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Taxonomic revision of the Kimmeridgian (Upper Jurassic) genus *Mesosimoceras* (Ammonoidea) and institution of the new genus *Presimoceras* (Ammonitina, Idoceratinae)

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With 12 figures and 2 tables

Zusammenfassung: Aus den *Taramelliceras strombecki, Crussoliceras divisum*, und untersten *Aspidoceras acanthicum* Zonen (Kimmeridge) wird die neue Gattung *Presimoceras* beschrieben und mit der Gattung *Mesosimoceras* verglichen. *Presimoceras* gehört zusammen mit der Gattung *Mesosimoceras* SPATH (1925) zu den Idoceratinae. Die von SPATH (1925) mit der Typusart »*Simoceras cavouri* GEMMELLARO« aufgestellte Gattung *Mesosimoceras* wird revidiert und enthält nur noch die *Cavouri-risgoviense*-Artengruppe. Die *herbichi-ludovicii* und *teres*-Gruppe wird der neuen Gattung *Presimoceras* mit der Typusart »*Ammonites nodulatus* QUENSTEDT« zugeordnet.

Eine Übersicht über alle bekannten *Presimoceras*- und *Mesosimoceras*-Arten wird gegeben. Phylogenetisch läßt sich *Presimoceras* von *Passendorferia* und *Mesosimoceras* von *Nebrodites* ableiten.

Abstract: *Presimoceras* is a new genus of Idoceratinae. The biostratigraphical range of *Presimoceras* is limited to the *Strombecki, Divisum* and lower part of the *Acanthicum* Zone within the Kimmeridgian (in the Southern European sense).

The genus *Mesosimoceras* (Idoceratinae) was instituted by SPATH (1925), with *Simoceras cavouri* GEMMELLARO as type species; this genus is here emended with the institution of *Presimoceras* n. gen. The species group *cavouri-risgoviense* is preserved in the emended genus *Mesosimoceras*, while the group *herbichi-ludovicii-teres* is accommodated in *Presimoceras* on account of the radical and numerous differences and the stratigraphical gap between *Mesosimoceras* and *Presimoceras*. As type species of the new genus *Ammonites nodulatus* QUENSTEDT is designated. The new genus is here subdivided into three groups of species: *herbichi, ludovicii* and *teres*.

Phylogenetically, *Presimoceras* is derived from *Passendorferia, Mesosimoceras* from *Nebrodites*.

Introduction

The genus *Mesosimoceras* was instituted by SPATH (1925), who subdivided the original genus *Simoceras* ZITTEL, 1870, after having elevated it to family rank (Simoceratidae), which included the genera: *Nebrodites* BURCKHARDT, 1912, *Waagenia* NEUMAYR, 1878, *Simoceras* ZITTEL, 1870, *Lytogyroceras* SPATH, 1925, *Benacoceras* SPATH, 1925, *Virgatosimoceras* SPATH, 1925, *Pseudosimoceras* SPATH 1925 and *Mesosimoceras*. Subsequent authors treated *Mesosimoceras* usually as a subgenus of *Nebrodites*.

SPATH considered *Mesosimoceras cavouri* (GEMMELLARO, 1872) as type species of the new genus.

In 1938 ROMAN, in discussing the genus *Simoceras* included *M. cavouri*, regarded *Nebrodites* as subgenus of *Simoceras*, and divided it in three groups of species; one group is the *Nebro-*

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dites agrigentinum group with the species *contortum* (NEUM.), *doublieri* (D'ORB.), *agrigentinum* (GEMM.) and *cafisii* (GEMM.). A second group is the *Nebrodites teres* group with the species *teres* (NEUM.), *fucinii* (CANAV.), *zitteli* (BURCKH.) and *rota* (BURCKH.). The third group is the *Nebrodites herbichi* group with the species *herbichi* (HAUER), *benianus* (CAT.), *zeuxis* (GEMM.), *nodosocostatus* (BURCKH.), *quenstedti* (BURCKH.) and *aguilerae* (BURCKH.). The second and third groups which include mainly *Mesosimoceras* s. l. mirror those mentioned by BURCKHARDT in 1912, when he instituted the genus *Nebrodites* without including *Mesosimoceras cavouri* as follows (translated from French):

"*Nebrodites teres* group = ribs strong and straight, generally simple and distant in the adult, whorls quadrate or rectangular, slightly overlapping, constrictions more or less deep, mainly superficial. Mexican species: *N. rota* BURCKH., *N. zitteli* BURCKH.; European species: *Amm. planula planus* QUENST., *Sim. teres* NEUM., *Sim. parateres* CAN., *Sim. fucinii* CAN., *Sim. ludovicii* MGH., *Sim. zullianum* PAR., *Sim. teres* FAVRE.

Nebrodites herbichi group = shell evolute, whorls generally more or less rectangular. Ribs chiefly on the body chamber, strong and straight, single and distant, tending to develop ventral tubercles; constrictions generally very weak or absent, chiefly on the body chamber. Mexican species: *N. nodosocostatus* BURCKH., *N. quenstedti* BURCKH., *N. aguilerae* BURCKH.; European species: *Amm. herbichi* HAU., *Amm. benianus* CAT., *Sim. zeuxis* GEMM., *Perisph. venetianus* ZITT., *Amm. planulacinctus* QUENST., *Amm. nodulatus* QUENST."

