

**THE LATE ALBIAN GENUS *SEMENOVICERAS* (HOPLITIDAE, AMMONITINA):  
PALAEOLOGIC STUDY OF A FAUNA  
OF THE *SEMENOVICERAS LITSCHKOVI* ZONE FROM MANGYSHLAK  
(WEST KHAZAKSTAN)**

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*Key-words:* Ammonoidea, Systematics, Biostratigraphy, Albian, Central Asia, West Khazakstan.

*Riassunto.* Sono descritte le ammoniti raccolte nel corso di una spedizione effettuata nel settembre 1995 in Mangyshlak. Tre livelli ammonitiferi sono stati campionati in una formazione caratterizzata da arenarie con concrezioni metriche fosfatiche, ferruginose. Le sei specie riconosciute nei due livelli più antichi appartengono al genere *Semenoviceras* Wright, 1996 (pro *Semenovites* Glazunova, 1960, non Tarbinskii, 1932), diffuso quasi esclusivamente in Asia Centrale ed in prevalenza nell'Albiano superiore. Il terzo livello ha fornito un esemplare del genere *Cunningtoniceras*, di età Cenomaniano medio, non descritto nel presente lavoro. Il secondo livello a *Semenoviceras* conteneva una fauna di straordinaria ricchezza appartenente alla zona a *S. litschkovi*, sottozona a *S. pseudocoelonodum*, definita nei territori dell'ex Unione Sovietica e correlabile con la zona a *D. cristatum* dell'Europa occidentale. Lo studio paleontologico ha consentito la definizione della variabilità della specie *Semenoviceras pseudocoelonodum* (Semenov), originariamente definita in base ad un frammento, l'olotipo, il solo finora conosciuto in letteratura. Viene inoltre confermata la suddivisione nei due sottogeneri *Semenoviceras* s. str. e *Planiboplites*.

*Abstract.* The ammonites collected during an expedition to Mangyshlak in September 1995, are described. Three ammonitiferous levels were sampled in an arenaceous formation characterised by ferruginous, phosphatic metric concretions. The six species recognised in the two older levels belong to the genus *Semenoviceras* Wright, 1996 (pro *Semenovites* Glazunova, non Tarbinskii, 1932), which was widespread in Central Asia mainly during the Late Albian. The third level yielded only a specimen of the mid-Cenomanian genus *Cunningtoniceras*, which will not be described. The second *Semenoviceras*-bearing level contained an extremely rich fauna of the *S. litschkovi* zone, *S. pseudocoelonodum* subzone, defined in the former Soviet Union and correlated with the *Dipoloceras cristatum* zone of western Europe. The present study allowed the intraspecific variability of *Semenoviceras pseudocoelonodum* (Semenov) to be defined, since the holotype was originally established on the basis of a single fragment. Furthermore, the subdivision in the subgenera *Semenoviceras* s. str. and *Planiboplites* is maintained.

#### Introduction.

The fossils described in this paper were collected by Marco Balini and Maurizio Gaetani (University of

Milan) in September, 1995, during an expedition to Mangyshlak, as part of the "Peri-Tethys" project (Gaetani et al., 1996).

The ammonites belong to the genus *Semenoviceras* Wright, 1996 (pro *Semenovites* Glazunova, 1960), which characterises the Upper Albian shallow platform deposits of Central Asia (Mangyshlak, Turkmenistan, Western Uzbekistan, Iran).

This genus is known from scarce illustrations, often published in journals currently difficult to find outside the former USSR.

Nevertheless, the type-species of *Semenoviceras*, *S. michalskii* (Semenov), is probably present in France (Jui-gnet et al., 1983), while in England and northern France the species *S. iphitum* (Spath) and *S. gracile* (Spath) (Casey, 1965; Amédéo & Destombes, 1978) occur. Therefore, further palaeontologic knowledge of the genus *Semenovites* may improve interregional correlations.

#### Origin of the material studied.

A Cretaceous arenaceous formation characterised by ferruginous, phosphatic metric concretions was sampled near Akmysh by Balini and Gaetani (Fig. 1). Due to the low-angle dipping of the beds and the gentle morphology, it was impossible to measure the stratigraphic thickness of the levels sampled and therefore to define the stratigraphic log. However, three ammonite-bearing levels, distinguished here as levels A, B and C, were sampled. All of the ammonites collected in levels A and B belong to the genus *Semenoviceras*.

The first and oldest level sampled (A) is a fine, dark, glauconitic sandstone. An isolated block from this level contained a single specimen of *Semenoviceras mangyshlakense* (Saveliev) bearing some nacre in its test. Level A lies about 50 metres below the top of the formation.

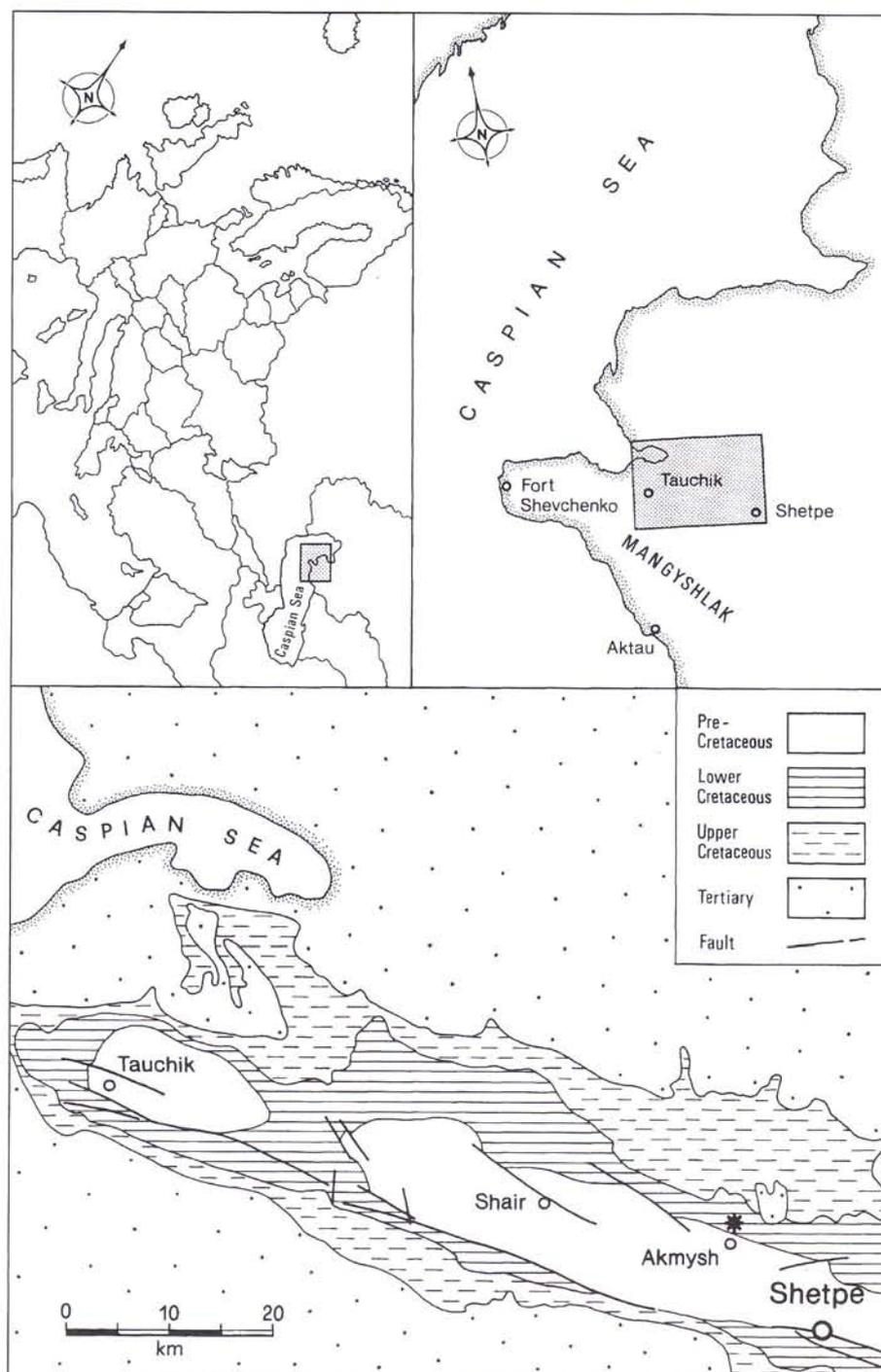


Fig. 1 - Geographic location of Mangyshlak and the fossiliferous locality, indicated by an asterisk, near Akmysh.

The second, younger level (B) contains a rich fauna characterised by a great abundance of *Semenoviceras (Planihoplites) pseudocoelonodum* (Semenov) and other, less abundant or even rare, *Semenoviceras* species. This level consists of glauconitic sandstones with phosphatic nodules and oxidized ferruginous concretions, which contain ammonites and bivalves. Level B is about 5 metres thick and lies approximately 10-20 metres above level A. The specimens were collected from the talus; the displacement of the specimens from their original bed appeared negligible, although it was impossible to be sure that all specimens belonged to the same chronostratigraphic level.

Since a taphonomic analysis was not performed, the possibility that resedimentation and taphonomic condensation processes occurred (both *sensu* Fernandez Lopez, 1991) cannot be ruled out.

It must be stressed that the collection of ammonites from level B had to be limited for practical reasons. However, the 26 specimens from this level are representative of the composition of the ammonite fauna since Balini and Gaetani evaluated the percentage of the different morphologic groups on site and decided to collect all specimens of the subgenus *Semenoviceras* s. str., which were relatively poorly represented, as well as the

