Sborník vědeckých prací Vysoké školy báňské v Ostravě
Ročník XXII, rok 1976, číslo 1, řada hornicko-geologická, článek 417 Ostrava

Jan FOLDYNA*), Zdeněk VAŠÍČEK**)

CONTRIBUTION TO THE BIOSTRATIGRAPHY OF THE SHIRANISCH FORMATION IN THE REGION OF JEBEL SINJAR, NW IRAQ

Abstrakt:

The present paper deals with the occurrences of ammonite fauna from the lower and middle part of the Shiranish formation of the Jebel Sinjar region on the territory of Iraq. These ammonites belong to five species, namely *Bostrychoceras polyplocum*, *Menuites* cf. *menu*, *Pachydiscus (Pachydiscus)* sp. ind., *Anaklinoceras budayi* and *A. kersianum*. The last two ones represent the newly determined species. Stratigraphically the findings correspond with the upper to the uppermost part of the Upper Campanian.

Příspěvek k biostratigrafii formace Širaniš v oblasti Džebel Sindžar (Irak)

V předloženém příspěvku se zabýváme nálezy amonitové fauny ze spodní a střední části formace Širaniš z oblasti Džebel Sindžar na území Iraku.

Nalezení amoniti náležejí 5 druhům, a to *Bostrychoceras polyplocum*, *Menuites* cf. *menu*, *Pachydiscus (Pachydiscus)* sp. ind., *Anaklinoceras budayi* a *A. kersianum*, přičemž poslední dva představují nově stanovené druhy. Stratigraficky odpovídají nálezy vyšší až nejvyšší části svrchního kampánu.

Ян Фолдына, Зденек Вашичек

К вопросу биостратиграфии формации Ширанш в области Джебел Синджар (Ирак)

В статье сообщается об обнаружениях аммонитовой фауны, находящейся в нижней и средней частях формации Ширанш в области Джебел Синджар на территории Ирака.

Обнаруженные аммониты принадлежат к следующим пяти видам: *Bostrychoceras polyplocum*, *Menuites* cf. *menu*, *Pachydiscus (Pachydiscus)* sp. ind., *Anaklinoceras budayi*, *A. kersanium*. Последние два представляют собой новые виды. Выпеуказанные обнаружения стратиграфически отвечают верхним частям кампанского яруса.

Beitrag zur Biostratigraphie der Schiranisch Formation in der Dschebel Sindschar-Region, NW Irak

In dem vorliegenden Beitrag werden Funde der Ammonitenfauna aus dem unteren und mittleren Teil der Schiranisch Formation vom Gebiet Dschebel Sindschar auf dem Gebiet von Irak behandelt.

Die aufgefundenen Ammoniten gehören zu 5 Arten, und zwar: *Bostrychoceras polyplocum*, *Menuites* cf. *menu*, *Pachydiscus (Pachydiscus)* sp. ind., *Anaklinoceras budayi* und *A. kersianum*, wobei die letzten zwei neue Arten vorstellen.

Stratigraphisch entsprechen die Funde dem höheren bis höchsten Teil des oberen Campans.

*) doc. Ing., CSc.; **) Ing. CSc.;
pracovníci katedry geologie a mineralogie hornicko-geologické fakulty VŠB v Ostravě

The paleontological material gathered on April, 1970, under the guidance of J. Foldyna by the participants of the first geological mapping course of the 4th year geology students on the Geological Department, College of Science, Mosul University, serves as the foundation for the present study.

Localization and Geology of the Faunal Findings

Localities where the material under study was found appear in the Jebel Sinjar region, NW Iraq (about 50 km from Mosul). The collecting localities are situated on the eastern, western and southern slope of a valley, in which there lies the village of Kersi (Pl. I, Fig. 1).

The Jebel Sinjar represents an asymmetric bilaterally plunging anticline with a predominantly steep (in some places overturned) northern limb and moderate southern limb forming a morphologically expressive ridge of about 10 km wide and extending through the Iraq region roughly east-westward in the length of about 40 km. The western continuation of this structure may be traced on the Syrian territory. From the point of view of the tectonical position, the anticlinal structure of Jebel Sinajar belongs to the margin of the unstable part of the Nubian-Arabian platform — to the folded zone, to the so-called Foothill Zone. This zone exhibits relatively moderate folding and is characterized by relatively narrow anticlines and broad synclines. Sedimentary rocks in this zone are essentially of quite platform character (T. Buday et M. Vaněček, 1971).

The oldest outcroping rocks, a complex of globigerinal limestones, marly limestones to marlstones, with intercalations of intraformational conglomerates and breccias, appear in the core of the Jebel Sinjar structure and belong to the so-called Shiranish formation (upper part of the Upper Campanian — Lower Maastrichtian according to L. Dubertret, 1959). The fauna described below was found in the above mentioned formation.

The base of the Shiranish formation is not exposed in Jebel Sinjar. The thickness of the Shiranish formation — 227,8 m — has been reported from the type locality (L. Dubertret, 1959). The lower part of the formation is in the type locality formed by the 128,8 m thick thin-bedded limestones, the upper part by the 99 m thick blue marlstones.