In 1959 ZIEGLER considering *Mesosimoceras* as subgenus of *Nebrodites*, proposed the following key:

Mesosimoceras = body chamber only with simple ribs
I 1 – forms small-sized with diameter about 25 mm. The ribs on the body chamber are strong ..... *M. hossingensis* (FISHER)
I 2 – forms medium-sized, tending to large, up to 70 mm in diameter.
1° – whorl section oval tending to compressed, whorls essentially higher than wide.
a) ribs on the body chamber widely spaced.
a1) venter smooth ..... *M. herbichi* (HAU.)
a2) ribs on the venter ..... *M. planulacinctus* (QUENST.)
b) shell with dense ribs on the body chamber, diameter about 200 mm ..... *M. risgoviensis* (SCHN.)
2° – whorl section roundish, or slightly higher than wide.
a) venter rounded, the ribs on the body chamber are rather dense; with scarce constrictions ..... *M. teres* (NEUM.)
b) venter somewhat oval in cross-section, dense ribs on the body chamber, constrictions numerous ..... *M. cavouri* (GEMM.)

From this scheme of ZIEGLER it becomes apparent, that form 1°b and 2°b in reality belong to the same group, as they exhibit the same characters: very dense ribs on the body chamber, an oval prolonged venter and moreover – characters not cited by ZIEGLER – a very slow whorl increase, very large umbilicus and increasing number of ribs during ontogeny, characters that do not normally appear in the remaining species of *Mesosimoceras*.

Emendment of the genus *Mesosimoceras* SPATH, 1925

The genus *Mesosimoceras* consequently comprises two groups of species of Kimmeridgian age: the group *cavouri-risgoviense* and the group *herbichi-teres*. The differences between these two groups of species are sufficient to separate them as distinct genera and distinguish them also from *Nebrodites*, *Passendorferia*, and *Idoceras*.

I propose, therefore, to reserve the name *Mesosimoceras* for the group *cavouri-risgoviense* that includes the type species of the genus.

Type species: *Mesosimoceras cavouri* (GEMMELLARO), 1872; 44, pl. 7, figs. 3–4.

Diagnosis: Shell with very highly evolute coiling and very slightly crescent; whorl section oval, higher than wide, tending to be compressed. Ornamentation: Many dense, simple ribs. From inner whorls the ribs become progressively more numerous on middle and outer whorls. The ribs sometimes end with ventro-lateral tubercles. Venter with median smooth band. In the early whorls rare biplicate ribs can be present. Constrictions more or less numerous and deep.

Stratigraphic range: Upper Kimmeridgian, *Cavouri* Zone (CHRIST, 1960 = *Pseudomutabilis* Zone, OLORIZ, 1978, 1979, OLORIZ & TAVERA, 1981, SAPUNOV, 1979 = *Sesquinodosum* Zone, SARTI, 1987, 1988, SCHNEID, 1914 = *Pseudomutabilis* Zone).

Tab. 1. Species assigned to *Mesosimoceras*.
Tab. 1. Arten der Gattung *Mesosimoceras*.

Mesosimoceras	1) *M. cavouri* group	1A *cavouri*, multiribbed morphotype 1B *cavouri*, pauciribbed morphotype
	2) *M. risgoviense* group	2A *risgoviense*, multiribbed morphotype 2B *risgoviense*, pauciribbed morphotype

Mesosimoceras cavouri group: Shell markedly evolute, very slightly crescent, maximum diameter about 150 mm, with very large umbilicus. Whorls hardly overlapping. Ornamentation: Inner, middle and outer whorls with close, always simple, radial or slightly prorsiradiate ribs. These ribs become progressively more numerous during ontogeny. The ribs end on the ventral margin where ventral or ventro-lateral tubercles are sometimes present.

Multiribbed morphotype: The closeness of ribs from inner to outer whorls is very considerable; on the last whorl a highly increased number of ribs can be seen (examples: FLORIDIA 1931, pl. 5, fig. 1; OLORIZ 1978, pl. 15, fig. 5; see also fig. 6A).

Pauci-ribbed morphotype: The distance of ribs increases on the inner and outer whorls; on the last whorl a lower number of ribs than in the previous morphotype is present (examples: GEMMELLARO 1872: pl. 7, figs. 3–4; CANAVARI 1898: pl. 15, figs. 1–2; ROMAN 1936: pl. 1, figs. 5–5a; SAPUNOV 1979: pl. 32, fig. 2; SARTI 1988: pl. 1, fig. 6 a–b; see also Fig. 1).

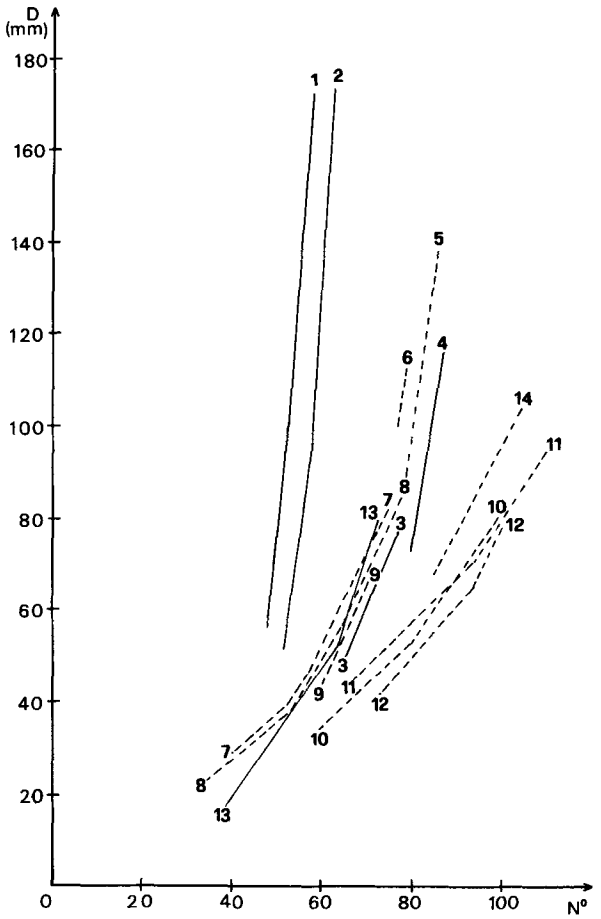
Mesosimoceras risgoviense group: Shell markedly evolute, slightly crescent, maximum diameter about 220 mm, with large umbilicus. Whorls slightly overlapping. Ornamentation: Simple, radial or slightly prorsiradiate ribs. On the inner whorls rare biplicate ribs can be present. The ribs become progressively more numerous during ontogeny. On the ventral margin the ribs have a small tubercle or ventro-lateral thickening. The ribs sometimes pass across the venter, though very weakened. Sporadic constrictions occur.

