

## Representatives of Genera *Malbosiceras* and *Pomeliceras* (Neocomitidae, Ammonoidea) from the Berriasian of the Crimean Mountains

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**Abstract**—The revised representatives of ammonite genera *Malbosiceras* and *Pomeliceras* from the Berriasian of the Crimean Mountains are classed with seven species, four of the first genus [*M. malbosii* (Pictet), *M. chaperi* (Pictet), *M. broussei* (Mazenot), *M. pictetiforme* Tavera] and three of the second one [*P. aff. boisseti* Nikolov, *P. breveti* (Pomel), *P. (?) funduklense* Lysenko et Arkadiev sp. nov.]. The identified species are described. The genus *Mazenoticeras* is considered as synonym of *Malbosiceras*. The above species prove that all the Berriasian zones (*jacobi*, *occitanica* and *boissieri*) are characteristic of corresponding deposits in the Crimean Mountains.

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**Key words:** Crimean Mountains, Berriasian, ammonites, biostratigraphic zonation, correlation.

### INTRODUCTION

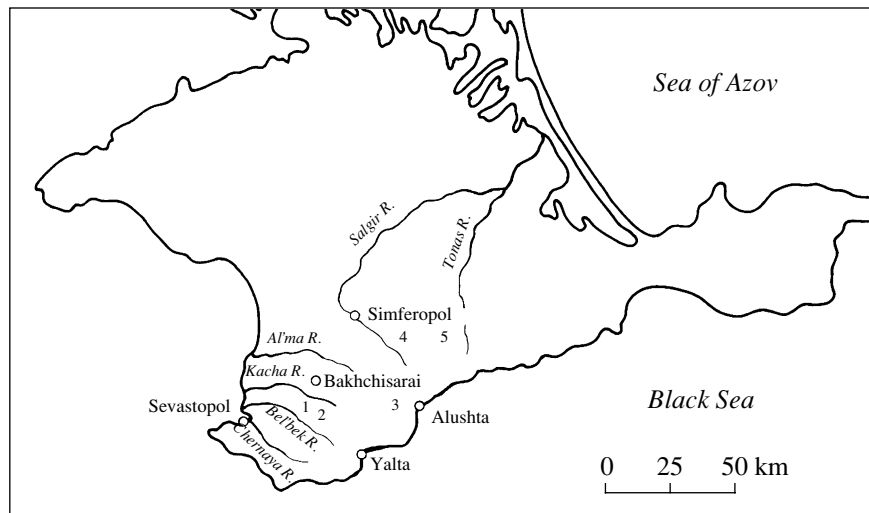
Representatives of ammonite genera *Malbosiceras* and *Pomeliceras* occur not very often in the Berriasian deposits of the Crimean Mountains. However, they are of great significance for zonal subdivision of relevant sediments, being well studied in many areas of Western Europe: in France (Mazenot, 1939; Le Hégarat, 1973), Bulgaria (Nikolov, 1982), and Spain (Tavera, 1985), where many species of both genera are permanent components of zonal assemblages successively replacing one another in sections.

In the Crimea, representatives of these ammonite genera have not been studied systematically. “Atlas of the Lower Cretaceous Fauna from the Northern Caucasus and Crimea” includes a brief description of ammonites from the northern Caucasus only (Drushchits, 1960), and *Malbosiceras* sp. alone has been described nearly 40 years later in “Atlas of Cretaceous Fauna of the Southwestern Crimea” (1997). In his work dedicated to the Berriasian ammonites of the Crimea and Caucasus, Kvantaliani (1999) described only *Pomeliceras* sp. juv. from the central Crimea. We had an opportunity to reexamine almost 30 ammonite specimens from two collections nos. 13143 and 330 stored in St. Petersburg at the TsNIGR museum and museum of the State Technical University, respectively. The specimens have been collected during a long period of research in the Crimea by V.V. Drushchits, B.T. Yanin, N.I. Lysenko, T.N. Bogdanova, V.V. Arkad'ev, and A.Yu. Glushkov.

### STRATIGRAPHIC DISTRIBUTION OF GENERA *MALBOSICERAS* AND *POMELICERAS* IN THE CRIMEA

Ammonites of genera *Malbosiceras* and *Pomeliceras* have been found in southwestern (Bel'bek River) and central areas (Enisarai Ravine, Sary-Su and Fundukly rivers, Chatyr-Dag massif) of the Crimea (Fig. 1).

In the Bel'bek River basin, species of the first genus have been encountered in the Berriasian sections of the Kabanii Ravine (*Atlas of Cretaceous...*, 1997; Bogdanova and Arkad'ev, 1999; Arkad'ev et al., 2002) and Mt. Kermenchik southern slope, near the village of Solnechnosel'e (Fig. 2). In the Kabanii Ravine section, species *Malbosiceras* ex gr. *paramimounum* (Maz.), *M. cf. paramimounum* (Maz.), and *M. ex gr. malbosii* (Pictet) occur in the *Euthymiceras*–*Neocosmoceras* Beds (Bogdanova et al., 1981), and their occurrence level is correlated with the *Malbosiceras paramimounum* Subzone of *Fauriella boissieri* Zone in southeastern France. According to our revision of materials from the Kabanii Ravine site, all the aforementioned taxa belong most likely to the species *Malbosiceras malbosii* (Pictet) only, but this does not change the former conclusion about age of their host deposits. In material from the Mt. Kermenchik site located not far away, we identified only *Malbosiceras broussei* (Mazenot), the species known in southeastern France from the *privasensis* and *paramimounum* subzones of the *occitanica* and *boissieri* zones, respectively.



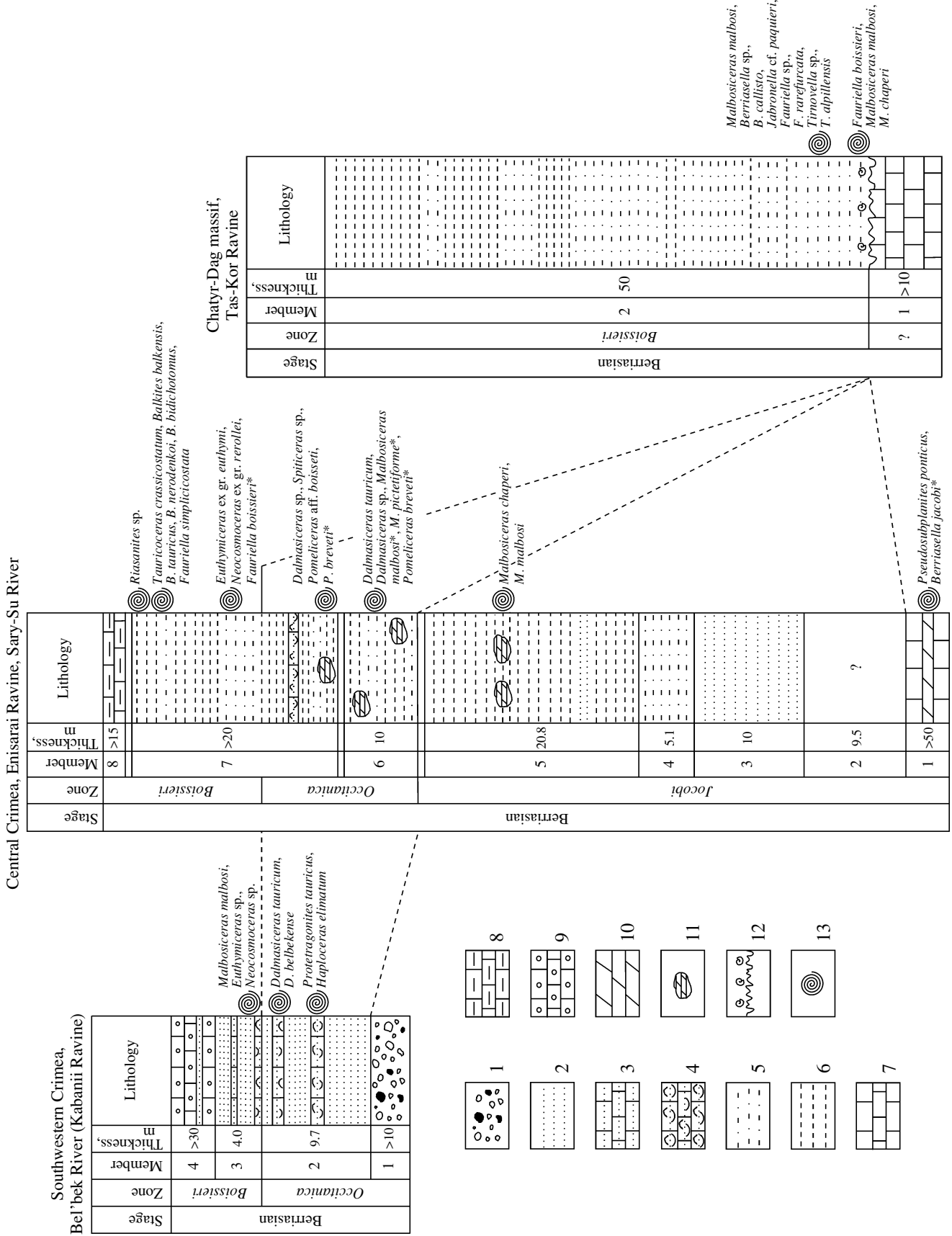
**Fig. 1.** Localities of the studied Berriasian Sections in the Crimean Mountains: (1) Bel'bek River, Kabanii Ravine; (2) village of Solnechnosel'e; (3) Chatyr-Dag massif; (4) Fundukly River, village of Petrovo; (5) Sary-Su River, Enisarai Ravine.