In the Jebel Sinjar region, the Shiranish formation has a rather atypical development. In the northern limb the Shiranish formation could be divided into the lower, middle and upper part as follows:

Lower part — is predominantly formed by a monotonous complex of blue-grey marlstones up to marly limestones weathering to grey-yellow colour. Its base is not exposed.

Middle part — begins with a 35 cm thick limestone bed with positive graded bedding; further above there follows an interchange of sandy limestones, marly limestones to marlstones. The whole middle part of the Shiranish formation has a number of characters and accompanying phenomena which are typical of a flysch sedimentation (complete or incomplete rhythms with positive gradation, wash-outs, various types of current bedding, convolute bedding and slump structures, intraformational conglomerates and breccias, sole marks of the type of groove casts, flute casts, load casts etc., clastic dikes etc.). The thickness of the rhythms is variable. In the upper parts of the middle part of the Shiranish formation there appear as a rule typically lenticular or modular silicified beds. The colour of the rocks is grey-yellow, grey to blue-grey.

Upper part — is formed predominantly by light grey, bluish marlstones to marly limestones with little thick inferior beds of limestones.

The true thickness of the lower, middle and upper parts of the Shiranish forr mation on the northern wing could not be ascertained partly because of the incomplete exposure of the lower part, of the dislocation of the middle and uppe- part and finally because of the problematic contact of the middle and upper part with the overlying unconformable Sinjar limestone formation (Paleocene — Lower Eocene). However, from the cross sections it follows that the total thickness of the Shiranish formation in Jebel Sinjar is definitely greater than the thickness reported from the type locality.

The succession of strata towards the overlying rock is represented by the Jaddala formation, Serikagni formation, Jeribe formation and Lower Fars. For our purpose, it is not necessary to describe them in details.

From the type of sediments and the analysis of the directions and orientation of the sole marks of the type of mechanoglyphs on the lower bedding planes (Pl. I, Fig. 2) it follows that the sedimentation area, in which the rocks of the middle part of the Shiranish formation were deposited, was essentially shallow and its bottom was dipping towards the east. Moreover, from the facies and thickness changes it follows that in this direction the sedimentary material was transported into the transversally oriented depression of about northeast-southwest direction; the margin of this transversal depression was situated in the proximity of the east plunge of the Jebel Sinjar structure and can be traced on the aerial photographs.

Preservation of the Faunal Material

The discovered fauna, as stated above, originates from grey-yellow marly, slab-like limestones. All the shells are flatly deformed into the plane of bedding so that only the visible part of the shells can be studied. This fact makes the measurement and the comparison of the results of measurement difficult, especially in the case of trochospiral shells as, beside the deformation of the shell into the plane of bedding, also the differences caused by the unequal turn of each shell in the bedding plane are apparent. The deformation into the plane of bedding was considerable, which is among others demonstrated by a shell having originally broad whorls (see Pl. II, Fig. 2). The tubercles on the ribs of this shell migrate apparently from the umbilicus to the sides of the shell.

From the general paleontological point of view, the shells are mostly preserved as external casts having possibly the last thin residue of the shell substance preserved. Exceptionally the shells are preserved in the weathered parts in the form of incomplete steinkerns. Here, the fragments of incomplete septal lines may be observed. All the above described material is deposited in the paleontological department of the Moravian Museum in Brno Czechoslovakia (ev. no. 18 323 — 18 334).

Systematic Part

Ammonoidea

Order *Lytoceratida* Hyatt, 1889
Suborder *Lytoceratina* Hyatt, 1889
Superfamily *Lytocerataceae* Neumayr, 1875
Family *Nostoceratidae* Hyatt, 1894

Subfamily *Nostoceratinae* Hyatt, 1894
Genus *Bostrychoceras* Hyatt, 1900

Type species: *Turrilites polyplocus* Roemer, 1841. Upper Campanian, W. Germany.

Bostrychoceras polyplocum (Roemer, 1841)
Pl. II, Fig. 1, Pl. III, Fig. 1

1841 *Turrilites polyplocus* Roemer; P. 92, Pl. 14, Fig. 1, non Fig. 2 (= *Bostrychoceras saxonicum* Schlütter, 1872)
1962 *Cirroceras (Cirroceras) polyplocum* A. Roemer; Wiedmann, P. 198, pl. 11, Fig. 4 (cum syn.)
1963 *Bostrychoceras secoense* n. sp., Young, P. 142, Pl. 3, Figs. 1–5, Pl. 4, Figs. 4, 8, Textfig. 7 s.
1974 *Bostrychoceras polyplocum* Roemer; Krymgolc, P. 165, Pl. 54, Figs. 1–3, Pl. 55, Fig. 1

Lectotype (established by C. Schlütter, 1872): *Turrilites polyplocus* in A Roemer, 1841, Pl. 14, Fig. 1. Upper Campanian, Innern, F. Germany. It was deposited in Hildesheim. According to the personal information of prof. J. Wiedmann from Tübingen the Hildesheim material is probably lost. Therefore, it will be necessary, in choosing the neotype, to base all studies on Schlütter's originals or other German materials.

Material: Six incomplete specimens without preservation of the juvenile whorls. The specimens are flatly deformed into the plane of bedding. In two cases the rests of sutures are evident, otherwise only external casts or rests of the shell substance are preserved. Inv. no. MM 18 323, 18 330, 18 332 – 18 334.