Multiribbed morphotype: Inner, middle and outer whorls with numerous ribs (examples: ANDELKOVIC 1966: pl. 20, fig. 5; OLORIZ 1978: pl. 15, fig. 4; SARTI 1988: pl. 1, fig. 5).

Pauci-ribbed morphotype: Ribs less numerous than in the previous morphotype (examples: PERVINQUIÈRE 1907: pl. 1, fig. 11; SCHNEID 1914: pl. 2, fig. 5; see also Fig. 1).

Mesosimoceras cavouri of ANDELKOVIC (1966: pl. 20, fig. 5) are inner whorls of *M. risgoviense*; his pl. 8, fig. 2 and pl. 11, fig. 7 are inner whorls of *Presimoceras* sp.

Nebrodites (M.) torcalensis of SAPUNOV (1979: pl. 32, fig. 4) is a *Mesosimoceras risgoviense*.



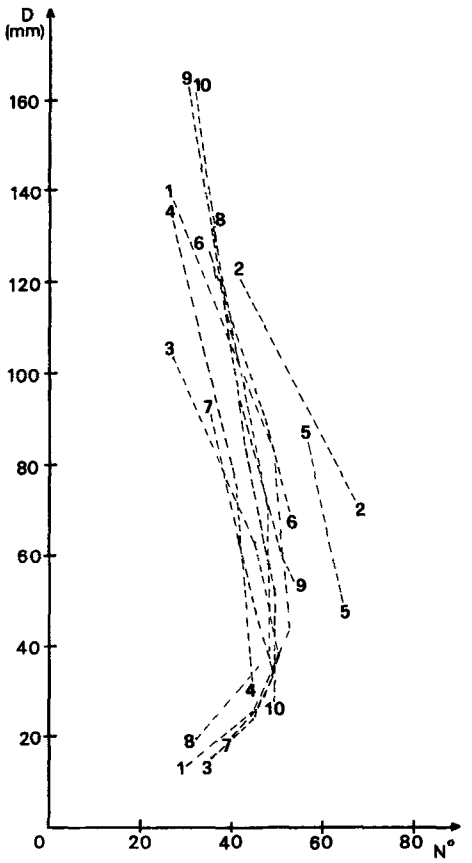
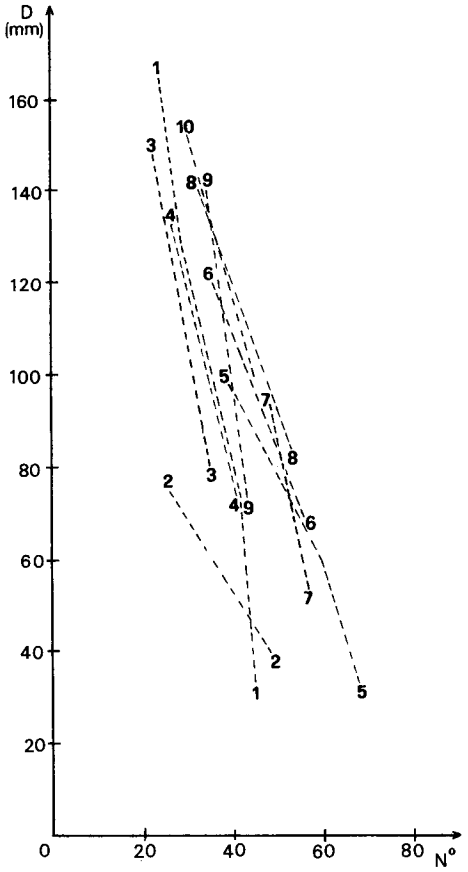


Fig. 1. Rib density curves of some *Mesosimoceras* species of the *Cavouri* and *Risgoviense* groups. *Mesosimoceras risgoviense:* 1: PERVINQUIERE (1907: pl. 1, fig. 11). 2: SCHNEID (1914: pl. 2, fig. 5) (holotype). 3: ANDJELKOVIC (1966: pl. 20, fig. 5). 4: OLORIZ (1978: pl. 15, fig. 4). 13: SARTI (1988: pl. 1, fig. 5). *Mesosimoceras cavouri:* 5: GEMMELLARO (1872: pl. 7, figs. 3–4) (holotype). 6: CANAVARI (1897: pl. 15, figs. 1–2). 7: SARTI (1988: pl. 1, fig. 6 a,b). 8: ROMAN (1936: pl. 1, fig. 5–5a). 9: SAPUNOV (1979: pl. 32, fig. 2). 10: FLORIDIA (1931: pl. 5, fig. 1). 11: Palaeontological Museum of Bologna, PADOVANI coll., Loc.: M. Nerone (Pesaro), n°, inv. P21NE (Fig. 6a of this paper). 12: OLORIZ (1978: pl. 15, fig. 5). 14: Palaeontological Museum of Padua, loc.: M. Kaberlaba (Vicenza), n°. inv. 4342.

