26, 196, 5 pp., Grenoble.
- BURCKHADDT, C. (1903): Beiträge zur Kenntniss der Jura und Creideformation der Cordillere. *Palaeontographica*, 50, pp. 1-140, pls. 16, Stuttgart.
- CALLOMON, J. H. (1969): Dimorphism in Jurassic ammonites, In: Westermann, G. E. G. (Ed.): *Sexual Dimorphism in Fossil Metazoa and Taxonomic Implications*. IUGS, Ser. A, No. 1, pp. 111-121, Stuttgart.

- CATULLO, T. A. (1846): Memoria geognostica paleozoica sulla Alpi Venete. Mem. Soc. It. Sci., 4, pp. 1-158, pls. 11, Padova.
- CECCA, F. (1985): Alcune ammoniti provenienti dalla "Maiolica" dell' Appennino Centrale (Umbria, Marche e Sabina). Boll. Serv. Geol. It., 103, pp. 133-162, pls. 6, Roma.
- CECCA, F., CRESTA, S., GIOVAGNOLI, M.-C., NANNI, R., MARIOTTI, N., NICOSIA, U., SANTANTONIO, M. (1981): Tithonian "Ammonitico Rosso" near Bolognola (Marche - Central Apennines): a shallow water nodular limestone. In: Farinacci, A., Elmi, S. (Eds.): Rosso Ammonitico Symposium Proceedings., pp. 91-111, Roma.
- CECCA, F., CRESTA, S., PALLINI, G., SANTANTONIO, M. (1985): Remarks on the Kimmeridgian - Lower Tithonian ammonite biostratigraphy of two sections in the Central Apennines (Italy). Newsl. Stratigr., 15, 1, pp. 28-36, Stuttgart.
- 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, pp. 109-132, pls. 5, Roma.
- COLLIGNON, M. (1960): Atlas des fossiles caractéristiques de Madagascar. Fasc. VI. (Tithonique). Rep. Malgache Serv. Géol., 137-175 pls., Tananarive.
- DEL CAMPANA, D. (1905): Fossili del Giura Superiore di Sette Comuni in provincia di Vicenza. Pubblic. R. Inst. Studi Sup. Firenze, 28, pp. 1-140, pls. 7, Firenze.
- DONOVAN, D. T., CALLOMON, J. H., HOWARTH, M. K. (1981): Classification of the Jurassic Ammonitina. In: House, M. R., Senior, J. R. (Eds.): The Ammonoidea. Syst. Ass. Spec. Vol., 18, Academic Press, pp. 101-157, London.
- DONZE, P., ENAY, R. (1961): Les Céphalopodes du Tithonique inférieur de la Croix-de-Saint-Concours près Chambéry (Savoie). Trav. Lab. Géol. Lyon, N. S. No. 7, pp. 1-236, pls. 22, Lyon.
- ENAY, R. (1983): Spéciation phylétique dans le genre d'Ammonite téthysien *Semiformiceras* SPATH du Tithonique inférieur des chaînes bétiques (Andalousie, Espagne). In: Modalités, rythmes et mécanismes de l'évolution biologique. Gradualisme phylétique ou équilibres ponctués? Coll. Intern. du CNRS, No. 330, Paris, pp. 115-123.
- ENAY, R., CECCA, F. (1986): Structure et évolution des populations tithoniques du genre d'ammonites téthysien *Haploceras* ZITTEL, 1868. In: Commemorazione di Raffaele Piccinini, Atti i convegno Pergola, 25-28 ottobre 1984, Fossili Evoluzione Ambiente, pp. 37-53, pls. 4, Pergola.
- ENAY, R., GEYSSANT, J. R. (1975): Faunes tithoniques des chaînes bétiques (Espagne méridionale). In: Colloque sur la limite Jurassique-Crétacé, Lyon - Neuchatel, septembre 1973, Mém. BRGM No. 86, pp. 39-55, Paris.