Description: High trochospiral shells with the body chamber coiled into a free, irregular spiral.

The surface sculpture is formed by originally thin ribs, which become stronger on the body chamber. On the ribs of the last closely coiled whorl of the trochospiral there usually appear less or more distinct two rows of tubercles, the lower row of which is usually stronger. The tubercles are never developed on all the ribs, they appear usually on every third rib. The tubercles of both the rows are sometimes placed on similar ribs (see Pl. III, Fig 1), sometimes on unequal ones Pl. II, Fig. 1). In the lower row, a bifurcation of the ribs takes sometimes place. On some ribs of the body chamber as a rule only the lower row of tubercles is distinctly developed; they — due to deformation — are passing apparently on the whorl periphery. The ribs sometimes bifurcate in the places of tubercles and besides this, intercalatory ribs may appear on the level of the tubercles being not joint to any rib.

Measurement: No shell is preserved completely, so that the total height of trochospiral shell is unknown. The measurement of the mean height of trochospiral whorls depends on the orientation and turning of the deformed shell in the bedding plane of the sediment. For this reason, in case of given specimens, it cannot be easily compared.

	18 333	18 330	18 323
Incomplete height of the trochospiral	107 mm		
Maximum diameter of the last whorl of the trochospiral	62 mm	~48 mm	~45mm
Middle height of the last whorl of the trochospiral	31 mm	24 mm	21 mm
Middle height of the last but one whorl of the trochospiral	25 mm		
Diameter of the last but one whorl of the trochospiral	51 mm		

On the visible half of the whorl of the body chamber or on the last whorl there are 20 — 24 ribs.

The apical angle of the three last whorls is about 30 °.

Remarks and Relations: The species *B. polyplocum*, its specific and generic position and delimitation have been often discussed lately (J. Wiedmann, 1962, M. K. Howarth, 1965, T. Matsumolo, 1967). For generic ranging of the mentioned spebies I accept the deductions of M. K. Howarth (1965) as the diagnosis of the genus *Cirroceras* Conrad, 1968 is too incomplete and obscure owing to the fragmentary and incompletely preserved type specimen. The material from Iraq is considerably variable, though it is not abundant. None of the six specimens agrees with the others. First of all, the variability in size, number and occurrence of the tubercles or their distribution on tthe ribs is involved. The conclusions about the variability of the species in J. Wiedmann (1962) correspond best to the above mentioned conditions and, for this reason, I accept his conception and ranging of the species *B. polyplocum.*

According to the number of ribs on whorls (about 40—50), the material of Iraq should correspond with the subspecies *Bostrychoceras polyplocum zumayenze* (Wiedmann, 1962). However, the specimens of Iraq are lacking the zone, in which the ribs are interrupted, which is typical of *B. zumayense*, so that the subspecific ranging cannot be uniform and my determination must be restricted to the definition of the species only.

As to the generic ranging, it may be stated that on the basis of the description and illustration of the new species *Cirroceras reevesi*, established by K. Young (1963), the genus *Cirroceras* could be an individual genus, which can be distinguished from the genus *Bostrychoceras* by the fact that its helicoidal shell has more whorls coiled in a free spiral. However, the quite juvenile whorls of this species are not known.

Distribution: The subspecies *Bostrychoceras polyplocum polyplocum* is widely distributed in the Upper Campanian of the F. Germany, Poland, USSR, Bulgaria, Spain, France, Fore Asia and North America.

The form with distant ribbing (the subspecies *B. p. zumayense* Wiedmann) is known from the Lower Maastrichtian of Spain according to J. Wiedmann, 1962.

Occurrence: The species in question was found in the lower part of the Shiranish formation only.

According to the distribution of the subspecies *B. polyplocum polyplocum*, there is good cause to believe that the lower part of the mentioned formation belongs to the Upper Campanian.

Genus *Anaklinoceras* Stephenson, 1941

Type species: *Anaklinoceras reflexum* Stephenson, 1941. Campanian. Texas.

This genus has been monotypical up to this time. W. J. Arkell, B. Kummel and C. W. Wright, 1957 range *Anaklinoceras* as a subgenus of *Nostoceras* Hyatt, 1894, similarly J. Wiedman (1962) considers *Anaklinoceras* as a subgenus of *Cirroceras* Conrad, 1868. On the basis of the two additional under-mentioned species I suppose that it is more suitable to consider the present subgenus *Anaklinoceras* as an individual genus, especially with regard to the forming of the body chamber into a hook-like part, which in case of the Iraq species has an expressively hamulinicone character. The representatives of the genera *Nostoceras* s. str. and *Cirroceras*, eventually *Bostrychoceras* are lacking this feature.

Anaklinoceras budayi n. sp.
Pl. IV, Figs. 1,2

Holotype: The specimen illustrated in the present report (see Pl. IV, Fig. 1). It is deposited in the paleontological department of the Moravian Museum in Brno; evidence number MM 18 324.
Stratum typicum: Lower Shiranish formation, the lower part of the Upper Campanian.
Locus typicus: Sinjar Mt., south Kersi Village (Iraq).
Derivatio nominis: In honour of the Czech geologist Dr. T. Buday, who merited for recognizing the geological structure of Iraq.
Paratype: Specimen illustrated in Pl. IV, Fig. 2 designated by the inventary number 18 329. It is deposited together with the holotype and was found at the same locality.
Material: Only the holotype and paratype, the latter being preserved only as an imprint the former as an external cast. Both the specimens are flatly deformed and especially the trochospiral part is in none of the specimens complete.