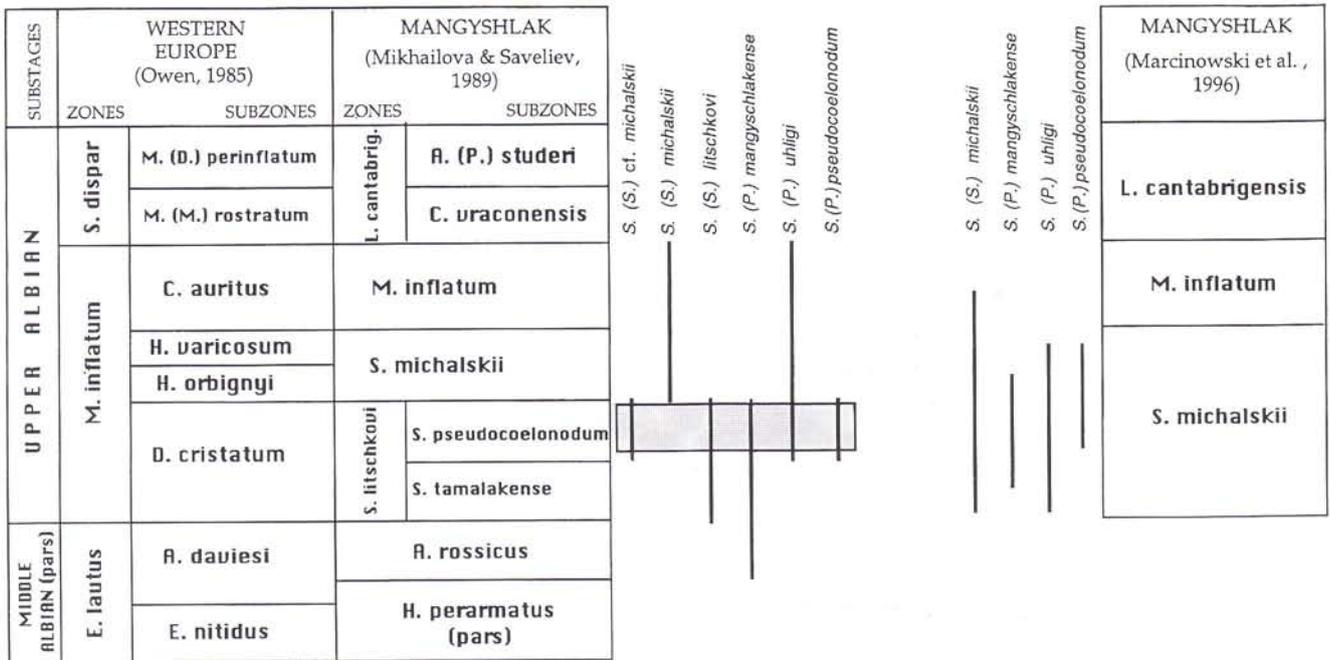


Fig. 2 - Correlations between the zonal schemes of the Upper Albian defined by Mikhailova & Saveliev (1989) for Mangyshlak and by Owen (1985) for western Europe. The ranges of *Semenoviceras* species recognized in this paper are represented according to the data reported by Mikhailova & Saveliev (1989). The dotted area represents the age of level B as deduced from these data. The ranges of *Semenoviceras* species, based on the stratigraphic data by Marcinowski et al. (1996), are presented schematically on the right side.

best preserved specimens of the subgenus *Planiboplites*.  
 The youngest level (C) consists of grey sandstones and lies about 5-10 metres above level B. A single specimen of *Cunningtoniceras* aff. *inermis* (Pervinquier) was collected from the talus. Its age should be Middle Cenomanian, according to Wright & Kennedy (1987).

**Biostratigraphy.**

The age of levels A and B, where specimens of the genus *Semenoviceras* were collected, may be deduced from the biostratigraphic data summarized by Mikhailova & Saveliev (1989). The ranges of the species reported by these authors are represented in Fig. 2 and compared with data recently published by Marcinowski et al. (1996).

A single ammonite, *S. (P.) mangyshlakense* (Saveliev), was collected from level A. Due to the absence of other ammonites it is difficult to identify the ammonite zone to which level A can be referred; either the Middle Albian *A. rossicus* zone or the Upper Albian *S. litschkovi* zone are possible.

The rich ammonite fauna collected from level B can be ascribed to the *S. litschkovi* zone, *S. (P.) pseudocoelonodum* subzone. The presence of *S. (S.) michalskii* (Semenov) does not indicate a younger age since *S. (S.) cf. michalskii* has been reported in the *S. (P.) pseudocoelonodum* subzone. The estimated thickness of level B, probably 5 metres, is reasonably consistent with the 7-14 me-

tre thickness reported by Mikhailova & Saveliev (1989) for the *S. pseudocoelonodum* subzone.

Marcinowski et al. (1996) considered *S. (S.) litschkovi* (Saveliev) a synonym of *S. (S.) michalskii* and proposed a simpler ammonite zonation for the Upper Albian of Mangyshlak. Their *S. michalskii* zone includes the *S. litschkovi* and *S. michalskii* zones *sensu* Mikhailova & Saveliev (1989). However, it must be noted that Marcinowski et al. (1996, p. 16) considered *S. (S.) litschkovi* a "...more robust and strongly ornamented variant" of *S. (S.) michalskii* and, according to their data, it predates the occurrence of the latter species (Marcinowski et al., 1996, p. 16, Kush section, Bed 1A). "Splitter" or "lumper" taxonomic interpretations of *S. (S.) michalskii* may lead to different biostratigraphic distinctions. In the present paper the species *S. (S.) litschkovi* is maintained provisionally, whereas *S. (S.) tamalakense* Saveliev is considered a synonym of *S. (S.) michalskii*. However, the real difference between the stratigraphic distributions proposed by Mikhailova & Saveliev (1989) and Marcinowski et al. (1996) is the biostratigraphic range, and possibly the palaeontologic interpretation, of *S. (P.) pseudocoelonodum* (Semenov).

**The systematic position of *Semenoviceras*.**

The genus *Semenoviceras* was created by Wright et al. (1996, p. 119) to replace *Semenovites* Glazunova, 1960, which is a homonym of *Semenovites* Tarbinskii,

1932. The type-species of *Semenoviceras*, "*Hoplites*" *michalskii* Semenov (1899, table 4, fig. 5), is the one originally designated by Glazunova (1960). This genus groups species formerly included in the genera *Anahoplites* Hyatt, 1990, and *Epihoplites* Spath, 1925.

*Semenoviceras* is characterised by compressed hoplitid shells, bearing tabulate whorl sections which become rounded towards the shell aperture. The sculpture, which tends to fade in the body chamber of some species, is characterised by falcate ribs springing from umbilical tubercles or bullae. The ribs end on the ventrolateral margin, developing clavi parallel, or slightly oblique (*S. mangyshlakense*), to the siphuncle. The ribbing is more or less strong and on the test appears to be made of bundles of ribs and/or striae.

An important characteristic is the suture, which was already noted and stressed as "degenerate" by Spath (1926, p. 183) in the description of his species *Epihoplites gracilis*. The suture-line is characterised by low and broad elements. The ventral lobe is short, the first saddle is cut by a relatively deep and broad auxiliary lobe, and the lateral lobe is very broad and asymmetrical, tending to be separated into two independent lobes due to the development of a large outer, auxiliary saddle. The suture often shows the ventral saddle displaced on the ventrolateral margin, with wide and low external saddles and first lateral lobes, and a dependent umbilical lobe.

Mirzoyev (1967) created the subfamily Semenovitinae to group Albian hoplitids belonging to the genera *Semenoviceras* and *Metaclavites* Casey, 1965. On the basis of suture characteristics, this subfamily was considered the root stock from which primitive representatives of the family Placenticeratidae sprang, as suggested by Casey (1965). Although the majority of authors agree with this phyletic hypothesis, the subfamily Semenovitinae was considered by Casey (1978), Wright (1981) and Saveliev (1992) to be inseparable from the Hoplitinae and unnecessary.

This opinion is strengthened by the study of the ontogenetic development of the sutures carried out by Mikhailova (1980), who considered *Semenoviceras* a synonym of the genus *Anahoplites*. It is worth noting that *Semenoviceras* bears displaced sutures as in some Hoplitidae and particularly in *Anahoplites* (see sutures drawn by Spath, 1926, fig. 40, 42 and Glazunova, 1953, fig. 37 - 39, 42), with the ventral saddle located on the ventrolateral margin of the flank instead of the siphonal line (i. e. where the plane of symmetry of the shell lies).

However, Mikhailova's opinion was not followed here. In fact, the genus *Semenoviceras* corresponds to a group of species distinguished by well defined morphological characteristics of both ornamentation and adult sutures, and palaeobiogeographic and stratigraphic distributions distinct from *Anahoplites*.

Saveliev (in Mikhailova & Saveliev, 1989, fig. 3; see also Saveliev, 1992, p. 24) considered *Semenoviceras* to be derived from *Anahoplites* at the top of Middle Albian. The first forms, belonging to the group of *S. mangyshlakense* (Saveliev), share morphologic characters of the shell with *Anahoplites* species but have different adult sutures. These primitive *Semenoviceras* belong to the subgenus *Planihoplites*, to which also younger species are ascribed, including some of the species described in the present paper. *S. ubligi* (Semenov), the type species of *Planihoplites*, was not assigned to *Semenoviceras* by Glazunova (1960, p. 93-94) although this author acknowledged close relationships on the basis of suture lines. It is worth noting that *S. ubligi* has been grouped in *Anahoplites* by Amédéo et al. (1977).

Finally, at the beginning of the Late Albian, *Planihoplites* gave rise to *Semenoviceras* s. str. (Saveliev, 1992, p. 24).

*Planihoplites* was originally proposed as a *nomen nudum* (Saveliev, 1969, p. 19; 1981, p. 45) and also erroneously called (see Saveliev, 1992, footnote p. 23) "*Platihoplites*" (Saveliev, 1969, p. 21). The formal diagnosis of *Planihoplites* was presented by Saveliev in 1992, together with the formal distinction of *Semenoviceras* in the two subgenera (Saveliev, 1992, p. 22, 24).

Wright et al. (1996) put *Semenoviceras* in the subfamily Hoplitinae Douvillé, 1890, while recognising the subfamily Anahoplitinae Breistroffer, 1947. However, *Semenoviceras* is clearly derived from *Anahoplites* via *Planihoplites* and therefore has to be included in the subfamily Anahoplitinae. It must be noted that *Planihoplites* was not mentioned by Wright (in Wright et al., 1996). However, the paper where Saveliev (1992) formally described this genus was included in Wright's list of references.

### Systematic descriptions.

The classification of the Cretaceous Ammonoidea by Wright et al. (1996) is followed.

Standard dimensions are given in millimetres and as percentages of the diameter. The following abbreviations correspond to the shell parameters explained in Fig. 3:

- D = maximum diameter;
- d = diameter at which the measurements were taken when less than D;
- Uw = umbilical width;
- Wh = whorl height;
- Wb = whorl breadth; the ratio Wb/Wh expresses the degree of compression of the whorl section.
- Ph = the diameter of the end of the phragmocone ("n" means that the specimen is entirely septate);

Some ornamental characters were also measured:

K/2 = number of ribs per half-whorl;

T/2 = number of umbilical tubercles (or bullae) per half-whorl.