In the central Crimea, ammonites of genera *Malboscieras* and *Pomeliceras* are known from the Berriasian sections of the Enisarai Ravine and Sary-Su River near the villages of Balki and Novoklenovo (Fig. 2). Kvantaliani and Lysenko (1979a) reported that *Malboscieras malbosi* (Pictet) is found here in the lower (!) Berriasian, i.e., below the occurrence level of *Dalmasiceras* forms.

Later on, Bogdanova and Kvantaliani (1983) described in detail the Berriasian section of the Enisarai Ravine and Sary-Su River, where they established presence of *Malboscieras* (?) sp. indet. and *Malboscieras* (?) sp. juven. The composite section is compiled based on outcrops of Berriasian rocks, which are fragmentary in this region of the Crimea, and researchers who studied the outcrops with a time gap of 30–40 years likely observed different stratigraphic levels. At any rate, Drushchits and Yanin (1959) mentioned *Thurmannia* ex gr. *boissieri* Pict. in the published list of ammonite taxa, which is the index species of the upper Berriasian zone, whereas we identified in their collection *Malboscieras malbosi* (Pictet), *M. chaperi* (Pictet), *M. pictetiforme* Tavera and *Pomeliceras breveti* (Pomel). In the stratotype area, the first taxon is characteristic of the *boissieri* Zone, the second one of the *jacobi* Zone. Nevertheless, we confirm that *Malboscieras malbosi* has been found below the *Dalmasiceras* Beds and associated *M. chaperi* in the Enisarai Ravine section, while in the Sary-Su River section this species is likely confined to the *Dalmasiceras* Beds. Consequently, stratigraphic range of *M. malbosi* is wider in the Crimea than in

Western Europe, spanning the interval from the *jacobi* Zone upper part to the *boissieri* Zone. Species *M. pictetiforme* has been described by Tavera (1985) from the *andrussovi* Zone of the Berriasian Stage in Spain, which is correlative with the *occitanica* Zone of standard scale. Species *Pomeliceras breveti* is a characteristic taxon of the *occitanica-boissieri* Zone. Kvantaliani (1999) described small specimens *Pomeliceras* sp. juv. (they correspond most likely to the *breveti* species in our opinion) from the *Euthymiceras* cf. *euthymi* Beds of the Sary-Su River section. Arkad'ev who studied this section in 2004 found here *Pomeliceras* aff. *boisseti* Nikolov that is typical most likely of the *occitanica-boissieri* Zone also, as we think. Unfortunately, stratigraphic level of the *chaperi* form found by Drushchits and Yanin in the central Crimea cannot be defined precisely. It is possible only to suggest that this form has been found in the lower part of sand-clay sequence of the Enisarai Ravine. Specimen of *Malboscieras* (?) sp. indet. was identified earlier by Bogdanova at the same level. After careful examination, we concluded that this specimen can be attributed to the *chaperi* form (Plate III, fig. 2, this work). This is consistent with opinion of Kvantaliani and Lysenko (1979a) who correlated the level in question with the *jacobi* Zone upper part. Index species of this zone is known from the central Crimea (Arkad'ev and Bogdanova, 2004). In addition, Bogdanova discovered ammonite *Pseudosubplanites ponticus* (Ret.) in the upper part of limestones (Bogdanova and Kvantaliani, 1983), which is characteristic of this zone. Hence, the *jacobi* Zone of central

**Fig. 2.** Correlated Berriasian sections of the Crimean Mountains: (1) conglomerate; (2) sandstone; (3) calcareous sandstone; (4) sandstone-coquina; (5) aleurolite; (6) clay; (7) limestone; (8) clayey limestone; (9) oncolitic limestone; (10) marl; (11) marl nodules; (12) hardground and condensed horizon; (13) occurrence levels of ammonites (species of presumable position in the section are marked by asterisks).



Crimea includes for sure the upper part of carbonate sequence and the lower part of sand–clay sequence.

Near the village of Petrovo at the Fundukly River, the central Crimea, there is known for a long time another part of the Berriasian section, from which Kvantaliani and Lysenko (1978, 1979b, 1980) described the genus *Tauricoceras* and published the following composition of ammonite assemblage: *Berriasella* sp., *Ptychophylloceras ptychoicum* (Quenst.), *Euphylloceras serum* (Opp.), *Holcophylloceras calypso* (d'Orb.), *Negrelliceras subnegreli* Djan. and numerous *Tauricoceras* species. They regarded this part of the Berriasian as equivalent of the *boissieri* Zone, although according to modern ideas none of the above forms is defining that zone. In the Sary-Su River section, the *Tauricoceras* Beds are at a higher stratigraphic level than the beds with *Euthymiceras* and *Neocosmoceras*, and besides we identified *Fauriella simplicicostata* (Mazenot) in materials collected by Yanin from the *Tauricoceras* Beds. The *Euthymiceras*–*Neocosmoceras* Beds are correlative with the *paramimounum* Subzone of the *boissieri* Zone in the Mediterranean ammonite zonation (Hoedemaeker et al., 2003), while the identified *F. simplicicostata* may indicate that the *Tauricoceras* Beds correspond to the overlying *picteti* Subzone of southeastern France (Le Hégarat, 1973). Accordingly, the *Tauricoceras* Beds of the Petrovo section can be attributed also to the *boissieri* Zone. In 2005, Lysenko and Arkad'ev reexamined this section and found a very large evolute shell with coarse ribs at the level of *Tauricoceras* Beds. This ammonite of the *Pomeliceras* affinity is however different from known species of this genus. It does not clarify the precise stratigraphic level of host beds in the Petrovo section, not contradicting simultaneously their correlation with the *boissieri* Zone.

In the Chatyr-Dag massif, *Malboliceras* specimens have been found in the Tas-Kor Ravine at the massif northern flank near the village of Mramornoe above the synonymous quarry (Fig. 2). The Berriasian deposits are exposed here in a separate fault-bounded tectonic block. Lysenko and Vakhrushev (1974) described this section in a very general mode without mentioning presence of *Malboliceras* forms. Sediments containing the latter overlie the denuded surface of the Berriasian (in opinion of Lysenko) limestones being represented by gray to yellowish gray clay and aleurolites about 60 m thick. Near the contact with limestones, there is a condensed horizon with sagged pockets containing abundant belemnite rostra *Duvalia* sp., bivalves *Gervillella anceps* (Deshayes in Leymerie), and corals *Montlivaltia* sp. (Lysenko and Vakhrushev, 1974). Arkad'ev identified *Fauriella boissieri* (Pictet), *Malboliceras malbosi* (Pictet) and *M. chaperi* (Pictet) in this horizon. Approximately 5 m above the limestone top, there is second occurrence level of abundant fossils. Dominant at this level are large (up to 200 mm in diameter) shells of *Malboliceras malbosi* (Pictet) found in association with *Berriasella* sp., *B. callisto* (d'Orbigny), *Jabronella*

cf. *paquieri* (Simionescu), *Fauriella* sp., *F. rarefurcata* (Pictet), *Tirnovella* sp., and *T. alpillensis* (Mazenot). Siltstones fine- to medium-grained are loose and can be easily broken by hands. At this level, all ammonites are compressed, deformed and replaced by aleuritic material. In distinction from them, ammonites of the lower level near limestones retained better their morphology, although they are somewhat rounded and show other signs of redeposition. Besides ammonites, siltstones contain bivalves, brachiopods, aptychi, shark teeth, and plant detritus. Ammonites of the condensed horizon belong to different zones: *Fauriella boissieri* is typical of synonymous zone of the upper Berriasian, while *Malboliceras chaperi* is a taxon of the *jacobi* Zone only, being redeposited therefore. The ammonite assemblage of the second level is characteristic of the *boissieri* Zone. In the stratotype area, species *F. boissieri* and *F. rarefurcata* are known from the *paramimounum*, *picteti*, and *callisto* subzones, being of maximum abundance in the last two units (Le Hégarat, 1973). In southeastern France, species *Tirnovella alpillensis* and *Jabronella paquieri* are also typical of the *picteti* and *callisto* subzones, while *Malboliceras malbosi* is widespread in the *paramimounum* and *picteti* subzones. The last species, as is mentioned above, is present however in the *jacobi* and *occitanica* zones of the Crimean sections. Hence, the ammonite assemblage from the Tas-Kor Ravine corresponds in age most likely to middle and upper parts of the *boissieri* Zone. Consequently, fragments of all three Berriasian zones (*jacobi*, *occitanica*, and *boissieri*) are present in sections of the central Crimea, although their real succession and ranges remain unclear.

