

**RARĂU SYNCLINE (EASTERN CARPATHIANS, ROMANIA) – REGION TYPE
OF NEW MESOZOIC TAXA AND PARATAXA**

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Abstract

Throughout the decades of research, the Mesozoic fauna of both the par-autochthonous and allochthonous rocks which build the sedimentary infill of the Rarău Syncline has provided holotypes for several taxa/parataxa, which will be recorded in the present paper, followed by several critical annotations.

Keywords: Rarău Syncline, Mesozoic, new taxa and parataxa, inventory.

Introduction

The Rarău Syncline represents a structural unit of the so-called Median Dacides (*sensu* Săndulescu, 1984), developed in the northern part of the Eastern Carpathians.

It has a crystalline basement, a Mesozoic sedimentary infill (topped by the Early Cretaceous wildflysch), and magmatic rocks (known only as allochthonous blocks). Only the Bucovinian (par-autochthonous rocks) and Transylvanian Nappes (allochthonous rocks) occur here. The age of the sedimentary succession in the Bucovinian Nappe ranges from the Early Triassic to the Early Cretaceous, with several sedimentary gaps and facies differences between the flanks. Elements of the Transylvanian Nappes (*sensu* Săndulescu, 1984) were encountered as sedimentary and volcanic klippen of various sizes in the Early Cretaceous wildflysch.

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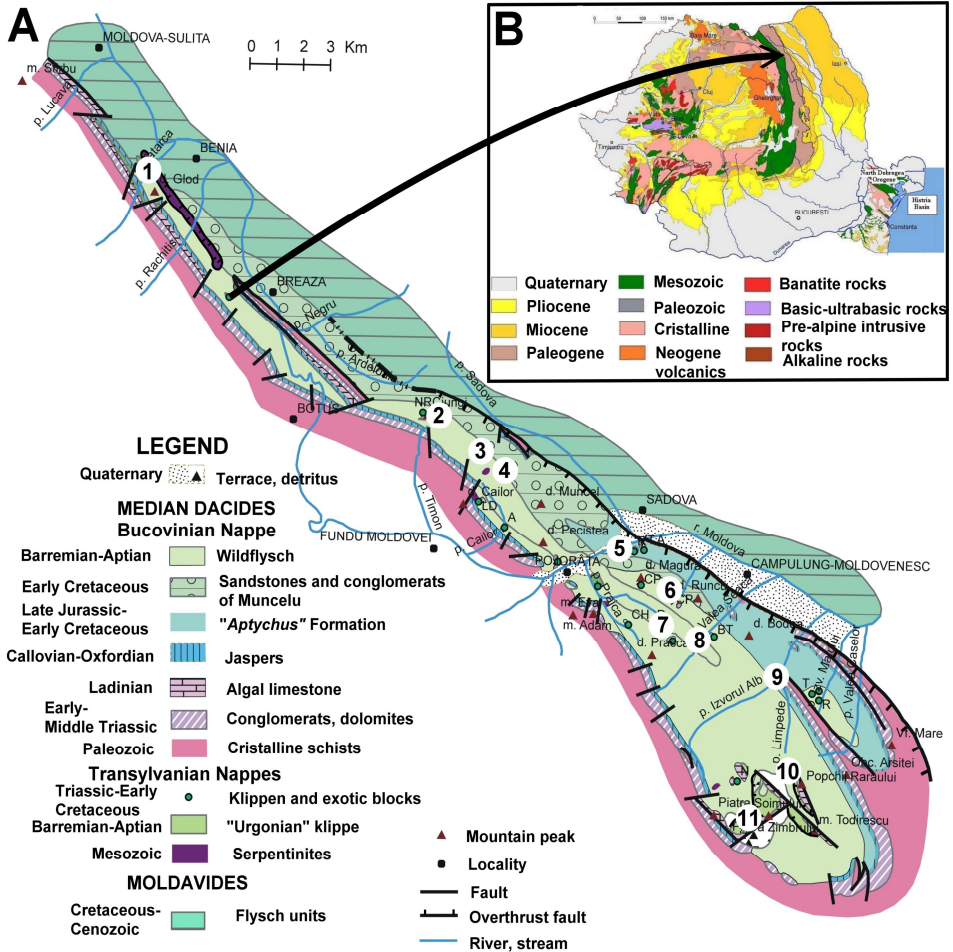


Fig. 1 Geological setting of the Rarău Syncline. A - Geological map of the Rarău Syncline (after Turculeț, 1971) and the main fossiliferous outcrops: 1. Tâtarca stream; 2. Timon klippe - Ciungi, Fundu Moldovei; 3. Măceș hill - Sadova; 4. Pârâul Cailor klippe; 5. „Aptychus” Formation - Pojorâta; 6. Runc hill; 7. Prașca klippe; 8. Valea Seaca stream; 9. Izvorul Alb stream; 10. Rarău Plateau. 11. Piatra Zimbrului. B - Geological map of Romania.

