NEW BARREMIAN AMMONITES FROM WESTERN TURKMENIA

T.N. Bogdanova

ABSTRACT: A description is given of three new ammonite species: Matheronites brevicostatus, Turkrneniceras rarecostatum and T. tumidum from the top of the Tuarkyr and Malyy Balkhan Barremian. Ontogenetic studies have established that the initial whorls of Turkrneniceras were evolute to differing degrees and that there was a loosely coiled first whorl in members of the genus Matheronites. On the basis of the similarity between Matheronites and Crioceratites the family Hemihoplitidae has been placed in the superfamily Ancyloceratacea rather than in the Berriasellaceae.

* * *

The upper horizons of the Barremian of Turkmenia contain a distinctive assemblage of ammonites, the generic and specific composition of which was until recently practically unknown in the literature. Luppov (1936) described a number of species of ammonites from the Tuarkyr Barremian, one of which, Matheronites turkmenicus Luppov, most probably originated from the top of the Barremian beds. Later, Tovbina (1963) described the new genus Turkrneniceras with three new species, T. turkmenicum, T. ge,pkderense and T. multicostatum.

It has now been established that members of the genera Matheronites and Turkrneniceras are found together and characterize a definite part of the Upper Barremian beds which was initially distinguished as a Turkrneniceras turkmenicum horizon (Tovbina, 1963) and subsequently as a zone of the same name. The distinctive ammonite composition of this zone complicates comparison of t part of the profile with profiles of other regions. However, fragments of Matheronites ridzewskyi Karakasch found in the Bol'shoy Balkhan and Tuarkyr in these beds enable us to compare them with the part of the Lower Cretaceous of the Caucasus which is distinguished as a zone of Matheronites ridzewskyi, Tropaeum hillsi and Imerites densecostatus throughout the entire Greater Caucasus (Rcnngarten, 1951) or as a zone of Matheronites ridzewskyi and Acrioceras furcatum in Dagestan (Mordvilko, 1960, 1962; Drushits, 1963; Drushits and Mikhaylova, 1966) and as the corresponding Tropaeum hillsi zone in the North Caucasus (Mordvilko, 1960, 1962). These deposits are represented throughout the greater part of the territory by a thin band of phosphoritic sandstone containing fossils of different ages (Renngarten, 1931, 1946', 1947, 1961; Mordvilko, 1960, 1962; Drushits, 1963; Drushits and Mikhaylova, 1966). It is very difficult to distinguish an assemblage of fossils characteristic of only this zone. In the fullest Dagestanian profile (Akusha region), where the thickness of the zone reaches several tens of meters, according to the data of I. A. Mikhaylova, V. V. Drushits and T. A. Mordvilko, the zona] ammonites are confined to its upper part and the overlying layers contain remains of Deshayesites. Elsewhere some beds containing Deshayesites rest disconformably on beds containing Colchidites ellipticus and C. rotundus in a number of profiles of the North Caucasus (near the town of Kislovodsk and in the Kuban' valley) (Drushits, 1963). In the correlation of profiles of Dagestan, the North Caucasus and other regions of the Caucasus, this of Deshayesites may evidently be regarded as a separate stratigraphic subdivision lying above lay containing Colchidites. Such a sequence of stratigraphic horizons is fully comparable to the ammo nite horizons of Turkmenia where deposits containing Turkrneniceras turkmenicum occur between layers containing Colchidites nicortsmindensis and Deshayesites.

This article contains a description of new species of Matheronites and Turkrneniceras. The material for it was provided by layer-by-layer collections of fossils made by P. Luppov, V. A. Prozorovskiy, L.N. Fursova, and the author. The material described is in the N. P. Chernyshev Central Geological Museum as item 10096.

Members of the genus Matheroniteshave still been very weakly investigated. Distinctive features of morphological structure and of the suture line of their inner whorls are unknown.

The scope of the genus Hemihoplites and its diagnosis, the scope of the entire family Hemihoplitidae and whether or not this family belongs to a higher taxonomic category are also unclear. Hemihoplites was erected by Spath (1924) with the type species Ammonites feraudianus d'Orb. Renngarten (1926, p. 27), who described a new subgenus Matheronites, included two species, M soulieri (Matheron) and M. ridzewskyi (Karakasch), in it at that time and wrote concerning Ammonites

Translated from Novyye barremskiye ammonity Zapadnoy Turkmenii, Paleont. Zhur., 1971, no. 3, p. 60-71. The author is with the All-Union Scientific-Research Geological Institute.

feraudianus: "... the fact that the suture line is unknown and that the illustration in 'Paleontologie Francaise' is not entirely clear makes it possible to associate this form with the group under consideration only provisionally." In his later writings Renngarten cited Matheronites as a genus. Investigators subsequently expressed various opinions concerning the existence of the genera Hemihoplites and Matheronites. Wright (1957) and Wiedmann (1962, 1966) cosidered that the group of species of the genus Matheronites should be combined with A. feraudianus and that in accordance with the rule of priority the name Hemihoplites should be retained for this group. Luppov (Luppov, 1936; Luppov, Bodylevskiy and Glazunova, 1949; Luppov, Eristavi and Drushits, 1958) and Dimitrova (1967) acknowledge the existence of two independent genera. The illustration given by Wiedmann (1966, pl. 6, fig. 3) of another specimen of Hemihoplites feraudianus from Pictet's collection did not clarify the diagnoses of the species and the genus.

Different points of view also exist concerning the scope of the family Hemihoplitidae. Spath erected this family with three genera: Hemihoplites, Pseudothurmannia and Metahoplites. In "Principles of Paleontology" this family is made up of Pseudothurmannia, Hemihoplites, Matheronites and Balearites. Wiedmann has a completely different point of view. He does not acknowledge the independent existence of the family Hemihoplitidae, and places the genus Hemihoplites along with Crioceratites, of which he regards the genus Pseudothurmannia (= Balearites) as a subgenus, in the subfamily Crioceratitinae of the family Ancyloceratidae.