#### INVESTIGATION HISTORY OF THE GENUS *MALBOSICERAS* GRIGORIEVA, 1938

Grigor'eva (1938) who studied ammonites of the Caucasus discriminated first the subgenus *Malboliceras* from the genus *Protacanthodiscus*, considering distinct umbilical and lateral tubercles, wide ventral side, and numerous “secondary” ribs (2–3 in a fascicle with 2–3 intercalary) as characteristic features of the new subgenus. In addition, she distinguished three other subgenera of the genus *Protacanthodiscus*, namely *Renngarteniceras*, *Euthymiceras* and *Pomeliceras*. In her opinion, characteristic of the last one are large, greatly evolute conchs with whorl sections of broad falcate shape and very large umbilical and lateral tubercles. Subsequently, researchers variably interpreted the new taxa. In numerous determinations, the same tuberculate Neocomitidae species are attributed to different genera: *Berriasella*, *Malboliceras*, *Mazenoticeras*, *Protacanthodiscus*, and *Pomeliceras*. To a great extent, this is connected with the fact that Spath (1923) determined the original genus *Protacanthodiscus* just nominally for the group of species *Hoplites andreaei* Kilian of the upper Tithonian without description of the genus diagnosis.

N.P. Luppov, M.S. Eristavi, and V.V. Drushchits (*Fundamental Paleontology*, 1958) considered genera *Malbosiceras* and *Protacanthodiscus* as synonyms, but already in "Atlas of the Lower Cretaceous Fauna from the Northern Caucasus and Crimea" (Drushchits, 1960), *Malbosiceras* is described as individual genus. In the early "Treatise on Invertebrate Paleontology" (Arkell et al., 1957), the genus *Malbosiceras* is missing and *Protacanthodiscus* is described with the following diagnosis (p. 352): "Inner whorls like in *Berriasella*, but lateral tubercles may occur on some ribs; middle and outer whorls with some distant bituberculate primary ribs, irregularly branched from outer lateral tubercle, and many intercalatories and nontuberculate primaries; venter with median smooth band, in some bordered by incipient small bullae and in others by parabolic nodes; aperture simple." Kvantaliani (1999) also regards *Malbosiceras* as younger synonym of *Protacanthodiscus*.

Nikolov (1966) who studied ammonites of the upper Tithonian–Berriasian in Bulgaria distinguished several new genera, the genus *Mazenoticerias* close to *Malbosiceras* included. His diagnosis to the former is as follows (p. 641): "Moderately large to large compressed ammonites with rather open umbilicus. The whorls increase rather rapidly in height. The ventral region is with a drove gradually passing into a smooth strip which disappears with age. Involution 1/4–1/3. Strong ribs, mostly branching off, bi- or trifurcate, recirradiate or slightly prorsiradiate. Two rows of tubercles: umbilical in the basis of the ribs and lateral at the spot of their branching off. There are main, secondary, and intercalated ribs." Later on, first in a paper (Nikolov, 1979) and then in monograph dedicated to ammonites of the family Berriasellidae (Nikolov, 1982), this researcher changed his viewpoint and regarded the individualized genus *Pomeliceras* as including two subgenera *Pomeliceras* and *Mazenoticerias*. Le Hégarat (1973) regarded *Malbosiceras* and *Mazenoticerias* in the rank of individual genera. He described eight *Malbosiceras* species characterizing the *jacobi*, *occitanica*, and *boissieri* zones, and six *Mazenoticerias* species predominantly typical of the *occitanica*–*boissieri* Zone in southeastern France. In opinion of Tavera (1985) who examined ammonites from the Jurassic–Cretaceous boundary interval in Spain, *Mazenoticerias* and *Pomeliceras* are synonyms of *Malbosiceras*, while Hoedemaeker (1982) considered *Malbosiceras* as subgenus of the genus *Berriasella*.

In recent edition of "Treatise on Invertebrate Paleontology" (Wright et al., 1996), the genus *Malbosiceras* is interpreted in a broad sense and genera *Pomeliceras*, *Mazenoticerias*, *Retowskiceras*, and *Chapericeras* are regarded as its synonyms. Diagnosis of *Malbosiceras* is as follows (p. 51): "Inner whorls much as in *Berriasella* with venter variably rounded, truncated, or feebly grooved; at varying stage in midgrowth midlateral tubercles appear on periodic ribs, with umbilical tubercles appearing later; intercalated ribs

without tubercles are confined or not to outer third of side." Diagnosis of the genus *Protacanthodiscus* is reproduced without changes from the first edition.

After reexamination of Berriasian ammonites collected by Grigor'eva in the Caucasus, Kalacheva and Sei (2000) concluded that *Mazenoticerias* is an individual taxon but not a synonym of the genus *Malbosiceras*. Following Kvantaliani (1999), they argued also for individualism of the genus *Pomeliceras* and attributed to this taxon several species described by Grigor'eva, unfortunately without desirable descriptive comments. The comparative characterization of variably ranked (genus, subgenus) *Protacanthodiscus*, *Malbosiceras*, *Pomeliceras*, *Mazenoticerias*, and *Retowskiceras* is presented in the Table, where distinctive feature of close genera *Euthymiceras* and *Himalayites* are also given for comparison.

The family affiliation of the genus *Malbosiceras* has been controversially interpreted as well. Being attributed to the family Berriasellidae in early period of investigation (Le Hégarat, 1973; Nikolov, 1982), it has been regarded in recent works (Wright et al., 1996; Kalacheva and Sei, 2000) as a taxon of Neocomitidae (subfamily Berriasellinae). Kvantaliani (1989, 1999) includes the genus *Protacanthodiscus* into subfamily Neocosmocerotidae and genus *Pomeliceras* into subfamily Pomeliceratinae of the family Berriasellidae.

#### EVALUATED SIGNIFICANCE OF MORPHOLOGICAL FEATURES USED TO DISCRIMINATE AMMONITE GENERA OF NEOCOMITIDAE

As it is evident from above review, the understanding of taxonomic affinity of genera *Malbosiceras*, *Mazenoticerias*, *Pomeliceras* and close ammonites is controversial. This is natural because of two reasons: first, ammonite of these taxa are poorly preserved in general and their classification is commonly based on external morphology of conchs (without attention to structure of inner whorls and suture line patterns); second, between the indicated genera (or subgenera) of Neocomitidae, there are many transitional forms. In addition, amount of paleontological specimens used by classification was variable. The Crimean representatives of genera *Malbosiceras* and *Pomeliceras* are not numerous and poorly preserved as well in many cases (fragmented outer whorls of conchs) that is an obstacle for comprehensive revision. Nevertheless, it would be reasonable to analyze once more the morphological features of conchs, which are important for classification of tuberculate ammonites from the Berriasian deposits.

By tradition, the main morphological criteria important for classification of ammonites are the extent of whorls overlapping, shape of whorl sections, character of ventral side, and sculpturing (number of rows and character of tubercles, ribbing type). Size and inflation

Comparative morphology of *Malbosicerias* and close ammonite genera with characteristic tuberculate sculpturing

Genus	Shell size	Inflation	Coiling	Whorl section	Ventral side	Tubercles	Ribs
<i>Protacanthodiscus</i> Spath, 1923	Medium	Medium	Semievolute	Rectangular-oval, extended in height	Wide and flat with smooth midventral band	Two rows (near-umbilical and lateral); ventral on some forms	Main ribs bifurcate in 2–3 branches above lateral tubercles; intercalary ribs may also take origin near um- bilicus
<i>Malbosicerias</i> Grigorieva, 1938	Medium to large	Medium to strong	Semievolute	Rectangular-oval, extended in height	Wide rounded	Two rows (near-umbilical and lateral); sometimes marginal on living chamber	Main ribs bifurcate in 2–3 bran- ches; intercalary ribs (2–4) appear above midline of lateral side, some take origin near umbilicus
<i>Pomeliceras</i> Grigorieva, 1938	Large	Strong	Evolute	Quadrangular to oval extended in width	Very wide rounded	Embossed; two rows (near-umbilical and lateral)	Main ribs bifurcate in 2–4 bran- ches; intercalary ribs (1–3) appear, if present, above midline of lateral side
<i>Mazenoticerias</i> Nikolov, 1966	Medium to large	Medium	Semievolute	Rectangular-oval, extended in height	Wide flat	Two rows (near-umbilical and lateral)	Main ribs bifurcate in 2–3 bran- ches; intercalary ribs (1–4) appear above midline of lateral side
<i>Euthymiceras</i> Grigorieva, 1938	Small to medium	Medium	Semievolute	Angular, extended in height	Narrow	Three rows (near-umbilical, lateral and ventral)	Main ribs bifurcate in two bran- ches, having sometimes one inter- calary rib in between
<i>Retowskiceras</i> Nikolov, 1966	Medium	Insignifi- cant	Semievolute	Rectangular-oval, extended in height	Wide rounded	Embossed; one lateral row	Main ribs bifurcate in 2–3 bran- ches; single intercalary ribs take origin near umbilicus
<i>Himalayites</i> Uhlig in Boehm, 1904	Medium to large	Strong	Evolute	Oval, extended in width	Very wide rounded	Embossed ridged; one lateral row	Main ribs bifurcate in 2–4 bran- ches; intercalary ribs take origin near umbilicus

extent are very variable parameters of conchs, and the latter can hardly be estimated for Crimean ammonites, which are compressed and highly deformed in most cases. In our collection, the poorly preserved ammonites are represented in general by fragmented outer whorls, and it is impossible, therefore, to use such a diagnostic feature as the midventral groove, which is observable predominantly on inner whorls of many ammonite species known from Western Europe.