Historical overview of the paleontological research

Starting with the second half of the 19th century, the paleontological valences of the Mesozoic rocks from the Rarău Syncline were emphasized by the geologists from the famous “geological school of Vienna”: Paul (1874, 1876-fide Turculeț, 1971); Walter

(1876 - fide Turculeț, 1971); Mojsisovics (1874, 1879, 1882, 1893). At the beginning of the next century, Uhlig (1900, 1910), Volz (1903), Trauth (1906), Arthaber (1906), Merhart (1910) and Kittl (1912) added new valuable data on fossil fauna. Several Romanian researchers such as Filipescu and Dragastan (1963), Popescu and Patruțiu (1964), Patruțiu (1965), Mutihac (1968, 1969), Turculeț (a series of papers written starting with 1964), Stănoiu (1966, 1967) etc. have also outlined the outstanding paleontological heritage of the Rarău Syncline. Furthermore, the Polish researcher Elżbieta Morycowa (1971) has advanced new data regarding the corals.

New taxa and parataxa described

Specimens of algae, foraminifera, poriferans, cnidarians, cephalopods, aptychi, gastropods, bivalves and brachiopods have been selected as holotypes for the description of new species/subspecies and para-species/para-subspecies. Moreover, as a result of the studies performed on several fossil taxa from the Rarău Syncline, new genera and subgenera /para-genera and para-subgenera were established. By summarizing the data, tens of new genera/subgenera and species/subspecies were described during the decades of research. These taxa will be pointed out further on.

The **fossil algae** of the Rarău Syncline rocks were not a favorite issue for researchers. Until now, five new subspecies have been described from the Sinemurian red limestones of the Prașca Peak Klippe (Transylvanian Nappes), namely *Globochaete alpina carpathica* TURCULEȚ, 1968; *G. alpina rumana* TURCULEȚ, 1968; *G. alpina eotrixana* TURCULEȚ, 1968; *G. alpina bucovinica* TURCULEȚ, 1968, and *G. alpina tumido-punctata* TURCULEȚ, 1968 (tab. 2). Currently, *Globochaete* is considered a planktonic single-cell green alga (Skompski, 1982, in Flügel, 2004), being common in open-marine pelagic environments, but could be also present in shallow-marine waters. No paper resumes the study of the mentioned subspecies in their *stratum typicum*, and no data regarding other areas were encountered in the relevant scientific papers. The holotypes are stored in the Museum of Paleontology and Stratigraphy within the Department of Geology at the “Alexandru Ioan Cuza” University of Iași (<http://www.iasigeology.go.ro/museum.html>).

Only one species of foraminifer, *Turrispirillina carpatho-rumana*, was described by Turculeț (1970), and later legitimized by several researchers (e.g. Quilty, 1990; Senowbari-Daryan and Flügel, 1996).

The holotype comes from the Late Triassic (Sevatian) limestones of the Timon/Timen Klippe – Ciungi (Fundu Moldovei), and it is hosted in the museum mentioned above.

Poriferans are not very abundant in the Rarău Syncline, but a new species of the genus *Chaetetopsis* (actually included in the class *Demospongiae*), namely *C. zonata*, was proposed by Patruțiu (1965). It is a genus with a basal calcareous skeleton which bears preserved spicule remains (the so-called “coralline sponge”). *Chaetetopsis zonata* was described from the Early Cretaceous limestone of Valea Seacă and the Runc hill, being later mentioned in other areas as well (“Soviet” Carpathians – Chernov and Yanin, 1979; Aliman-Dobrogea – Dragastan, 1999 etc.).

Fossil cnidarians (colonial corals) are commonly recorded in the Mesozoic klippen and exotic blocks of the Early Cretaceous wildflysch, but they cannot be observed in properly-exposed patch reefs. Several authors, such as Volz (1903) and Morycowa (1971),

have emphasized the taxonomical importance of the coral fauna from the Rarău Syncline. The corals belong to *Zoantharia – Scleractinia* and *Octocoralia – Alcyonida*.