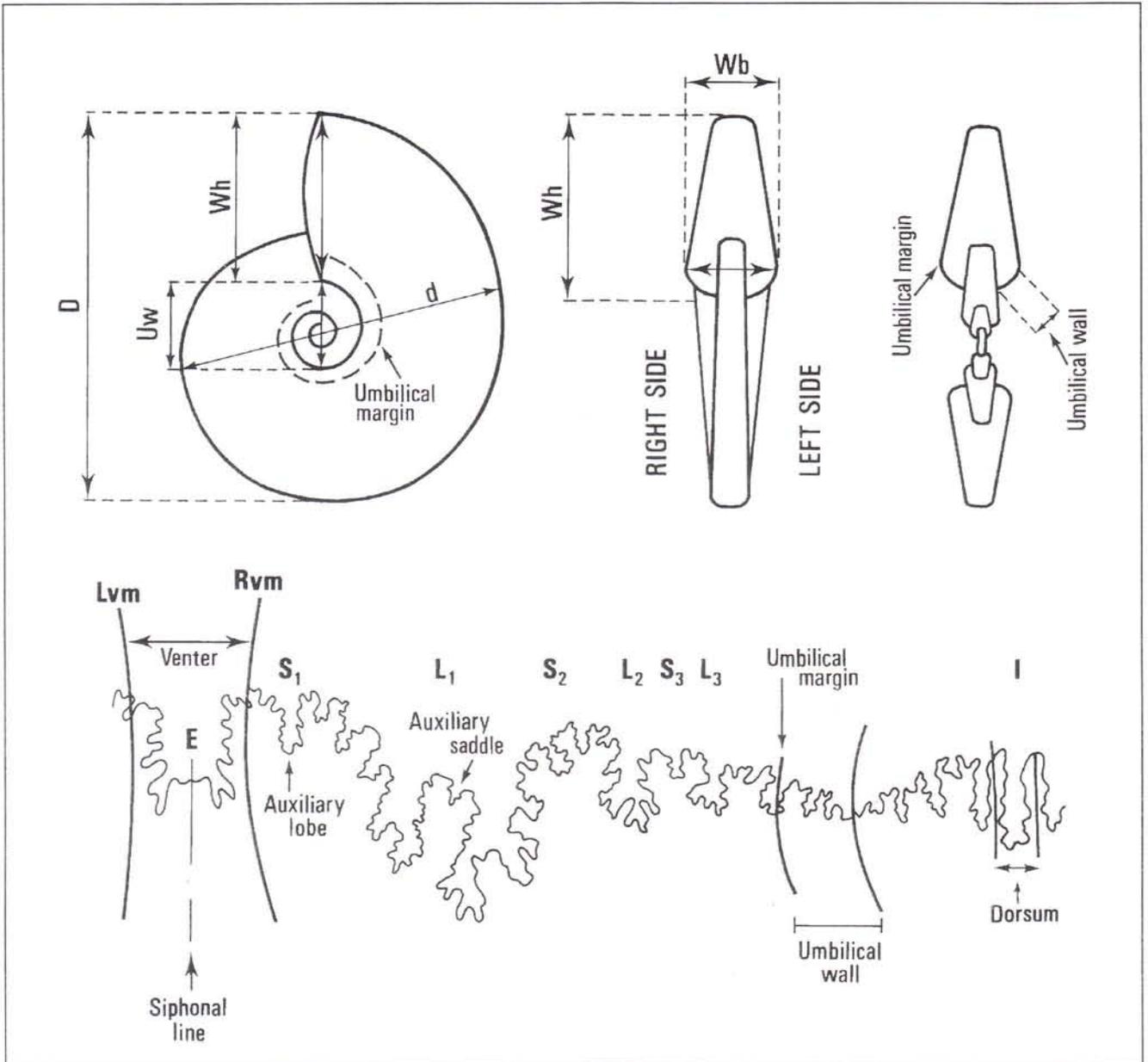


Fig. 3 - Abbreviations of the dimensional parameters used in the systematic descriptions, nomenclature of some shell characters and sutural elements. D = maximum diameter; d = lower diameter; Uw = umbilical width; Wh = whorl height; Wb = whorl breadth; Lvm = left ventrolateral margin; Rvm = right ventrolateral margin; E = external saddle and lobe; S<sub>1</sub>, S<sub>2</sub>, S<sub>n</sub> = first, second, etc. lateral saddles; L<sub>1</sub>, L<sub>2</sub>, L<sub>n</sub> = first, second, etc. lateral lobes; I = internal lobe.

A purely descriptive nomenclature was used to describe elements of the suture-line. Except for the external lobe and saddle, saddles and lobes were numbered progressively from the ventrolateral margin towards the dorsum (Fig. 3).

The specimens are housed in the "Museo di Paleontologia" of the University of Milan (MPUM), numbers 8082 to 8087, followed in parentheses by my own numbers (e. g. 8084 (11)). A MPUM number may include more than one specimen of the same species, whilst my numbers indicate single specimens; these numbers may be used to distinguish different specimens in the tables of measurements.

Class Cephalopoda Leach, 1817

Order Ammonoidea Zittel, 1884

Suborder Ammonitina Hyatt, 1889

Superfamily Hoplitaceae Douvillé, 1890

Family Hoplitidae Douvillé, 1890

Subfamily Anahoplitinae Breistroffer, 1947

Genus *Semenoviceras* Wright, 1996

(*pro Semenovites* Glazunova, 1960, *non* Tarbinskii, 1932)

Type-species *Hoplites michalskii* Semenov, 1899

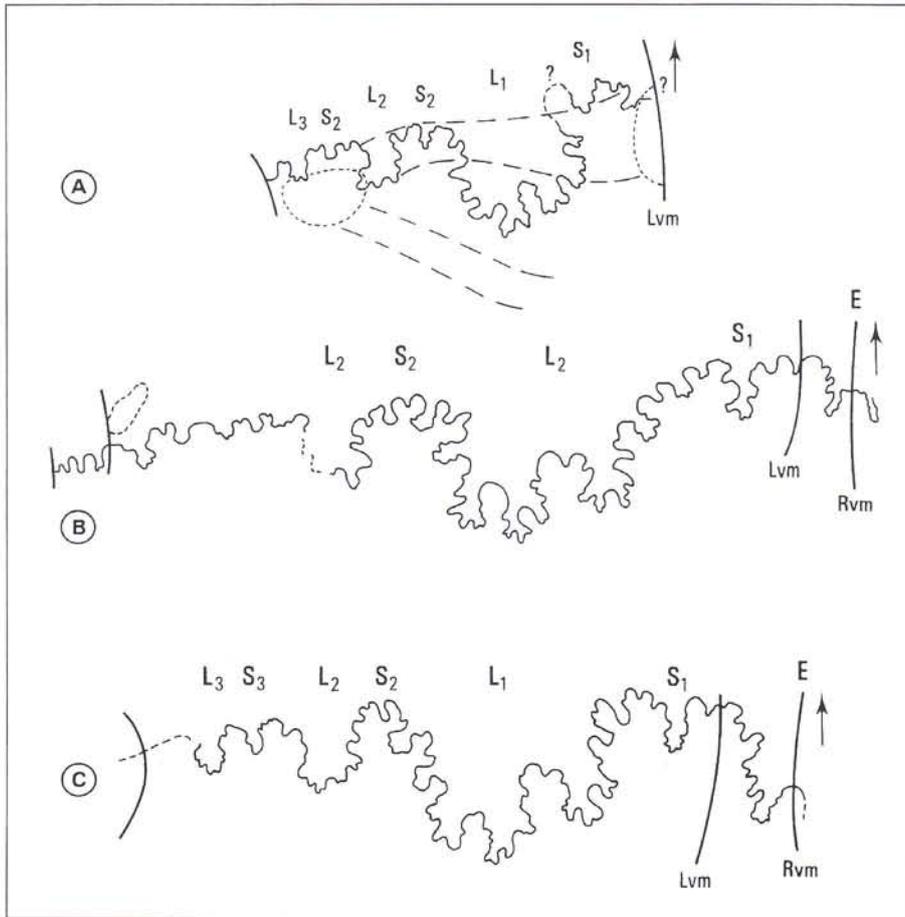


Fig. 4 - Sutures: a) *S. (S.) michalskii* (Semenov), spec. 8086 (21) at  $d \approx 25$ ,  $h \approx 12$ ; b) *S. (P.) cf. ubligi* (Semenov), spec. 8083 (19) at  $d \approx 65-67$ ,  $h = 33$ ; c) *S. (P.) pseudocoelonodum* (Semenov), spec. 8082 (18) at  $d \approx 62-65$ ,  $h = 34$ .

Saveliev (1992, footnote p. 24) included in *Semenoviceras* s. str., together with the type-species *S. (S.) michalskii* (Semenov), the species *S. (S.) laticostatum* (Saveliev), *S. (S.) litschkovi* (Saveliev), *S. (S.) tamalakense* Saveliev, *S. (S.) baisunense* (Luppov), *S. (S.) gracile* (Spath) and *S. (S.) iphitum* (Spath). The subgenus *Semenoviceras* s. str. was therefore conceived for species characterised by strong ornamentation, prominent periumbilical spiniform tubercles and sharp ventrolateral clavi.

Saveliev (1992, p. 23, 24) selected *S. (P.) ubligi* (Semenov) as the type-species of *Planihoplites*, which includes *S. (P.) ubligi* var. *pseudofittoni* (Semenov), *S. (P.) tenue* (Saveliev), *S. (P.) pseudocoelonodum* (Semenov), *S. (P.) pseudoauritum* (Semenov) and *S. (P.) mangyshlakense* (Saveliev). According to Saveliev's (1992) original diagnosis, *Planihoplites*, compared to *Semenoviceras* s. str., was created for species with more compressed shells, narrower whorls, narrower umbilici, smaller umbilical "never spined" tubercles (Saveliev, 1992, p. 24), weaker ornamentation that weakens further in the middle part of the flank, less roughly branched ribs, and more numerous and smaller ventrolateral clavi. In addition, E is more displaced and L is more asymmetrical in *Planihoplites* than in *Semenoviceras* s. str.

The inclusion of *S. pseudoauritum*, a clear synonym of *S. michalskii*, conflicts with the original diagnosis of

*Planihoplites*. This aspect will be discussed further below.

Marcinowski et al. (1996, p. 36) did not distinguish the two subgenera but recognised two groups: 1) "species with relatively strong ornamentation", including *S. (S.) michalskii*, *S. (S.) litschkovi*, *S. (S.) baisunense* and *S. (P.) pseudocoelonodum*; and 2) "forms with relatively weak ornamentation pattern", including *S. (P.) ubligi* (Semenov) and *S. (P.) mangyshlakense*. Both groups correspond roughly to the subgenera *Semenoviceras* s. str. and *Planihoplites*. However, despite the presence of individuals with stronger ribs within the population, the species *S. (Planihoplites) pseudocoelonodum* (Semenov) cannot be considered "strongly ornamented". The material studied in this paper allows for the first time the intraspecific variability of *S. (P.) pseudocoelonodum* to be appreciated and demonstrates that this species should not be compared with those belonging to the subgenus *Semenoviceras* s. str.

#### Subgenus *Semenoviceras* Wright, 1996

Type-species *Hoplites michalskii* Semenov, 1899.