Diagnoses of genera *Protacanthodiscus* and *Malbosiceras* are very close. Well-embossed main ribs lacking tubercles and taking origin from umbilicus represent main distinctive feature of the first genus. According to this feature and lower stratigraphic position (*Protacanthodiscus* forms are known mostly from the Upper Jurassic), we share the opinion that there is individual genus *Protacanthodiscus*.

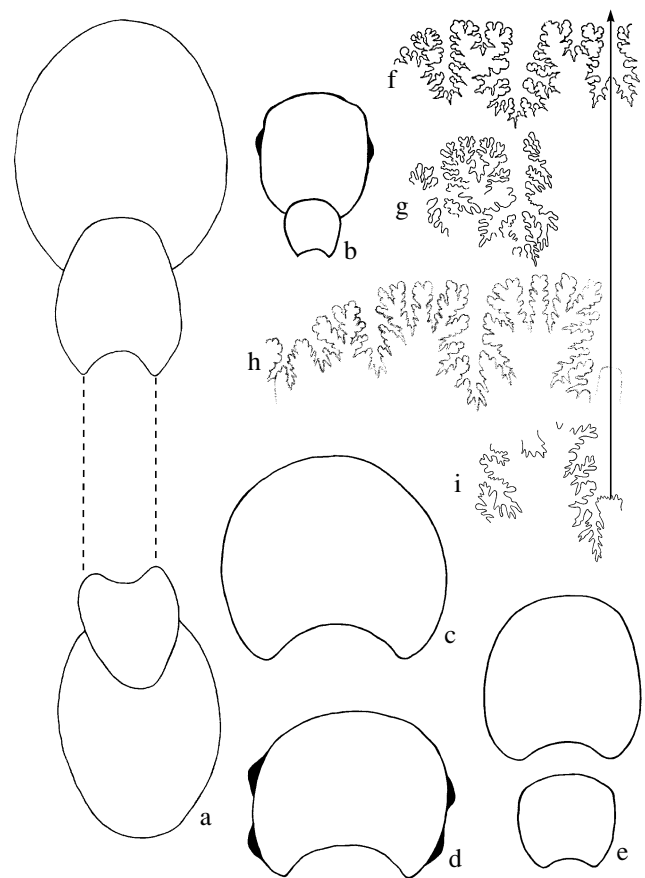
Diagnostic features of *Malbosiceras* and *Mazenoticer* are almost identical, and both genera occur at close stratigraphic levels. Taking this into account, we regard *Mazenoticer* as younger synonym of *Malbosiceras*.

Whorl sections of *Pomeliceras* are subquadrangular to broad oval in shape, and relevant advolute inflated conchs have embossed acute tubercles. In our opinion, these features are sufficient for retaining the individual status of the genus (although there are transitional forms between *Malbosiceras* and *Pomeliceras*).

Genera *Retowskiceras* and *Euthymiceras* are also close in morphology to *Malbosiceras*, but the first one has only one row of embossed lateral tubercles. Distinctive features of the second genus are three rows of tubercles and narrow whorl sections extended in height.

Like in *Pomeliceras* forms, conchs of the genus *Himalayites* are strongly inflated, having wide oval whorl sections. The main distinctive feature of the latter genus is one row of prick-shaped lateral tubercles.

The character of suture line cannot be used at present with confidence for discrimination of genera considered above, since only outer segments of suture lines in *Malbosiceras* and *Pomeliceras* conchs have been considered so far in publications. Nevertheless, some differences should be noted. Sutures lines of *Malbosiceras malbosi* and *Pomeliceras breveti* have been figured respectively by Mazenot (1939, Plate 13, fig. 8a) and Pomel (1889, Plate 9, fig. 5), and it is clear that these elements of both species are of comparable configuration, having ventral and lateral lobes of equal depth and subsequent umbilical lobes decreasing toward umbilical seam (Fig. 3). Nevertheless, main saddles are dissected in three elements in the *breveti* suture line and only in two elements in suture line of the *malbosi* species. In addition, lobe and saddle patterns of *Malbosiceras* suture line are more frequently undulating than in *Pomeliceras* forms. Our examination confirmed this distinction, and we regard *Mal-*



**Fig. 3.** Whorl sections (a–e) and suture lines (f–i) of described ammonites: (a) *Malbosiceras broussei* (Mazenot), specimen no. 22/13143,  $\times 0.4$ , Southwestern Crimea, Bel'bek River, Solnechnosel'e site, *occitanica* (?) Zone, collection of V.V. Arkad'ev; (b) *M. malbosi* (Pictet), specimen no. 11/13143,  $\times 0.5$ , central Crimea, Enisarai Ravine, *jacobi* (?) Zone, collection of B.T. Yanin; (c) *Pomeliceras breveti* (Pomel), specimen no. 25/13143,  $\times 0.5$ , central Crimea, Sary-Su River, *occitanica* Zone; (d) *P. (?) funduklense* Lysenko et Arkadiev, sp. nov., specimen no. 24/13143,  $\times 0.5$ , central Crimea, village of Petrovo, Fundukly River, *boissieri* (?) Zone, collection of N.I. Lysenko and V.V. Arkad'ev; (e) *P. aff. boisseti* Nikolov, specimen no. 23/13143,  $\times 0.5$ , central Crimea, Sary-Su River, *occitanica* Zone, collection of V.V. Arkad'ev; (f, g) *Malbosiceras malbosi* (Pictet), (f) from work by Mazenot (1939, Plate 13, fig. 8c), (g) specimen no. 12/13143,  $\times 0.8$ , central Crimea, Sary-Su River, *occitanica* Zone; (h, i) *Pomeliceras breveti* (Pomel), (h) from work by Pomel (1889, Plate 9, fig. 5), (i) specimen no. 26/13143,  $\times 0.75$ , central Crimea, Enisarai Ravine, *occitanica* Zone.

*bosiceras* and *Pomeliceras* as individual genera and *Mazenoticer* as synonym of *Malbosiceras*.

SYSTEMATIC DESCRIPTION

FAMILY NEOCOMITIDAE SALFELD, 1921

SUBFAMILY BERRIASSELLINAE SPATH, 1922

Genus *Malbosiceras* Grigorieva, 1938

**Type species:** *Ammonites malbosi* Pictet, 1867; Berriasian France.

Plate I



1a



1b



2a



2b



3



4



**Diagnosis.** Discoid semievolute shell with whorl sections of rectangular-oval shape, elongated in height; sculpturing elements are two rows of tubercles (near-umbilical and lateral) and ribs. Living chamber is sometimes decorated with third row of tubercles. Fascicles of ribs (2–3) take origin from lateral tubercles. Intercalary ribs (2–4) appear between main ones in the upper half of whorl. Suture line is strongly dissected, including ventral and lateral lobes of equal depth and several umbilical lobes decreasing toward suture. Saddles with very narrow base are intricately dissected into auxiliary lobes.

*Malboscieras malbosi* (Pictet, 1867)

Plate I, figs. 1–4, Plate II, fig. 1

*Ammonites malbosi*: Pictet, 1867, p. 77, Plate 14, fig. 1 (not fig. 2); not Pictet, 1868, p. 242, Plate 39, fig. 2; Pomel, 1889, p. 57, Plate 5, figs. 1–3.

*Hoplites malbosi*: not Kilian, 1889, p. 670, Plate 32, fig. 4; Burckhardt, 1900, p. 48, Plate 28, fig. 1.

Not *Protacanthodiscus* (*Malboscieras*) *malbosi*: Grigor'eva, 1938, p. 110, Plate 5, fig. 1, fig. 10 (= *Pomeliceras boisseti*).

*Berriasella malbosi*: Mazenot, 1939, p. 98, Plate 13, fig. 8, Plate 14, fig. 1; Arnould-Saget, 1953, p. 52, Plate 5, fig. 7.

*Berriasella* sp. indet. gr. de *B. chaperi* Mazenot, 1939, p. 80, Plate 12, fig. 3.

*Protacanthodiscus malbosi*: Nikolov, 1960, p. 174, Plate 14, fig. 4, Plate 15, fig. 1.

*Malboscieras malbosi*: Drushchits, 1960, p. 278, Plate 23, fig. 1; Dimitrova, 1967, p. 108, Plate 50, fig. 6; Le Hégarat, 1973, p. 87, Plate 9, fig. 5, Plate 10, figs. 1–5; not Khimshiashvili, 1976, p. 95, Plate 8, fig. 1 (= ?*Pomeliceras*); Nikolov, 1982, p. 134, Plate 45, fig. 2, Plate 46, figs. 1, 2; not Sakharov, 1984, Plate 5, fig. 2 (= *Pomeliceras* sp.); Tavera, 1985, p. 265, Plate 38, figs. 2, 3, fig. 20A; ?Khimshiashvili, 1989, p. 14, Plate 5, fig. 2; Wright et al., 1996, p. 51, fig. 37: 2a–2c.

*Berriasella* (*Malboscieras*) *malbosi*: Hoedemaeker, 1982, p. 32, Plate 2, fig. 4; not Howarth, 1992, p. 632, Plate 7, figs. 1–4, 7, 8 (= *Euthymiceras*?).