Volz (1903) described nine new species (tab. 2), Early Cretaceous in age, from the Izvorul Alb, Valea Seacă and Izvorul Malului streams, and the Rarău Plateau.

Volz's paper played a very important role in the evolution of coral studies, despite the fact that the type material formerly held at Muzeum Geologiczne im. Henryka Teissyere, Institut Nauk Geologicznych Uniwersitetu Wroclawskiego in Wroclaw seems to have been almost completely destroyed during the Second World War (Löser, 2006 – after a personal communication by Pacholska; Löser and Saldaña-Villodre, 2008). The loss of the holotypes rendered the determinations difficult, but the species are generally valid and they were later encountered in different areas of the world (Romania, Poland, Serbia, Spain, Mexico, Afghanistan etc.).

Morycowa (1971) also published an important paper on the corals collected by Patruilius from the Early Cretaceous rocks of the Rarău Syncline. The author encountered several of Volz's species, but also described four new genera (*Pseudomyriophyllia*, *Hidnophoromeandraraea*, *Trochoidomeandra*, and *Pseudopolytremacis* – tab. 1) and 22 new species/subspecies (tab. 2) from the Izvorul Alb and Valea Seacă streams, the Rarău Plateau and Pietrele Albe. Generally, the taxa were largely adopted by paleontologists, being cited in many parts of the world. Recently, several specimens of the coral species from the Rarău Syncline have been mentioned by Turculeț (2004a).

Molluscans are the most abundant fossils, especially in the allochthonous rocks of the Transylvanian Nappes, but can also be encountered currently in the par-autochthonous deposits of the Bucovinian Nappe.

Nautiloids have been quoted mainly in Triassic deposits (Turculeț, 1980, 1986), but they also appear scarcely in the Early Jurassic (Turculeț, 1971; Țibuleac, 2009a,b). Only one new subspecies from the Norian of the Timon Klippe-Ciungi (Fundu Moldovei), namely *Grypoceras mesodicum subsulcatum*, has been described (Turculeț, 1986).

Ammonoids have been studied extensively throughout the years, but only one new genus and a subgenus have been described from the Rarău Syncline rocks.

Firstly, Mojsisovics (1893) suggested the *Eremites* genus, having as type species *Trachyceras orientale*. A new species was also signaled by Mojsisovics (1882) from the Transylvanian Triassic of the Pârâul Cailor Klippe. The genus was included in Moore's Treatise on Invertebrate Paleontology, Part L (in Arkell et al., 1957), and it has been cited in different part of the world (e.g. Laws, 1982; Hallam and Wignall, 2000).

The new subgenus of *Harpophylloceras*, namely *Bucoviniceras*, was suggested by Turculeț (1970a), who noticed the fact that the species *Harpophylloceras* (or *Juraphyllites*) *bucovinicus* (UHLIG, 1900) displays features that intermediate between the *Harpophylloceras*, *Meneghiniceras*, and *Juraphyllites* genera. Uhlig's species being quite strange and rare, the validity of the subgenus was not disputed until now.

The newly-described ammonoid species of Triassic and Early Jurassic age are more numerous (tab. 2).

From the Triassic, Mojsisovics (1882) described several new prolecanitids and ceratitids (from the Pârâul Cailor Klippe), more frequently cited in the papers being *Sageceras walteri*, (e.g. Tratzberg, Austria – Tatzreiter, 1986; Cataloi, Dobrogea – Turculeț, 2009). *Trachyceras* (= *Eremites*) *orientale* and *Trachyceras* (*Protrachyceras*) *rudolphi* are quite

rarely recorded in Triassic rocks. Several authors adopted the point of view of Simionescu, who considered *S. walteri* synonymous with its relative *S. haindingeri* HAUER.

A new subspecies from the “*Trachyceras* aon rocks of Pojorâta”, *Clionites catharinae bucovinensis*, was suggested by Simionescu (1913) in comparison with *C. catharinae* MOJSISOVICS. The description was part of a paper on the Triassic ammonoids from Agighiol (Dobrogea). The holotype is stored in the Museum of Paleontology and Stratigraphy within the Department of Geology of the “Alexandru Ioan Cuza” University of Iași.

