ACTA PALAEONTOLOGICA ROMANIAE V. 5 (2005), P. 483-491

NEW DATA ABOUT THE AGE AND THE STRATIGRAPHICAL POSITION IN THE CRETACEOUS WILDFLISH OF THE OLISTOLITH FROM PRAŞCA PEAK (RARĂU SYNCLINE, EASTERN CARPATHIANS, ROMANIA)

Paul ȚIBULEAC[1]

REZUMAT: Lucrarea prezintă primele rezultate din cercetarea recentă a olistolitului din dealul Praşca (Sinclinalul Rarău, Carpații Orientali) şi este fundamentată pe o faună de amoniți cu valoarea biostratigrafică, unii dintre taxonii figurați fiind semnalați pentru prima dată în acest punct fosilifer: *Paracoroniceras lyra, Agassiceras scipionianum, Euagassiceras sauzeanum* (=*E. resupinatus*)*, E. spinaries, Arnioceras densicosta, Caenisites* cf. *brooki, Eparietites denotatus, Asteroceras* cf. *suevicum, A.* cf. *involutum, Echioceras raricostatoides, Leptechioceras meigeni, Paltechioceras boehmi, Epideroceras lorioli* etc.

O altă noutate este prelevarea unor amoniți *in situ*, spre deosebire de toate faunele semnalate de cercetătorii anteriori. Din interpretarea datelor faunistice rezultă argumentarea unor noi biozone/ subbiozone index ale Sinemurianului, poziția răsturnată a olistolitului în cadrul wildflişului cretacic şi posibilitatea prezenței Hettangianului, la partea inferioară, respectiv a Pliensbachianului, la partea superioară a stratelor (dedusă din corelarea exemplarelor prelevate *in situ* cu extinderea în relief a olistolitului).

ABSTRACT: Recent results of the researches on the olistolith from Praşca Peak (Rarău Syncline, Eastern Carpathians) are presented. The paper is based on an ammonite fauna with taxon-index species, several of them being mentioned here for the first time: *Paracoroniceras lyra, Agassiceras scipionianum, Euagassiceras sauzeanum* (=*E. resupinatus*)*, E. spinaries, Arnioceras densicosta, Caenisites* cf. *brooki, Eparietites denotatus, Asteroceras* cf. *suevicum, A.* cf. *involutum, Echioceras raricostatoides, Leptechioceras meigeni, Paltechioceras boehmi, Epideroceras lorioli* etc.

Other new data: the first specimens colected *in situ,* the argumentation of new biozones/subbiozones of Sinemurian, the up-side-down position in the Cretaceous wildflish of the olistolith, the supositions regardind the presence of Hettangian and Pliensbachian (inferred from the correlation of the specimens colected *in situ* with the relief development of the olistolith).

Keywords: Olistolith, Sinemurian, biozones, “ammonitico rosso” facies, stratigraphical position.

HISTORICAL DATA

Uhlig (1900) discovered the Liassic olistolith from Praşca Peak (Rarău Syncline, Eastern Carpathians) quoting a reach fauna of ammonites with several new species: *Phylloceras persanense* HERBICH, 1878; *Phylloceras* sp. indet.; *Phylloceras planispira* REYNÈS,1868; *Rhacophyllites bucovinicus* UHLIG, 1900; *Rhacophyllites nardii* MENEGHINI, 1853; *Lytoceras* aff. *secernendum* DI STEFANI, 1886; *Aegoceras keindli* EMMRICH, 1853; *Aegoceras* n. sp. indet.; *Oxynoticeras guibali* d’ORBIGNY, 1844; *Arietites* cf. *charpentieri* SCHAFHÄUTL, 1851; *Arietites romanicus* UHLIG, 1900; *Arietites waehneri* UHLIG, 1900; *Arietites herbichi* UHLIG 1900; *Arietites* n. sp. indet.; *Arietites boesei* UHLIG, 1900, *Arietites* cf. *resurgens* DUMORTIER, 1867, *„Arietites”* cf. *pluricosta* MENEGHINI, 1853; *Arietites raricostatum* ZIETEN, 1831. Beside the Early Liassic ammonites, *Atractites* sp.*, Spiriferina aequilobata* UHLIG 1900, were mentioned. The Uhlig’ s fauna was revised by Patrulius & Popa (1981 - unpublished paper), Popa & Patrulius (1996), but future reviews will be necessary: after Uhlig all new species of arietitids were considerd as *Paltechioceras* (Patrulius & Popa, 1996; Turculeț & Țibuleac, 2001) being also several confusions between *Arnioceras* and *Paltechioceras*; we suposse that *Arietites waehneri* is an *Arnioceras*).

Few years later, Trauth (1906) completed the fauna with other ammonites (also revised by Popa & Patrulius, 1996) and a bivalve taxon: *Phyloceras zetes* d’ORBIGNY, 1850; *P. cilindricum* SOWERBY, 1831; *„Phylloceras”* cf. *lunense* MENEGHINI 1867-1889; *Phylloceras* aff. *leptophyllum* HAUER; *Lytoceras* sp.; *Oxynoticeras* cf. *oxynotum* QUENSTEDT, 1843; *Aegoceras* (*Microderoceras*) aff. *nothum* MENEGHINI, 1853; *Arietites* n. sp. ind.; *Arietites* sp.; *Arietites semilaevis* HAUER, 1853; *A. falcaries* var. *ceratitoides* QUENSTEDT, 1848; *A. boesei* UHLIG, 1900 and *Lima (Plagiostoma)* cf. *acuticosta* var. *raricosta* QUENSTEDT.