Abb. 1. Rippenkurven einiger *Mesosimoceras*-Arten der *Cavouri*-Gruppe und *Risgoviense*-Gruppe.

Fig. 2. Rib-density curves of some *Presimoceras* species of the *Herbichi* group, *Herbichi* subgroup (1A). *Presimoceras herbichi:* 1: NEUMAYR (1873: pl. 40, figs. 1–2) (holotype). 2: DUMORTIER & FONTANNES (1876: 117). 3: QUENSTEDT (1888: pl. 108, fig. 16). 4: DEL CAMPANA (1905: 108). 5: ANDJELKOVIC (1966: pl. 10, fig. 2). 6: Palaeontological Museum of Padua, Loc: S. Anna d'Alfaedo (Verona), n°. inv. 13519. 7: Palaeontological Museum of Bologna, SARTI coll., loc.: Asiago (Vicenza), n°, inv. A31B. *Presimoceras nodulatum:* 8: QUENSTEDT (1888: pl. 109, fig. 2) (holotype). *Presimoceras cristinae:* 9: SARTI (1988: pl. 2, fig. 1a–b) (holotype). 10: aff. *cristinae*, Palaeontological Museum of Camposilvano (Verona), BENETTI coll., loc.: Brancheto (Boscochiesanuova – VR), n°, inv. K228cS.

Abb. 2. Rippenkurven einiger *Presimoceras*-Arten der *Herbichi*-Gruppe, *Herbichi*-Untergruppe.



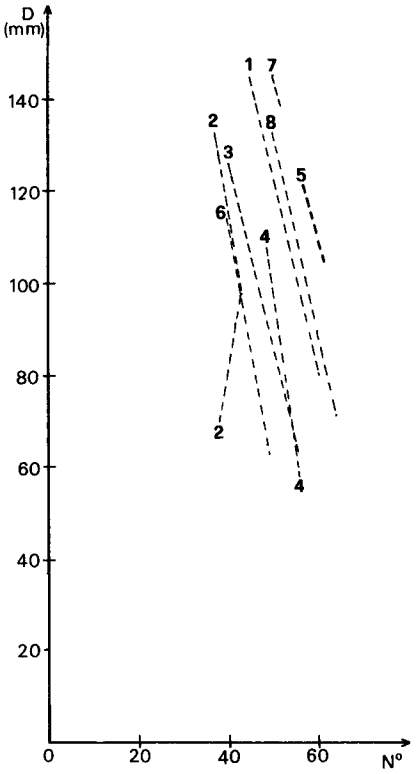


Fig. 3. Rib-density curves of some *Presimoceras* species of the *Herbichi* group, *Benianum* subgroup (1B).
Presimoceras benianum: 1: CANAVARI (1897: pl. 30, fig. 1 a–c). 2: CATULLO (1853: pl. 2, fig. 2 a–b) (holotype). 3: Palaeontological Museum of Padua, loc.: Malcesine (Verona), n°. inv. 2116. 4: Palaeontological Museum of Bologna, SARTI coll., loc.: M. Pasubio (Trento), n°. inv. P321B.
Presimoceras planulacinctum: 5: OLORIZ (1978: pl. 16, fig. 3 a–b).
Presimoceras fucinii: 6: CANAVARI (1898: pl. 22, fig. 2a–c) (holotype). 7: Canavari (1898: pl. 22, fig. 1 a–c) (paratype of *parateres*). 8: Palaeontological Museum of Camposilvano (Verona), BENETTI coll., loc.: Boscochiesanuova (Verona), n°, inv. K305cS.
Presimoceras nodosocostatum: 9: BURCKHARDT (1912: pl. 23, figs. 1–5) (holotype).
Pesimoceras aguilerae: 10: BURCKHARDT (1906: pl. 8, figs. 1–4) (holotype).

Abb. 3. Rippenkurven einiger *Presimoceras*-Arten der *Herbichi*-Gruppe, *Benianum*-Untergruppe.

Fig. 4. Rib-density curves of some *Presimoceras* species of the *Ludovicii* group.
Presimoceras ludovicii: 1: CANAVARI (1898: pl. 23, fig. 2 a–b) (holotype). 4: CANAVARI (1898: pl. 23, fig. 1 a–b). 5: Palaeontological Museum of Camposilvano (Verona), BENETTI coll., loc.: Velo Veronese (Lessini-VR), n°. inv. 40n. 7: Palaeontological Museum of Bologna, DEVOTI coll., loc.: Porto Assenzo (Brenzone), n°. inv. D.Bol.19A. 8: Palaeontological Museum of Bologna, PADOVANI coll., loc.: M. Nerone (Pesaro), n°. inv. P19N.
Presimoceras explanatum: 3: NEUMAYR (1873: pl. 40, fig. 3) (holotype). 6: Palaeontological Museum of Bologna, DEVOTI coll., loc.: Porto Assenzo (Brenzone), n°. inv. D. Bol. 51A.
Presimoceras quenstedti: 2: BURCKHARDT (1912: pl. 24, figs. 1–4) (holotype).