Subsequently, Turculeț (2000a) selected specimens for two new species – *Paratibetites carpathicus* and *Halorites excentricus* – from the Timon Klippe (tab. 2), which are also stored in the same Museum of Paleontology and Stratigraphy. *Paratibetites carpathicus* is of special interest, since it constitutes evidence for the connection between Carpathian and Himalayan areas at the Norian stratigraphic level.

Uhlig (1900) described five new ammonite species (tab. 2) from the Sinemurian of the Prașca Klippe (Transylvanian Nappe). As mentioned above, “*Rhacophyllites*” (= *Harpophylloceras* or *Juraphyllites*) *bucovinicus* requires special attention regarding its morphological convergences with *Harpophylloceras eximius*, *Meneghiniceras lariense* and *Juraphyllites mimatensis*. The other four species belong to the *Paltechioceras* genus, the most widely quoted being *Paltechioceras romanicus*. Several authors (e.g. Blau, 1998) considered the other *Paltechioceras* species (*P. waehneri*, *P. boesei* and *P. herbichi*) synonymous with *P. romanicus*. The main part of Uhlig’s collection from the Prașca Klippe is stored in the Museum of Geological Survey of Austria (Vienna).

A new species of *Leioceras* (*L. giganteum*) was described by Turculeț (1982) from the Aalenian blocks found near the Pojorâta village (Transylvanian Nappes). It was described based on a single large specimen that preserves only the body chamber and, consequently, the validity of the taxon is not very precise. The specimen is hosted in the Museum of Paleontology and Stratigraphy within the Department of Geology of the “Alexandru Ioan Cuza” University of Iași.

Throughout the past four decades, new para-subgenera, para-species and para-subspecies of **aptychi** were described by Turculeț in a series of papers. Syntheses of the latter were published during the last part of that period (Turculeț, 1994; Turculeț, 2000). Thus, Turculeț (1994) suggested four new para-subgenera for *Lamellaptychus*, following the basic arrangements of the ribs as in the types of Trauth and Gasiorowsky: *Beyrichilamellaptychus*, *Lamellosuslamellaptychus*, *Thorolamellaptychus* and *Didayilamellaptychus*. Moreover, Turculeț and Avram (1994-1995) used the name *Beyrichipunctaptychus* for several species of punctaptychi with trajectories of the ribs similar to those in *Beyrichilamellaptychus*. This proposal represents “a new stage in the classification of aptychi” (Méchová et al., 2010), and several authors embraced it (with a series of additions and changes), trying to adopt and improve a new systematics of the aptychi (Méchová et al., 2010).

Turculeț (1964, 1971, 1973, 1989, 1992-1993, and 2000) also described 12 new para-species and para-subspecies from the so-called “*Aptychus*” Formation of the Rarău Syncline (tab. 2), several para-taxa being encountered in different regions of the Alpine chain.

Gastropods provided holotypes for two new taxa: *Turbo* (= *Werfenella*) *rectecostatus altograndis* (Turculeț, 1987) from the Early Triassic of the Runc Klippe, and *Brouzetia*

carpathica (Turculeț, 2004) from the Barremian-Aptian wildflysch; no records of these two species have been cited in other regions until now.

Bivalves are equally common molluscans in the Mesozoic rocks of the Rarău Syncline.

The *Daonella* genus proved a reliable biostratigraphic value for the Middle Triassic, but its systematics seems to be incoherent (Schatz, 2004) because of incomplete specimens, descriptions on poorly-preserved records or juvenile material, the absence of taphonomical observations and lithological context etc. An important step was Turculeț's proposal for the five new subgenera of *Daonella* (*Mousonella*, *Grabella*, *Arzelella*, *Loemelella* and *Pichlerella*). This proposal (Turculeț, 1972) emerged as a result of the studies performed on the daonellids from the klippen of Pârâul Cailor, Piatra Șoimului, Piatra Zimbrului and Izvorul Malului stream. These subgenera were largely adopted by researchers, several recent studies (e.g. Schatz, 2001a, 2001b, 2004) trying to elucidate the synonymies between the numerous species. *Daonella* (*Pichlerella*) *pauli* MOJSISOVICS, 1874, and *D.* (*Pichlerella*) *pichleri minima* TURCULEȚ, 2004, two taxa described from the Pârâul Cailor stream, belong most probably to *Daonella* (*Pichlerella*) *pichleri* GÜMBEL, 1873.