I do not have material on all genera of the family Hemihoplitidae, but only on Matheronites. Study of features of the coiling and the suture line in Turkmenian members of this genus (M. brevicostatus n. sp.) has shown that their shell consists of an uncoiled first whorl and weakly involute subsequent whorls. The first character includes members of the genus with forms characterized by the ancyloceratid type of coiling. The existence of four lobes of the first suture line and of a weakly developed inner lobe I^1 located on the [umbilical] seam [шов] and not on the inner side, as in normally involute forms, also indicates the affinity of members of this genus to the group of ancyloceratid ammonites. Therefore, while accepting the scope of the family Hemihoplitidae as proposed in "Principles of Paleontology," I nevertheless consider it more correct to place Matheronites and the whole family Hemihoplitidae in the superfamily Ancyloceratacеae, as is done by Wright, Wiedmann, and Dimitrova, rather than in the Berriasellaceae.

Family HEMIHOPLITIDAE Spath, 1924

Matheronites Renngarten, 1926

Matheronites: Renngarten, 1926, p. 27; Luppov, 1936, p. 122; Dimitrova, 1967, p. 66 (pars).
Emericiceras: Sarkar, 1955, p. 86 (pars).
Hemihoplites: Wiedmann, 1966, p. 81 (pars).

Type species. Ammonites soulieri Matheron, 1878; Barremian; France.

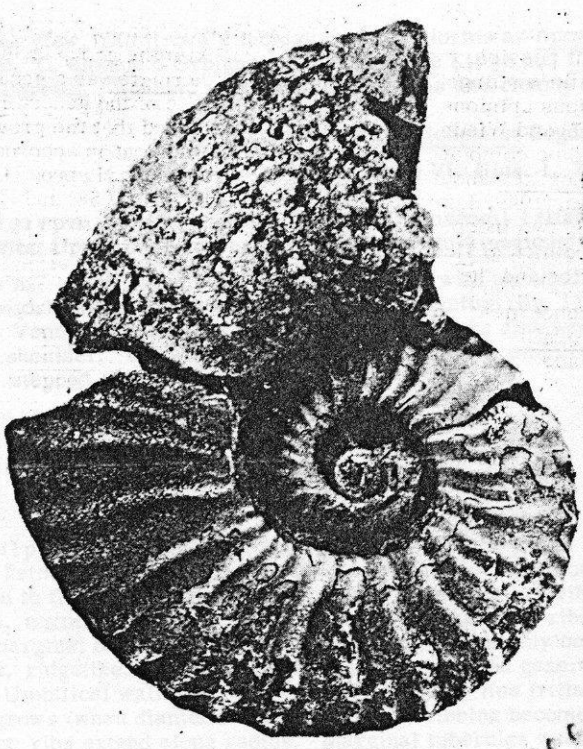
Diagnosis. Shell weakly involute, with uncoiled first whorl. Whorls ranging in cross section from square to octagonal, height slightly greater than width. Venter and flanks weakly convex. Umbilicus moderately broad. Shell covered in S-shaped curved ribs bearing 1-3 rows of tubercles. Suture line characterized by symmetrical umbilical lobe and broad, deeply bipartite saddles. Inner lateral lobe I displaced to umbilical shoulder. First inner lateral lobe I^1 displaced to seam. Dorsal lobe single ended, of same length as umbilical lobe.

Specific composition. 8 species: M. soulieri (Matheron), M. ridzewskyi (Karakasch), M. khvamliensis Rouchadze, M. astarte (Fallot and Termier), M. coheni (Sarkar), M. turkmenicus Luppov, M. ukensis Dimitrova, M. brevicostatus n. sp. from the Barremian and Aptian (?) of France, Italy, Bulgaria, North Africa, the Caucasus and Turkmenia.

Comparison. Distinguished from the genus Pseudothurmannia by its coarser and less numerous ribs, stronger tubercles, and lower, subquadrate whorls; distinguished from Crioceratites by the compactly coiled and even slightly involute ephebic whorls, by fewer and more curved ribs, by the development of tubercles on both primary and intercalatory ribs, and also by the presence of five lobes in adult specimens owing to the development of the lobe I^1 located on the seam; distinguished from Hemihoplites by its broader and more involute whorls, by its more convex venter, and by its more gently rounded ventrolateral margin; in addition, the intercalatory ribs are usually short in Hemihoplites and branching of the main ribs occurs infrequently even on ephebic whorls.

Comment. All species of this genus may be divided into two groups by the nature of the sculpture.

The first comprises M. soulieri, M. ridzewskyi, M. khvamliensis, M. astarte and M. coheni. This group is characterized by straight or weakly curved ribs, by the lack of true intercalatory ribs, and by three or two rows of tubercles. The second group comprises M. turkmenicus, M. ukensis and M. brevicostatus. These species are typified by distinctly S-shaped, curved, frequently branching primary ribs, by the presence of intercalatory ribs and by a single row of marginal tubercles.