Abb. 4. Rippenkurven einiger *Presimoceras*-Arten der *Ludovicii*-Gruppe.

The new genus *Presimoceras*

For the group *herbichi-ludovicii-teres*, excluded from the emended genus *Mesosimoceras*, the new genus *Presimoceras* is instituted.

Type species: *Presimoceras nodulatum* (QUENSTEDT, 1888). Holotype of *P. nodulatum:* QUENSTEDT 1888: 981, pl. 109, fig. 2. The specimen is stored at the Staatl. Museum für Naturkunde in Stuttgart (Collection Nr. SMNS 14 487) (Fig. 7a,b–8).

Choice of type species: In my opinion *herbichi* and *nodulatum* are the most representative species of the genus *Presimoceras* and in Europe they are widespread, the original of NEUMAYR's figure (1873: pl. 40, figs. 1–2) is preserved in the collection of the Paleontology Museum of the University of Cluj-Napoca, Romania (Fig. 10).

Diagnosis: Shell evolute, with large umbilicus; whorls elliptical to subquadrate depressed, slightly crescent. Ribs on the inner whorls numerous, simple and biplicate, becoming progressively more widely spaced with ontogeny. On the body chamber ribs are prominent, distant, generally simple or rarely biplicate. The ribs end with ventro-lateral tubercles that are generally claviform and more or less developed; in some specimens the ribs pass across the venter though weakened. Constrictions are generally rare and weak or absent.

Stratigraphic range: Lower Kimmeridgian, *Strombecki* Zone – *Divisum* Zone – lower third of *Acanthicum* Zone (ANDELKOVIC 1966, CECCA et al. 1985, GEYER 1961, GEYER & PELLEDUHN 1979, KARVÈ CORVINUS 1966, OLORIZ 1978, 1979, OLORIZ et al. 1979, 1980, 1981, PAVIA et al. 1987, SAPUNOV 1979, SARTI 1984, 1985, 1986, 1987, ZIEGLER 1959).

Tab. 2. Species assigned to *Presimoceras*.
Tab. 2. Arten der Gattung *Presimoceras*.

Presimoceras	1) *P. herbichi* group	1A	*herbichi* (HAUER IN NEUM.) *nodulatum* (QUENST.) *cristinae* (SARTI)
		1B	*benianum* (CAT.) *planulacinctum* (QUENST.) *fucinii* (CAN.) *aguilerae* (BURCKH.) *nodosocostatum* (BURCKH.)
	2) *P. ludovicii* group	2A	*quenstedti* (BURCKH.)
		2B	*explanatum* (NEUM.) *ludovicii* (MGH.)
	3) *P. teres* group		*teres* (NEUM.)

Key for species of *Presimoceras*

A new term is introduced here: "Ribbing Increase Whorls" (R. I. W.). In all ribbed ammonites where the number of ribs generally decreases during ontogeny, we invariably observe an increase of the rib density with ontogeny in the first whorls. In *Presimoceras* the tendency to decrease the number of the ribs from internal to external whorls, so characteristic of this genus, occurs from a diameter of about 40–60 mm onwards (with the exception of *Presimoceras quenstedti*, where the decrease in the number of ribs per whorl starts at a diameter of more than 90 mm). For R. I. W. of *Presimoceras* we mean those whorls, where the number of ribs increases until diameters between 40 and 60 mm are reached, beyond which a decrease on the middle and outer whorls sets in.

(1) *Presimoceras herbichi* group: Shell medium to large-sized, evolute, with large umbilicus. The ribs on the body chamber are simple and widely spaced. Distinct change of rib density from inner to outer whorls (strong decrease in the number of ribs on the outer whorls). Constrictions rare and weak (Figs. 2, 3).

(1A) Whorl section oval, tending to be compressed, distinctly higher than wide. More than 1/3 of ribs of the "Ribbing Increase Whorls" biplicate.

(1A 1) Last whorl section oval elongated, tubercles mostly claviform ..... *P. herbichi.*

(1A 2) Last whorl section rectangular high; true tubercles present; shell larger than 1A 1.

(1A 2–1) Ribs thin, tubercles small, increased number of biplicate ribs on the inner and middle whorls ..... *P. nodulatum.*

(1A 2–2) Ribs strong, tubercles big ..... *P. cristinae.*

(1B) Whorl section roundish or quadrate, chiefly in the inner and middle whorls wider than high, in the body chamber slightly higher than wide.

(1B 1) Less than 1/3 of ribs of the "R. I. W." biplicate.

(1B 1–1) Tendency of the ribs to pass in a more or less reduced state over the venter.

(1B 1–1a) Ribs on the body chamber and on part of the phragmocone very distant ..... *P. benianum.*

(1B 1–1b) Ribs more close on the phragmocone ..... *P. planulacinctum* (Fig. 6B).

(1B 1–2) Tendency of the ribs to end at the ventral margin ..... *P. fucinii* (Fig. 9B).

(1B 2) More than 1/3 of ribs of the "R.I.W." biplicate.

(1B 2–1) Ribs strong, clavi big ..... *P. aguilerae.*

(1B 2–2) Ribs thinner and clavi smaller than 1B 2–1 ..... *P. nodosocostatum.*

(2) *Presimoceras ludovicii* group: Shell medium to large-sized, evolute, with medium to large umbilicus. The ribs on the body chamber are simple and sporadically biplicate and rather close. On the inner and middle whorls there is an increase of biplicate ribs. There is no clear change of rib density among inner, middle and outer whorls. Constrictions are absent (Fig. 4).