Several Romanian researchers mentioned the olistolith in their regional researches between the Jurassic deposits of the Transylvanian Nappe. Kräutner (1929) only signaled „a small outcrop in Adnet facies” in the Rarău Syncline. Ilie (1957) situated the olistolith in the Mesteacăn valley and he also considered the Liassic developed at the South of the Pietrele Doamnei („red-brick-coloured marls…red clayesh limestones with greenish spots, traversed by diaclaza ... with *Schlotheimia* sp.”). But these deposits have been positioned at the upper part of the jasper strata (Callovian-Oxfordian), which is a stratigraphical

[1] *University “Al. I. Cuza” of Iaşi, Faculty of Geography-Geology, Carol I Avenue, 20 A, e-mail: ptib@uaic.ro*

incompatibility. Popescu & Patrulius (1964) were the first Romanian researchers who rediscovered the Uhlig's olistolith and they well depicted the geographic setting.

New fossil taxa were identified by Turculeț (1965): ostracods, foraminifers (*Dentalina* sp., *Nodosaria* sp., *Involutina liassica* (JONES), *Pseudoglandulina* cf. *rotundata* (BORN.), *Frondicularia rombiformis* MAM., *F.* cf. *oolitica* (BORN.), *Parafrondicularia* sp., *Articulina* sp., *Cristellaria* sp., *Glomospira* sp., *Oolina (Entosolenia)* sp., *Globigerina* sp.), brachiopods (*Koninckina (Koninckinodonta) pichleri* BITTN., *K. (K.) hardi* BITTN., *Amphiclinodonta* cf. *liasina* BITTN., *Terebratula (Waldheimia) heysiana* (DUNK), *T.* cf. *waterhousii* DAV., bivalves (*Pecten (Aequipecten) priscus* SCHKOTH., *Pecten* sp., gastropods (*Trochus imbricatus* (QU.), cephalopods (*Aulacoceras liasicum* GÜMB., *Aulacoceras* sp.), echinoderms (*Pentacrinus (extractinus) laevisutus* POMPEKJ., *Diademopsis* sp., *Prinocidaris* sp.), fossil fishes (teeth). In the petrographical sections, the author observed the great frequence of the echinoderms (radiola, test fragments, plates). In according with Atanasiu & Răileanu's opinion (1950), Turculeț considered that the olistolith is not a typical Adnet facies, but probably a transition between the Adnet and Hierlatz types.

Turculeț (1968) reported the presence of *Globochaete alpina* LOMB. in the rocks of the olistolith, five new subspecies being described: *Globochete alpina rumana, G alpina carpathica, G. alpina eothrixana, G. alpina bucovinica, G. alpina tumido-punctata*.

Mutihac (1968) signaled the olistolith (in the Mestecăn valley) and he considered that similar blocks appear on the summit between Pojorâta and Seaca valleys, in Seaca valley, in the Pietrele Albe area (on Izvorul Alb) and at the west of Pietrele Doamnei.

Turculeț (1971) – compiled the previous researches about the olistolith giving a general list of the taxa, with few alterations. The same author (Turculeț, 1976) proposed the olistolith to become a paleontological reservation, which would be protected for the scientific researches.

Popa & Patrulius (1996) in a general review of the Early Jurassic ammonites from the Romanian Carpathians mentioned the entire fauna signaled along the time. The authors also signaled some ammonites collected form the Praşca olistolith and mentioned in an unpublished paper: *Adnethiceras* sp. aff. *A. adnethicus* (HAUER,1854), *Tragolytoceras* sp., *Echioceras* sp. aff. *E. regulare (*TRUEMAN & WILIAMS, 1925), *Paltechioceras* sp., *Pseudasteroceras* sp., *Juraphyllites* sp. The biozones-index are *Asteroceras obtusum, Oxynoticeras oxynotum, Echioceras raricostatum*, possibly the upper part of Early Sinemurian.

Turculeț & Țibuleac (2001) depicted and figured for the first time 34 taxa of ammonites from the olistolith (but some of them would be revised).

All the ammonites mentioned until now (approximately 70 taxa) were collected from the soil which buried the olistolith.