Kittl (1912) described two species of *Halobia* from the Izvorul Malului stream, namely *H. bukowinensis* and *H. ocevjana*, which were rarely quoted in the literature; Turculeț (1971, 1990, 2004a,) also suggested several new bivalve taxa (tab. 2) from Runc hill (*Bakevellia bucovinensis*), Pârâul Cailor (*Leptochondria bucovinensis*) and Timon stream (*Monotis haueri convexa*, *M. haueri semistriata*), all the fossiliferous points representing klippen of the allochthonous Transylvanian Nappes; and also from Bucovinian par-autochthonous rocks (Tâtarca stream), Turculeț (1998) proposed two subspecies, respectively *Entolium demissum postplicatum* and *E. demissum semistriatum*.

Using the same reasoning as in the *Daonella* case, and based on the fossil records from the Rarău Syncline, Turculeț adopted the same sub-genera separation for the halobiids and monotids (tab. 1): *Dispersehalobia*, *Styrihalobia*, *Austrihalobia*, *Carlyhalobia*, *Halorihalobia*, *Norihalobia*, *Salihalobia*, *Radihalobia*, and *Rugohalobia* (Turculeț, 2002), and *Scutimonotis*, *Ochotimonotis*, *Zabaikalimonotis*, and *Salimonotis* (Turculeț, 2005), respectively. The bivalves collected throughout time by Turculeț are stored in the same museum of the "Alexandru Ioan Cuza" University of Iași mentioned above.

In addition to the newly-described bivalve taxa, it should be mentioned that no ontogenetic observations were made on the morphological changes, the specimens being sometimes incomplete or poorly-preserved. Consequently, the newly-named taxa could be affected by future taxonomical revisions as part of this dynamic process which is the systematics of fossil fauna.

Brachiopods were encountered at different levels of the Mesozoic, but only one new species has been suggested since 1900, namely *Spiriferina aequilobata* UHLIG, 1900, from the Sinemurian of the Prașca Klippe. A pedicle valve of this species seems to have been found in the same area (Țibuleac, 2009b).

Conclusions

The Mesozoic sedimentary rocks of the Rarău Syncline provided rich and attractive Mesozoic fauna. Throughout the decades of research, foreign and Romanian paleontologists have selected specimens as holotypes for tens of species-subspecies/para-species, and, consequently, as type species for new genera/para-genera. Given their

importance, several outcrops are protected by law (Pârâul Cailor, the “Aptychus” Formation at Pojorâta), and many others were suggested for protection (Timon Klippe, Runc hill, Piatra Zimbrului, the Prașca klippen, the Tâtarca stream etc.).

Future taxonomical revisions could affect the assignment of the new taxa and para-taxa from the Mesozoic sedimentary rocks of the Rarău Syncline as well future research could enlarge the amount of newly-described taxa. The present paper represents an inventory of different stages in the knowledge of the fossil fauna from the Rarău Syncline and in paleontological research, in general.

Acknowledgements

The corresponding author wishes to thank Dr. Eugen Grădinaru (University of Bucharest) for his critical review of the manuscript, which helped improve an earlier version of the present paper.

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Received November, 2010

Revised: December, 2010

Accepted: December, 2010

Tab. 1 New genera and subgenera described from the Mesozoic sedimentary rocks of the Rarău Syncline