#### ***Semenoviceras (Semenoviceras) michalskii***

(Semenov, 1899)

Pl. 1, fig. 1, 2; Fig. 4 a, 5 a, b

- 1899 *Hoplites Michalskii* Semenov, p. 120, pl. 4, fig. 5 a-d.  
 1899 *Hoplites pseudoauritus* Semenov, p. 119, pl. 4, fig. 4 a-c.  
 non 1910 *Desmoceras Michalskii* - Sinzow, p. 38, pl. 3, fig. 1-7; fig. 1-3,  
 7 = *S. litschkovi* (Saveliev), fig. 4-6 = *S. laticostatum* (Saveliev)  
 ? 1910 *Desmoceras Michalskii* - Sinzow, p. 38, pl. 4, fig. 14  
 1953 *Anahoplites michalskii* - Glazunova, p. 74, fig. 36; pl. 22, fig. 3  
 a-c  
 1960 *Semenovites michalskii* - Glazunova, tabl. 1, fig. 11.  
 1967 *Semenovites michalskii* - Mirzoyev, fig. 2a, 4, 5b.  
 1977 *Semenovites* cf. *michalskii* - Amédro, Destombes & Teherani, p.  
 977, pl. 1, fig. 2a, b  
 1980 *Anahoplites michalskii* - Mikhailova, p. 90, fig. 7.  
 ? 1983 *Semenovites* cf. *michalskii* - Juignet et al., p. 201, pl. 1, fig. 3, 4.  
 1992 *Semenovites (Semenovites) tamalakensis* Saveliev, p. 155, fig. 37;  
 pl. 18, fig. 2 a-c.  
 1995 *Semenovites (S.) michalskii* - Seyed-Emami & Immel, p. 390, fig.  
 44.  
 1996 *Semenovites michalskii* - Seyed-Emami & Immel, p. 17, pl. 5, fig.  
 7, 10; pl. 6, fig. 3.

**Material** - Three specimens: one incomplete and deformed (8086 (21)) and two fragments of the body chamber (8086 (12) and 8086 (22)).

#### Dimensions.

Specimen	D	Uw	Wh	Wb	Wb/Wh	K/2	T/2	Ph
8086 (12) pl. 1, fig. 1	≅100	-	-	-	-	-	-	-
8086 (21) pl. 1, fig. 2	52.5	11 (0.21)	24.5 (0.46)	14.5 (0.28)	0.59	-	-	-

**Description.** Evolute shell with tabulate whorl section and flat flanks converging towards a flat venter. Umbilical wall steep, inclined, with a rounded umbilical margin. Ventrolateral margin gently rounded between the ribs.

The ribbing is strong, distant, and falcoid, originating from prominent umbilical spiniform tubercles. The ribs are weak on the lower half of the flank and stronger on the upper half where they are shaped like a spatula. The ribs stop at the ventrolateral margin forming sharp clavi (one clavus per rib) parallel to the siphonal line. Two ribs spring from a tubercle; in both specimens studied an intercalatory rib occurs between two bundles.

The suture is preserved, although eroded and incomplete, on specimen 8086 (21) only (Fig. 4 a). It is very similar to the suture drawn by Glazunova (1953, fig. 36), which differs only in having a larger number of lobes near the umbilical margin, due to the larger size of her specimen. It is also very similar to the suture drawn by Mirzoyev (1967, fig. 2B. 9a). Compared to the holotype's suture (Semenov, 1899, pl. 4, fig. 5 c), the arrangement of the major elements seems to be the same, although the lateral lobe is more symmetrical in specimen 8086 (21). The same holds true for the suture illustrated by Mikhailova (1980, fig. 7). Sutures drawn by

Glazunova (1953), Mirzoyev (1967) and Mikhailova (1980) are symmetrical, whilst that of the holotype is displaced. It is impossible to see whether or not the suture is displaced in our specimens.

**Discussion.** The most complete (8086 (21)), and the largest (8086 (12)) specimens, studied display larger whorl sections than the holotype of *S. (S.) michalskii* but have similar sculpture and sutures.

*S. (S.) michalskii* differs from *S. (S.) baisunense* (Luppov) in having a narrower whorl section, spatula-shaped ribs and sharper ventrolateral clavi.

*S. (S.) tamalakense* Saveliev seems to be an evolute morphotype of *S. michalskii*.

*S. pseudoauritum* (Semenov) is probably a variant of *S. michalskii* characterised by more dense ribbing and narrower venter. Marcinowski et al. (1996, p. 36) also considered *S. pseudoauritum* a synonym of *S. michalskii*.

The distinction between *S. (S.) michalskii* and *S. (S.) litschkovi* (Saveliev) is not clear since both species bear similar ribbing. The ventral area in the younger whorls of the latter species is narrower, with less convergent flanks; the whorl section is also elliptical-tabulate and not triangular-tabulate as in *S. (S.) michalskii* (compare Fig. 5 d with Fig. 5 a, b). *S. (S.) litschkovi* is characterised also by a narrower umbilicus. Marcinowski et al. (1996, p. 16) considered *S. (S.) litschkovi* a variant of *S. (S.) michalskii* with stronger ornamentation, but acknowledged that this variant occurs earlier than typical specimens of *S. (S.) michalskii*.

Additional specimens will be required to resolve this taxonomic problem.

Glazunova (1953) illustrated a specimen referred to the Middle Albian of Kopet Dagh, inconsistent with the Late Albian age acknowledged for this species (Fig. 2), as noted by Amédro et al. (1977). On the other hand, Glazunova (1953, tab. 3) considered *S. michalskii* in Mangyshlak as Middle Albian. Finally, Mikhailova & Saveliev (1989) did not include *S. michalskii* in the zone of *A. asiaticus* of Kopet Dagh and implicitly considered that Glazunova's specimen is of Late Albian age.

#### **Semenoviceras (Semenoviceras) litschkovi**

(Saveliev, 1960)

Pl. 1, fig. 3, 4; Fig. 5 d

1910 *Desmoceras Michalskii* Semenov - Sinzow, p. 38, pl. 3, fig. 1-3, 7; pl. 4, fig. 13

*pars* 1910 *Desmoceras rossicus* Sinzow, p. 38, pl. 3, fig. 13; non pl. 3, fig. 8-12, 14, 15; pl. 4, fig. 15, 16 = *A. rossicus*)

1960 *Anahoplites litschkovi* Saveliev, p. 177, fig. 32; pl. 41, fig. 1

**Material** - Two specimens: one incomplete and slightly deformed (8087 (6)), and one without its body chamber (8087 (25)).

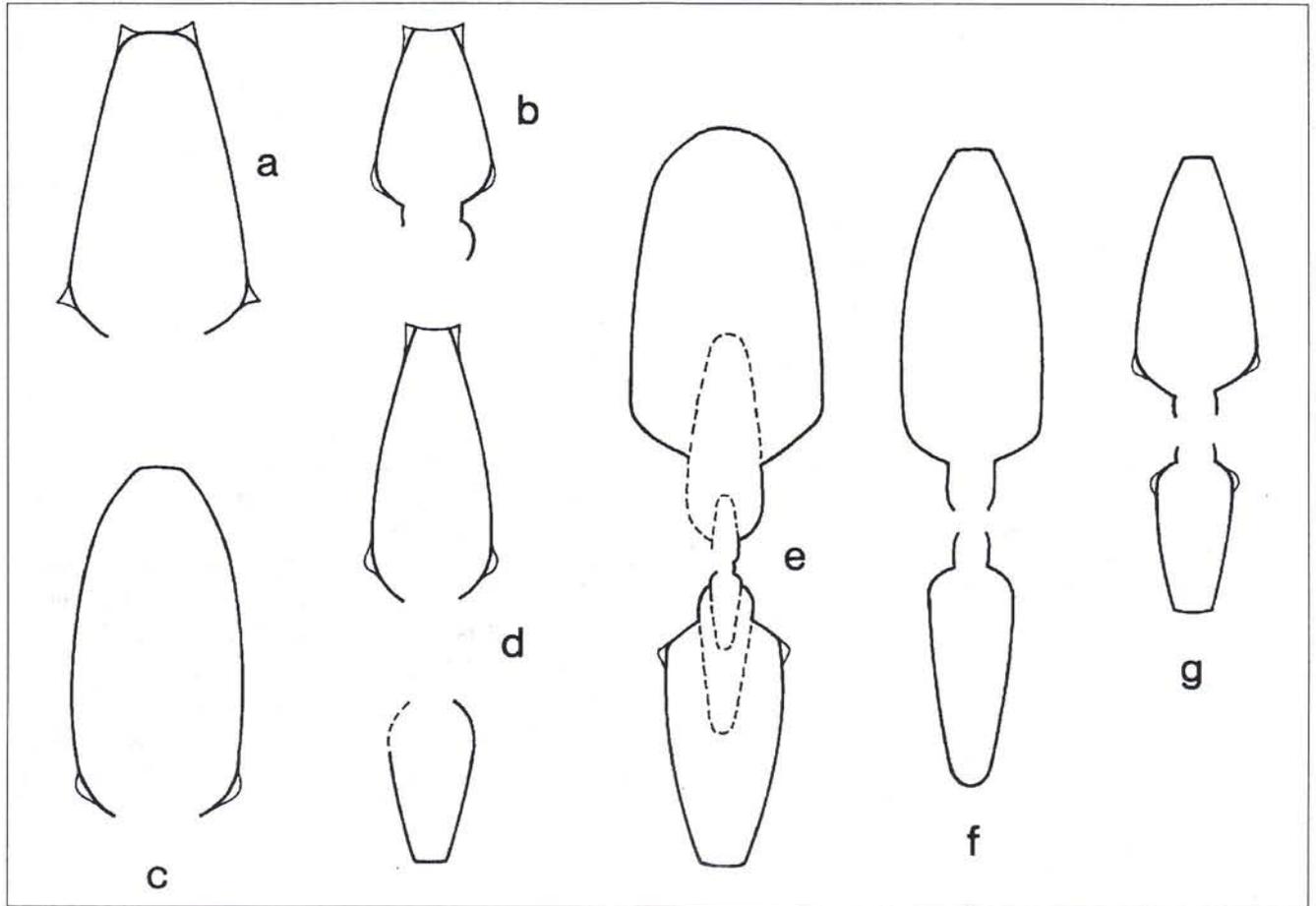


Fig. 5 - Whorl sections: a) *S. (S.) michalskii* (Semenov), spec. 8086 (12) at  $d \approx 85$ ; b) *idem*, spec. 8086 (21) at  $d = 51$ ; c) *S. (P.) mangyshlakense* (Saveliev), spec. 8085 (1) at  $D = 102$ ; d) *S. (S.) litschkovi* (Saveliev), spec. 8087 (6) at  $d = 73$ ; e) *S. (P.) aff. pseudocoelonodum* (Semenov), spec. 8084 (11) at  $d = 100.5$ ; f) *S. (P.) ubligi* (Semenov), spec. 8083 (14) at  $d = 88$ ; g) *idem*, spec. 8083 (2) at  $d = 61.5$ .