GEOLOGICAL SETTING

The olistolith appears in the Cretaceous wildflish of the Rarău Syncline, on the eastern slope of the Praşca Peak, near its top (Fig. 1). The

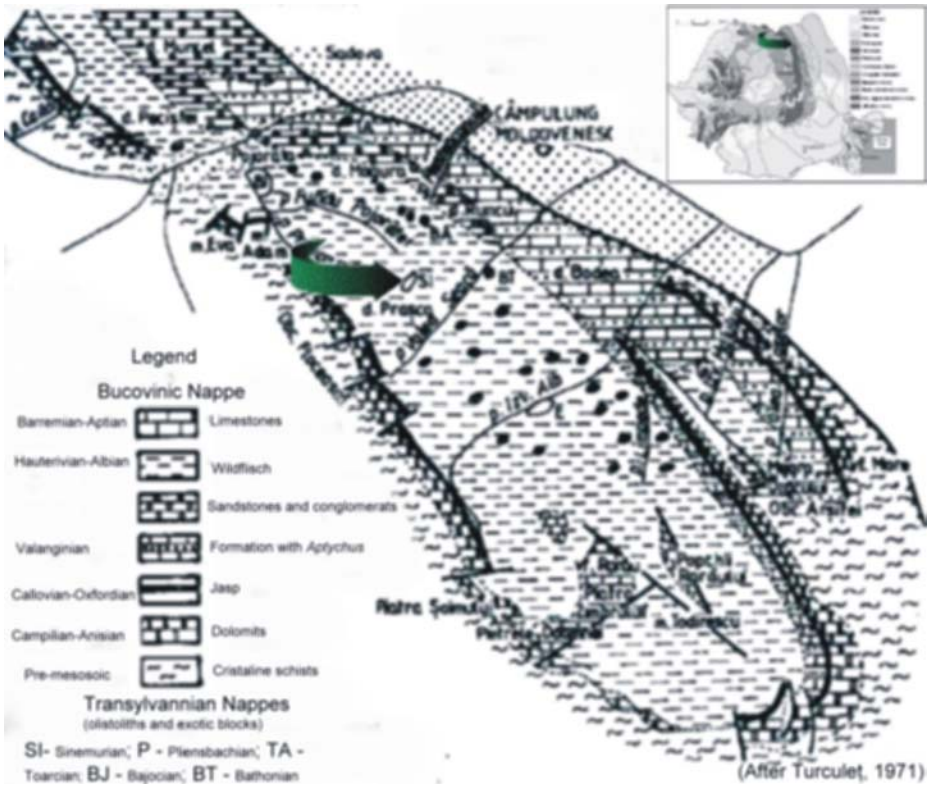

Fig. 1. Location of the Praşca Hill outcrop

sure route to catch it is from Valea Seacă rivulet, following the affluent which comes from the left slope (Turculeț, 1970), after the valley widens. But other routes are from Câmpulung on the Mesteacăn valley or from Pojorâta village on Fundu Pojorâtei valley, then following the summits of the hills.

STRATIGRAPHICAL POSITION OF THE PRAŞCA OLISTOLITH

Any data about the olistolith position in the Cretaceous wildflysh was not mentioned by previous researchers (all specimens were colected *ex situ*). The diggings from last two summers made with several students (Chirilă Gabriel, Dragoş Nicuşan, Ciprian Ursan, Cristian Bălțăteanu) were the first steps to clarify this problem. We dug along the top of the Praşca Peak in different locations to find under the soil the rocks of the olistolith, then on the slope to proceed specimens *in situ* from those points where we had succeded the first time. That way, it was possible to colect *in situ* several taxon-range exemplaries: *Euagassiceras sauzeanum* (d'ORBIGNY, 1884) = *E. resupinatus* (SIMPSON, 1843), *E. spinaries* (QUENSTEDT, 1858) from *Arnioceras semicostatum* T.- r. Zone; *Eparietites denotatus* (SIMPSON, 1855) *Eparietites* sp. from *Asteroceras obtusum* T.- r. Zone: *Oxynoticeras oxynotum* (QUENSTEDT, 1843) from *Oxynoticeras oxynotum* T.- r. Zone; *Echioceras raricostatum* (ZIETEN, 1831), *E. raricostatoides* (VADÁSZ, 1908), *Epideroceras lorioli* (HUG, 1899), *Paltechioceras romanicum* (UHLIG, 1900), *Paltechioceras* sp. from *Echioceras raricostatum* T.- r. Zone). *Ex situ* we also found *Paracoroniceras lyra* (HYATT, 1867), *Arnioceras ceratitioides* (QUENSTEDT, 1848), *A. densicosta* (QUENSTEDT, 1884), *Arnioceras* sp., *Agassiceras scipionianum* (d'ORBIGNY, 1884), from *Arnioceras semicostatum* T.- r. Zone; *Asteroceras* cf. *involutum* (GUÉRIN-FRANIATTE, 1966), A. cf. *suevicum* (QUENSTEDT, 1884) from *Asteroceras obtusum* T.- r. Zone; *Caenisites* cf. *brooki* (SOWERBY, 1818 from *Caenisites turneri* T.- r. Zone; *Leptechioceras meigeni* (HUG, 1899), also *Epideroceras lorioli, Paltechioceras boehmi* (HUG, 1899), *Paltechioceras* sp. (*Echioceras raricostatum* T.- r. Zone).

The olistolith is built by the red limestones, with thin marls intercalations, which have an obiously almost parallel stratification (248-256°/45-50°). Corelating the samples *in situ* from several points of the olistolith with the stratification we approximate that the olistolith is up-side-down, on the top of the hill being the earliest strata and down the slope the latest.