Nr. crt.	New genera and subgenera	Author/ Year	General systematics	Type species/subspecies	Age
1	<i>Pseudomyriophyllia</i>	Morycowa, 1971	<i>Anthozoa, Zoantharia, Scleractinia</i>	<i>Pseudomyriophyllia carpathica</i> nov. sp. MORYCOWA 1971	Early Cretaceous
2	<i>Hydnophoromeandraraea</i>	Morycowa, 1971	Idem	<i>Hydnophoromeandraraea volzi</i> nov. sp. MORYCOWA, 1971	Idem
3	<i>Trochoidomeandra</i>	Morycowa, 1971	Idem	<i>Trochoidomeandra problematica</i> nov. sp. MORYCOWA, 1971	Idem
4	<i>Pseudopolytremacis</i>	Morycowa, 1971	<i>Anthozoa, Octocorallia, Alcyonida</i>	<i>Pseudopolytremacis spinoseptata</i> nov. sp. MORYCOWA, 1971	Idem
5	<i>Eremites</i>	Mojsisovics 1893	<i>Cephalopoda, Ammonoidea, Ceratitida</i>	<i>Trachyceras orientale</i> MOJSISOVICS, 1882	Ladinian-Carnian
6	<i>Harpophylloceras (Bucoviniceras)</i>	Turculeț, 1970	<i>Cephalopoda, Ammonoidea, Phylloceratida</i>	<i>Harpophylloceras bucovinicus</i> (UHLIG, 1900)	Sinemurian
7	<i>Lamellaptychus (Beyrichilamellaptychus)</i>	Turculeț, 1994	<i>Cephalopoda, Ammonoidea, Aptychi</i>	<i>Aptychus beyrichi</i> OPPEL, 1865	Middle Jurassic–Early Cretaceous
8	<i>Lamellaptychus (Lamellosulamellaptychus)</i>	Turculeț, 1994	Idem	<i>Trigonellites lamellosus</i> PARKINSON 1811	Idem
9	<i>Lamellaptychus (Thorolamellaptychus)</i>	Turculeț, 1994	Idem	<i>Aptychus Thoro</i> OPPEL, 1863	Idem
10	<i>Lamellaptychus (Didayilamellaptychus)</i>	Turculeț, 1994	Idem	<i>Aptychus Didayi</i> COQUAND, 1841	Idem
11	<i>Punctaptychus (Beyrichipunctaptychus)</i>	Turculeț and Avram, 1995	Idem	<i>Aptychus punctatus</i> VOLTZ, 1837;	Late Jurassic
12	<i>Daonella (Mousonella)</i>	Turculeț, 1972	<i>Bivalvia Pteriomorpha</i>	<i>D. mousoni</i> (MÉRIANI, 1853)	Triassic
13	<i>Daonella (Grabella)</i>	Turculeț, 1972	Idem	<i>D. grabensis</i> KITTL, 1912	Idem
14	<i>Daonella (Arzelella)</i>	Turculeț, 1972	Idem	<i>D. arzelensis</i> KITTL, 1912	Idem
15	<i>Daonella (Loemmelella)</i>	Turculeț, 1972	Idem	<i>D. loemmelli</i> (WISSMANN, 1841)	Idem
16	<i>Daonella (Pichlerella)</i>	Turculeț, 1972	Idem	<i>D. pichleri</i> (GÜMBEL, 1873)	Idem

Rarău syncline (Romania) – Region type of new mesozoic taxa and parataxa

Nr. crt.	New genera and subgenera	Author/ Year	General systematics	Type species/subspecies	Age
17	<i>Halobia (Dispersehalobia)</i>	Turculeț, 2002	Idem	<i>H. disperseinsecta</i> KITTL, 1912	Idem
18	<i>Halobia (Styrihalobia)</i>	Turculeț, 2002	Idem	<i>H. styriaca</i> (MOJSISOVICS, 1874)	Idem
19	<i>Halobia (Austrihalobia)</i>	Turculeț, 2002	Idem	<i>H. austriaca</i> MOJSISOVICS, 1874	Idem
20	<i>Halobia (Carlyhalobia)</i>	Turculeț, 2002	Idem	<i>H. carlyana</i> MOJSISOVICS, 1874	Idem
21	<i>Halobia (Halorihalobia)</i>	Turculeț, 2002	Idem	<i>H. halorica</i> MOJSISOVICS, 1874	Idem
22	<i>Halobia (Norihalobia)</i>	Turculeț, 2002	Idem	<i>H. norica</i> MOJSISOVICS, 1874	Idem
23	<i>Halobia (Salihalobia)</i>	Turculeț, 2002	Idem	<i>H. salinarium</i> (BRONN, 1830)	Idem
24	<i>Halobia (Radihalobia)</i>	Turculeț, 2002	Idem	<i>H. radiata</i> MOJSISOVICS, 1874	Idem
25	<i>Halobia (Rugohalobia)</i>	Turculeț, 2002	Idem	<i>H. rugosa</i> GÜMBEL, 1861	Idem
26	<i>Monotis (Scutimonotis)</i>	Turculeț, 2004	Idem	<i>M. scutiformis</i> (TELLER, 1886)	Idem
27	<i>Monotis (Ochotimonotis)</i>	Turculeț, 2004	Idem	<i>M. ochotica</i> (KERYSERLING, 1848)	Idem
28	<i>Monotis (Zabaikalimonotis)</i>	Turculeț, 2004	Idem	<i>M. zabaikalica</i> (KIPARISOVA, 1932)	Idem
29	<i>Monotis (Salimonotis)</i>	Turculeț, 2004	Idem	<i>M. salinaria</i> (SCHLOTHEIM, 1820)	Idem