#### Dimensions.

Specimen	D	Uw	Wh	Wb	Wb/Wh	K/2	T/2	Ph
8087 (6)	$\approx 100$	-	-	-	-	-	8	76
pl. 1, fig. 4	76	12 (0.16)	38 (0.50)	18 (0.24)	0.47	15	6	
8087 (25)	61	-	-	-	-	-	-	n
pl. 1, fig. 3	59	9.5 (0.16)	27 (0.46)	13 (0.22)	0.48	19	6	
	35.5	6 (0.17)	18 (0.51)	8.5 (0.24)	0.47	13	2	

Description. The specimens available correspond to compressed, moderately evolute, discoidal shells. The

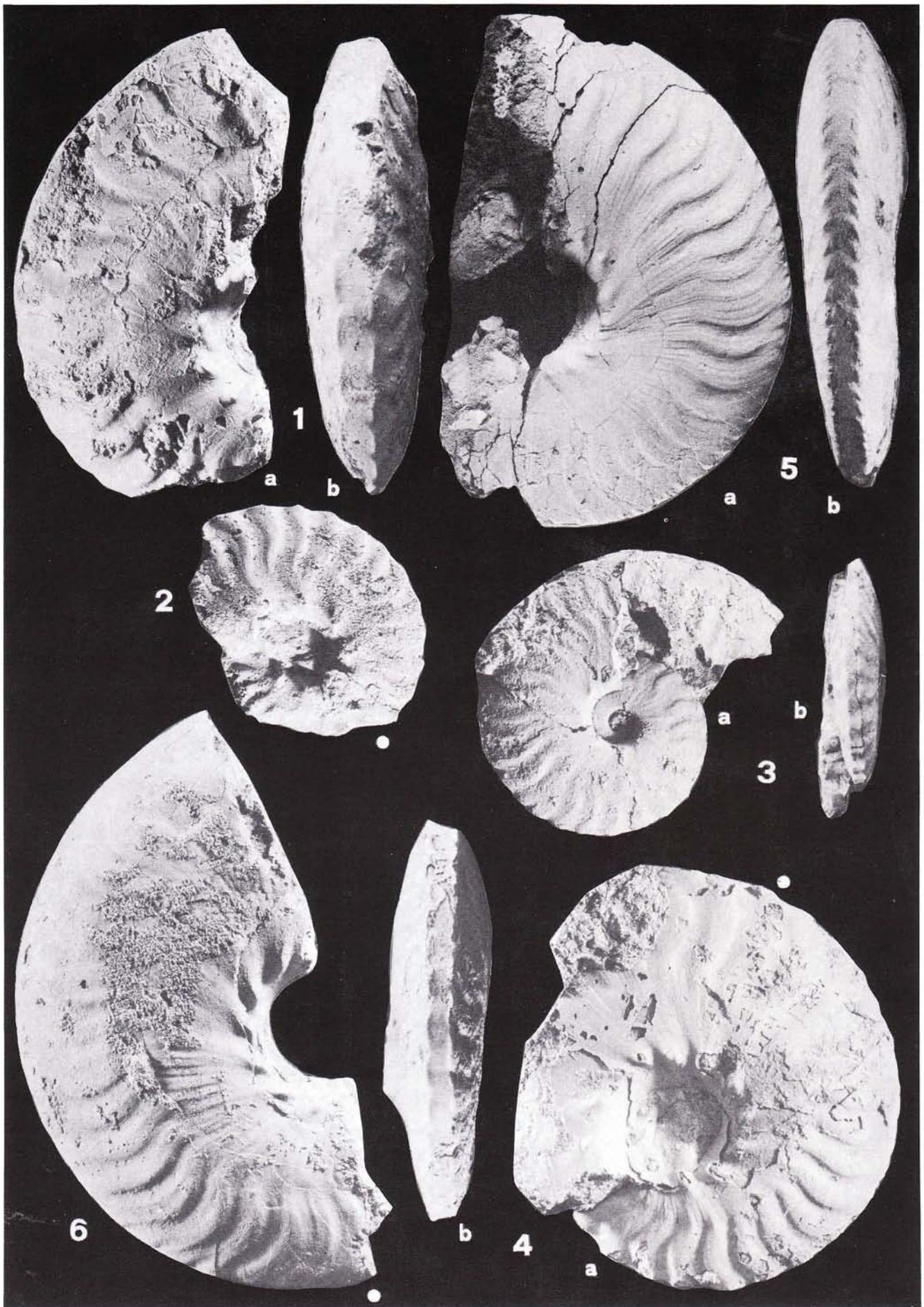
section is high, elliptical-tabulate, with gently rounded flanks converging towards the flat venter. The umbilical wall is steep and oblique, particularly on the body chamber.

The sculpture is well defined and made of strong, rounded umbilical tubercles and strong, falcoid ribs. A bundle made of two ribs springs from the umbilical tubercles; intercalatory ribs occur between two bundles. The ribs are weak on the lower half of the flank but become stronger and spatula-shaped on the upper half. The ribs end at the ventrolateral margin, developing

#### PLATE 1

- Fig. 1 - *Semenoviceras (Semenoviceras) michalskii* (Semenov). Akmysh, level B. N. 8086 (12). a) lateral view; b) ventral view; x 1. The specimen corresponds to a portion of the body chamber.
- Fig. 2 - *Semenoviceras (Semenoviceras) michalskii* (Semenov). Akmysh, level B. N. 8086 (21); x 1.
- Fig. 3 - *Semenoviceras (Semenoviceras) litschkovi* (Saveliev). Akmysh, level B. N. 8087 (25). a) lateral view; b) ventral view; x 1. Totally septated specimen.
- Fig. 4 - *Semenoviceras (Semenoviceras) litschkovi* (Saveliev). Akmysh, level B. N. 8087 (6). a) lateral view; b) ventral view; x 1.
- Fig. 5 - *Semenoviceras (Planihoplites) mangyshlakense* (Saveliev). Akmysh, level A. N. 8085. a) lateral view; b) ventral view; x 1. The specimen corresponds to a portion of the body chamber.
- Fig. 6 - *Semenoviceras (Planihoplites) pseudocoelonodum* (Semenov). Akmysh, level B. N. 8082 (7). a) lateral view; b) ventral view; x 1.

The dot indicates the beginning of the body chamber.



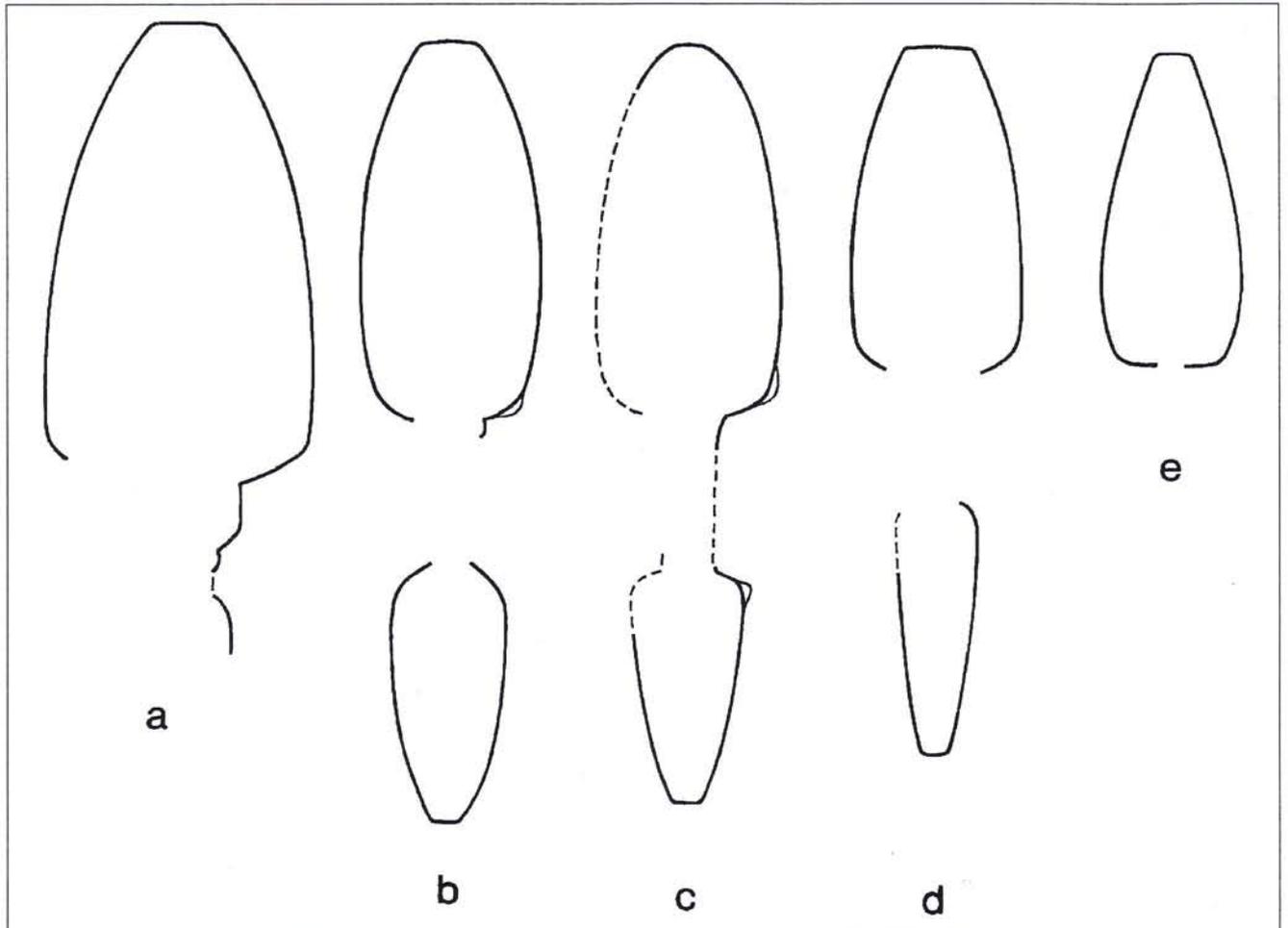


Fig. 6 - Whorl sections of *S. (P) pseudocoelonodum* (Semenov): a) spec. 8082 (20) at  $d \approx 135$ ; b) spec. 8082 (18) at  $d = 110$ ; c) spec. 8082 (4) at  $D = 107$ ; d) spec. 8082 (5) at  $d = 98$ ; e) spec. 8082 (7) at  $d \approx 85$ .

prominent clavi parallel to the siphonal line. Numerous fine striae, developed on the lower half of the flank, are visible on the test.

Discussion. The species *S. (S.) litschkovi* (Saveliev) shows numerous morphologic similarities, already discussed, with *S. (S.) michalskii* (Semenov). *S. laticostatum* (Saveliev) differs from *S. (S.) litschkovi* in having a whorl section that is triangular-tabulate rather than elliptical-tabulate, more distant ribs in the inner whorls, and in lacking the characteristic spatula shape of the ribs on the upper half of the flank.

Subgenus *Planihoplites* Saveliev, 1992 emend.