AGE OF THE OLISTOLITH

Uhlig (1900) and Trauth (1906) signaled the Early Liassic presence (throught the ammonites there were argued two taxon-index biozones - *Oxynoticeras oxynotum* and *Echioceras raricostatum*). Popa & Patrulius (1996) considered also the presence the *Asteroceas obtusum* biozone and possibly the „Lower Sinemurian („*Arnioceras* species reported by previous authors"). Turculeț & Țibuleac (2001) admitted even the possibility of the Hettangian presence (an exemplary of *Schistophylloceras*) and the beginning of Pliensbachian.

Our faunal arguments sustain the presence of a very condensed Sinemurian strata between *Arnioceras semicostatum* and *Echioceras raricostatum* T. – r zones (see Tabel I) with taxon-range exemplaries colected *in stiu* or *ex situ* (the less argued T.-r. zone of the Sinemurian being the

Pliensbachian (Carixian)		
Late Sinemurian	*Echioceras raricostatum*	*Paltechioceras aplanatum*
		Leptechioceras macdonnelli
		Echioceras raricostatum (or E. raricostatoides)
		Crucilobiceras densinodulum
	Oxynoticeras oxynotum	*Oxynoticeras oxynotum*
		Oxynoticeras simpsoni
	Asteroceras obtusum	*Eparietites denotatus*
		Asteroceras stellare
		Asteroceras obtusum
Early Sinemurian	*Canisites turneri*	*Microderoceras birchi*
		Caenisites brooki (or C. alcinoe)
	Arnioceras semicostatum	*Euasteroceras sauzeanum*
		Agassiceras scipionianum
		Coroniceras reynesi (or Paracoroniceras lyra or P. charlesi=P. gmuedense
	Arietites bucklandi	*Arietites bucklandi*
		Coroniceras rotiforme
		Metophioceras conybeari (+ Vermiceras spiratissimus)
Hettangian		

Tabel I - Taxon-range Biozones and Subbiozones of Sinemurian (after Dean, Donovan & Howarth, 1961; with several completions)

Arietites bucklandi, but supossed present by *Vermiceras spiratissimus* – Turculeț & Țibuleac, 2001). Indeed, seeing the position of the olistolith it is also possible the presence of the Hettangian (on the top of the hill) and the Pliensbachian down the slope. The next diggings could prove or not these assertions.

The olistolith have offered also few bivalves, brachiopods, belemnites, aulacocerids and crinoids.

CORRELATIONS

Uhlig (1900) described the olistolith as developed into so-called Adnet facies, very famous through the quaries with the decorative limestones starting from the time of Roman Empire. After him, all researchers considered its presence if they already observed several differences (Atanasiu et Răileanu (1950); Turculet, 1965).

The evolution of the Adnet type-region is a particular one, influenced by the Rhaetian Adnet reef which made possible the development of several facies variations: the Schnöll and Adnet Formations – Adnet Group, developed in the area of the reef - interfinger with the Scheibelberg Formation - formed more distally from the same reef (Böhm *et al.*, 1999; Böhm, 2003). Including the olistolith from Praşca Peak in the Adnet facies only on the basis of several lithological similarities (especially with the Schmiedwirt Member) is not well argued. It may be the better option to consider the olistolith from Praşca Peak developed into a "ammonitico rosso" facies with general similarities and special differences with other Liassic regions of the Tethyan realm (Appennines, Alps, Bakony, Pontides etc.).

In the Rarău Syncline, the presence of the Early Sinemurian was also signaled by Turculeț (1976) identifing an exemplair of *Euagassiceras sauzeanum* (d'ORBIGNY, 1884) in an exotic block from Izvorul Malului rivulet (but not in the „*ammonitico rosso*" facies).

Herbich (1878 – fide Grasu, 1970), Vadász (1908) and Grasu (1970) mentioned also an „Adnet" olistolith at the springs of the Sec rivulet, in the Curmătura saddle (Hăghimaş Mountains, Eastern Carpathians). It covers an interval between Early Hettangian and Late Sinemurian, *Euagassiceras sauzeanum* being identified throught other taxa.

In Perşani Mountains, the stratigraphical interval is bigger than in the previous two areas (Middle Hettangian – Early Pliensbachian), but olistoliths which represent the "Adnet facies" are smaller than the one from Praşca Peak. There were signaled (in the connection with our fauna) *Coroniceras (Paracoroniceras) lyra, Arnioceras* sp., *Agassiceras scipionianum, Caenisites* sp., *Euagassiceras* sp., *Echioceras raricostatum, Epideroceras* sp. aff. *E. lorioli, Leptechioceras* sp., *Paltechioceras* sp. aff. *P. aplanatum* (Popa & Patrulius, 1996).

In Romania, there are other zones with Sinemurian fauna (not in the „Adnet facies") in Apuseni Mountains, Southern Carpathians, Northern Dobrogea (Tomescu & Bordea, 1974-1975; Popa & Patrulius, 1996).

ACKNOWLEDGEMENTS

We wish to express our gratitude to Murray Edmunds and Ian Troth (United Kingdom) for their help in the field and in the determination of several ammonites. Many thanks to Mr. Andrei Viforeanu, general manager of S.C. „Geomed Impex SRL 2002" Bucureşti who financed our field researches and to the students who helped us in the diggings (Gabriel Chirilă, Dragoş Nicuşan, Ciprian Ursan and Cristian Bălțăteanu).