**Shape.** Discoid semievolute shell with wide umbilicus; in shell 30–40 mm high, whorl sections are rectangular-oval, stretched in height (Fig. 3b). Sections are of the same shape in shell 200 mm in diameter. Lateral sides are slightly convex; ventral side is wide, rounded.

**Sculpturing.** Judging from incompletely preserved specimens, nos. 1/13143 and 3/13143, initial whorls are

decorated with bipartite ribs without tubercles. Tubercles appear approximately since the fifth whorl, shell diameter about 60 mm. Small near-umbilical tubercles appear first, being followed by lateral ones approximately a whorl quarter later. When diameter is close to 100 mm, shell is ornamented with two rows of 14 to 16 near-umbilical and lateral tubercles. The latter are confined to the middle of lateral side. Main ribs beginning from near-umbilical tubercles bifurcate after lateral ones into three, sometimes two branches. Some of 2–3 intercalary ribs take origin nearly from umbilicus; the other ones from the whorl midline. Above lateral tubercles, ribs are slightly inclined anteriorly and cross venter remaining strong. When shell diameter is 200 mm, sculpturing is of somewhat different mode: main rib is sometimes associated in this case with additional, not very distinct rib beginning from the near-umbilical tubercle. On living chamber spanning a quarter of the last whorl, main ribs bear at their ventro-lateral rims the third row of ridged tubercles axially elongated and bent toward aperture.

Specimen no.	D	H	W	D <sub>u</sub>	H/D	W/D	D <sub>u</sub> /D
1/13143	200	66	35?	76	0.33	0.18	0.38

The suture line studied fragmentarily in specimen no. 12/13143 (Fig. 3g) is described above along with other diagnostic features of the genus.

**Comparison.** In distinction from close *M. paramimounum* (Mazenot), the described species has more coarse ribs with better-developed near-umbilical tubercles and greater amount of intercalary ribs.

**Distribution.** Berriasian, *jacobi* Zone (upper part) to *boissieri* Zone of the Crimea. Berriasian, *boissieri* Zone, *paramimounum* and *picteti* subzones of the Caucasus, Bulgaria, France, Spain, Algeria, Tunisia, Iraq, Argentina (?).

**Material:** 18 specimens (no. 1–18/13143) from the central Crimea (Sary-Su River, Chatyr-Dag massif); collections of N.I. Lysenko, V.V. Drushchits, B.T. Yanin, A. Yu. Glushkov, and V.V. Arkad'ev.

*Malboscieras chaperi* (Pictet, 1868)

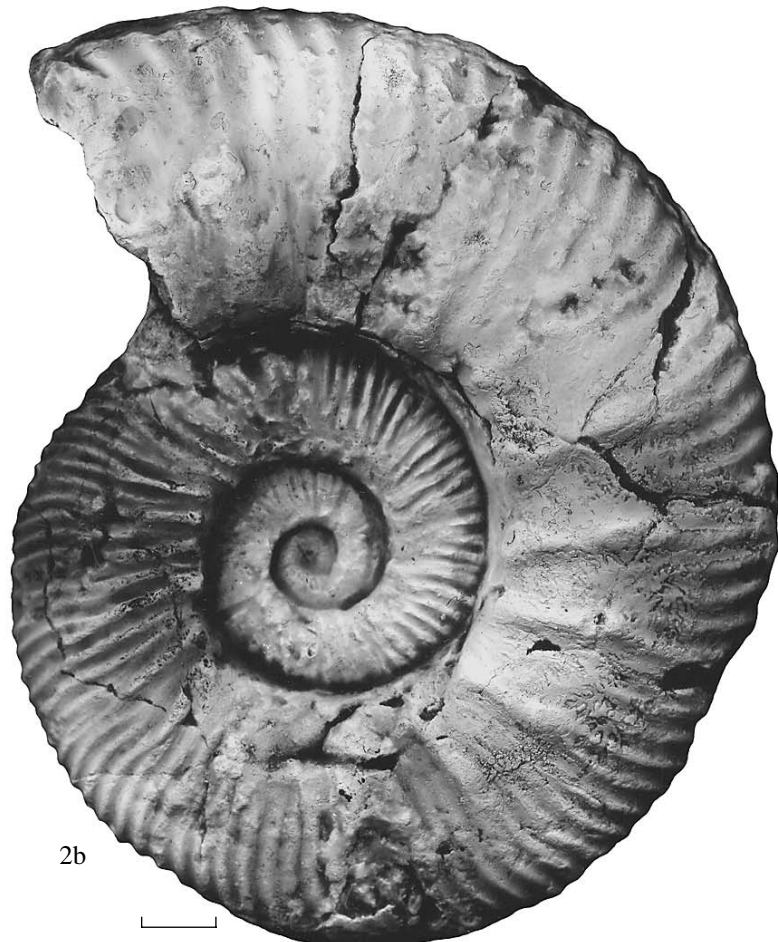
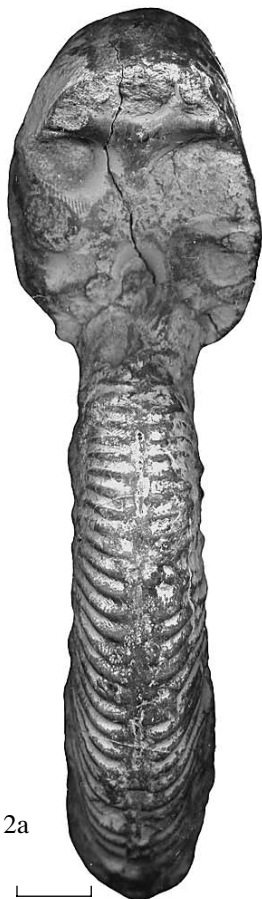
Plate III, figs. 1–3

*Ammonites chaperi*: Pictet, 1868, p. 242, Plate 37, fig. 1a–1c, 2, not fig. 3 (= *Malboscieras tarini*).

*Hoplites chaperi*: Kilian, 1889, p. 666, Plate 30, fig. 5, not Plate 31, fig. 1 (= *Malboscieras asper*); not Toucas, 1890, p. 606, Plate 18, fig. 8 (= *Malboscieras tarini*).

**Plate I.** *Malboscieras malbosi* (Pictet) from the Berriasian of the Crimean Mountains.

(1) specimen no. 8/13143: (a) side view, ×1, (b) whorl section, ×1, Central Crimea, Sary-Su River, *occitanica* (?) Zone, collection of V.V. Drushchits; (2) specimen no. 11/13143: (a) whorl section, ×1, (b) side view, ×1; Central Crimea, Enisarai Ravine, *jacobi* (?) Zone, collection of B.T. Yanin; (3) specimen no. 1/13143 side view, ×0.75, Chatyr-Dag massif, Tas-Kor Ravine, *boissieri* Zone, collection of N.I. Lysenko; (4) specimen no. 7/13143, side view, ×1, southwestern Crimea, Bel'bek River, Kabanii Ravine, *boissieri* Zone, collection of V.V. Arkad'ev (scale bar 1 cm).



*Berriasella chaperi*: Mazonot, 1939, p. 80, Plate 8, figs. 5–9, Plate 9, fig. 1.

*Berriasella* sp. (gr. de *B. chaperi*): Mazonot, 1939, p. 95, Plate 10, fig. 5, Plate 11, fig. 5 (not Plate 12, fig. 3).

*Malboscieras chaperi*: ? Le Hégarat, 1973, p. 86, Plate 9, figs. 6, 7; ? Sapunov, 1977, Plate 6, fig. 2; Sapunov, 1979, p. 184, Plate 57, figs. 2–5; Nikolov, 1982, p. 128, Plate 42, figs. 5, 6, Plate 43, fig. 1; Tavera, 1985, p. 271, Plate 39, fig. 3, fig. 20D.

*Protacanthodiscus chaperi*: Lefeld, 1974, p. 347, Plate 9, fig. 4.

*Pomeliceras (Mazenoticerias)* aff. *tarini*: Nikolov, 1982, p. 156, Plate 53, fig. 2.

*Berriasella (Malboscieras) chaperi*: Horwath and Knauer, 1986, Plate 1, fig. 1; Horwath, 1992, p. 634, Plate 9, figs. 6, 7.

**Shape.** Discoid semievolute shell with quickly growing whorls; wide lateral sides are slightly convex, and rounded ventral side is gently joining lateral ones. Open wide umbilicus has steep walls. Narrow whorl section is rounded-rectangular in shape, stretched in height.

**Sculpturing.** Lateral sides bear ribs and two rows of tubercles. Small near-umbilical tubercles stretched in radial direction are situated on umbilical inflection; their number is 24, when shell diameter is 110 mm. These are starting points of main ribs. Second row of tubercles is situated below the middle of whorl side close to the first one. These tubercles are larger, prick-shaped, also elongated in radial direction. Above lateral tubercles, ribs bifurcate in two, sometimes three branches. Some of intercalary ribs between major ones take origin close to umbilical rim, others from the middle of lateral side. Being weakly inclined anteriorly, all ribs cross ventral side not changing their morphology.

Specimen no.	D	H	W	D <sub>u</sub>	H/D	W/D	D <sub>u</sub> /D
19/13143	110	37	29	44	0.34	0.26	0.40
20/13143	87	34	24	33	0.39	0.28	0.38

Suture line is strongly dissected, having a deep lateral lobe.