Type-species *Hoplites Ubligi* Semenov, 1899

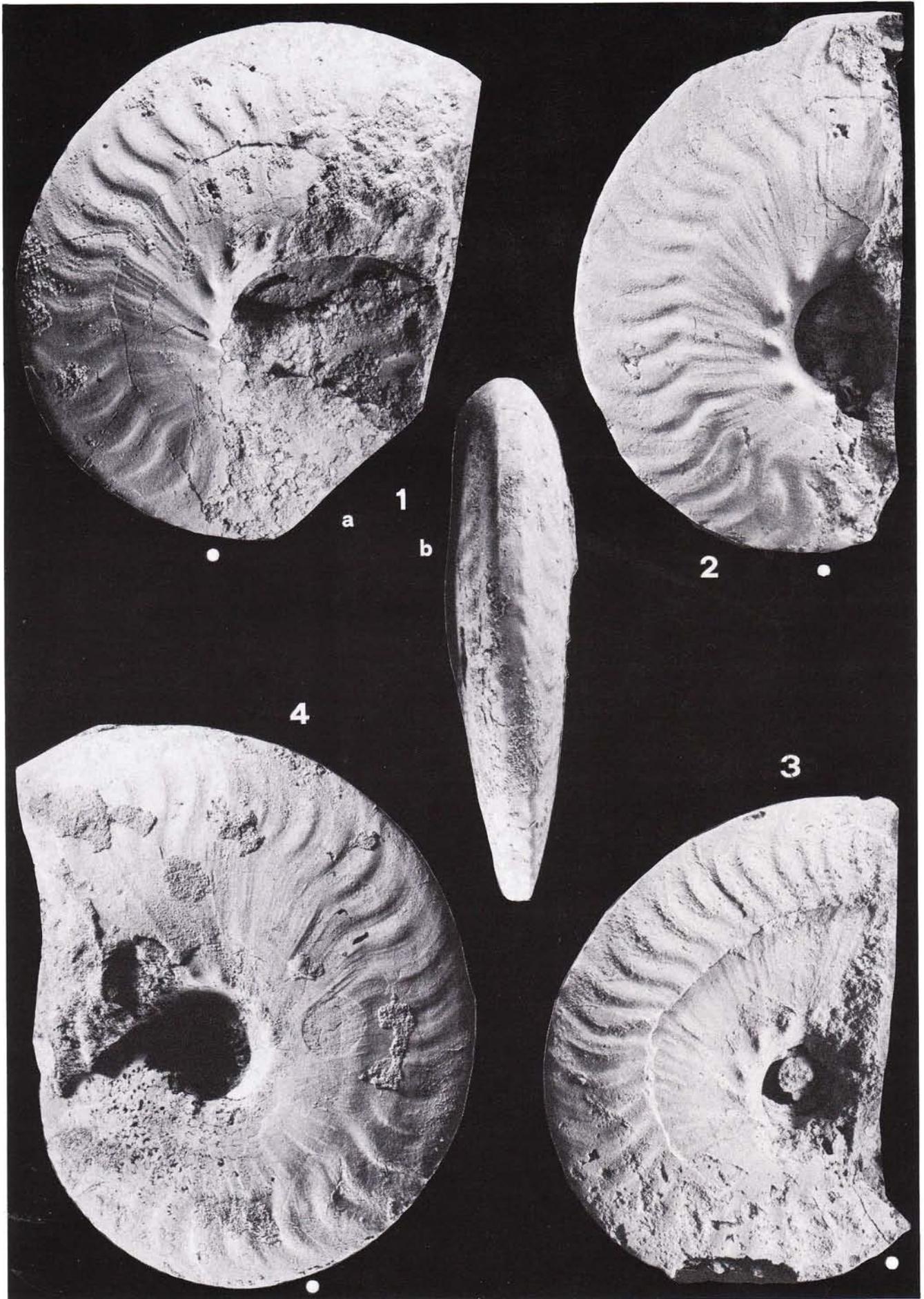
As mentioned above, Saveliev (1992) included in *Planihoplites* the species *S. pseudoauritum* (Semenov). Compared to *S. (P) ubligi*, *S. pseudoauritum* shows a similar whorl-section but its stronger ornamentation resembles more closely the species which Saveliev (1992, p. 24, footnote) included in *Semenoviceras* s. str. This ornamentation is characterised by prominent periumbilical tubercles, strong spatula-like ribs, sharp ventrolateral clavi which are visible, although eroded, in Semenov's (1899, pl. 4, fig. 4b) original specimen. In the present paper *S. pseudoauritum* is considered a synonym of *S. michalskii*.

The subgenus *Planihoplites* is re-defined on the basis of the material studied in this paper. It includes *Se-*

#### PLATE 2

- Fig. 1 - *Semenoviceras (Planihoplites) pseudocoelonodum* (Semenov). Akmysh, level B. N. 8082 (5). a) lateral view; b) ventral view; x 1.  
 Fig. 2 - *Semenoviceras (Planihoplites) pseudocoelonodum* (Semenov). Akmysh, level B. N. 8082 (4); x 1. Morphotype with strong tubercles.  
 Fig. 3 - *Semenoviceras (Planihoplites) pseudocoelonodum* (Semenov). Akmysh, level B. N. 8082 (3); x 1.  
 Fig. 4 - *Semenoviceras (Planihoplites) pseudocoelonodum* (Semenov). Akmysh, level B. N. 8082 (18); x 1.

The dot indicates the beginning of the body chamber.



*menoviceras* species characterised by compressed, relatively involute shells, with an elliptical triangular-tabulate whorl section and flat to rounded flanks. The ventral area is narrow and tabulate at all stages, except near the aperture, where it becomes rounded. The shell is smooth up to  $d \approx 15-20$  mm and adorned by fine striae up to  $d \approx 25-30$  mm. Subsequently, umbilical bullae or tubercles develop, from which falcoid ribs spring. The ribs tend to weaken in the middle part of the flank. Small, weak ventrolateral clavi develop parallel or oblique to the siphonal line, but they begin to disappear in the second half of the mature body-chamber whilst the ribbing weakens. The clavi are clearly separated from the rib end. The characteristics of the suture are the same as those indicated by Saveliev (1992).

### *Semenoviceras (Planihoplites) uhligi* (Semenov, 1899)

Pl. 4, fig. 3-6; Fig. 4 b, 5 f, g

1899 *Hoplites Uhligi* Semenov, p. 124, pl. 5, fig. 1 a-c

1899 *Hoplites pseudo-Fittoni* Semenov, p. 125, pl. 5, fig. 2 a-c

pars 1910 *Desmoceras Uhligi* - Sinzow, p. 39, pl. 4, fig. 4, 5 only; non fig. 1, 2 = *A. sinzowi* Spath; non fig. 3 = *S. mangyshlakense* (Saveliev); non fig. 7, 8, 9 and ? 10-12 = *A. daviesi* Spath; non fig. 13 = *S. litschkovi* (Saveliev).

1980 *Anaboplites uhligi* - Mikhailova, p. 89, fig. 6

Material - Five specimens 8083 (2), 8083 (14), 8083 (26); 8083 (19) (fragment) and 8083 (24) were determined as *S. (P.) cf. uhligi*.

#### Dimensions.

Specimen	D	Uw	Wh	Wb	Wb/Wh	K/2	T/2	Ph
8083 (2) pl. 4, fig. 3	87	15 (0.17)	42 (0.48)	-	-	-	-	62
	82	13 (0.16)	41 (0.50)	-	-	19	$\approx 8$	
	68	11 (0.16)	36 (0.53)	15.5 (0.23)	0.43	17	9	
	61.5	10 (0.16)	31.5 (0.51)	14.5 (0.235)	0.46	16	8	
	56	9 (0.16)	29 (0.52)	13.5 (0.24)	0.465	15	8	
8083 (14) pl. 4, fig. 4	88	15 (0.17)	42.5 (0.48)	$\approx 20$ (0.23)	0.47	22	8	$\approx 55$
	64	9.5 (0.15)	33 (0.515)	13.5 (0.21)	0.41	19	8	
8083 (19) pl. 4, fig. 6	>70	-	-	-	-	-	-	$\approx 66$
8083 (26) pl. 4, fig. 5	43	7 (0.16)	22.5 (0.52)	10 (0.23)	0.44	-	7	n
	28	4 (0.14)	14.5 (0.52)	6.5 (0.23)	0.45	-	0	

Description. Discoid, compressed, moderately evolute shells. The whorl section is high, already tabulate at  $d = 15$  mm, with flat to gently rounded flanks converging towards a flat, narrow venter. The maximum whorl breadth is near the umbilical margin. Between  $d = 20 - 25$  mm an oblique, steep umbilical wall develops, becoming steeper with the growth. The umbilical edge is rounded and definite. Near the aperture, or in the second half of the body chamber, the flat venter becomes gently rounded but the ventrolateral margin remains clearly developed. However, it must be noted that our specimens are incomplete and the aperture is not preserved, thus preventing observations of final changes in the morphology of the venter as in other species.

The shell is smooth up to  $d = 15$  mm. At  $d = 25$  mm fine striae are visible. At  $d = 30$  mm prorsiradiate bullae appear on the umbilical margin, together with bundles of falcate striae which end at the ventrolateral margin with clavi running parallel to the siphonal line. During growth all elements of the sculpture become stronger. Two or three ribs may originate from a single bulla. Some falcate ribs branch at mid-flank, where they change direction from prorsiradiate to rursiradiate. In the second half of the body chamber the ribs become distant and imbricated while they tend to fade.

The suture could not be drawn from the most complete specimens and that illustrated in Fig. 4 b belongs to specimen 8083 (19) determined as *S. (P.) cf. uhligi*. Instead of a clear and definite lateral lobe, it shows a fan-shaped lobe interrupted by a large auxiliary saddle. Also the second lateral saddle,  $S_2$ , is very large and fan-shaped. The suture is displaced, with the external saddle located on the right ventrolateral margin.

Discussion. This is the first time that specimens with the body chamber preserved are illustrated for this species.

*S. (P.) uhligi* shows strong morphologic similarities with *S. (P.) pseudocoelonodum*. It differs from the latter in having a narrower venter, a more compressed whorl section with more convergent flanks, strongly prorsiradiate umbilical bullae and stronger ribbing on the body chamber.

*S. (P.) mangyshlakense* bears ventrolateral clavi oblique to the siphonal line and slightly rounded whorl flanks.

#### PLATE 3

- Fig. 1 - *Semenoviceras (Planihoplites) pseudocoelonodum* (Semenov). Akmysh, level B. N. 8082 (20); x 1. Possible macroconch.  
 Fig. 2 - *Semenoviceras (Planihoplites) pseudocoelonodum* (Semenov). Akmysh, level B. N. 8082 (15); x 1. Morphotype with strong tubercles.  
 Fig. 3 - *Semenoviceras (Planihoplites) pseudocoelonodum* (Semenov). Akmysh, level B. N. 8082 (9); x 1. Morphotype with strong tubercles.  
 Fig. 4 - *Semenoviceras (Planihoplites) pseudocoelonodum* (Semenov). Akmysh, level B. N. 8082 (17); x 1.  
 Fig. 5 - *Semenoviceras (Planihoplites) pseudocoelonodum* (Semenov). Akmysh, level B. N. 8082 (16); x 1.

The dot indicates the beginning of the body chamber.



Marcinowski et al. (1996) considered *S. (P.) tenue* (Saveliev) a synonym of *S. (P.) uhligi*. The former species bears umbilical bullae beginning as small tubercles, a more evolute shell, a thicker whorl section and more spaced ribbing. On the basis of the material studied in this paper *S. (P.) tenue* is considered morphologically more similar to the form distinguished as *S. (P.) aff. pseudocoelonodum* (Semenov) rather than to *S. (P.) uhligi*. A detailed palaeontologic study of larger populations is needed to clarify this problem.