Diagnosis: Aberrant shell with the juvenile part coiled in a low trochospiral; the last whorl passes through a planispiral part into a hook-like, hamulinicone shell. The surface sculpture is mostly formed by simple nearly straight ribs. On the coiled part the ribs are dense, bearing a row of small tubercles near the ventral side. The ribs become more distant and thicker on the hamulinicone part.
Description: The shell consists of a spiral and a hook-like part. The juvenile part of the shell, the initial whorls of which are missing, is coiled in a space spiral. The trochospiral part is finished by a nearly complete planispiral whorl, which passes into a high (hamulinicone) part.

The sculpture of the spiral part is formed by nearly straight, dense and relatively fine ribs (according to the situation on the whorl either slightly convex or slightly concave). Every rib bears a weak tubercle on the last but one whorl of the spiral part, about 1,5 mm above the base of the trochospiral (near the ventra side). A slight constriction is visible on this whorl. On the last whorl, which is mostly planispiral, only every second rib bears a tubercle near the external part. The ribs bearing the tubercles are a little stronger on the external part than the remaining ribs. Exceptionally, branched ribs run out from the internal part of the last whorl. A slight tubercle may be developed in the place of bifurcation. In one specimen there occur in the external side close to a constriction 5 intercalatory ribs reaching to about half of the whorl height. At the end of planispiral whorl a narrow convex constriction is conspicuous separating obviously the phragmocone from the body chamber. The rib before the constriction is simple, behind the constriction it is branched from the base. Before the last mentioned constriction, on the hook-like part (proversum)*[1], in the length of about 1,5 cm, the ribbed character of the last whorl still continues. The tubercles, however, are apparently missing. The ribs become strikingly distant and a little stronger beyond this section, especially towards the external part.

In spite of the less complete preservation of the peripheral part of the shell it may be presumed that these ribs bore a longitudinal tubercle on the external part, which was analogical to that being present on every rib on the internal part of the proversum. Weak intercalatory ribs appear on the external half of the bent (flexus). Simple distant ribs are present on the retroversum as well as on the proversum. The retroversum is finished by an about 2 mm broad peristome, where only growth lines are visible. A deep, narrow, straight constriction accompanied

*) [1]Proversum, flexus, retroversum were defined by Z. Vašíček (1972, textfig. 12.)

on both sides by strong ribs, is present behind this zone. No evidence for the presence of suture was found.

Measurement: Owing to the incomplete preservation of the shells and the flat deformation, the measurement is only of orientative character. Nevertheless, a variability in some dimensions of the shells is apparent. The specimen 18326 represents a transitional type to the species *A. kersianum*, which is described below:

Holotype	18 324	18 329	18 326
Maximum shell length (approximative)	80 mm	68 mm	58 mm
Height of the spiral part in the axis of coiling (estimation)	27—30 mm	—	21—23 mm
Length of the retroversum measured from the internal periphery of the flexus	22 mm	22 mm	—
Diameter of the last whorl in the place of constriction (max.)	30 mm	29 mm	26 mm
Height of the last whorl in the place of constriction	11,5 mm	—	11,2 mm
Height of the last whorl of trochospiral in the place of constriction	7 mm	—	—
Number of ribs within the 2 cm long section:			
a) on the proversum from the last constriction to the bent (flexus)	13	12	13
b) on the proversum from the inner periphery of the flexus to the spiral part	6	6	*)[2]
c) on the retroversum from the opening to the flexus	7	8	—

On the last whorl of the specimen 18329, from the last constriction to the juvenile part, there is about 36 ribs on the umbilicus.

Remarks and Relations: The newly determined species *Anaklinoceras budayi* shows a variability in the size of shells, from 68 to 80 mm. On the other hand the sculpture has a constant character.

The new species differs from the typical species *Anaklinoceras reflexum* Stephenson, 1941 in a number of signs: the shell of Stephenson's species is of smaller dimensions, the hook-like part is low and rather embracing the spiral part, while *A. budayi* has the body chamber elongated into high typically hamulinicone subparallel arms. The constriction separating the phragmocone from the body chamber is not present in the Stephenson's species.

Anaklinoceras kersianum sp. n. described below is closer to *A. budayi* than *A. reflexum*. *A. budayi* differs from the first mentioned species in greater dimen-

*)[2] Owing to the smaller length of the proversum the sections a), b) are partly overlapping in the specimen 18 326.

sions and distinct tubercles on the ribs of the spiral part. Branched ribs occur on the last whorl of *A. budayi* exceptionally, while they are numerous in *A. kersianum* and, finally, the ribs on the hook-like part in *A. budayi* are markedly more distant.
Occurrence: The species *Anaklinoceras budayi* occurs in the lower and evidently also in the middle part of the Shiranish formation in Iraq (specimen 18 325 designated as *A.* cf. *budayi*).

Analogically to the distribution of the species *A. reflexum*, the distribution of *A. budayi* indicates stratigraphically the Campanian, the middle part of the Shiranish formation corresponding probably to the Upper to Uppermost Campanian.