**Comparison.** In distinction from other representatives of the genus *Malboscieras*, the described species has closely spaced rows of near-umbilical and lateral tubercles situated in the whorl lower half. From close species *M. malbosi* (Pictet), it differs in shape of whorl section that is narrower, extended in height, and deprived of third row of tubercles.

**Distribution.** Berriasian, *jacobi* Zone in the Crimea, Poland, Bulgaria, France, Spain, Iraq.

**Material:** three specimens (nos. 19–21/13143) from the central Crimea (Enisarai Ravine, Chatyr-Dag massif); collections of V.V. Drushchits, N.I. Lysenko, and T.N. Bogdanova.

*Malboscieras pictetiforme* Tavera, 1985

Plate II, fig. 2

*Malboscieras pictetiforme*: Tavera, 1985, p. 269, Plate 39, fig. 1, fig. 20, B.

**Shape.** Discoid evolute shell with broad, slightly convex lateral sides and narrow flattened ventral side; umbilicus is open, wide and shallow, with steep walls. Section of the last whorl is rounded-rectangular, more high than wide.

**Sculpturing.** In intermediate whorls (D = 60 mm) lateral sides are decorated with thin radial ribs taking origin at umbilical rim and bifurcating almost all in the whorl upper third. On ventral side, ribs are interrupted by smooth band. Small near-umbilical tubercles appear at the next stage of growth. Main ribs of this stage have basal tubercles, while intercalary ribs are lacking this morphological element (ribs of both types take origin at umbilical shoulder). Lateral tubercles appear, when shell diameter is 73 mm. These ridged tubercles are extended in radial direction. Sculpturing with ribs and two rows of tubercles is characteristic, when shell diameter is 125 mm. Main ribs of this stage begin at elongated near-umbilical tubercles spaced for 8–9 mm from each other. These sharp embossed ribs extend to ridged lateral tubercles to be bifurcated afterward in two, sometimes three branches. Secondary branches are less embossed than main ribs. Intercalary ribs, 2–3 in between main ribs, take origin at the whorl midline. At this stage, amount of ribs per whorl is as follows: 40 internal and 80 external. All the ribs overlap ventral side with a weak inflection, being interrupted here by midventral band.

Specimen no.	D	H	W	D <sub>u</sub>	H/D	W/D	D <sub>u</sub> /D
27/13143	125	45	37	47	0.36	0.30	0.38

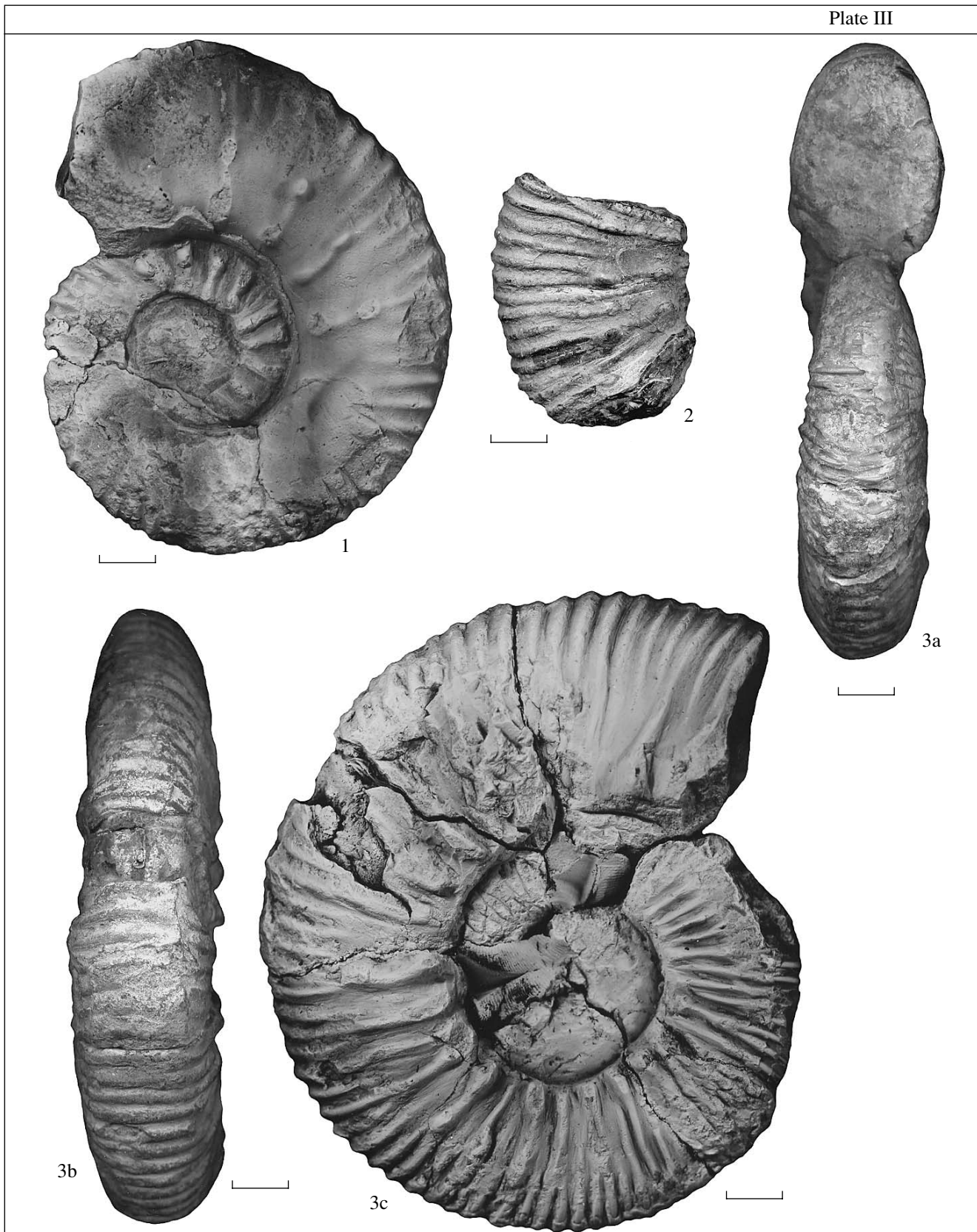
**Comparison.** Finer sculpturing at the middle stage of growth and more elongated ridged tubercles differ the species under consideration from close *M. paramimounum* (Mazonot), while *M. malbosi* (Pictet) is lacking these tubercles and has wider whorl sections.

**Distribution.** Berriasian, *occitanica* Zone in the Crimea and Spain.

**Plate II.** Species of the genus *Malboscieras* from the Berriasian of the Crimean Mountains.

(1) *Malboscieras malbosi* (Pictet), specimen no. 3/13143 side view, ×0.75, Chatyr-Dag massif, Tas-Kor Ravine, *boissieri* Zone, collection of N.I. Lysenko; (2) *Malboscieras pictetiforme* Tavera, specimen no. 27/13143: (a) apertural view, ×1, (b) side view, ×1, central Crimea, Sary-Su River, *occitanica* (?) Zone, collection of V.V. Drushchits (scale bar 1 cm).

Plate III



**Material:** two specimens (nos. 27–28/13143) from the central Crimea (Sary-Su River); collection of V.V. Drushchits.

*Malbosiceras broussei* (Mazenot, 1939)

Plate IV, fig. 1

*Berriasella broussei*: Mazenot, 1939, p. 91, Plate 11, figs. 4, 6, Plate 12, fig. 5.

*Berriasella tarini*: Mazenot, 1939, p. 89, Plate 11, fig. 2.

*Mazenoticerias broussei*: Le Hégarat, 1973, p. 118, Plate 15, figs. 1–4, Plate 16, figs. 1, 2, Plate 43, fig. 2; Benest et al., 1977, p. 206, Plate 1, figs. 4–5, 8–9; not Kalacheva and Sei, 2000, Plate 23, fig. 1.

*Pomeliceras (Mazenoticerias) broussei*: Nikolov, 1979, p. 511, fig. 1; Nikolov, 1982, p. 156, Plate 53, fig. 3, Plate 54, fig. 1, Plate 55, fig. 1.

*Malbosiceras broussei*: Tavera, 1985, p. 269, Plate 38, fig. 4.

**Shape.** Very large semievolute, moderately inflated shell. When D = 152 mm, whorl section is rounded-rectangular, a little more high than wide (Fig. 3a). In the next whorl (D = 273 mm), whorl section is rounded, nearly isometric. Lateral sides are slightly convex, and venter is wide and rounded. Open wide umbilicus has steep walls.

**Sculpturing.** Large (nearly 1 cm high) tubercles located near umbilicus are extended in radial direction. When D = 273 mm, 8 near-umbilical tubercles have been counted per half the whorl. They give origin to straight sharp radial ribs joining the lateral tubercles above midline of the lateral side. Lateral tubercles are very large (~ 1.5 cm), prick-shaped, round in plane view. Above them, ribs bifurcate into three, sometimes four branches less high and distinct than main ribs. Intercalary ribs, 3–4 in between main ribs, appear above the whorl midline. All the ribs remain unchanged in morphology when overlap ventral side being slightly inclined anteriorly.