The suture drawn in Fig. 4 b differs from Semenov's type (1899, pl. 5, fig. 1a, 2a) and Sinzow's specimen (1910, pl. 4, fig. 4) which have the external saddle displaced on the left ventrolateral margin. Only the type of *pseudo-fittoni* (Semenov, pl. 5, fig. 2 a), here considered a synonym of *uhligi*, could have the external saddle displaced on the right margin. The suture illustrated by Mikhailova (1980, fig. 6) probably was incorrectly drawn as symmetric.

#### **Semenoviceras (Planihoplites) mangyshlakense**

(Saveliev, 1960)

Pl. 1, fig. 5; Fig. 5 c

*pars* 1910 *Desmoceras Uhligi* - Sinzow, p. 39, pl. 4, fig. 3 only.  
1960 *Anahoplites mangyshlakensis* Saveliev, p. 182, fig. 35; pl. 42, fig. 2  
1996 *Semenovites mangyshlakensis* - Marcinowski, Walaszczyk & Olszewska-Nejbert, pl. 11, fig. 2 a, b.

**Material** - Specimen 8085 (1), which only corresponds to a deformed body-chamber. Test with some nacre preserved.

#### Dimensions.

Specimen	D	Uw	Wh	Wb	Wb/Wh	K/2	T/2	Ph
8085 (1)	102	-	47 (0.46)	23 (0.225)	0.49	20	9	<65

**Description.** The fragment studied, slightly more than a half-whorl, corresponds to the body chamber of a compressed, moderately evolute hoplitid shell. The umbilicus is deep with steeply inclined umbilical walls and a rounded umbilical edge. The flanks are gently convex and stop in a rounded, definite, ventrolateral margin. The venter is tabulate up to the aperture.

The sculpture is characterised by falcate ribs, originating from prorsiradiate bullae located on the umbilical margin; these become tubercles close to the aperture. Two ribs spring from a single bulla. Numerous fine striae are developed on the test; they are more dense on the lower half of the flank where they are united in bundles corresponding to the trace of the main rib. These striae are barely developed on the internal mould. The ribs are straight and prorsiradiate up to the mid-flank, where they thicken and form the main, falcate rib. Each rib ends at the ventrolateral margin forming two clavi oblique to the siphonal line (pl. 1, fig. 5b). The venter is smooth on the internal mould but on the test it is possible to see that it is crossed by some extremely weak striae.

The aperture is simple with a ventral sinus running parallel to the line traced by the rib on the ventral area.

**Discussion.** *S. (P.) mangyshlakense* bears clavi oblique to the siphonal line. This is a character shared with species of *Anahoplites* from which *Semenoviceras* was derived.

Our specimen shows similarities with the one illustrated by Marcinowski et al. (1996) but differs from the holotype in having a smaller number of ribs and a flat venter up to the aperture. In the holotype the final portion of the final whorl is deformed but the venter seems to become gently rounded.

The specimen illustrated by Sinzow (1910, pl. 4, fig. 3) under the name *Desmoceras uhligi*, formerly considered by Spath (1926, p. 153) as *Anahoplites daviesi*, was considered by Saveliev (1960) as *S. (P.) mangyshlakense*. However, that specimen corresponds to a younger stage not preserved in our specimen.

This species shows some morphologic similarities to *S. (P.) pseudocoelonodum* (Semenov). However, the latter bears ventrolateral clavi parallel to the siphonal line and a rounded venter in the last portion of the body chamber.

#### **Semenoviceras (Planihoplites) pseudocoelonodum**

(Semenov, 1899)

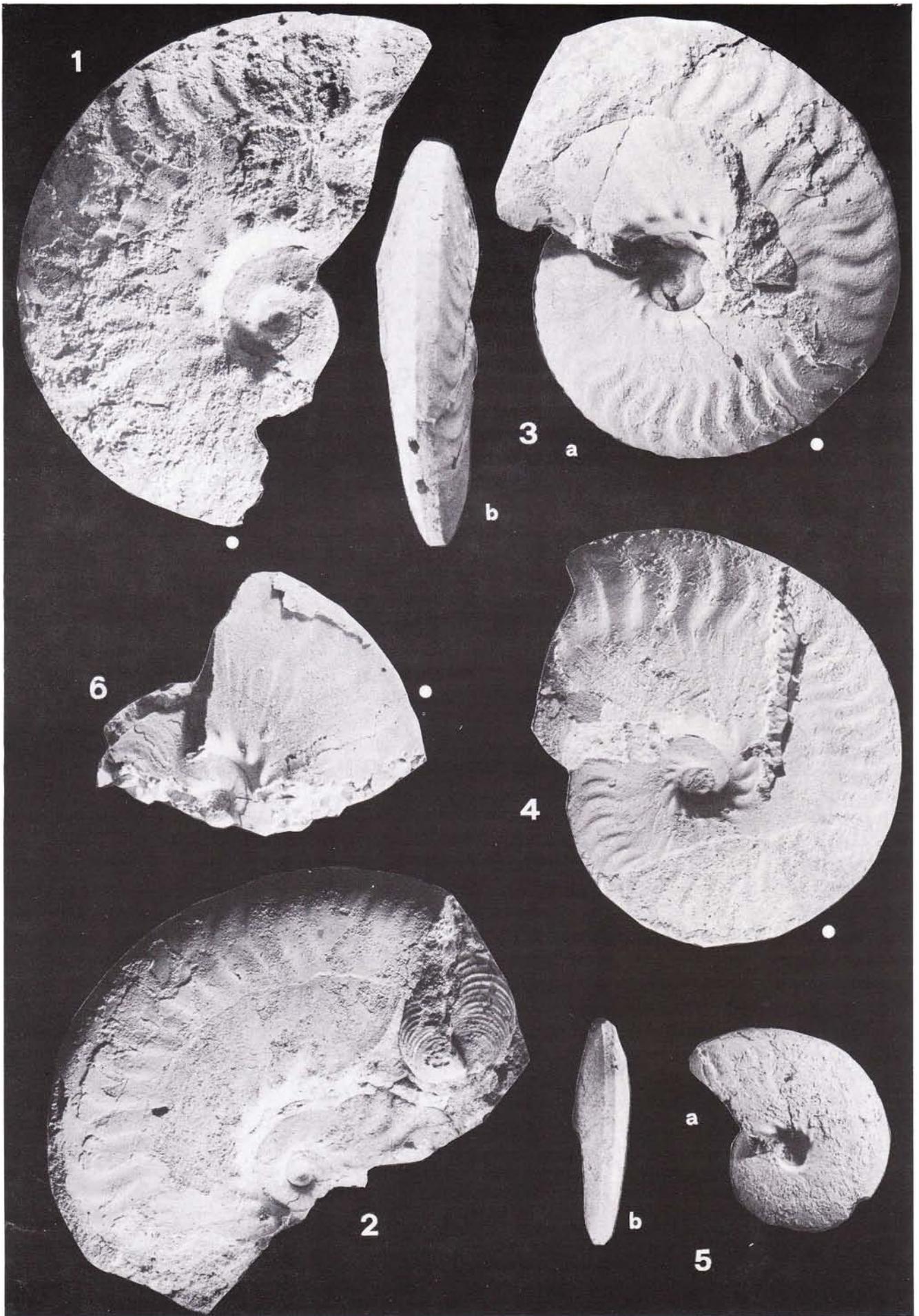
Pl. 1, fig. 6; Pl. 2, fig. 1-4; Pl. 3, fig. 1-5; Fig. 4 c, 6 a-e

1899 *Hoplites pseudocoelonodus* Semenov, p. 122, pl. 4, fig. 7 a, b

#### PLATE 4

- Fig. 1 - *Semenoviceras (Planihoplites) aff. pseudocoelonodum* (Semenov). Akmysh, level B. N. 8084 (11); x 1.  
Fig. 2 - *Semenoviceras (Planihoplites) aff. pseudocoelonodum* (Semenov). Akmysh, level B. N. 8084 (10); x 1. The last whorl corresponds to a portion of the body chamber.  
Fig. 3 - *Semenoviceras (Planihoplites) uhligi* (Semenov). Akmysh, level B. N.8083 (2). a) lateral view; b) ventral view; x 1.  
Fig. 4 - *Semenoviceras (Planihoplites) uhligi* (Semenov). Akmysh, level B. N.8083 (14); x 1.  
Fig. 5 - *Semenoviceras (Planihoplites) uhligi* (Semenov). Akmysh, level B. N.8083 (26). a) lateral view; b) ventral view; x 1. Totally septated specimen.  
Fig. 6 - *Semenoviceras (Planihoplites) cf. uhligi* (Semenov). Akmysh, level B. N.8083 (19); x 1.

The dot indicates the beginning of the body chamber.



**Material** - Thirteen specimens: 8082 (3-5, 7-9, 15-18, 20, 23) all incomplete, more or less deformed. Specimens 8082 (23) and 8082 (27) have been determined as *S. (P.) cf. pseudocoelonodum* because of their insufficient preservation.

**Dimensions.**

Specimen	D	Uw	Wh	Wb	Wb/Wh	K/2	T/2	Ph
8082 (3) pl. 2, fig. 3	≈102	-	-	-	-	22	7	≈56-60
8082 (4) pl. 2, fig. 2	107	20 (0.19)	52.5 (0.49)	-	-	19	6	≈65
8082 (5) pl. 2, fig. 1	106.5 103 100	- - 21 (0.21)	- - 47 (0.47)	- 23 (0.22) 22 (0.22)	- - 0.47	- 21 -	- 8 -	≈70
8082 (7) pl. 1, fig. 6	≈113	≈22 (0.19)	52.5 (0.46)	26 (0.23)	0.495	22	7	≈74
8082 (8)	≈120	-	-	-	-	≈25	10	≈77
8082 (9) pl. 3, fig. 3	≈105 93	- 16 (0.17)	- 52.5 (0.56)	- 22 (0.24)	- 0.42	- 14	7 -	≈68
8082 (15) pl. 3, fig. 2	≈113	21 (0.185)	55.5 (0.49)	26.5 (0.23)	0.48	19	7	75
8082 (16) pl. 3, fig. 5	≈103	-	-	-	-	≈17	9	75
8082 (17) pl. 3, fig. 4	≈100 91	- 15 (0.16)	- 48 (0.53)	- 20 (0.22)	- 0.42	- 24	- 8	≈55
8082 (18) pl. 2, fig. 4	113 83	19>(0.17) ?14>0.17	57 (0.50) 44 (0.53)	25 (0.22) 19.5 (0.23)	0.44 0.44	20 16	8 7	≈65
8082 (20) pl. 3, fig. 1	≈138 92	22 (0.16) 14 (0.15)	68 (0.49) 49 (0.53)	32 (0.23) 21.5 (0.23)	0.47 0.44	22 -	10 -	≈80-82

**Description.** Discoid, compressed, moderately evolute shells, with half-whorled body chamber. The maximum diameter is about 115 mm, but two specimens, 8082 (20) and 8082 (27), reached at least 140 mm. The whorl section is high, with flat to gently rounded flanks converging towards a flat venter. Between the diameter of 20 - 30 mm a steep, vertical or gently inclined umbilical wall develops and continues with the same aspect up to the aperture. The umbilical edge is rounded and definite. Near the aperture, or in the second half of the body chamber, the venter becomes rounded, the ventrolateral margin disappears, and the whorl becomes ovate.