REFERENCES

Alkaya F., Meister C. (1995) - Liassic ammonites from the Central and Eastern Pontides (Ankaraand Kelkit areas, Turkey). *Revue de Paléobiologie,* vol.14/1, p. 125-193, 14 pl., Genève.

Arkell W.J., Kummel B., Wright C. W. (1968) – Mesozoic *Ammonoidea*. In: Moore R.C. (ed.) *Treatise on Invertebrate Paleontology*. Part. L, *Mollusca 4,* Geological Society of America and University of Kansas Press, p. L 80-L 471.

Atanasiu I., Răileanu Gr. (1950) – Contribuțiuni la cunoaştera Liasicului din Munții Hăghimaş. *Buletin ştiințific, seria Geol.-Geogr.-Biol, Şt. Tehn. şi Agricole,* Academia RPR, t. II, nr. 5, 16 p., 2 pl., Bucureşti.

Blau J. (1998) Monographie der Ammoniten des Obersinemuriums (Lotharingium, Lias) der Liezer Dolomiten (Österreich): Biostratigraphie, Systematik und Paläobiogeographie. *Revue de Paléobiologie,* vol. 17/1, p. 177-285, 15 pl., Genève.

Böhm F., Ebli O., Krystyn L., Lobitzer H., Rakús M, Siblík M. (1999) – Fauna, Stratigraphy and Depositional Environment of the Hettangian-Sinemurian (Early Jurassic) of Adnet (Salzburg, Austria). *Abhandlungen der geologischen Bandessanstalt,* 56/2, p. 143-271, 30 pl., Wien.

Böhm F. (2003) – Lithostratigraphy of the Adnet Group (lower to middle Jurassic, Salzburg, Austria). *Österr. Akad. Wiss. Schriftenr. Erdwiss. Komm.* 16*,* 25 p., 16 fig., Wien.

Dean W. T., Donovan D. T., Howarth M. K. (1961) – The Liassic ammonite zones and subzones of the north-west European Province. *Bulletin of the British Museum (Natural History). Geology.* Vol. nr 4, no.10, p. 436 – 505, 12. pl., 1 sketch, London.

Dommergues J. -L., Meister C. (1990) – Les faunes d'ammonites liasiques de l'Austroalpin Moyen dans les Alpes Rhetiques et implications paleogeographiques. *Revue de Paléobiologie,* vol. 9/2, p. 291-307, 9 fig text, 2 pl., Genève.

Dommergues J.-L., Meister C. (1989) – Succession des faunes d'ammonites du Sinémurien supérieur dans le Chablais Méridional et les klippes de Savoie (Préalpes Médianes, Haute/Savoie, France). *Geobios,* nr. 22, fasc. 4, p. 455-483, 11 fig., 6 pl., Lyon.

Dommergues J.-L., Meister C. (1991) – Area mixed marine faunas between two major paleogeographical realms, exemplified by the Early Jurassic (late Sinemurian and Pliensbachian) ammonites in the Alps. *Palaeogeography, Palaeoclimatology,*

Palaeoecology, vol. 86, p. 252-282, Elsevier Science Publishers B. V., Amsterdam.

Dommergues J.-L., Ferretti A., Meister C. (1994) - Les faunes d'Ammonites du Sinémurien de l'Apennin Central (Marches et Toscane, Italie). *Bolletino della Società Paleontologica Italiana,* 33/1, p. 13-42, 4 pl., Modena.

Edmunds Murray, Varah M., Bentley A. (2003) - The ammonite biostratigraphy of the Lower Lias " Armatum Bed" (Upper Sinemurian-Lower Pliensbachian) at St Peter's Field, Radstock, Somerset. *Proceedings of the geologists' Association,* 114, p. 65-96.

Fucini A. (1903) - Cephalopodi liassici del Monte di Cetona. *Palaeontographia Italica*, IX, p. 125-239, 9 pl .

Getty T. A. (1973) – A revision of the generic classification of the family *Echioceratidae* (*Cephalopoda, Ammonoidea*) (Lower Jurassic). *The University of Kansas Paleontological contributions,* Paper 63, 32 p, 5 pl.

Grasu C. (1970) Observaţii asupra Liasicului de Adneth de la Curmătura (Hăghimaş). *Lucrările Staţiunii de Cercetări Biologice, Geologice şi Geografice „Stejarul",* v. 3, p. 7-12, 2 pl., Pângărați - Piatra-Neamț.

Ilie M. (1957) - Cercetări geologice în regiunea Rarău-Câmpulungul Moldovei-Pârâul Cailor. *Anuarul Comitetului Geologic RPR*, XXX, p. 107-211, 2 schiţe, Întreprinderea poligrafică no. 4, Bucureşti.

Kment K. (2000) – Frühe liassische Ammoniten aus der Gegend um Hinterriss im Karwendelgebirge (Tirol) und dem Mangfallgebirge bei Rottach-Egern (Bayern). *Jahrbuch der Geologischen Bundestalt*, vol. 142/2, p. 181-218, Wien.

Kräutner T. (1929) - Cercetări geologice în cuveta marginală mezozoică a Bucovinei cu privire specială asupra regiunii Rarăului. *Anuarul Institutului Geologic*, vol. XIV, 29 p., Cartea Românească, Bucureşti.