Specimen no.	D	H	W	D <sub>u</sub>	H/D	W/D	D <sub>u</sub> /D
22/13143	152	53	44	70?	0.35	0.29	0.46
	273	80	77	128	0.29	0.28	0.47

**Comparison.** The *broussei* form is close to species described by Le Hégarat (1973, pl. 17, fig. 1) as *Mazenoticerias* aff. *broussei* but has greater amount of intercalary ribs. Large ridged tubercles of described

form are very similar to the same sculptural elements of *Mazenoticerias malbosiforme* Le Hégarat (1973, pl. 19, figs. 1, 2, pl. 44, fig. 3), but intercalary ribs are less frequent in the latter. In distinction from *Pomeliceras (Mazenoticerias) hegarati* Nikolov (Nikolov, 1982, Plate 55, figs. 2, 3), our species has wider spaced tubercles and greater amount of intercalary ribs.

Revising collection from the Belaya River section (northwestern Caucasus), Kalacheva and Sei (2000, Plate 23, fig. 1) figured as *Mazenoticerias broussei* (Mazenot) the ammonite specimen originally classed by Grigor'eva with *Dalmasiceras ? subchaperi* Retowski (Grigor'eva, 1938, p. 118, Plate 7, fig. 2). They did not presented, unfortunately, their own description of that specimen, Grigor'eva noted for which (ibid., p. 118), "that median row of tubercles is somewhat below the middle of lateral side." However, in the figured *broussei* holotype (Mazenot, 1939, pl. 12, fig. 5), the second row of tubercles is clearly seen above the median line of lateral side. Taking into account this discrepancy, we do not include the above taxonomic determinations into synonymy of the *broussei* species.

**Distribution:** Berriasian, *occitanica (privasensis)* Subzone and *boissieri (paramimounum)* Subzone) in the Crimea, Bulgaria, France, and Algeria.

**Material:** one specimen (no. 22/13143) from the southwestern Crimea (Solnechnosel'e site, Bel'bek River basin); collection of V.V. Arkad'ev.

**Genus** *Pomeliceras* Grigorieva, 1938

**Type species:** *Ammonites breveti* Pomel, 1889; Berriasian of Algeria.

**Diagnosis.** Large inflated semievolute to evolute shell. Whorl section quadrangular or oval with slightly rounded ventral side is extended in width. Sculpturing is represented by ribs and two rows of prick-shaped or ridged tubercles (near-umbilical and lateral). Main ribs bifurcate (2–3 branches) beginning from lateral tubercles. Intercalary ribs are occasional or absent. Suture line includes a deep lateral lobe and several umbilical lobes decreasing toward umbilical seam. Main saddles broad at the base are dissected by three auxiliary lobes.

*Pomeliceras* aff. *boisseti* Nikolov

Plate V, fig. 1

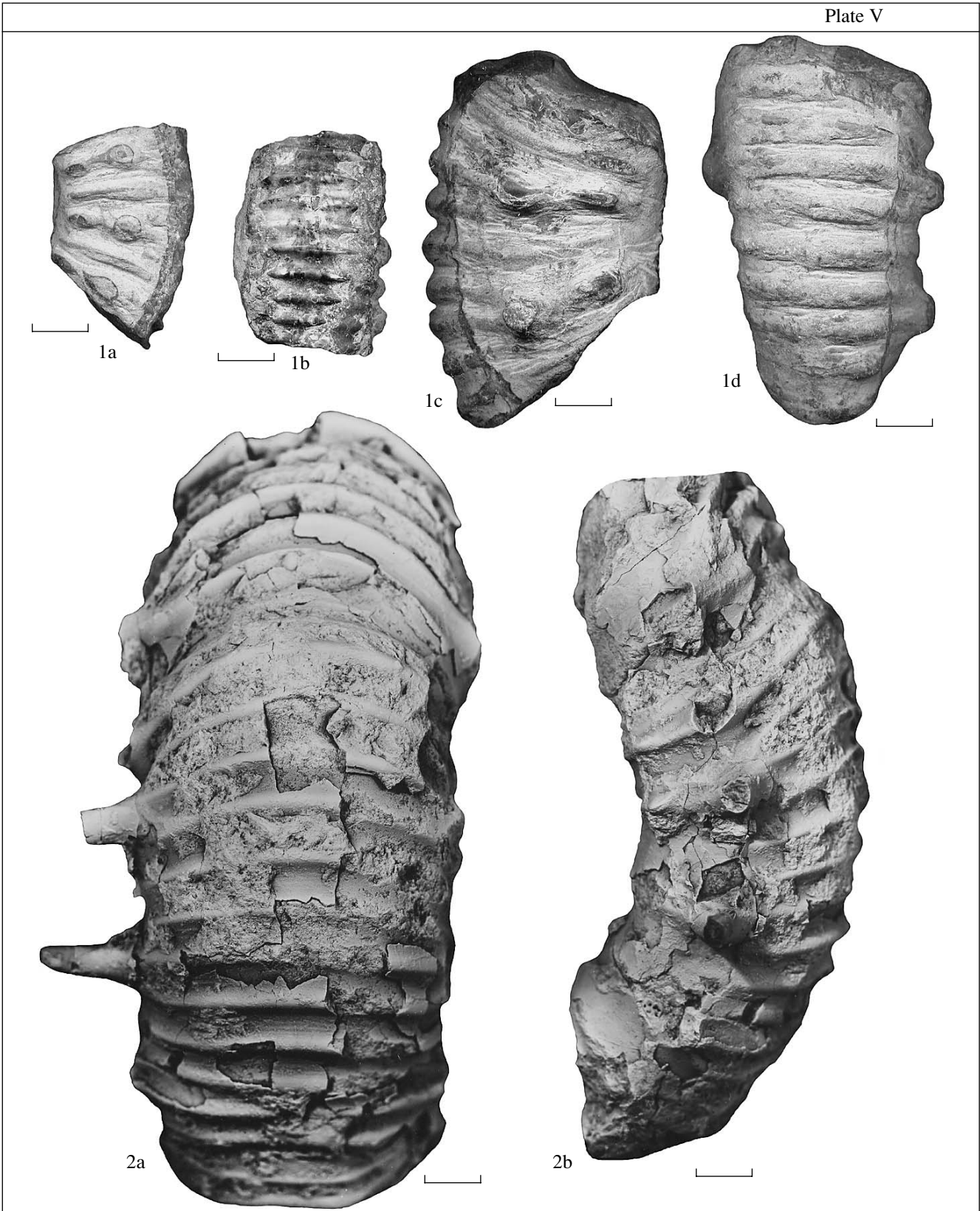
**Shape.** Judging from a quarter of phragmocone whorl present in collection, it is part of large inflated evolute shell. Wide ventral side is nearly flat; lateral sides are broad, slightly convex. When D = 25 mm, whorl section is quadrangular (Fig. 3e), with sharp ven-

**Plate III.** *Malbosiceras chaperi* (Pictet) from the Berriasian of the Crimean Mountains.

(1) specimen no. 20/13143 side view, ×1, Central Crimea, Chatyr-Dag massif, Tas-Kor Ravine, condensed horizon at the *boissieri* Zone base, collection of N.I. Lysenko; (2) specimen no. 21/13143 side view, ×1, central Crimea, Enisarai Ravine, *jacobi* Zone, collection of T.N. Bogdanova; (3) specimen no. 19/13143: (a) apertural view, ×1, (b) ventral side, ×1, (c) side view, ×1, central Crimea, Enisarai Ravine, *jacobi* Zone, collection of V.V. Drushchits and B.T. Yanin (scale bar 1 cm).



**Plate IV.** *Malbosiceras broussei* (Mazenot) from the Berriasian of the Crimean Mountains. Specimen no. 22/13143: (1a) ventral side,  $\times 0.8$ , (1b) side view,  $\times 0.8$ , southwestern Crimea, Bel'bek River, Solnechnosel'e site, *occitanica* (?) Zone, collection of V.V. Arkad'ev (scale bar 1 cm).



**Plate V.** Species of the genus *Pomeliceras* from the Berriasian of the Crimean Mountains.

(1) *Pomeliceras* aff. *boisseti* Nikolov, specimen no. 23/13143: (a, c) side view,  $\times 1$ , (b, d) ventral side,  $\times 1$ , central Crimea, Sary-Su River, *occitanica* Zone, collection of V.V. Arkad'ev; (2) *Pomeliceras breveti* Pomel, specimen no. 25/13143: (a) ventral side,  $\times 1$ , (b) side view,  $\times 1$ , central Crimea, Sary-Su River, *occitanica* Zone (scale bar 1 cm).

tro-lateral inflections; when  $D = 45$  mm, it is rectangular-oval, insignificantly extended in height (width 42.5 mm).

**Sculpturing.** Large ridged tubercles at the umbilical shoulder (two tubercles per a whorl quarter) are basal elements of main embossed ribs. Tubercles in the middle of lateral side are very large, extended slightly in radial direction, and main ribs bifurcate above them into three less embossed branches crossing ventral side. Intercalary ribs, one between pair of main ribs, take origin at umbilical shoulder also.