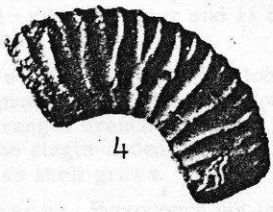
1a

1b

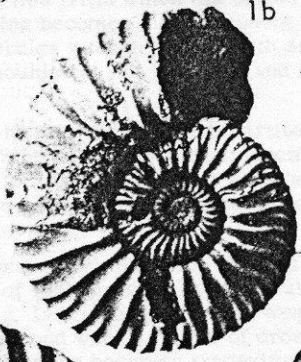
2a

2b

2c



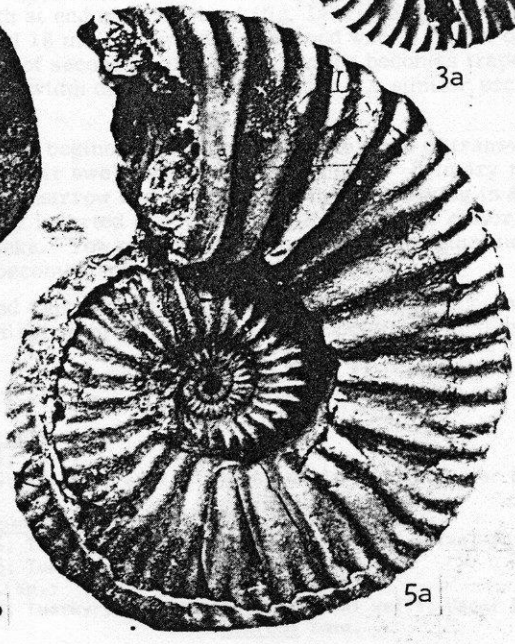
4



3a

3b

5b



5a

5c

In our view, Dimitrova's inclusion of such forms as Ancyloceras orbignyi Haug, Crioceras suessi Toula, C. alpinus d'Orbigny, C. barremense Kilian and C. parolinianum de Zigno in this genus is hardly correct. Ephebic whorls of these forms are clearly of a crioceratid appearance.

Matheronites brevicostatus Bogdanova, n. sp.

Plate VI, Illus. 1, 2

Holotype. TsGM [Central Geological Museum] 1/10096; Tuarkyr, in the area of the Gobekadzhi wells; Upper Barremian, Turkmeniceras turkmenicum zone.

Form. Shell large, of medium thickness with uncoiled first whorl and weakly involute subsequent whorls which are trapeziform in cross section (fig. 1). Height of whorls slightly greater than width. Venter is broad and weakly convex. Flanks also weakly convex, convexity greatest near umbilical shoulder. Umbilical shoulder gently curved, umbilical wall high and convex. Umbilicus broad, stepped, fairly deep.

Dimensions (mm) and ratios:

	D	H	W	Du	H/D	W/D	Du/D	W/H
Holotype 1/10096	90.1	37.7	30.5	28.7	0.42	0.34	0.32	0.81
Specimen 2/10096	19.3	7.8	7.0	6.2	0.40	0.36	0.32	0.89

Sculpture consists of primary and intercalatory ribs and of a single row of marginal tubercles. Primary ribs originate at seam and slant backward on umbilical wall, after which they pass over on to flank, gradually strengthening. Intercalatory ribs originate at different heights from umbilicus, normally in upper half of flanks. Intercalatory ribs, which originate very high on flanks, near marginal tubercle, and are in practice present only on venter, occur on outer whorls. All ribs coarse, ridgelike, heavily curved in an S-shape, and generally inclined slightly backwards from radius. Umbilical wall covered by true ribs and by fine frills which die out on umbilical shoulder. As shell grows (when diameter exceeds 50 mm) ribbing becomes more frequent and bending of ribs less distinct; ribs extend along radius. Marginal tubercles weaken with growth and disappear at D = 75-80 mm. 16 ribs on venter and 11 on umbilical shoulder at D = 19.3 mm and correspondingly 20 and 11 at D = 90.1 mm.

Suture line consists of 5 lobes and broad, heavily dissected, bipartite saddles (fig. 2). Ventral lobe practically as long as umbilical lobe, which is narrow with dissected, practically symmetrically arranged branches. Inner lateral lobe I located on umbilical walls and lobe I^1 on seam. Dorsal lobe single-ended, longer than lateral lobe on initial whorls, but gradually shorter than lateral lobe as shell grows.

Ontogeny. Protoconch not in evidence. First whorl uncoiled. Umbilicus reaching 2.5 mm. Diameter of first whorl 7-8 mm. Cross section of shell practically round at beginning of first whorl, slightly extended in width at end of first whorl (fig. 1a-c). Second whorl weakly encroaching on first. Diameter of second whorl 18 mm. In middle of second whorl, height of cross section becomes equal to width (fig. 1f). At end of second whorl, cross section becomes trapeziform with flat venter and flanks (fig. 1h). Greatest width displaced to umbilicus. A similar section also characteristic for later whorls (fig. 1i).

Sculpture appears at beginning of second whorl in form of transverse ridges on venter with barely perceptible tubercular swellings on outer shoulders. Primary ribs appear in middle of second whorl: ventral ridges narrow and continued on flanks, curving in a weak S-shape. Between primary ribs are irregularly inserted intercalatory ribs which are either confined to venter or originate above middle of flanks. Toward end of second whorl, marginal tubercles become distinct. On third whorl, sculpture becomes specific in nature.

Suture line simple and four-lobed at beginning of first whorl (fig. 2a). All its main elements are formed toward end of first whorl (fig. 2d). Only subdivision of these elements takes place on

---

KEY TO PLATE VI

Natural size throughout

Matheronites brevicostatus n. sp.:
1 - Holotype 1/10096;
2 - Specimen 2/10096; Tuarkyr, area of the Gobekadzhi wells; Upper Barremian, Turkmeniceras turkmenicum zone.

Turkmeniceras rarecostatum n. sp.:
3 - Holotype 3/10096; Tuarkyr, Tekedzhik Ridge; Upper Barremian, Turkmeniceras turkmenicum zone;
4 - Specimen 4/10096; Tuarkyr, Mt. Kel'dzha; same age.

Turkmeniceras tumidum n. sp.:
5 - Holotype 5/10096; Tuarkyr, area of the Gobekadzhi wells; Upper Barremian, Turkmeniceras turkmenicum zone.