Meister C., Böhm F. (1993) - Austroalpine Liassic Ammonites from the Adneth Formation (Northern Calcareous Alps). *Jahrbuch der Geologischen Bundestalt*, 136/1, p. 163-211, Wien.

Meister C., Friebe G. (2003) - Austroalpine Liassic Ammonites from Vorarlberg (Austria, Northern Calcareous Alps). *Beitr. Paläont.*, vol. 28, p. 9-99, 17 pl., Wien.

Mutihac V. (1968) - *Structura geologică a Compartimentului nordic din Sinclinalul Marginal Extern (Carpaţii Orienta*li). Ed. Acad. RSR, 128 p., 9 pl., Bucureşti.

Patrulius D., Popa E., Popescu I. (1969) - Structura pânzei bucovinice în partea meridională a masivului cristalin moldav (Carpaţii Orientali). An. Com. Stat. Geol., vol. XXXVII, p. 71-117, Bucureşti.

Popa E., Patrulius D. (1996) - Lower Jurassic Ammonites in the Romanian Carpathians. *Memoriile Institutului Geologic al României,* vol. 36, p. 53-63, Bucureşti.

Popescu Gr., Patrulius D. (1964) - Stratigrafia Cretacicului şi a klippelor exotice din Rarău (Carpaţii Orientali). Anuarul Comitetului Geologic, XXXIV/2, p. 73-118, 2 sc., Bucureşti.

Quenstedt F.A.-1883 (ed .1973) - *Die Ammoniten des Schwäbischen Jura. I Band, Der Schwarze Jura (Lias).* Atlas 1-54, E. Schweizerbart'sche Verlagshandlung, 440 p., Stuttgart.

Rakús M., Lobitzer H. (1993) - Early Liassic Ammonites from the Steinplatte-Kammerköhralm Area (Northern Calcareous Alps/Salzburg). *Jahrbuch der Geologischen Bundestalt*, Bd. 136, H. 4, p. 919-932, Wien.

Squazzoni G. (1962) – Fauna ammonitica del calcari selciferi metamorfici delle Alpi Apuane. *Paleontographia Italica,* LVII (n. ser. XXVII), p. 35-79, 3 pl..

Tomescu Camelia, Bordea S. (1974 – 1975) – Asupra prezenţei unor amoniţi ai Sinemurianului inferior în Unitatea de Următ (Valea Mare – Munţii Bihor). *Dări de seamă ale şedinţelor.* Vol. LXII/3. Paleontologie, p. 175-182, 1 pl., Bucureşti.

Trauth F. (1906) - Ueber den Lias von valessaca in der Bukowina. *Verein. a.d. Univ. Wien,* Bd. IV/31, Wien.

Turculeţ I. (1965) - Câteva date privind Liasicul din dealul Praşca. *Analele ştiinţifice ale Universităţii "Al. I. Cuza" Iaşi*, s. II/b, XI, p. 203-204, 1pl., Iaşi.

Turculeţ I. (1968) - Observations sur l'Algue *Globochaete alpina* Lomb., des depôts liasiques de la cuvette de Rarău. *Rivista Ital. Paleont.-Strat.,* vol. 74, nr. 4, p. 1155-1174, Milano.

Turculeţ I. (1970) - Klippa sinemuriană din dealul Praşca (Rarău) - un valoros punct fosilifer. *Studii şi comunicări de ocrotirea naturii*, Comitetul judeţean pentru cultură şi artă - Consiliul judeţean de îndrumare pentru ocrotirea naturii Suceava, I, p. 229-233.

Turculeţ I. (1971) - Cercetări geologice asupra depozitelor jurasice şi eocretacice din cuveta Rarău-Breaza (Carpaţii Orientali). *Studii tehnice şi econonomice*, Institutul Geologic, seria J/Stratigrafie, nr. 10, 141 p., 41 pl., 1 hartă, Bucureşti.

Turculeţ I. (1984) - Inventarul revizuit al taxonilor mezozoici, noi pentru ştiinţă, descrişi din România. II. Moluşte şi brachiopode liasice. *Volum omagial "150 de ani de la înfiinţarea Muz. Ist. Nat. Iaşi"* - p. 355-358, Iaşi.

Turculeţ I., Ţibuleac P. (2001) – Sinemurian ammonites from the Praşca Hill (The Rarău Syncline, Eastern Carpathians). *Acta Paleontologica Romaniae,* vol. 3, p. 427-452, Vasiliana 98, Iaşi.

Uhlilg V. (1900) - Ueber eine unterliasische Fauna aus der Bukowina. *Abhandlungen des deutschen naturwissenschaftlich-medicinischen Vereins für Böhmen "Lotos"*. II Band, 1, 31 p, 1 pl., Prag.

Vadász M. E. (1908) - Die unterliassische Fauna von Alsórákos in Komität Nagyküküllö. *Sonderabdruck aus den Mitteilungen aus dem Jahrbuche der kgl. Ungarischen Geologischen Reichsanstalt,* XVI Band, 5 Heft, p. 309-406, 6 pl., Budapest, Druck des Franklin-Vereins.