(2A) Whorl section quadrate or wider than high ..... *P. quenstedti.*

(2B) Whorl section strongly higher than wide.

(2B 1) Umbilicus medium-sized ..... *P. explanatum.*

(2B 2) Umbilicus large ..... *P. ludovicii.*

(3) *Presimoceras teres* group: Shell small to medium-sized, very evolute and with large umbilicus. Whorl section quadrate or wider than high. The ribs are simple and rather close, tending to become more distant with ontogeny; in the last half of the body chamber the ribs rapidly become widely spaced. On the inner whorls some biplicate ribs can be present. Constrictions are rare and weak (Figs. 5, 9A).

"Mesosimoceras" venetianum (ZITTEL, 1870) is not included in *Presimoceras*, because the holotype, stored in the Palaeontological Museum of Padua, is a *Nebrodites* and the figures in ZITTEL (1870) and DEL CAMPANA (1905) are misleading.

The species *zullianum* (NICOLIS & PARONA), *sapunovi* (BROCHWICZ-LEWINSKI & ROZAK), *evolutus* (=*zeuxis*) (GEMMELLARO) and the genus *Benacoceras* of the *Planula* Zone and *Platynota* Zone, are transitional forms between *Passendorferia* and *Presimoceras* and are not included in the new genus owing to the total absence of tubercles, the high number of biplicate ribs, the presence of tripartite ribs and the lack of a smooth ventral band or at least a weakening of ventral ribs in some of these species.

Moreover some forms occurring in the *Platynota* Zone likely belong to *Lessiniceras*. For them PAVIA et al. (1988) assume the same phylogenetic link with *Passendorferia*.

Presimoceras fucinii is regarded here as a synonym of *P. parateres* (CANAVARI) and *P. teres herbichoides* (OLORIZ). The differences between these species are so weak so that they represent only intraspecific variability.

Mesosimoceras teres in SAPUNOV (1979: pl. 32, fig. 3 a-b), and ZIEGLER (1959: pl. 1, fig. 19) belongs to *Nebrodites* gr. *doublieri* (FAVRE) because of the high number of biplicate ribs, the whorl section, and the lack of ventro-lateral thickening.

Pseudosimoceras teres in ANDELKOVIC (1966: pl. 25, fig. 2) is a *Nebrodites* gr. *heimi.*

Among *Presimoceras*, most specimens of *Presimoceras nodulatum* are usually identified as *herbichi.*

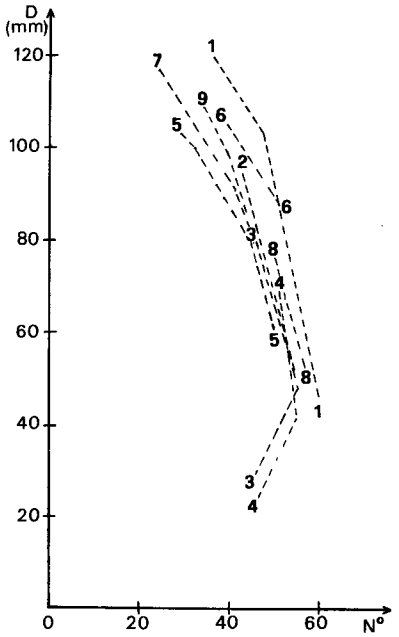


Fig. 5. Rib-density curves of some *Presimoceras teres*. – 1: Palaeontological Museum of Padua, loc.: Campo Fontana (Verona), n°. inv. 2117. 2: DEL CAMPANA (1904: 257). 3: NEUMAYR (1873: pl. 40, fig. 4) (lectotype). 4: Palaeontological Museum of Bologna, SARTI coll., loc.: Asiago (Vicenza), n°. inv. A151C. 5–9: Palaeontological Museum of Camposilvano (Verona), BENETTI coll., 5: loc.: Podestaria (Boscochiesanuova-VR), n°. inv. K222cS. 6: loc.: S. Giorgio (Boscochiesanuova-VR), n°. inv. 847. 7: loc.: S. Giorgio (Boscochiesanuova-VR), n°.inv. 390. 8: loc.: S. Giorgio (Boscochiesanuova-VR), n°.inv. 652. 9: loc.: Malga Lessinia (Verona), n°.inv. 937.

Abb. 5. Rippenkurven von *Presimoceras teres*.

Differences between *Presimoceras* and *Mesosimoceras*

The following features serve to distinguish between *Presimoceras (P)* and *Mesosimoceras (M)*:

(1) The ribs on the outer whorls of *P* are much more widely spaced than on *M*.
(2) The ribs decrease in number with ontogeny in *P*. Contrarily the ribs become more numerous in *M* (see rib frequency curves, Figs. 1–5).
(3) The ribs on the body chamber of *M* are thinner and sharper than on *P*.
(4) The umbilicus of *M* is larger than in *P* (Fig. 11).
(5) The thickness of *P* whorls is greater than that of *M* whorls (Fig. 11).
(6) The suture of *P* is more complicated and subdivided than that of *M*.
(7) On the outer whorls of *P* biplicate ribs can be present; on the outer whorls of *M* biplicate ribs are absent.
(8) *P* and *M* represent different biostratigraphic ranges: *Strombecki* and *Divisum* Zone (exceptionally also lower third of *Acanthicum* Zone) for *P*, *Cavouri* Zone for *M* (Fig. 12).