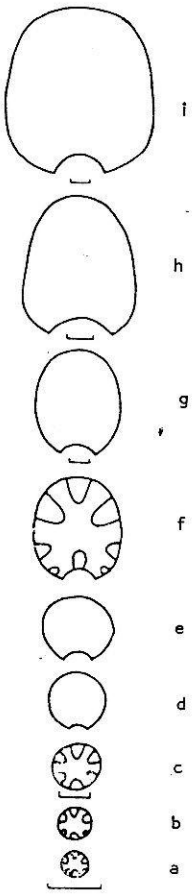


FIGURE 1. Ontogenetic alteration in cross section of whorls of Matheronites brevicostatus n. sp.; Specimen 2/10096.

a - at H = 0.5 mm and W = 0.55 mm
b - at H = 1.35 mm and W = 1.55 mm
c - at H = 1.9 mm and W = 2.1 mm (a-c - first whorl)
d - at H = 2.2 mm and W = 2.45 mm
e - at H = 2.4 mm and W = 2.6 mm
f - at H = 4.1 mm and W = 4 mm
g - at H = 4.6 mm and W = 4.3 mm
h - at H = 6.3 mm and W = 6 mm (d-h - second whorl)
i - at H = 9 mm and W = 7.2 mm (beginning of third whorl).

Tuarkyr, area of the Gobekadzhi wells; Upper Barremian.

One division of the scale on all the drawings corresponds to 1 mm.

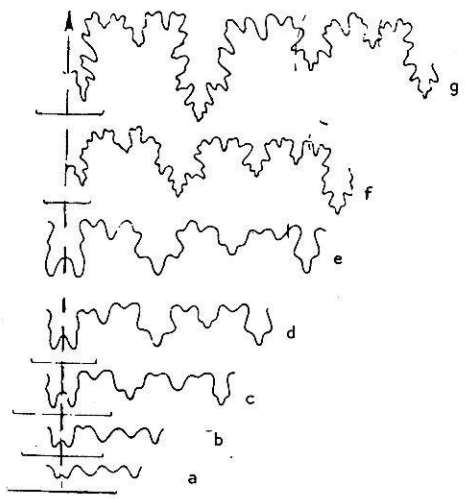


FIGURE 2. Ontogenetic alteration of the suture line in Matheronites brevicostatus n.sp.; Specimen 2/10096.

a - at H = 0.5 mm and W = 0.55 mm (beginning of first whorl)
b - at H = 0.95 mm and W = 1.1 mm (first half of first whorl)
c - at H = 1.35 mm and W = 1.55 mm (middle of first whorl)
d - at H = 1.65 mm and W = 1.88 mm (end of first whorl)
e - at H = 2.15 mm and W = 2.3 mm (beginning of second whorl)
f - at H = 4.7 mm and W = 4.5 mm (second half of second whorl)
g - at H = 8.2 mm and W = 7.2 mm (beginning of third whorl).

Tuarkyr, area of the Gobekadzhi wells; Upper Barremian.

subsequent whorls (fig. 2e-g). Suture line formula: $(V_1V_1)UID - (V_1V_1)UII^1:D$.

Comparison. The new species is distinguished from most known species by its coarse ribs. It is additionally distinguished from M. turkmenicus by nearly regular alternation of primary and intercalatory ribs, by the lack of inflection of the ribs on the venter and by the more convex venter and flanks; it is distinguished from M. ridzewskyi by the strongly curved ribs, by the presence of intercalatory ribs and only one row of marginal tubercles; it is distinguished from M. soulieri by the practically regularly inserted intercalatory ribs, by the lack of umbilical tubercles and by the more sharply expressed marginal tubercles. Coarse ribbing is characteristic for the Caucasian species M. khvamliensis, but the Turkmenian species is distinguished from it by the single row of marginal tubercles and the more curved solitary ribs.

Geologic and geographic range. Upper Barremian, Turkmeniceras turkmenicum zone; western Turkmenia.

Material. 6 specimens of different sizes: 4 from the area of the Gobekadzhi wells, 2 from Mt. Kel'dzhe (N. P. Luppov's collection).

Family DESHAYESITIDAE Stoyanow, 1949

Turkmeniceras Tovbina, 1963

Turkmeniceras: Tovbina, 1963, p. 100; 1965, p. 44-45.

Type species. T. turkmenicum Tovbina, 1963; Upper Barremian; Turkmenia.

Diagnosis. Shell weakly involute, with uncoiled or contacting second whorl. Section ranging from subquadratic to rectangular-oval. Umbilicus broad, ribs weakly S-shaped. Umbilical lobe slightly asymmetrical, inner lateral lobe I located on umbilical shoulder or displaced to lateral side. Saddle I/I^1 dissected by one or two teeth.

Specific composition. Five species: T. turkmenicum Tovbina, T. geokderense Tovbina, T. multicostatum Tovbina, T. rarecostatum n. sp., T. tumidum n. sp. from the Barremian of Turkmenia.

Comparison. Distinguished from Deshayesites, Prodeshayesites and Paradeshayesites by its less involute shell, the uncoiled or contacting second whorl, weakly curved ribs, flattened venter, and the presence of two inner lateral lobes instead of three or even four.

Comment. S. Z. Tovbina, who described this genus in very great detail, defined its scope and gave a very thorough justification for its erection. However, recently available factual material makes it possible to reveal some distinctive structural features of the first whorls of the spiral. Study of several specimens of T. geokderense has shown that they lack the uncoiled-whorl stage and that all the initial whorls are in contact (fig. 3a). Uncoiling of the whorls has been observed mainly in members of T. turkmenicum and its variants. The degree of uncoiling of the initial whorls differs (fig. 3b, c). One of the main differences between the suture lines of Turkmeniceras and Deshayesites, in addition to those previously noted by Tovbina (1963), is to be found in the development and structure of the inner saddle I/I^1. After the appearance of the inner lobe I^1 it remains undifferentiated for a fairly long time, for example until the beginning of the fifth whorl (H = 5.2 mm) in T. rarecostatum. It is fairly narrow in adult specimens and is divided by two lobes located on the umbilical wall; the outer of these lobes is more strongly developed than the inner lobe which also remains undivided for a long time (in T. rarecostatum and in some members of other species it remains undivided to the last line). Division of the outer lobe begins at H = 10 mm. These newly forming lobes are not independent and may be regarded only as elements complicating the saddle. The suture-line formula is $(V_1V_1)UI{:}I^1D$. The same part of the suture line is very heavily differentiated in the genus Deshayesites and there are three lobes on the outside of the whorl when H = 5 mm, of which the middle one is the inner lobe I^2. The inner lobe I^1 lies on the inner side. The suture-line formula is $(V_1V_1)UII^2I^3{:}I^1D$.