The shell is smooth at least up to  $d = 10-15$  mm. Umbilical bullae begin to develop, together with ribbing, at  $d = 30$  mm (see internal whorls of specimens illustrated in Pl. 3, fig. 1-4). The ornamentation is typically formed by bundles of fine, prorsiradiate striae which spring from umbilical bullae; at mid-flank they thicken and become rursiradiate, developing falcate ribs which end at the ventrolateral margin as clavi parallel to the siphonal line. These ribs, which on the test are made of bundles, can be more or less numerous and more or less strong in different specimens. However, the ribbing is generally weak and tends to fade at the end of the growth. The bullae actually begin at the umbilical

edge as rounded tubercles which are elongated as prorsiradiate bullae at the base of the flank where they give rise to the bundles of striae.

In the last part of the body chamber the ventrolateral clavi disappear whilst the sculpture fades and the venter becomes rounded. These changes in the last part of the body chamber indicate the end of the growth.

The suture shows a large and asymmetric lateral lobe and the external saddle displaced on the right ventrolateral margin (Fig. 4 c).

The aperture is simple and shows a gentle sinus.

**Discussion.** This species was originally established on the basis of a single fragment. The internal whorls of the holotype are unknown. No other specimens are illustrated in the literature. However, it must be stressed that the body chamber of many of the specimens studied in the present paper is very similar, or even identical, to the holotype. For this reason the specimens described above were assigned to *pseudocoelonodum*. Accordingly, the variability of *S. (P.) pseudocoelonodum* is here defined for the first time.

The holotype actually represents the most common morphology developed within the population. More involute shells are developed, as well as morphologies with stronger ribs or with more dense ribbing. However, these characters intergrade with involute specimens displaying different rib densities. On the contrary, it is possible to identify (Pl. 2, fig. 2; Pl. 3, fig. 2, 3) a morphotype characterized by strong tubercles.

In the specimen illustrated in Pl. 2, fig. 3, the body chamber is 3/4 of the whorl, whereas it is half a whorl in all specimens studied; on the other hand, the aperture is nearly straight. It is probably an immature specimen which died during formation of the septum.

The specimen illustrated in Pl. 3, fig. 1 is the largest, and probably incomplete or immature, since the venter is still flattened at the maximum diameter. A badly preserved specimen, 8082 (27) displays a larger size because its phragmocone ends at  $Ph \approx 90$  mm. Both specimens could be interpreted as the macroconch form or a larger variant. In both cases additional, better preserved material is needed. The specimen illustrated by Sinzow (1910, pl. 4, fig. 14) shows similarities with the supposed macroconch, but its internal whorls are strongly tuberculated and therefore cannot be compared with the specimens under study here. Marcinowski et al. (1996) probably classified specimens similar to the one illustrated by Sinzow (see above) as *S. pseudocoelonodum*, since they consider this species closer to the group of *S. (S.) michalskii* than to *S. (P.) ubligi*.

*S. (P.) pseudocoelonodum* does not develop spatula-shaped ribs, its ventrolateral clavi disappear in the last part of the body chamber and are never sharp and raised as in *S. (S.) michalskii* and *S. (S.) litschkovi* (compare Pl. 1, fig. 1b and 4b with Pl. 2, fig. 2b). Therefore, *S.*

(*P.*) *pseudocoelonodum* is clearly closer to *S. (P.) ubligi* and cannot be grouped with the "species with relatively strong ornamentation" (Marcinowski et al., 1996, p. 36).

The specimens here assigned to *S. (P.) pseudocoelonodum* always bear weak ventrolateral clavi parallel to the siphonal line. Therefore, they cannot be identified with *S. (P.) mangyshlakense*, which bears ventrolateral clavi oblique to the siphonal line.

**Semenoviceras (Planihoplites) aff. pseudocoelonodum**  
(Semenov, 1899)

Pl. 4, fig. 1, 2; Fig. 5 e

Material. Specimens 8084 (10), 8084 (11), 8084 (13).

Dimensions.

Specimen	D	Uw	Wh	Wb	Wb/Wh	K/2	T/2	Ph
8084 (10) pl. 4, fig. 2	≈100 78.5	- 14 (0.18)	- 38 (0.48)	- 17 (0.22)	- 0.45	≈20 -	9 -	-
8084 (11) pl. 4, fig. 1	103	22 (0.21)	47.5 (0.46)	26 (0.25)	0.55	19	-	? 75
8084 (13)	98.5 72	19 (0.19) 13 (0.18)	46 (0.47) 36 (0.50)	23 (0.23) 18 (0.25)	0.50 0.50	- -	8 8	67.5

Description. Discoid, moderately evolute shells, with half-whorled body chamber. The whorl section is high, with flat to gently rounded flanks converging towards a flat venter.

Up to  $d=10$  mm the flanks and the venter are rounded, whilst at  $d=15$  mm the venter flattens. Up to a  $d = 20$  mm the shell is lenticular with gently rounded flanks; the umbilical wall is not clearly developed at this stage but at  $d = 27-30$  mm it begins, steep and gently inclined, whilst the umbilical edge appears. In the second half of the body chamber, and particularly close to the aperture, the venter becomes rounded whilst the umbiculus widens, and the umbilical wall becomes oblique and higher. The maximum thickness of the whorl is below mid-flank at all stages.

The innermost whorls were studied after breaking specimen 8084 (13) and combining observations on specimens 8084 (10) and 8084 (11). The shell seems to be smooth up to a diameter of 30 mm, where tubercles appear on the umbilical margin. A characteristic hoplitid sculpture begins with fine, falcate striae between 35 and 40 mm; at  $d = 45$  mm the main ribs with the imbricated aspect are already developed. The straight, prorsiradiate part of the rib is relatively weak whilst the rursiradiate falcoid is stronger. The ribs stop at the ventrolateral margin, developing clavi parallel to the siphonal line. The umbilical tubercles are strong and rounded; only in specimen 10 tubercles show the aspect of bullae.

In the second half of the body chamber the ventrolateral clavi disappear whilst the venter becomes

rounded. These changes indicate the end of the growth.

The suture cannot be drawn due to poor preservation in all specimens studied.

Discussion. The specimens described show similarities with *S. (P.) pseudocoelonodum* (Semenov) but cannot be included in this species. *S. aff. pseudocoelonodum* bears falcoid ribs that are less sinuous than in *S. (P.) pseudocoelonodum*, tubercles instead of bullae, slightly thicker whorls, a gently wider umbilicus and an oblique umbilical wall. At the end of the growth the venter is broader (compare Fig. 5 e with Fig. 6) and the sculpture remains stronger than in *S. (P.) pseudocoelonodum*.

*Semenoviceras tenue* (Saveliev, 1960, p. 184, fig. 36, 37; pl. 41, fig. 2) shows some striae between the main ribs and the umbilical tubercles more frequently have the aspect of bullae, particularly in the inner whorls. These bullae are already developed at a diameter of 15 mm. The aspect of the tubercles in *S. (P.) aff. pseudocoelonodum* and their later development clearly differ from the holotype of *S. tenue*.

*S. (P.) ubligi* (Semenov) is more involute, bears narrower whorls with more convergent flanks. Its sculpture differs from *S. (P.) aff. pseudocoelonodum* because of the more dense ribbing and the development of umbilical bullae instead of tubercles.

*S. (P.) mangyshlakense* (Saveliev) differs in having ventrolateral clavi running oblique to the siphonal line.

**Conclusions.**

The material from Mangyshlak allowed a reassessment of 6 of the 12 species currently included in the genus *Semenoviceras*. Morphologic similarities and differences among these species were specified and documented on the basis of a detailed palaeontological analysis.

Specimens of *Semenoviceras (Planihoplites) ubligi* (the type-species of the subgenus *Planihoplites*) with preserved body chambers were described and illustrated for the first time.

A definition of intraspecific variability within the species *Semenoviceras (Planihoplites) pseudocoelonodum* (Semenov), which is the index of the upper subzone of the *S. litschkovi* zone, is now possible due to sufficient material. This species was probably dimorphic, although this hypothesis cannot be demonstrated clearly on the basis of the material studied.

The subgenus *Planihoplites* was re-defined. The characters of the internal whorls were included in the definition of the subgenus and the species *S. pseudoauritum* (Semenov) was placed in *Semenoviceras* s. str. and considered a synonym of *S. michalskii* (Semenov).

Two distinct morphologic groups of species exist. Strongly ornamented species, with periumbilical spinate tubercles and prominent ventrolateral clavi, belong to the subgenus *Semenoviceras* s. str. whereas weakly orna-

mented species with periumbilical bullae and weaker ventrolateral clavi, fading in the body chamber, are included in *Planihoplites*. Minor differences also exist in whorl sections and adult suture. However, these characters must be subjected to a morphologic analysis that encompasses all species through the entire time-range of the genus.

Marcinowski et al. (1996, p. 36) distinguished these two morphologic groups but did not recognise the two subgenera. However, these authors disregarded some important, discriminating morphologic ornamental characters, e.g. the shape and ontogenetic development of periumbilical tubercles and ventrolateral clavi, and the rib shape). Their palaeontologic interpretation of *S. (P.) pseudocoelonodum*, which is erroneously considered close to the group of *S. michalskii*, probably explains the biostratigraphic distribution larger than that reported by Mikhailova & Saveliev (1989).

#### Acknowledgements.

My sincere thanks to Marco Balini and Maurizio Gaetani (University of Milan) who collected the material studied in this paper. They also provided the necessary field information. Maurizio kindly gave me the opportunity to study these interesting ammonites and therefore expand my knowledge of Lower Cretaceous ammonite palaeontology. Many thanks to Prof. Tamara Bogdanova (VSEGEI, Saint Petersburg) who kindly sent me the necessary Russian literature, totally lacking in the Italian libraries. I am indebted to Prof. Viktor Zakharov (Novosibirsk) for his help with Russian translations, as well as for sending me further Russian literature. Prof. Raymond Casey and Peter Rawson (London) reviewed the manuscript and provided important suggestions for its improvement. I thank Prof. R. Marcinowski (Warsaw) for interesting discussions on *Semenoviceras*. I also thank Franco Paolucci (University of Urbino) for the drawings.

The expedition in Mangyshlak received the financial support of the "PTP", Peri-Tethys Program. The present study was partly supported by C. I. R. P. E. and grant ex 60% to Prof. F. Guerrera (University of Urbino).

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Received April 21, 1997; accepted July 21, 1997