Origin of *Presimoceras* and *Mesosimoceras*

As with regards to the origin of *Presimoceras* a very close relation between this genus and the genus *Passendorferia* seems possible, because of their close resemblance and the presence of species with intermediate characters, occurring between the disappearance of *Passendorferia* and the appearance of true *Presimoceras*.

BROCHWICZ-LEWINSKI & ROZAK (1976) assumed a transition between the two genera: "The appearance of late Oxfordian *Nebrodites (Mesosimoceras)* figured by ZEISS (1962) and BARTHEL (1963) is such that it is difficult to state whether we are dealing with late *N. (Passen-*

Fig. 6
A: *Mesosimoceras cavouri* (GEMMELLARO, 1872). Kimmeridgian. Monte Nerone, provincia di Pesaro, Italy. – Palaeontological Museum of Bologna, PADOVANI coll., n°.inv. P21NE. Lat. view (× 1). (See also Fig. 1)
B: *Presimoceras planulacinctum* (QUENSTEDT, 1888), lectotype, figured by QUENSTEDT (1888: pl. 108, fig. 14). – Museum für Geologie und Paläontologie Tübingen. Inv. Nr. Ce/5/108/14. Lateral view (× 1). The ventral view has been figured by ZIEGLER (1959: pl. 1, fig. 20).

Abb. 6
A: *Mesosimoceras cavouri* (GEMMELLARO, 1872). Kimmeridge. Monte Nerone, provincia di Pesaro, Italien. – Museum für Paläontologie in Bologna, PADOVANI coll. Inv. Nr. P21NE. Seitenansicht (× 1). (Siehe auch Abb. 1)
B: *Presimoceras planulacinctum* (QUENSTEDT, 1888), Lectotyp, Original zu QUENSTEDT (1888: 987, Taf. 108, Abb. 14). Seitenansicht (× 1). Die Ansicht der Externseite findet sich bei ZIEGLER (1959: Taf. 1, Abb. 20).

Fig. 7. *Presimoceras nodulatum* (QUENSTEDT, 1888), holotype, figured by QUENSTEDT (1888: pl. 109, fig. 2). – Staatl. Museum für Naturkunde in Stuttgart, Inv. Nr. SMNS 14 487. A: Lateral view (× 1); B: Ventral view at D.115–131 mm (× 1). (See also Fig. 2)

Abb. 7. *Presimoceras nodulatum* (QUENSTEDT, 1888), Holotyp, Original zu QUENSTEDT (1888: 981, Taf. 109, Abb. 2). A: Seitenansicht (× 1); B: Ansicht der Externseite bei 115–131 mm (× 1). (Siehe auch Abb. 2)

Fig. 8. *Presimoceras nodulatum* (QUENSTEDT, 1888), holotype, figured by QUENSTEDT (1888: pl. 109, fig. 2). – Staatl. Museum für Naturkunde in Stuttgart, Inv. Nr. SMNS 14 487; lateral view (× 1).

Abb. 8. *Presimoceras nodulatum* (QUENSTEDT, 1888), Holotyp, Original zu QUENSTEDT (1888: 981, Taf. 109, Abb. 2); Seitenansicht (× 1).

Fig. 9
A: *Presimoceras teres* (NEUMAYR, 1873), lectotype, figured by NEUMAYR (1873: pl. 40, fig. 4). – Geologische Bundesanstalt Wien, Inv. Nr. 1873/03/65. Lateral view (× 1). Specimen with part of the final body chamber lacking. (See also Fig. 5)
B: *Presimoceras* cf. *fucinii* (CANAVARI, 1898), figured by NEUMAYR (1873: pl. 40, fig. 5). – Geologische Bundesanstalt Wien, Inv. Nr. 1873/03/65. Lateral view (× 1). This specimen, figured by NEUMAYR (1873) as the ventral view of *Simoceras teres*, is a phragmocone.

Abb. 9
A: *Presimoceras teres* (NEUMAYR, 1873), Lectotyp, Original zu NEUMAYR (1873: 187, Taf. 40, Abb. 4). Seitenansicht (× 1). Dem Lectotyp fehlt der vorderste Teil der Wohnkammer. (Siehe auch Abb. 5)
B: *Presimoceras* cf. *fucinii* (CANAVARI, 1898), Original zu NEUMAYR (1873: 187, Taf. 40, Abb. 5). Seitenansicht der Innenwindungen (× 1). Der von NEUMAYR (1873) als Ansicht der Externseite von *Simoceras teres* abgebildeten Form fehlt die Wohnkammer.

Fig. 10. *Presimoceras herbichi* (VON HAUER, 1866), figured by NEUMAYR (1873: pl. 40, fig. 1 a, b). – Muzeul de Paleontologie-Stratigrafie, Universitatea din Cluj-Napoca, Romania. N°. inv. 2051. Lateral view (× 1). Photograph courtesy of Dr. CARMEN CHIRA.

Abb. 10. *Presimoceras herbichi* (VON HAUER, 1866), Original zu NEUMAYR (1873: Taf. 40, Abb. 1 a, b). – Museum für Paläontologie-Stratigraphie in Cluj-Napoca, Romania. Inv. Nr. 2051. Seitenansicht (× 1).