It must be noted that the inner lobe I lies either on the umbilical wall or on the flank (near the umbilical shoulder) in members of the genus Turkmeniceras and it is gradually shifted to the flank in almost all species of this genus. The structure of the inner saddle is therefore the main difference in the suture lines of large specimens of Turkmeniceras and Deshayesites. The division of the saddle I/I^1 and also the translocation and position of the inner lobe in members of Turkmeniceras and Deshayesites as the shell grows may be traced in Figure 4. In the interests of fuller and more accurate comparison the lines of different species of both genera are given at approximately the same whorl height.

Turkmeniceras rarecostatum Bogdanova, n. sp.

Plate VI, Illus. 3, 4

Holotype. TsGM 3/10096; Tuarkyr, Tekedzhik ridge; Upper Barremian, Turkmeniceras turkmenicum zone.

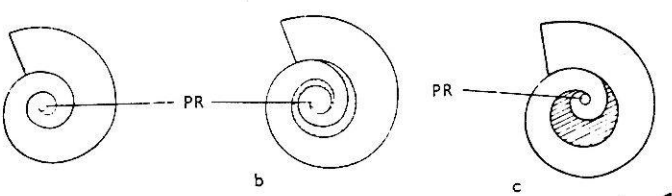


FIGURE 3. Coiling of the initial whorls in different species of the genus Turkmeniceras.

a - T. geokderense Tovbina; b, c - T. turkmenicum Tovbina.

PR - protoconch.

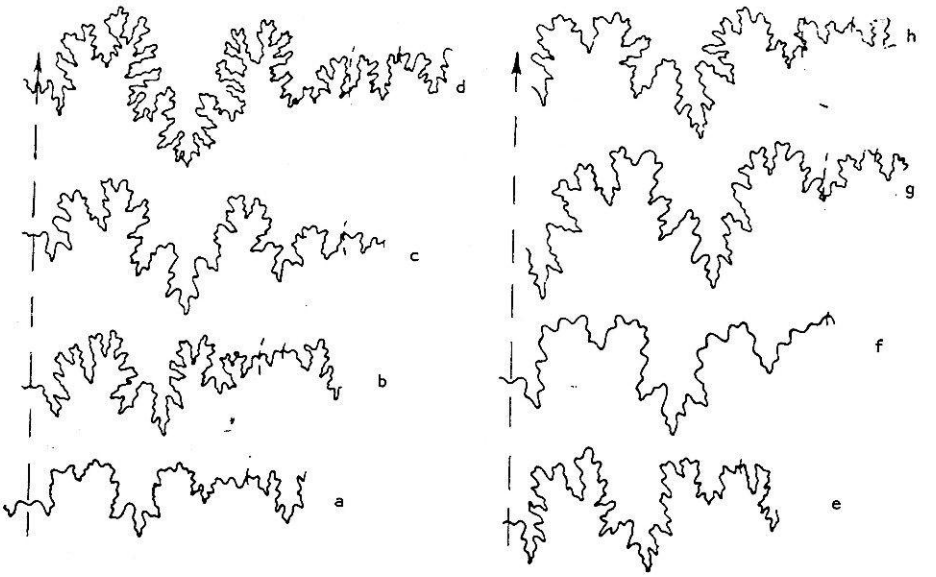


FIGURE 4. Suture lines of Deshayesites and Turkmeniceras.

a - Deshayesites consobrinus d'Orb. at H = 6.2 mm; b - D. dechyi Papp. at H = 10.2 mm; c - D. planus Casey at H = 13.8 mm; d - D. callidiscus Casey at H = 24.1 mm; e - Turkmeniceras geokderense Tovbina at H = 7.3 mm; f - T. rarecostatum n. sp. at H = 9.1 mm; g - T. turkmenicum Tovbina at H = 13 mm; h - T. geokderense Tovbina at H = 22.5 mm (a, b - according to Mikhaylova, 1958).

Form. Shell small (up to 50 mm), slightly flattened. Whorls moderately increasing, subquadrate in section, slightly extending in height as shell grows, very weakly involute (fig. 5). Degree of involution increases slightly toward final whorl. Venter broad and flat. Flanks flat or weakly rounded. Umbilicus broad, stepped, with low steep walls smoothly merging into the lateral sides. Dorsum very weakly curved.

Dimensions (mm) and ratios:

	D	H	W	Du	H/D	W/D	Du/D	W/H
Holotype 3/10096	45.5	14.7	11.2	16.5	0.32	0.24	0.36	0.76
" "	30.6	11.2	10.2	11.3	0.36	0.33	0.37	0.90

Sculpture. Shell covered in strong, weakly S-shaped, slender, practically regularly alternating primary and intercalatory ribs which straighten on final whorl. Primary ribs well developed, arising at seam and tilted forward on umbilical wall; weakly S-shaped on flanks. Intercalatory ribs on early whorls are short and originate in middle; their origin is subsequently displaced to upper quarter of flanks. Some intercalatory ribs connected to primary ribs, usually posteriorly. General direction of ribs on flanks radial or slightly tilted backward. They intersect venter with a weak, broad bend forward. On living chamber some primary ribs become forked and intercalatory ribs are absent. At D = 45.5 mm the number of ribs in half a whorl reaches 25 on venter and 13 on the umbilical shoulder.

Suture line (fig. 6). All elements of suture line characterized by relatively great width and weak differentiation. Umbilical lobe slightly asymmetrical. Umbilical portion very weakly divided; a well-developed lobe I on umbilical wall and a lobe I^1 on inner side. Ventral lobe same length as umbilical lobe.