Anaklinoceras kersianum n. sp.
Pl. III, Fig. 2

Holotype: The specimen figured in the present paper in Pl. III, Fig. 2. It is deposited in the paleontological department of the Moravian Museum in Brno under the evidence number MM 18 328.
Stratum typicum: Middle Shiranish formation, Upper Campanian.
Locus typicus: Sinjar Mt., south of Kersi village (Iraq).
Derivatio nominis: The name is derived from the name of the village Kersi, in the vicinity of which the holotype was found.
Material: Only one specimen — the holotype — is available. It is flatly deformed, preserved only as a weathered external cast. Embryonal whorls and aperture are not preserved.

Diagnosis: Small aberrant shell with the initial part coiled in trochospiral whorls, which pass over the last incomplete planispiral whorl into a hook-like hamulinicone part. The sculpture is formed on the coiled part by dense fine ribs, the greater part of ribs being bifurcated on the internal part of the whorls. The ribs become more distant and stronger on the hook-like part.
Description: Aberrant shell with trochospiral juvenile part, which is embraced by a planispiral half whorl passing in a hook-like part.

The sculpture of the coiled part is formed by fine straight ribs. On more juvenile whorls simple ribs probably predominate, while in the planispiral part they are bifurcated. The bifurcation takes place on the base of the whorl or slightly higher. Small tubercles were possibly present in the place of bifurcation — there cannot be determined, according to the holotype, whether they were absent or weathered out. A narrow straight constriction is visible at the end of the planispiral whorl separating probably the phragmocone from the body chamber. The constriction is limited in the front by a simple rib, at the back by a bifurcated one. The bifurcation takes place in a fifth of the height.

The ribs are as strong and dense in front of the constriction (on the straight part already) as on the coiled part. Bifurcated ribs are missing. The ribs become stronger and more distant on the straight part in the distance of 5 mm from the mentioned constriction. These ribs then gradually become stronger from the inner part to the external one. Tubercles are indicated on the ribs on the inner part of the proversum. It seems they have been present also on the periphery of the external part. Pairs of ribs predominate in the region of flexus bifurcating on the inner part of flexus. Also an intercalatory rib is present here. Retroversum is nearly not preserved.

Measurements:

Maximum length of the shell	48 mm
Height of the spiral part in the axis of coiling (approximate)	19 mm
Diameter of the last whorl in the place of constriction	23 mm
Height of the last whorl in the place of constriction	10,5 mm
Height of the last whorl of the trochospiral in the axis of coiling	3,5 mm

There are 12 ribs within a 2 cm long section of the proversum from the constriction to the flexus which is nearly the total straight part of the proversum.
Remarks and Relations: A comparison with *A. budayi* is given in the description of the mentioned species. *A. kersianum* differs from *A. reflexum* Stephenson among others in general form and finer and denser ribs, which are often bifurcated on the last whorl.
Occurrence: The species *Anaklinoceras kersianum* was found in the middle part of the Shiranish formation. Stratigraphically it probably corresponds to the Upper to Uppermost Campanian.

Suborder *Ammonitina* Hyatt, 1889
Superfamily *Desmoceratacea* Zittel, 1895
Family *Pachydiscidae* Spath, 1922

Genus *Pachydiscus* Zittel, 1884
Subgenus *Pachydiscus* Zittel, 1884

Type species: *Ammonites neubergicus* Hauer, 1858. Maastrichtian, Austria.

Pachydiscus (Pachydiscus) sp. ind.
Pl. IV, Fig. 4

Material: A single flatly deformed incomplete and moreover weathered specimen preserved as partial steinkern. Inv. no. 18 327.

Description: Nearly involute shell, in which the 3/4 of the last high and flat whorl are probably representing the body chamber. Distant, flat and inexpressive ribs are present on this last whorl occurring only above the umbilical line of coiling. On the sides of the whorl they are generally subradial and on the external part are somewhat thickened and slightly declined towards the opening. Owing to the weathering of the cast no other details of the sculpture have been preserved.
Measurement: As the corrosion in the periphery of the shell took place measurement is only of orientative character.

At D*[3] = 57 mm, H = 28 mm (0,49) and U = 12,7 mmm (0,22).

There are 9 ribs on the better preserved half of the last whorl.
Remarks and Relations: Owing to the poor preservation of only a single specimen there cannot be made more precise than subgeneric determination.

*)[3] D — diameter of shell, H — height of whorl, U — diameter of umbilicus

According to the surface sculpture the closest resemblance exhibit those specimens figured by D. L. Jones (1963) and described as *P. (P.) ootacodensis* (Stoliczka, 1865), possibly *P. (P.) hornbyense* Jones, 1963. However, in the species *P. ootacodensis*, the type is obscure as neither F. Stoliczka (1865) nor F. Kossmat (1898) have established the lectotype of this species. Lectotype suggested by D. L. Jones, 1963 (specimen figured by F. Kossmat, 1898, Pl. 16, Fig. 1) bears on its sides quite indistinct ribs so that the identification of both the Indian an American material in this conception and designation is not possible. The species *P. hornbyense* differs from the specimen of Iraq in the presence of umbilical tubercles on the ribs in Jones' species as well as in a denser ribbing.
Distribution: According to the statement of D. L. Jones (1963) the specimens, which he considers as the species *P. ootacodensis*, occur in the strata of the Uppermost Campanian (?) and the Lower Maastrichtian. The species *P. hornbyense* has an analogical distribution.
Occurrence: The representative of the subgenus *Pachydiscus* described and figured in the present report originates from the middle part of the Shiranish formation, which apparently belongs to the Uppermost Campanian.