- FAVRE, E. (1877): La zona à *Ammonites acanthicus* dans les Alpes de la Suisse et de la Savoie. Mém. Soc. Paléont. Suisse, 14, pp. 1-113, pls. 7, Basle.
- FAVRE, E. (1880): Description des fossiles des couches tithoniques des Alpes Fribourgeoises. Mém. Soc. Paléont. Suisse, 16, pp. 1-72, pls. 5, Basle.
- FISCHER, P. (1882): Manuel de conchyliologie et de paléontologie conchyliologique. Edit. Savay, 4, pp. 305-416; Paris.
- FONTANNES, F. (1879): Description des Ammonites des calcaires du Château du Crussol (Ardèche). Trav. Univ. Lyon, pp. 1-122, pls. 13, Lyon.
- FÖZDY, I. (1987): Upper Jurassic ammonite biostratigraphy in the Transdanubian Central Range (Hungary). Preliminary results. Ann. Univ. Sci. Budapest., Sect. Geol., 27, Budapest (in press)
- FÖZDY, I. (1988): Kimmeridgian and Tithonian ammonite biostratigraphy in the Bakony Mts. (Hungary). Pergola (in press).
- GEMMELLARO, G. G. (1868-1876): Studi pal. sulla fauna del Calcarea a *Terebratula janitor* del Nord di Sicilia. Giorn. Sci. Nat. Ecoenom. Part I. pp. 1-56; pls. 12; Part II, pp. 57-92, pls. 15; Part III, pp. 1-100, pls. 13). Palermo.
- GEYSSANT, J. R. (1979): Évolution, systématique et dimorphisme d'un nouveau genre d'ammonite: *Baeticoceras* (Ammonitina, Simoceratinae) dans le Tithonique supérieur des Cordillères bétiques (Espagne). Palaeontographica, 166, pp. 1-36, pls. 4, Stuttgart.
- GEYSSANT, J. R. (1982): L'équilibre intermittent: une modalité d'évolution présente chez les Simoceratidae (Ammonites du Tithonique). 9^e Réunion. Ann. Sci. Terre, Paris, 1982. p. 275, Paris.

- GEYSSANT, J. R. (1985): Révision taxonomique du genre d'ammonite téthysien *Simoceras* et création d'un nouveau genre *Volanoceras* (Ammonitina, Simoceratidae). *Geobios*, 18, 5, pp. 677–680, Lyon.
- HAUPT, O. (1907): Beiträge zur Fauna des Malm und der unteren Kreide in der argentinischen Cordillera. *N. Jb. Miner. Geol. Palaeont., B.* – B. 23, pp. 187–236, pls. 4, Stuttgart.
- HIMSHASHVILI, N. G. (1976): Ammonoidei Titona i Berriasa Kavkasa. 180 p, 25 pls., Mecnereba, Tbilisi.
- HOLLMANN, R. (1961): *Simoceras (Simoceras) biruncinatum* (QUENSTEDT, 1845) forma *Aegra Calcar* ZIETEN, 1830 (Ammonoidae) aus dem Untertithon der Sette Comuni (Norditalien). *Mem. Mus. Civ. Stor. Nat.*, 9, pp. 267–272, pl. 1, Verona.
- IMLAY, R. W. (1942): Late Jurassic fossils from Cuba and their economic significance. *Bull. Geol. Soc. Am.*, 53, 10, pp. 1417–1478, pls. 12, New York.
- JEKELIUS, E. (1916): A brassói hegyek mezozoós faunája. III–VII. A brassói dogger és malmfauna. *M. Kir. Földt. Int. Évk.*, 24, 3, pp. 221–314, pls. 3, Budapest.
- KILIAN, M. (1889): Études paléontologiques des terrains secondaires et tertiaires de l'Andalousie. Mission d'Andalousie, *Mém. Acad. Sci. Inst. France*, 30, 2, pp. 601–739, pls. 33, Paris.