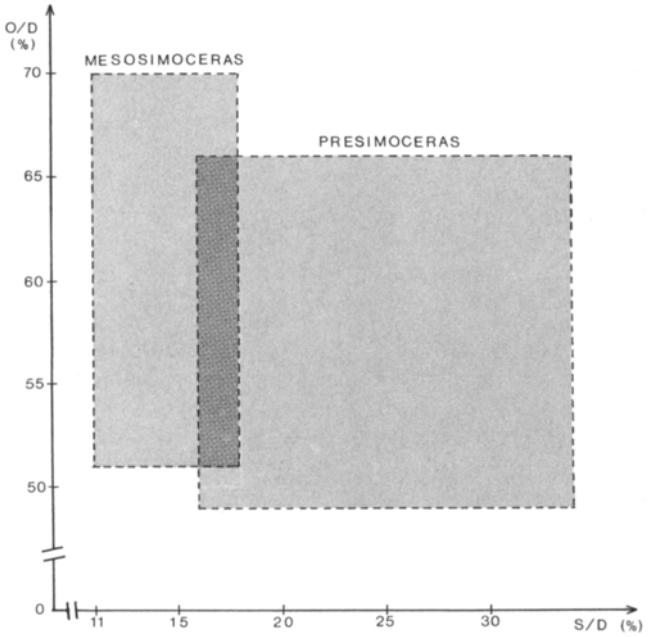


Fig. 11. Diagram showing the relationships between umbilical width (O) and thickness (S) to the diameter (D) of *Mesosimoceras* and *Presimoceras* (O/D – S/D).

Abb. 11. Beziehungen zwischen Nabelweite (O)/Durchmesser (D) und Dicke(S)/Durchmesser (O/D – S/D) der Arten von *Mesosimoceras* und *Presimoceras*.

dorferia) or early *N. (Mesosimoceras)*. A transition between those subgenera is thus assumed . . . " (p. 377–378).

Hence the First Appearance Datum (F.A.D.) of true *Presimoceras* is at the base of the *Strombecki* Zone (at most at the top of *Platynota* Zone).

Brochwicz-Lewinski & Rozak (1976) furthermore suggested a close relationship between *Nebrodites* and *Enayites*, assuming that the representative of *N. (Enayites)* could be ancestral to *N. (Nebrodites)*, on the basis of the similar morphology and the stratigraphic range (via *Subnebrodites* as intermediate).

As regards the origin of *Mesosimoceras*, Sarti (1988) discovered the new species *Nebrodites ferrarii* in the Kimmeridgian *Acanthicum* Zone and observed that, despite an ornamentation typical of *Nebrodites* and approaching that of the *agrigentinus-doublieri* group, the new species shows a spire increase comparable to that of the *cavouri-risgoviense* group. For this reason and for its intermediate stratigraphic position one could consider this species as a form transitional to this last group.

Moreover in *Mesosimoceras* and *Nebrodites* there is an increase in rib frequency with ontogeny, whilst in *Presimoceras* there is a decrease in frequency on the middle and outer whorls at a diameter of more than 30–40 mm (exception: *Nebrodites grecoi* (Can.), *Nebrodites venetianus* (Zitt.), and *Nebrodites planycyclus* (Gemm.).

From this derives the assumption that "*Mesosimoceras*" as understood until now is polyphyletic (in correspondence with *Strombecki* Zone and *Acanthicum* Zone) and consequently

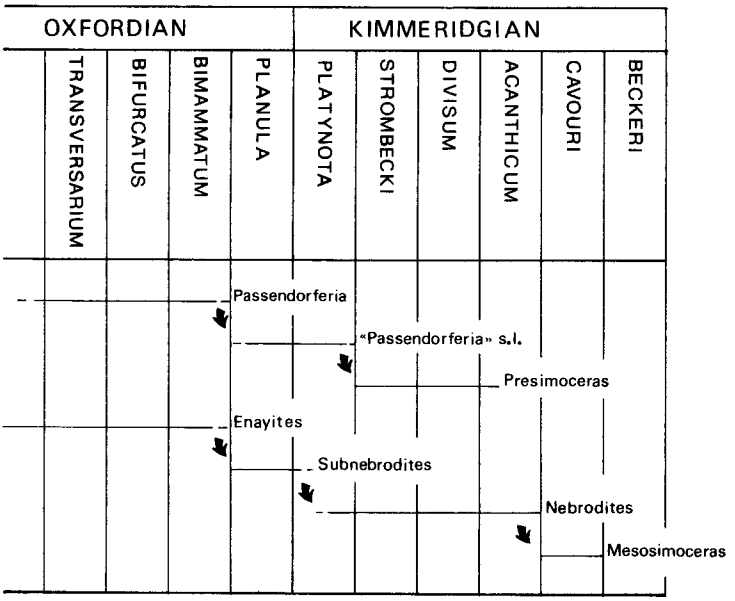


Fig. 12. The inferred relationships between *Passendorferia* → transitional forms (*Passendorferia* s. l.) → *Presimoceras* and *Enayites* → *Nebrodites* → *Mesosimoceras*.

Abb. 12. Stratigraphische Beziehungen zwischen *Passendorferia* → Übergangsformen (*Passendorferia* s. l.) → *Presimoceras* und *Enayites* → *Nebrodites* → *Mesosimoceras*.

this is another reason to differentiate between the two phyletic lines with distinct generic names (Fig. 12).

Dimorphism: Several species of *Mesosimoceras* and *Presimoceras* are based on large numbers of individuals, and limits of intraspecific variation are well known. In these species large shells and smaller shells with the same ornamentation can be observed (in the same species the large form differs from the smaller one in few details of the ribbing and sculpture); I believe the two groups of specimens represent no more than a dimorphic pair (example: *Mesosimoceras cavouri* of Fig. 6A = microconch; *M. cavouri* of CANAVARI 1897: pl. 15, figs. 1–2 = macroconch).

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