Genus *Menuites* Spath, 1922

Type species: *Ammonites menu* Forbes, 1846. Campanian, South India.

Menuites cf. *menu* (Forbes, 1846)
Pl. II, Fig. 2

1846 *Ammonites Menu* Forbes, P. 111, Pl. 10, Fig. 1
1864 *Ammonites Menu* Forbes; Stoliczka, P. 103, Pl. 52, Fig. 4, ?3
1922 *Menuites menu* Forbes; Spath, P. 123
Holotype: *Ammonites Menu* in Forbes, 1846, Pl. 10, Fig. 1. Upper Campanian, South India. Deposited in London, Geological Society Collection, ev. no. 10482.
Material: Very flatly deformed incomplete shell, the whorls of which were originally robust (broad) as can be judged from the apparent migration of the tubercles from the umbilicus towards the middle of the whorl height. Inv. no. 18 331.

Description: Semiinvolute shell with secondarily high whorls. The body chamber forms 3/4 of the incomplete last whorl.

The surface sculpture consists of simple flat inexpressive ribs. The ribs bear expressive circular tubercles near umbilicus. Another row of faint tubercles is present near the ventral side on the ribs. Also sporadic ribs lacking umbilical tubercles occur near the phragmocone among the ribs with a pair of tubercles. Internal whorls are not apparent.
Measurement: The measurement has only an orientative character owing to the incomplete preservation of the shell.
At D = 67 mm is H = 29 mm (0,43) and U = 16 mm (0,24).
Within a half whorl of D = 67 mm there fall 8 ribs.
Remarks and Relations: The incomplete preservation of the shell does not allow a precise specific determination. The character of the sculpture shows the closest resemblance to the species *Menuites menu.*
Occurrence: A single specimen, which has been found, originates from the middle part of the Shiranish formation.
Distribution: The type of the species *Menuites menu* as well as the other species of this genus originates from the Campanian as it follows e. g. from the statements of W. J. Arkell, B. Kummel and C. W. Wright, 1957.

Conclusion

The following two ammonite species *Bostrychoceras polyplocum* (Roemer) and *Anaklinoceras budayi* n. sp. originate from the lower part of the Shiranish formation.

From the middle part of the Shiranish formation, the following species could be determined: *Anaklinoceras kersianum* n. sp., *Pachydiscus (Pachydiscus)* sp. ind., *Menuites* cf. *menu* (Forbes) and a transitional type between *Anaklinoceras kersianum* and *A. budayi*.

This ammonite fauna corresponds as a whole to the Upper Campanian. According to the biostratigraphical zones of the Upper Campanian presented e. g. by A. Blaskiewicz, 1966 from Poland (from the underlying to the overlying rock: 1) *Neancyloceras phaleratum*, 2) *Bostrychoceras polyplocum*, 3) *Cirroceras donezianum*, 4) *Nostoceras vistulae*) it may be presumed that the lower part of the Shiranish formation corresponds to the zone with *Bostrychoceras polyplocum*. This species is widely distributed not only in Europe.

The middle part of the Shiranish formation corresponds obviously to the Upper Campanian (probably to the zone with *Cirroceras donezianum*), may be to the Uppermost Campanian.

Purely Maastrichtian elements have not been proved.

The majority of ammonites, as arises out of the descriptions, belongs partly to the aberrant ammonites, partly to the coiled sculptured types, which according to the data of G. Scott (1940) lived in an environment about 35 to 150 m deep.

This presumption is also supported by the findings of small shells of the genus *Inoceramus* Sowerby having usually both valves opened together, which excludes a transportation of longer duration. Also with respect to the completeness of the hook-like shells of the genus *Anaklinoceras* it may be presumed that at least a part of the fauna found in the mentioned formation is not transferred and is deposited in the place of its life.

Our presumptions correspond to the statements of L. Dubertret (1959) who mentions that the Shiranish formation represents an open sea equivalent of various litoral to sublitoral clastics and neritic reef types and associated limestones.

On the contrary, the conclusion of A. A. Kureshy, 1970, who supposes — with regard to the microfauna — that the Shiranish formation was deposited in an abyssal zone, seems to be improbable.