Ontogeny. Protoconch and first whorl not in evidence. Second whorl (D = 2.8 mm) noninvolute, practically round in cross section, very weakly extended in width, widest halfway up height (fig. 5a, b). A weak recess appears on dorsal side at beginning of third whorl and whorl encroaches on previous one (fig. 5c); degree of involution increases gradually throughout third whorl; cross section is practically round and width slightly exceeds height (fig. 5d, e). Toward end of fourth whorl (D = 16 mm) section becomes practically square with flattened venter and flanks (fig. 5g). On fifth whorl (D = 30 mm) height increases faster than width and section becomes rectangular-oval (fig. 5h). Toward middle of sixth whorl (living chamber) greatest width shifts toward umbilicus and section becomes trapeziform (fig. 5i).

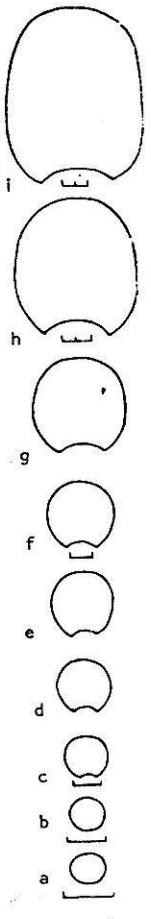


FIGURE 5. Ontogenetic alteration in cross section of whorls of Turkmeniceras rarecostatum n. sp.; Holotype 3/10096.

a - at H = 0.6 mm, W = 0.65 mm
b - at H = 0.9 mm, W = 1.1 mm (a, b - second whorl)
c - at H = 1.3 mm, W = 1.4 mm
d - at H = 1.6 mm, W = 1.6 mm
e - at H = 2.0 mm, W = 2.1 mm (c, e - third whorl)
f - at H = 2.6 mm, W = 2.7 mm
g - at H = 4.6 mm, W = 4.6 mm (f, g - fourth whorl)
h - at H = 8.3 mm, W = 7.6 mm (middle of fifth whorl)
i - at H = 13 mm, W = 11.5 mm (middle of sixth whorl).

Tuarkyr, Tekedzhik ridge; Upper Barremian.

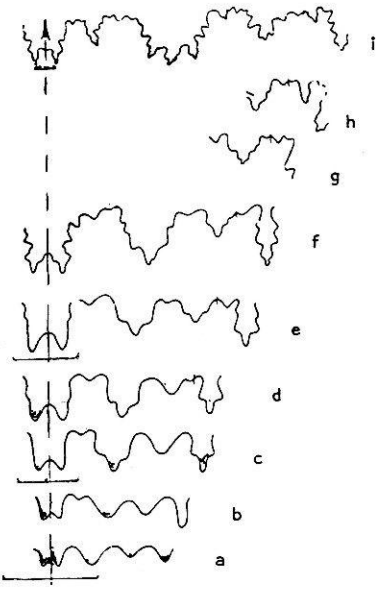


FIGURE 6. Ontogenetic alteration of suture line in Turkmeniceras rarecostatum n. sp.; Holotype 3/10096.

a - at H = 0.6 mm, W = 0.65 mm (middle of second whorl)
b - at H = 0.9 mm, W = 1.1 mm (end of second whorl)
c - at H = 1.5 mm, W = 1.6 mm (middle of third whorl)
d - at H = 1.7 mm, W = 1.8 mm (second half of third whorl)
e - at H = 2 mm, W = 2.1 mm (end of third whorl)
f - at H = 3.2 mm, W = 3.4 mm (middle of fourth whorl)
g - at H = 5.2 mm, W = 5 mm (beginning of fifth whorl)
h - at H = 8.3 mm, W = 7.6 mm (middle of fifth whorl)
i - at H = 13 mm, W = 11.5 mm (middle of sixth whorl).

Tuarkyr, Tekedzhik ridge; Upper Barremian.

Sculpture appears in middle of third whorl (D = 4-5 mm) as ridgelike swellings on flanks and venter. These swellings develop very rapidly into distinct ridgelike S-shaped primary ribs, slightly weakened on venter. Solitary intercalatory ribs of same strength as primary ribs and branching from them appear toward end of third whorl (D = 7-8 mm). They arise no lower than mid-flank. Sculpture becomes specific at beginning of fourth whorl. No weakening of ribs on venter.

Suture line simple throughout second whorl and consists of four lobes: $(V_1V_1)UID$ (fig. 6a). Differentiation of outer saddle begins at end of second whorl (fig. 6b). Throughout third whorl all elements of suture line gradually increase in complexity. A lobe I^1 forms in saddle I/D on outer side of whorl and by end of third whorl is displaced to inner side (fig. 6c-e). At beginning of 5th whorl there is differentiation of saddle I/I^1 (fig. 6g), which is gradually extended as shell grows and by last line is complicated on outer side of whorl by two very weakly developed lobes of no independent significance (fig. 6i). Suture line formula: $(V_1V_1)UID \rightarrow (V_1V_1)UI:I^1D$.

Comparison. Distinguished from other species of this genus by small size, by regular alternation of primary and intercalatory ribs, by the convexity and practically square cross section of the whorls and by the weak differentiation of the umbilical saddle of the suture line.

Geologic and geographic range. Upper Barremian, Turkmeniceras turkmenicum zone; western Turkmenia.

Material. Six specimens in various conditions: one from the Tekedzhik ridge, one from Mt. Kel'dzhe (V. A. Prozorovskiy's collection), one from the Mirisynkyr upland, two from the area of the Gobekadzhi wells, one from around Geokdere (collection of V. F. Ludvig and A. A. Kudelin).

Turkmeniceras tumidum Bogdanova, n. sp.

Plate VI, Illus. 5

Holotype. TsGM 5/10096; Tuarkyr, in the area of the Gobekadzhi wells; Upper Barremian, Turkmeniceras turkmenicum zone.