- KRANTZ, F. (1928): La fauna del Titono superior y medio de la Cordillera Argentina en la parte meridional de la provincia de Mendoza. *Acad. Nac. Cienc. Rep. Arg.*, 10, pp. 2–57, pls. 4, Buenos Aires.
- KUTEK, J., WIERZBOWSKI, A. (1979): Lower to Middle Tithonian ammonite succession at Rogoznik in the Pieniny Klippen Belt. *Acta Geol. Pol.*, 29, 2, pp. 196–205, pls. 2, Warszawa.
- LINARES, A., VERA, J. A. (1966): Precisiones estratigráficas sobre la serie mesozoica de Sierra Gorda, Cordilleras Béticas (provincia de Granada). *Estudios Geol.*, 22, pp. 65–99, pls. 14, Madrid.
- MENEGHINI, G. (1885): Nuove ammoniti dell' Appennino Centrale raccolte dal Reverendo Don A. Moriconi. *Mem. Soc. Tosc. Sci. Nat.*, 6, 2, pp. 363–382, pls. 3, Pisa.
- NEUMAYR, M. (1873): Die Fauna der Schichten mit *Aspidoceras acanthicum*. *Abh. k.-k. Geol. Reichsanst.*, 5, 6, pp. 141–257, pls. 12, Wien.
- OLÓRIZ, S. F. (1978): Kimmeridiense-tithonico inferior en el sector central de las Cordilleras Béticas (Zona Subbética). *Paleontologia, Bioestratigrafía. Tesis doct. Univ. Granada*, No. 184, pp. 1–758, pls. 57, Granada.
- OLÓRIZ, S. F., TAVERA, J. M. (1977): *Simospiceras* (Ammonoidea) gen. nov. avance sobre nuevas morfologías pertenecientes a la base del Tithonico superior en las Cordilleras Béticas (Zona Subbética). *Cuadernos Geol.*, 8, pp. 183–189, pl. 1, Granada.
- OPPEL, A. (1863): Über jurassische Cephalopoden (Fortsetzung). *Paläont. Mitt. Mus. k. bayer. Staat.*, 3, pp. 163–266, pls. 23, Stuttgart.
- OPPEL, A. (1865): Die tithonische Etage. *Zeitschr. Deutsch. geol. Ges.*, 17, pp. 535–558, Berlin.
- PATRULIUS, D., AVRAM, E. (1976): Les céphalopodes des couches de Carhaga (Tithonique supérieur – Barrémien inférieur). *Mém. Inst. Géol. Géophys.*, 24, pp. 153–201, pls. 10, Bucharest.
- PEJO, I. (1966): Fauna e Jures se siperme e zones tektonike Mirdita. *Bul. Shkenc. Nat.*, 4, pp. 94–101, Tirana.
- QUENSTEDT, F. A. (1845–1849): Petrefactenkunde Deutschlands. Abt. I, Die Cephalopoden. pp. 1–104 (1845); pp. 105–184 (1846); pp. 185–264 (1847); pp. 265–472 (1848)? pp. 473–580 and Atlas (1849), Tübingen.
- RAILEANU, G., NASTASEANU, A. (1960): Contributii la cunoasterea faunei de ammoniti din Jurasicul superiore la Svinita (Banat). *Stud. Cerc. Geol.*, 5, pp. 7–38, pls. 11, Bucharest.
- RAMACCONI, G. (1939): Fauna guiraliassica e cretacea de Monte Cucco e dintorni (Appennino Centrale). *Paleont. It.*, 39, pp. 143–214, pls. 5, Pisa.
- RETOWSKI, O. (1893): Die tithonische Ablagerungen von Theodosia. Ein Beitrag zur Palaeontologie der Krim. *Bull. Soc. Imp. Nat. Moscou*, N. S. 7, 2–3, pp. 1–95, 6 pls., Moscou.

- ROSSI, F. (1984): Ammoniti del Kimmeridgiano superiore - Berriasiano inferiore del Passo del Furlo (Appennino umbro-marchigiano). Mem. Soc. It. Sci. Nat. Mus. Civ. St. Nat. Milano, 23, 3, pp. 73 - 136, pls. 8, Milano.