(Translated by M. Šňupárková)

REFERENCES

[1] *Arkell W. J., Kummel B. et Wright C. W.* (1957): Mesozoic Ammonoidea. — Treatise Invert. Paleont., L, pp. L 80 — L 490. New York

[2] *Blaskiewicz A.* (1966): Uwagi o stratygrafii kampanu i mastrychtu doliny srodkowej Wisly. — Kwart. geol., *10*, pp. 1060—1071. Warszawa

[3] *Buday T.* et *Vaněček M.* (1971): Outline of mineral occurrences of Iraq and general mineral investigation programme for 1971—1990. — NIMCO. Baghdad

[4] *Dubertret L.* (1959): Lexique stratigraphigue international. — III, Asie, 10 a — Centre Nat. Rech. Scient., pp. 1 — 333. Paris

[5] *Forbes E.* (1846): Report on the fossil Invertebrata from southern India, collected by Mr. Kaye and Mr. Cunliffe. — Trans. Geol. Soc. London, 7, 1845, pp. 97—174, pls. 7—19. London

[6] *Howarth M. K.* (1965): Cretaceous ammonites and nautiloids from Angola. — Bull. Brit. Mus. natur. Hist., Ser. Geol., *10*, pp. 337—413, psl. 1—13. London

[7] *Jones D. L.* (1963): Upper Cretaceous (Campanian and Maestrichtian) ammonites from Southern Alaska. — Geol. Surv. proffess. Pap. (Washington), 342, pp. 1—53, pls. 6—41. Washington
[8] *Kossmat F.* (1898): Untersuchungen über die südindische Kreideformation I. — Beitr. Paleont. Geol. Österr. — Ung. Orients, *11*, (3), pp. 89—152, pls. 14—19. Wien
[9] *Krymgol'c G. J.* (1974): Klass Cephalopoda, podklass Ectocochlia. Nadotrjad Ammonoidea — Ammonoidei. *In* „Atlas verchnemelovoj fauny Donbassa". — Pp. 158—195, pls. 53—70. Moskva
[10] *Kureshy A. A.* (1970): The biostratigraphy of Sinjar, Iraq. — Bull. Coll. Sci., *11* (2), pp. 98—104. Baghdad
[11] *Matsumoto T.* (1967): Evolution of the Nostoceratidae (Cretaceous Heteromorph Ammonoids). — Mem. Fac. Sci. Kyushu Univ., Ser. D, Geol., *18* (2), pp. 331—347, pls. 18—19. Fukuoka
[12] *Roemer A.* (1841): Die Versteinerungen des norddeutschen Kreidegebirges. — Pp. 1—145, pls. 1—6. Hannover
[13] *Schlütter C.* (1872): Cephalopoden der oberen deutschen Kreide. — Palaeontographica, *21*, pp. 25—120, pls. 9—35. Cassel
[14] *Scott G.* (1940): Paleoecological factors controlling the distribution and mode of life of Cretaceous ammonoids in the Texas area. — J. Paleont., *14*, (4), pp. 299—322. Menasha
[15] *Spath L. F.* (1922): On the Senonian ammonite fauna of Pondoland. — Trans. roy. Soc. S. Afr., *10*, pp. 113—147, pls. 5—9. Johannesburg
[16] *Stoliczka F.* (1864): The fossil Cephalopoda of the Cretaceous rocks of southern India. Ammonitidae, with revision of the Nautilidae. — Palaeont. indica, 2—5, pp. 57—106, pls. 32—54. Calcutta
[17] *Vašíček Z.* (1972): Ammonoidea of the Těšín-Hradiště Formation (Lower Cretaceous) in the Moravskoslezské Beskydy Mts. — Rozpr. Ústř. Úst. geol., 38, pp. 1—103, pls. 1—16. Praha
[18] *Wiedman J.* (1962): Ammoniten aus der vascogotichen Kreide (Nordspanien). I. Phylloceratina, Lytoceratina. — Palaentographica, Abt. A, *118*, pp. 119—237, pls. 8—14. Stuttgart
[19] *Young K.* (1963): Upper Cretaceous ammonites of the Gulf Coast of the United States. — Bull. Univ. Tex. Bur. Econ. Geol. Technol., 6304, pp. 1—373, pls. 1—82. Austin.

Předloženo: 11. 11. 1975

recenzent: RNDr. František Řehoř, CSc.
Pedagogická fakulta Ostrava

Jan Foldyna, Zdeněk Vašíček

Příspěvek k biostratigrafii formace Širaniš v oblasti Džebel Sindžar

Při mapovacím kursu posluchačů university v Mosulu (Irak), který vedl J. Foldyna, se podařilo v uloženinách formace Širaniš v oblasti Džebel Sindžar odkrýt některé nové, dosud neznámé faunistické lokality. Amonitová fauna těchto lokalit je předmětem našeho článku.

Formace Širaniš v uvedené oblasti je ve spodní části tvořena monotonním komplexem šedých slínitých vápenců, ve střední části se střídají písčité a slínité vápence až slínovce s řadou znaků flyšové sedimentace. Ve svrchní části je tvořena převážně světlešedými slínovci s podřadnými polohami vápenců.

Nalezené fosilie pocházejí ze spodní a střední části formace Širaniš. Schránky amonitů jsou ploše deformované, zachovalé jako vnější jádra, zčásti i jako nedokonalá kamenná jádra.

Ze spodní části pocházejí druhy *Bostrychoceras polyplocum* (Roemer) a *Anaklinoceras budayi* n. sp.

Ve střední části byly nalezeny druhy *Anaklikoceras kersianum* n. sp., přechodný typ mezi *A. budayi* a *A. kersianum*, *Menuites* cf. *menu* (Forbes) a *Pachydiscus (Pachydiscus)* sp. ind.