Tab. 2 New species and subspecies described from the Mesozoic sedimentary rocks of the Rarău Syncline

Nr. crt.	Names of new taxa and parataxa	Author/ Year	Systematics	Locus typicus	Age
1	<i>Globochaete alpina carpathica</i>	Turculeț, 1968	<i>Incertae sedis</i>	Prașca Klippe	Sinemurian
2	<i>G. alpina rumana</i>	Turculeț, 1968	<i>Incertae sedis</i>	Prașca Klippe	Sinemurian
3	<i>G. alpina eotrixana</i>	Turculeț, 1968	<i>Incertae sedis</i>	Prașca Klippe	Sinemurian
4	<i>G. alpina bucovinica</i>	Turculeț, 1968	<i>Incertae sedis</i>	Prașca Klippe	Sinemurian
5	<i>G. alpina tumido-punctata</i>	Turculeț, 1968	<i>Incertae sedis</i>	Prașca Klippe	Sinemurian
6	<i>Turrspirillina carpatho-rumana</i>	Turculeț, 1970	<i>Foraminiferea, Spirillinida</i>	Timon Klippe, Ciungi - Fundu Moldovei	Norian (Sevatian)
7	<i>Chaetetopsis zonata</i>	Patrulius, 1965	<i>Porifera Demospongea</i>	Valea Seacă stream and Runc hill	Early Cretaceous
8	<i>Cyathphora pygmaea</i>	Volz, 1903	<i>Anthozoa, Zoantharia, Scleractinia</i>	Izvorul Alb stream	Early Cretaceous
9	<i>Pseudocoenia annae</i>	Volz, 1903	Idem	Rarău Plateau	Idem
10	<i>Holocystis bukowinensis</i>	Volz, 1903	Idem	Izvorul Alb stream	Idem
11	<i>Stylina parvistella</i>	Volz, 1903	Idem	Valea Seacă stream	Idem
12	<i>Acanthocoenia neocomiensis</i>	Volz, 1903	Idem	Runc hill	Idem
13	<i>Cryptocoenia irregularis</i>	Volz, 1903	Idem	Izvorul Alb stream	Idem
14	<i>Placocoenia uhligi</i>	Volz, 1903	Idem	Valea Seacă stream	Idem
15	<i>Placocoenia decamera</i>	Volz, 1903	Idem	Izvorul Malului stream	Idem
16	<i>Diplocoenia hegyesina</i>	Volz, 1903	Idem	Culmea Hăghinișului - Rarău Plateau	Idem
17	<i>Heliocoenia rarauensis</i>	Morycowa, 1971	Idem	Rarău Plateau	Idem
18	<i>Heliocoenia triradiata</i>	Morycowa, 1971	Idem	Rarău Plateau	Idem
19	<i>Heterocoenia minima</i>	Morycowa, 1971	Idem	Izvorul Alb stream	Idem
20	<i>Dimorphocoenia izvoralbensis</i>	Morycowa, 1971	Idem	Idem	Idem
21	<i>Pseudomyriophyllia carpathica</i>	Morycowa, 1971	Idem	Idem	Idem