Form. Shell large, of medium thickness with moderately increasing and weakly involute whorls, rectangular-oval or practically square in section. Early whorls (up to 4 mm in diameter) have practically no groove on dorsal side and do not encroach on preceding whorls. The state of the material is such that it is impossible to establish whether the 2-4 initial whorls are contacting or uncoiled. Venter broad and flat, flanks also flat. Ventrolateral margin gentle but distinct. Umbilical shoulder very gentle. Umbilical wall narrow and fairly steep. Umbilicus broad, small and stepped.

Dimensions (mm) and ratios:

	D	H	W	Du	H/D	W/D	Du/D	W/H
Specimen 7/10096	82.6	34.4	28.2	25.0	0.42	0.34	0.30	0.82
Holotype 5/10096	80.7	32.6	28.0	25.2	0.40	0.35	0.31	0.86

Sculpture. Shell covered by ribs which are unequally developed on early and late whorls. To a diameter of 50-60 mm ribs fairly thin, sharp and practically straight. Primary ribs originate at seam in all growth stages, deflected rearward on umbilical wall, perceptibly strengthened on umbilical shoulder. In most specimens primary ribs are branched; branching occurs on lower third of flanks or practically at umbilical shoulder. Up to three intercalatory ribs between primary ribs; these originate at various heights from umbilical shoulder. Radial frilling clearly apparent at this stage of shell growth. All ribs coarsen rapidly on whorls more than 60 mm in diameter as width of whorl increases. Ribs on large whorls intensify as high as upper third of flank where they divide into two branches. Intercalatory ribs arise at this level in almost every interspace. All ribs on venter form a broad, weak arc directed forward. Bend of ribs on flanks very weak and disappears completely with growth. Number of ribs in half a whorl reaches 33 on venter and 14 on umbilical shoulder at D = 82.6 mm and 29 and 11 respectively at D = 80.7 mm.

Suture line characterized by a strongly divided, practically symmetrical umbilical lobe which is only slightly longer than ventral lobe (fig. 7). Inner lobe I situated on umbilical shoulder and slightly shifted to flank. Two very weakly developed auxiliary lobes on umbilical wall (outer more strongly developed than inner) complicating umbilical saddle. Lobe I^1 narrow and weakly developed. External saddle broad and bipartite.

Comparison. Distinguished from other species of this genus by its coarse ribs and its broad whorl section. The latter character converges T. tumidum with T. rarecostatum, but the shell of the former is usually larger and has ribbing of a completely different nature: a larger number of longer intercalatory ribs which are separate or branching from the primary ribs. On the early whorls (to a diameter of 35-40 mm) the sculpture of T. tumidum is closest to the sculpture of T. geokderense, but is sparser and coarser, with fewer solitary primary ribs.

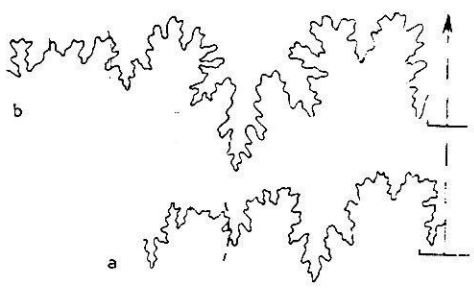


FIGURE 7. Suture lines of Turkmeniceras tumidum n. sp.; Specimen 6/10096.

a - at H = 8.7 mm; b - at H = 25 mm; Tuarkyr, Mt. Kel'dzhe; Upper Barremian.

Geologic and geographic range. Upper Barremian, Turkmeniceras turkmenicum zone; western Turkmenia.

Material. 11 specimens in various conditions: 9 from Tuarkyr (Tekedzhik, Kel'dzhe, Mirisynkyr and the area of the Gobekadzhi wells) and 2 from the Malyy Balkhan range (Port Simon).

Ontogenetic data for Matheronites and Turkmeniceras

Genus	Structure of spiral		Diameter of whorl, mm				Sculpture appears:	Sculpture peculiar to species appears:	Suture line
	1st whorl	2nd whorl	1	2	3	4			
Matheronites	Uncoiled	Weakly involute	7-8	18			Start of 2nd whorl	End of 2nd whorl	(V_1V_1) UID → (V_1V_1) UII^1: D
Turkmeniceras	Involute	Uncoiled to contacting	1	2.8	8	16	Middle of 3rd whorl	Start of 4th whorl	(V_1V_1) UID → (V_1V_1) UI : I^1D

* * *

Aspects of the systematics and phylogeny of hemihoplitids, heteroceratids and in part deshayesitids have been dealt with recently in papers by Tovbina (1963, 1965) and Wiedmann (1962, 1966). The German investigator, who studied Barremian Hemihoplites species, concluded that the Deshayesitaceae[1] may have originated from hemihoplitids and placed the genus Turkmeniceras in an age sequence between Hemihoplites and Deshayesites. Tovbina (1965) assumed that Turkmeniceras was genetically related to the genus Colchidites, i.e., in her opinion, the deshayesitids originated from forms with a helicoidal initial spiral. Wiedmann, who accepted Tovbina's point of view and related it to his data, suggested that individual species of the genus Hemihoplites might also have a helicoidal initial spiral. Wiedmann based his investigations on two Hemihoplites species (H. feraudianus and H. astarte), for which the structural features of the inner whorls were unknown. The helicoidal stage of the spiral was not found when one specimen of Matheronites brevicostatus was split.

Comparison of the ontogenetic development of members of the genera Matheronites and Turkmeniceras is illustrated by the table, from which it is evident that the characters of the two genera have little in common except for the suture line. Both genera are characterized by a common type of suture line which is more developed in Turkmeniceras than in Matheronites. In our view, such divergence of most of the characters in the genera compared and at the same time the similarity and continuity of the characters of Colchidites and Turkmeniceras excludes the possibility that the genus Turkmeniceras originated from Matheronites. However, the origin of the deshayesitids cannot be regarded as a question which is finally solved. Further study of the ontogenetic development of the hemihoplitids, and in particular of members of the genus Pseudothurmannia, for which Turkmeniceras species were for long taken to be, could be of assistance in the solution of this question.