Spodní část formace Širaniš odpovídá podle nálezů druhu *B. polyplocum* stejnojmenné zóně svrchního kampánu (např. podle A. Blaskiewicze, 1966), střední část uvedené formace ještě vyššímu nebo až nejvyššímu kampánu.

Podle převládajících schránek aberantních amonitů, s nimiž byly nalezeny též schránky rodu *Inoceramus* Sorwerby, které mají obě rozevřené misky pohromadě, lze předpokládat, že nalezená fauna pochází z neritické zóny (podle G. Scotta, 1940 z hloubek kolem 35—150 m) s přímou komunikací s otevřeným mořem.

Explanations to plates

Plate I

Fig. 1 Shiranish Formation; western slope of Kersi Valey.
Fig. 2 Sole markings on the lower bedding planes; middle part of the Shirnish Formation; overturned northern limb.

Plate II

Fig. 1 *Bostrychoceras polyplocum* (Roemer). Ev. no. 18323; lower part of the Shiranish Formation.
Fig. 2 *Menuites* cf. *menu* (Forbes). Ev. no. 18331; middle part of the Shiranish Formation.

Plate III

Fig. 1 *Bostrychoceras polyplocum* (Roemer). Ev. no. 18333; lower part of the Shiranish Formation.
Fig. 2 *Anaklinoceras kersianum* n. sp. Holotype ev. no. 18328; middle part of the Shiranish Formation.

Plate IV

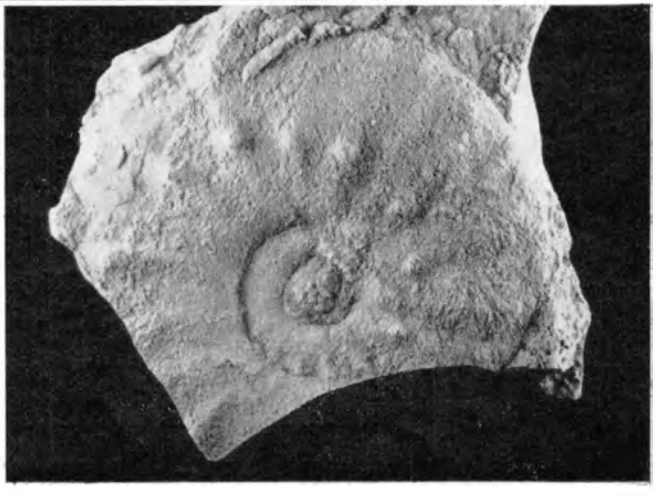
Fig. 1,2 *Anaklinoceras budayi* n. sp. 1 — Holotype ev. no. 18324, 2 — Paratype (imprint) ev. no. 18329; lower part of the Shiranish Formation.
Fig. 3 *Anaklikoceras* cf. *budayi* n. sp. Ev. no. 18326; middle part of the Shiranish Formation.
Fig. 4 *Pachydiscus* (*Pachydiscus*) sp. ind. Ev. no. 18327; middle part of the Shiranish Formation.

Photographs by J. Foldyna (Plate I) and M. Grmelová (Plate II — IV; all specimens were whitened with ammonium chloride prior to photographing and are reproduced in natural size). All specimens photographed are deposited in the Paleontological Dept. of the Moravian Museum, Brno.

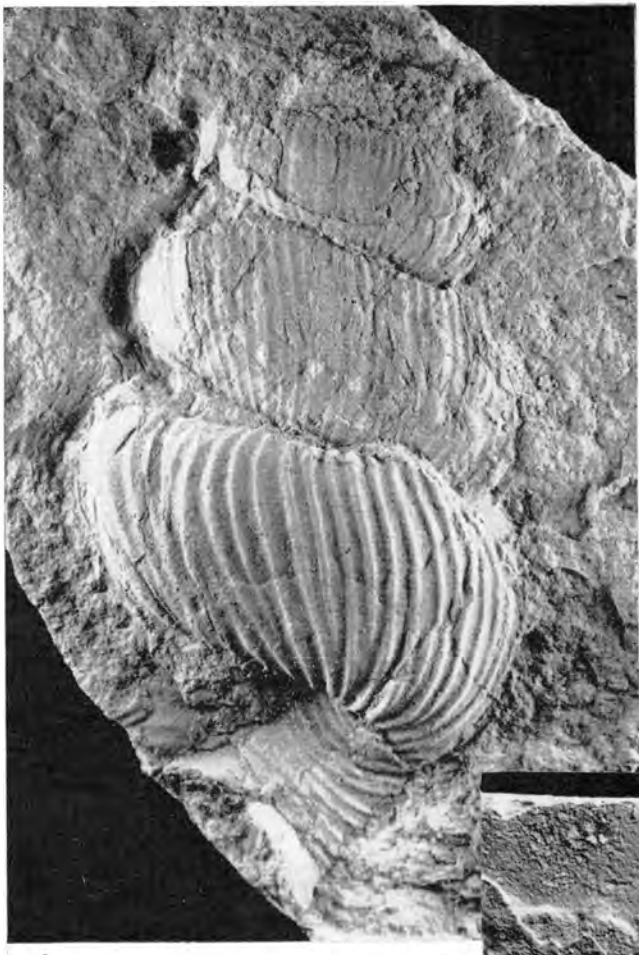
1

2

1



2



1

2

1

2

3

4