Vadász M. E. (1914) – Geologische Beobachtungen im Persány- und Nagyhagymás-Gebirge. *Sonderabdruck aus den Mitteilungen aus dem Jahresbericht der kgl. Ungar.Geologischen Reichsanstalt,* p. 264-298, mit 9 textfiguren, Budapest, Buchdruckerei Ármin Fritz, 1915.

CAPTIONS OF PLATES

PLATE I
Fig. 1, 2 - *Paracoroniceras lyra* (HYATT, 1867), *ex situ* – (x 0,7)
Fig. 3, 4 - *Euagassiceras spinaries* (QUENSTEDT, 1858), *ex situ* – (x 0,7)
Fig. 5 - *Euagassiceras sauzeanum* (d'ORBIGNY, 1884) = *E. resupinatum* (SIMPSON, 1843), *ex situ* – (x 0,7)
Fig. 6 - *Agassiceras scipionianum* (d'ORBIGNY, 1884), *ex situ* – (x 0,7)
Fig. 7 - *Eparietites denotatus* (SIMPSON, 1855), *in situ* – (x 1)
Fig. 8 - *Eparietites* sp., *in situ* - (x 1)

PLATE II
Fig. 1, 2 - *Arnioceras ceratitoides* (QUENSTEDT, 1848), *ex situ* – (x 0,7)
Fig. 3 - *Arnioceras densicosta* (QUENSTEDT, 1884), *ex situ* – (x 1)
Fig. 4 - *Asteroceras* cf. *involutum* (GUÉRIN-FRANIATTE, 1966), *ex situ* – (x 0,7)
Fig. 5 - *Asteroceras* cf. *suevicum* (QUENSTEDT, 1884), *ex situ* – (x 0,7)
Fig. 6 - *Caenisites* cf. *brooki* (SOWERBY, 1818), *ex situ* – *(*x 0,9)
Fig. 7, 8 - *Oxynoticeras oxynotum* (QUENSTEDT, 1843), *in situ* - (x 1)

PLATE III
Fig. 1 - *Echioceras raricostatum* (ZIETEN, 1831), *in situ,* (x 1)
Fig. 2 - *Echioceras raricostatoides* (VADÁSZ, 1908), *in situ* (x 1)
Fig. 3, 4 - *Epideroceras lorioli* (HUG, 1899) (x 1), *in situ*
Fig. 5 - *Leptechioceras meigeni* (HUG, 1899), *ex situ* (x 0,9)
Fig. 6, 7 - *Paltechioceras romanicum* (UHLIG, 1900), *in situ* (6 x 0,8; 7x 1)
Fig. 8 - *Paltechioceras* aff. *romanicum* (UHLIG, 1900) *in situ,* (x 1)
Fig. 9 - *Paltechioceras boehmi* (HUG, 1899) *ex situ,* (x 1)