- SANTANTONIO, M. (1985): *Simoceras volanense* (OPPEL), *Simoceras aesinense* MENEGHINI e forme affini nel Titonico inferiore dell'Appennino umbro-marchigiano. In: Commemorazione di Raffaele Piccinini, Atti i convegno Pergola, 25 - 28 ottobre 1984, Fossili Evoluzione Ambiente, pp. 11 - 23, pls. 6, Pergola.
- SAPUNOV, I. G. (1979): Les Fossiles de Bulgarie. III. 3, Jurassique supérieur, Ammonoidea. Acad. Bulg. Sci., pp. 1 - 237, pls. 59, Sofia.
- SARTI, C. (1986): Faune e biostratigrafia del Rosso Ammonitico del Trentino centrale (Kimmeridgiano - Titonico). Boll. Soc. Paleont. It., 23, 3, pp. 473 - 514, pls. 7, Modena.
- SCHNEID, T. (1915): Die Ammonitenfauna der ober-tithonischen Kalke von Neuburg a. d. Donau. Geol. Paläont. Abh., N. F. 13, pp. 305 - 416, pls. 13, Jena.
- SPATH, L. F. (1923 - 43): A monograph of the Ammonoidea of the Gault. Palaeontogr. Soc., pp. 1 - 787, pls. 72, London.
- SPATH, L. F. (1924): On the Blake collection of ammonites from Kachh, India. Mem. Geol. Surv. India, Paleont. Ind., N. S. 11, 1, pp. 1 - 29, Calcutta.
- SPATH, L. F. (1925): On the collection of fossils and rocks from Somaliland. VII. Ammonites and aptychi. Monogr. Geol. Dep. Hunterian Mus. 1, pp. 111 - 164, pls. 2, Glasgow.
- SPATH, L. F. (1950): A new Tithonian ammonite fauna from Kurdistan, Northern Iraq. Bull. Brit. Mus. (Nat. Hist.), 1, pp. 93 - 137, pls. 4, London.
- TOUCAS, A. (1890): Étude de la faune des couches tithoniques de l'Ardèche. Bull. Soc. géol. France, 3, 18, pp. 560 - 629, pls. 5, Paris.
- VERMA, H. M., WESTERMANN, G. E. G. (1973): The Tithonian (Jurassic) ammonite fauna and stratigraphy of Sierra Catorce, San Luis Potosi, Mexico. Bull. Am. Paleont., 63, No. 277, pp. 1 - 320, pls. 56, Ithaca, New York.
- VIGH, G. (1976): In: Fülöp, J.: The Mesozoic basement horst blocks of Tata. Geol. Hung., Ser. Geol., 16, pp. 1 - 229, pls. 52, Budapest.
- 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, pp. 1 - 210, pls. 7, Budapest.
- ZEISS, A. (1968): Untersuchungen zur Palaeontologie der Cephalopoden des Unter-Tithon der Südlichen Frankenalb. Abh. Bayer. Akad. Wiss., math.-naturwiss. Kl., N. F. 132, pp. 1 - 190, pls. 5, München.
- ZEJSZNER, L. (1846): Howe Lubniedokladnie opisane gatunki skamienialosci Tatrowych. Poszyt 1, pp. 1 - 32, pls. 4, Warszawa.
- ZITTEL, K. A. (1868): Die Cephalopoden der Stramberger Schichten. Paläont. Mitt. Mus. k. bayer. Staat., 2, 1, pp. 1 - 118, pls. 24, München.
- ZITTEL, K. A. (1869): Geologische Beobachtungen aus den Central-Appenninen. Geogn. Palaeont., Beitr. 2, pp. 88 - 178, München.
- ZITTEL, K. A. (1870): Die Fauna der älteren Cephalopoden führenden Tithonbildungen. Paläont. Mitt. k. bayer. Staat., 2, 2, pp. 119 - 310, 15 pls., Cassel.