REFERENCES

Dimitrova, N., 1967, FOSSILS IN BULGARIA, v. 4. KREDA VALLEY. NAUTILOIDEA AND AMMONOIDEA: Bulgarian Acad. Sci. Press, p. 1-424.

Drushits [Drushchits], V. V., 1963, STRATIGRAPHIC POSITION OF Colchidites BEDS – Colchidites securiformis ZONE: Akad. Nauk SSSR Doklady, v. 152, no. 6, p. 1428-1431.

_____ and Mikhaylova, I. A., 1966, LOWER CRETACEOUS BIOSTRATIGRAPHY OF NORTH CAUCASUS: Izd-vo Moskov. Univ., p. 1-189.

Luppov, N. P., 1936, AMMONITES FROM BARREMIAN DEPOSITS OF EASTERN KARABUGAZ AREA (NORTHWESTERN TURKMENIA): Leningr. Obshch. Yestestvoispyt. Trudy, v. 65, no. 1, p. 116-124.

_____ Bodylevskiy, V. I., and Glazunova, A. Ye., 1949, ORDER AMMONOIDEA. AMMONITES. ATLAS OF INDEX FORMS OF FOSSIL FAUNAS OF USSR, v. 10: Moscow, p. 183-253.

Luppov, N. P., Eristavi, M. S., and Drushits, V. V., 1958, SUPERFAMILY BERRIASELLACEAE. In PRINCIPLES OF PALEONTOLOGY. MOLLUSCA – CEPHALOPODA, v. 2: Gosgeoltekhizdat, p. 96-104.

Mikhaylova, I. A., 1958, DESHAYESITIDS FROM LOWER CRETACEOUS OF DAGESTAN AND CENTRAL CISCAUCASIA. In MATERIALS FOR PRINCIPLES OF PALEONTOLOGY, no. 2: p. 21-29.

[1] Wiedmann regards the deshayesitids as a superfamily.

Mordvilko, T. A., 1960, LOWER CRETACEOUS OF NORTH CAUCASUS AND CISCAUCASIA: Izd-vo Akad. Nauk SSSR, p. 1-238.

_____ 1962, LOWER CRETACEOUS OF SOUTHEASTERN REGIONS OF NORTH CAUCASUS AND CISCAUCASIA: Pt. 2, Izd-vo Akad. Nauk SSSR, p. 1-294.

Renngarten [Rengarten], V. P., 1926, FAUNA OF CRETACEOUS DEPOSITS OF ASSA-KAMBILEYEVKA DISTRICT IN CAUCASUS: Geol. Kom-ta Trudy, nov. ser., no. 147, p. 1-132.

_____ 1931, THE INGUSH MOUNTAIN REGION. GEOLOGICAL STUDIES IN VALLEYS OF ASSA AND KAMBILEYEVKA RIVERS IN NORTH CAUCASUS: Glavn. Geologorazv. Upr. Trudy, no. 63, p. 1-195.

_____ 1946, STRATIGRAPHY OF MESOZOIC AND CENOZOIC DEPOSITS OF KABARDINIAN ASSR: Sov. po Izuch. Proizv. Sil Akad. Nauk SSSR Materialy, p. 105-127.

_____ 1947, GEOLOGY OF THE USSR, v. 9, THE NORTH CAUCASUS, pt. 1, GEOLOGICAL DESCRIPTION. THE CRETACEOUS SYSTEM: Moscow, Leningrad, p. 170-205.

_____ 1951, A PALEONTOLOGICAL DEMONSTRATION OF LOWER CRETACEOUS STRATIGRAPHY OF GREATER CAUCASUS. In ACADEMICIAN A. A. ARKHANGEL'SKIY MEMORIAL VOLUME: Izd-vo Akad. Nauk SSSR, p. 35-66.

_____ 1961, KEY SECTIONS OF LOWER CRETACEOUS DEPOSITS OF DAGESTAN: Izd-vo Akad. Nauk SSSR, p. 1-87.

Sarkar, S., 1955, REVISION DES AMMONITES DEROULEES DU CRETACE INFERIEUR DU SUD-EST DE LA FRANCE: Soc. Géol. France Mém., v. 34, no. 72, p. 1-176.

Spath, L. F., 1924, ON THE AMMONITES OF THE SPEETON CLAY AND THE SUBDIVISIONS OF THE NEOCOMIAN: Geol. Mag., v. 61, no. 716e, p. 73-89.

Tovbina, S. Z., 1963, UPPER BARREMIAN AMMONITES OF TURKMENIA: Vses. Nauchno-Issled. Geol. Inst. Trudy, nov. ser., v. 109, no. 14, p. 89-119.

_____ 1965, ONTOGENY OF AMMONITE GENUS Colchidites: Paleont. Zhur., no. 3, p. 40-48.

Wiedmann, J., 1962, UNTERKREIDE-AMMONITEN VON MALLORCA. Lief. 1. LYTOCERATINA, APTYCHI: Akad. Wiss. u. Literatur Abh., Math.-Naturw. Kl., no. 1, p. 1-148.

_____ 1966, STAMMESGESCHICHTE UND SYSTEM DER POSTTRIADISCHEN AMMONOIDEEN. Teil 2: Neues Jahrb. Geologie und Paläontologie Abh., Bd. 127, H. 1, S. 13-81.

Wright, C. W., 1957, FAMILY HEMIHOPLITIDAE. In TREATISE ON INVERTEBRATE PALEONTOLOGY, pt. L, MOLLUSCA 4: Geol. Soc. America and Univ. Kansas Press, p. L212.

PJ/jr