PLATE 1

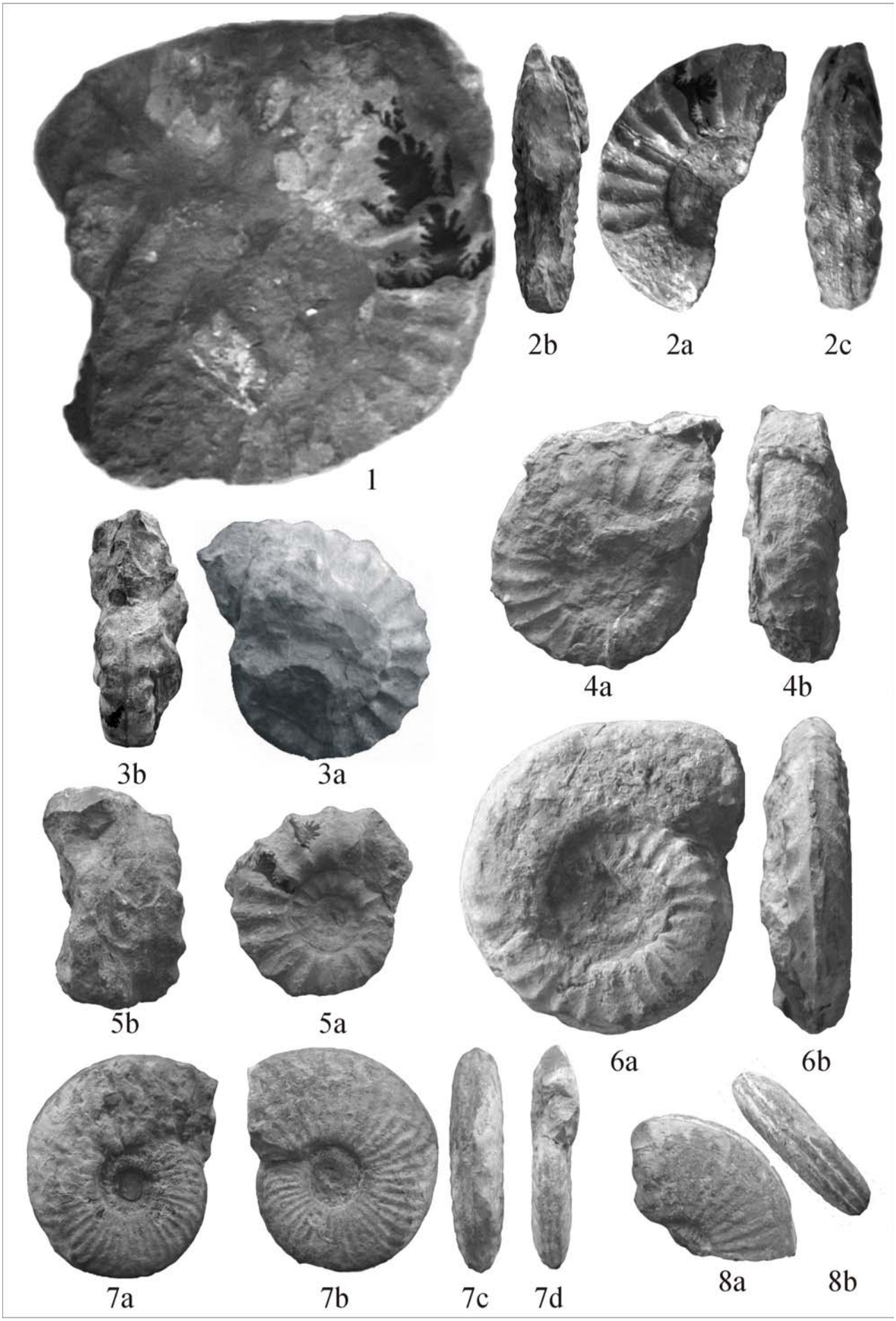

PLATE 2

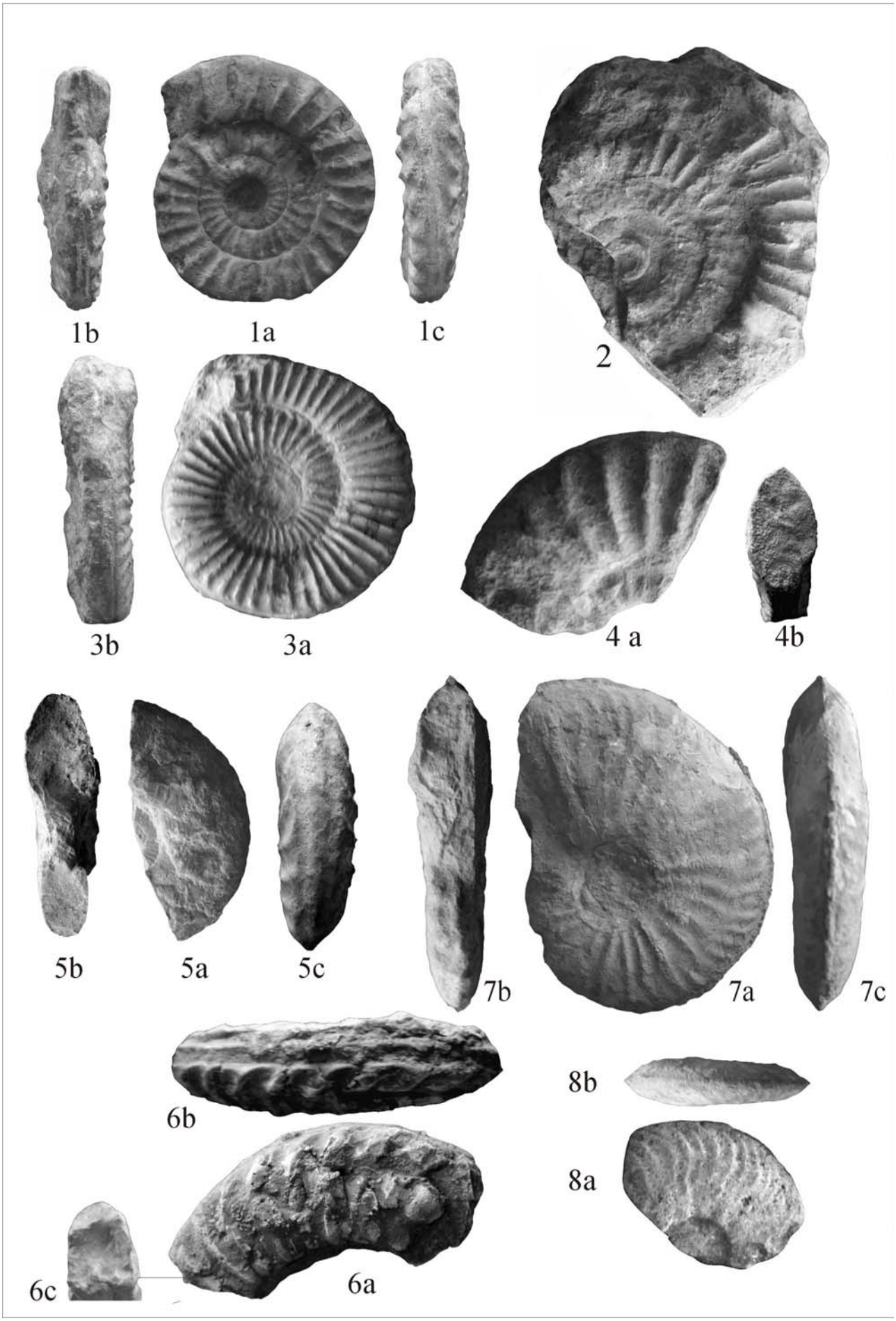

PLATE 3