**Comparison and remarks.** The species under consideration is most close to *Pomeliceras boisseti* Nikolov but has, in distinction, intercalary ribs beginning from umbilical shoulder and wider whorl sections close in shape to quadrangle. Nikolov (1982) regarded *Mazenoticer* aff. *breveti* (Pomel) figured by Le Hégarat (1973, pl. 14, fig. 3, pl. 45, fig. 1) as holotype of *Pomeliceras* (P.) *boisseti* nominally determined by him earlier (Nikolov, 1979). Size parameter of the holotype are as follows:  $D = 92$  mm,  $H = 31$  mm,  $W = 24$  mm,  $D_u = 37$  mm, i.e., height of its whorl section is greater than width. On the other hand, Nikolov (1982) cited *Protacanthodiscus* (*Malbosiceras*) *malbosi* in synonymy of the *boisseti* species, although this taxon has wide, almost quadrangular whorl section according to original description by Grigor'eva (1938). Kalacheva and Sei (2000) also attributed that Caucasian ammonite to the *boisseti* species. The Caucasian and our specimens having very large tubercles are also comparable in evolute character of shells, whorl section shape, and coarse ribbing. Nevertheless, they are incompletely identical, because specimen from the Crimea has distinct intercalary ribs beginning from umbilical shoulder.

Mitta (2005) figured *Malbosiceras* aff. *boisseti* (Nikolov) from the *Riasanites rjasanensis* Zone of the Ryazanian Stage of Moscow syncline (without description to our regret). The figured specimen comparable in diameter (80 mm) with holotype is suitable for objective comparison. It has the same rectangular-oval whorl section somewhat extended in height ( $H = 26$  mm,  $W = 22$  mm). However, holotype and our specimens have tripartite ribs prevailing on the last whorl in distinction from bipartite ribs of specimen from the Moscow region. In addition, specimen figured by Mitta has distinct midventral band, near to which rib terminations are swollen into tubercles that is characteristic of the genus *Euthymiceras*. It is remarkable also that in his previous work dedicated to Berriasian neocomitids of Moscow region, Mitta (2002) figured identical ammonites from the same locality and classed them more correctly, as we think, with *Euthymiceras euthymi* (Pictet).

However, this "transformation" of "*Euthymiceras euthymi*" into *Malbosiceras* aff. *boisseti* is deprived of any comments (Mitta, 2005).

Two rows of tubercles differ the described species from representatives of the genus *Himalayites*.

**Distribution:** Berriasian, *occitanica* Zone of the Crimean Mountains.

**Material:** one specimen (no. 23/13143) from the central Crimea (Sary-Su River); collection of V.V. Arkad'ev.

*Pomeliceras breveti* (Pomel, 1889)

Plate V, fig. 2

*Ammonites breveti*: Pomel, 1889, p. 74, Plate 9, figs. 1–5.

*Protacanthodiscus* (*Pomeliceras*) *breveti*: Grigor'eva, 1938, p. 113, Plate 6, fig. 1; Plate 7, fig. 1.

*Himalayites* (?) aff. *breveti*: Mazenot, 1939, p. 237, Plate 39, fig. 6; Plate 40, fig. 15.

*Himalayites breveti*: Drushchits, 1960, p. 279, Plate 24, fig. 1.

*Pomeliceras breveti*: Khimshiashvili, 1976, p. 90, Plate 12, fig. 2; Plate 25, figs. 1, 2; Kvantaliani, 1999, p. 153, Plate 44, fig. 1; Sei and Kalacheva, 2000, Plate 25, fig. 1 (= *Protacanthodiscus* (*Pomeliceras*) *breveti* Pomel in Grigor'eva, 1938, p. 113, Plate 6, fig. 1).

*Pomeliceras* (*Pomeliceras*) *boisseti*: Nikolov, 1982, p. 150, Plate 51, fig. 1; Plate 52, fig. 1.

*Pomeliceras* sp. juv.: Kvantaliani, 1999, p. 154, Plate 44, fig. 2.

**Shape.** Large inflated semievolute shell. Very wide rounded ventral side is gently joining small lateral sides, which gradually slope to umbilical wall. Oval whorl section is elongated sideways (Fig. 3c).

**Sculpturing.** Main ribs take origin from umbilical suture. On umbilical shoulder, they are decorated with ridged tubercles and then, going straight, attain above midline of lateral side the second row of tubercles. The latter are prick-shaped and large (up to 1.5 cm high). Above this level, ribs bifurcate into three branches. Intercalary ribs, one between pair of main ribs, appear approximately at the level of lateral tubercles. All ribs (main and intercalary) are equally embossed, crossing ventral side with slight inflection forward but without changes in morphology.

Character of suture line fragmentarily studied in specimen no. 26/13143 (Fig. 3h) is described in the genus diagnosis.

**Comparison and remarks.** In distinction from *Pomeliceras* (P.) *boisseti* Nikolov, the described species has oval whorl section stretched sideways and

**Plate VI.** *Pomeliceras* (?) *funduklense* Lysenko et Arkadiev, sp. nov. from the Berriasian of the Crimean Mountains. Specimen no. 24/13143: (a) side view,  $\times 1$ , (b) apertural view,  $\times 1$ , central Crimea, Petrovo site, Fundukly River, *boissieri* (?) Zone, collection of N.I. Lysenko and V.V. Arkad'ev (scale bar 1 cm).





larger prick-shaped tubercles. Nikolov (1982) attributed *Himalayites* aff. *breveti* described by Mazenot (1939) to the *boisseti* group. We believe that form described by Mazenot is identical to *breveti* specimens and worthy to be included in synonymy of the species under consideration. Species *Mazenoticer* aff. *breveti* (Pomel) described by Le Hégarat (1973) is not included into synonymy, because it has, in our opinion, narrower whorl section elongated in height and wider lateral sides.

**Distribution:** Berriasian, *occitanica* Zone in the Crimea, Caucasus, Bulgaria, France, and Algeria.

**Material:** two specimens (nos. 25–26/13143) from the central Crimea (Sary-Su River); collection of V.V. Drushchits and B.T. Yanin.

*Pomeliceras* (?) *funduklense* Lysenko et Arkadiev,  
sp. nov.

Plate VI, fig. 1

Named after the Fundukly River in the central Crimea

**Holotype:** specimen no. 24/13143, TsNIGR museum, St. Petersburg, Berriasian, *boissieri* (?) Zone, central Crimea, Fundukly River.

**Shape.** Very large evolute shell. Whorls overlap each other for one third. Whorl section is rounded-quadrangular, when diameter is 112 mm, and turns into oval, more extended sideways than upward (Fig. 3d) at greater diameter. Wide ventral side is rounded slightly, joining narrow lateral sides with fairly sharp inflexion.

**Sculpturing.** Embossed straight ribs are widely spaced on lateral sides. Their basal ends near umbilicus are somewhat swollen in a knoblike manner. In the upper third of lateral side, near the ventro-lateral inflexion, ribs are crowned with acanthoid ridges especially distinct on the last whorl. Closer to ventral side, ribs are divided in two branches and cross ventral side being somewhat less embossed and slightly bent anteriorly. Amount of ribs is 27, when diameter is 153 mm. On the last whorl, ribs are spaced wider.

Specimen no.	D	H	W	D <sub>u</sub>	H/D	W/D	D <sub>u</sub> /D
24/13143	178	49	58	94	0.28	0.33	0.53

**Comparison.** Absence of intercalary ribs and prominent ridged tubercles differ the new species from other representatives of the genus. We regard absence of intercalary ribs as important, probably generic characteristic, and the new species is attributed therefore to the genus *Pomeliceras* with question mark.

**Distribution.** Berriasian, *boissieri*? Zone, the Crimean mountains.

**Material:** one specimen (no. 24/13143) from the central Crimea (Petrovo site, Fundukly River); collection of N.I. Lysenko and V.V. Arkad'ev.

## CONCLUSION

The revised representatives of ammonite genera *Malbosiceras* and *Pomeliceras* from the Berriasian of the Crimean Mountains are classed with seven species, four of the first genus: *M. malbosi*, *M. chaperi*, *M. broussei*, *M. pictetiforme*, and three of the second one: *P. aff. boisseti*, *P. breveti*, *P. (?) funduklense* sp. nov. The genus *Mazenoticer* is considered as synonym of *Malbosiceras*. Species *M. chaperi* confirms presence of the *jacobi* Zone deposits in the central Crimea. Its occurrence above the *Pseudosubplanites ponticus* Beds in the Enisarai Ravine section means that the relevant *Malbosiceras chaperi* Beds correspond to uppermost part of the *jacobi* Zone. In a condensed horizon of the Chatyr-Dag massif, *Malbosiceras chaperi* is found in association with *Fauriella boissieri*, and this points to fragmentary character of Berriasian sections in the Crimea. Stratigraphic range of *M. malbosi* occurring from the *jacobi* Zone upper part to the *boissieri* Zone is wider in the Crimea than in stratotype area. In the Crimea, this taxon is especially abundant in the last zone. The most complete succession (all three standard zones of the Berriasian) appears to be in the central Crimea (Sary-Su River basin and Enisarai Ravine). In the southwestern and central Crimea, ammonites characterize only upper part of the *occitanica* Zone (deposits with *Dalmasiceras* corresponding to the *D. tauricum* local subzone), because geological succession is incomplete. The *D. tauricum* Subzone has been recently defined as well in the Uruk section of the northern Caucasus (Kalacheva and Sei, 2000), and relevant stratigraphic interval can be regarded as a reliable biostratigraphic reference level.

Reviewers I.A. Mikhailova and M.A. Rogov

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