Rarău syncline (Romania) – Region type of new mesozoic taxa and parataxa

Nr. crt.	Names of new taxa and parataxa	Author/ Year	Systematics	Locus typicus	Age
22	<i>Amphiastraea rarauensis</i>	Morycowa, 1971	Idem	Idem	Idem
23	<i>Thamnasteria pseudopaliformis</i>	Morycowa, 1971	Idem	Idem	Idem
24	<i>Thamnoseris carpathica</i>	Morycowa, 1971	Idem	Idem	Idem
25	<i>Mesomorpha ornata</i>	Morycowa, 1971	Idem	Idem	Idem
26	<i>Fungiastraea(Fungiastraeopsis) subpolygonalis</i>	Morycowa, 1971	Idem	Izvorul Alb and Valea Seacă streams	Idem
27	<i>Siderastraea senecta</i>	Morycowa, 1971	Idem	Izvorul Alb stream	Idem
28	<i>Meandraraea meandriiformis</i>	Morycowa, 1971	Idem	Valea Seacă stream	Idem
29	<i>Hydnophoromeandraraea volzi</i>	Morycowa, 1971	Idem	Izvorul Alb stream	Idem
30	<i>Actinaraea tenuis</i>	Morycowa, 1971	Idem	Valea Seacă stream	Idem
31	<i>Trochoidomeandra problematica</i>		Idem	Izvorul Alb stream	Idem
32	<i>Columncoenia ksiazkiewiczzi bucovinensis</i>	Morycowa, 1971	Idem	Idem	Idem
33	<i>Diplocoenia saltensis major</i>	Morycowa, 1971	Idem	Idem	Idem
34	<i>Diplogyra lamellosa eguchii</i>	Morycowa, 1971	Idem	Pietrele Albe	Idem
35	<i>Felixigyra patruliusi patruliusi</i>	Morycowa, 1971	Idem	Izvorul Alb stream	Idem
36	<i>Felixigyra patruliusi tenuiseptata</i>		Idem	Idem	Idem
37	<i>Actinastraea pseudominima major</i>	Morycowa, 1971	Idem	Idem	Idem
38	<i>Pseudopolytremacis spinoseptata</i>	Morycowa, 1971	<i>Anthozoa, Octocorallia, Alcyonida</i>	Idem	Idem
39	<i>Grypoceras mesodicum subsulcatum</i>	Turculeț, 1986	<i>Cephalopoda, Nautiloidea, Prolecanitida</i>	Timon Klippe, Ciungi –F. Moldovei	Norian
40	<i>Sageceras carpathicum</i>	Mojsisovics, 1879	<i>Cephalopoda, Ammonoidea, Prolecanitida</i>	Pârâul Cailor Klippe	Ladinian
41	<i>Sageceras walteri</i>	Mojsisovics, 1882	<i>Idem</i>	Pârâul Cailor Klippe	Ladinian

Nr. crt.	Names of new taxa and parataxa	Author/ Year	Systematics	Locus typicus	Age
42	<i>Trachyceras (Protrachyceras) rudolphi</i>	Mojsisovics, 1882	<i>Cephalopoda, Ammonoidea, Ceratitida</i>	Pârâul Cailor Klippe	Ladinian
43	<i>Trachyceras (=Eremites) orientale</i>	Mojsisovics, 1882	Idem	Pârâul Cailor Klippe	Ladinian-Carnian
44	<i>Paratibetites carpathicus</i>	Turculeț, 2000	Idem	Timon Klippe, Ciungi (Fundu Moldovei)	Norian
45	<i>Halorites excentricus</i>	Turculeț, 2000	Idem	Timon Klippe, Ciungi (Fundu Moldovei)	Norian
46	<i>Arcestes (Proarcestes) reyeri</i>	Mojsisovics, 1882	Idem	Pârâul Cailor Klippe	Carnian
47	<i>Harpophylloceras (Bucovinicerus) bucovinicus</i>	Uhlig, 1900	<i>Cephalopoda, Ammonoidea, Phylloceratida</i>	Prașca Klippe	Sinemurian
48	<i>Paltechioceras romanicus</i>	Uhlig, 1900	<i>Cephalopoda, Ammonoidea, Ammonitida</i>	Prașca Klippe	Sinemurian
49	<i>Paltechioceras wahneri</i>	Uhlig, 1900	Idem	Prașca Klippe	Sinemurian
50	<i>Paltechioceras herbichi</i>	Uhlig, 1900	Idem	Prașca Klippe	Sinemurian
51	<i>Paltechioceras boesei</i>	Uhlig, 1900	Idem	Prașca Klippe	Sinemurian
52	<i>Leioceras giganteum</i>	Turculeț, 1982	Idem	Pojorâta	Aalenian
53	<i>Lamellaptychus (Beyrichiamellaptychus) raraui</i>	Turculeț, 1964	<i>Cephalopoda Ammonoidea, Aptychi</i>	Valea Seacă stream	Kimmeridgian - Tithonian
54	<i>Lamellaptychus (Beyrichiamellaptychus) carpathicus</i>	Turculeț, 1964	Idem	Valea Seacă stream	Kimmeridgian - Tithonian
55	<i>Lamellaptychus (Beyrichiamellaptychus) curtus macarovicii</i>	Turculeț, 1964	Idem	Izvorul Alb stream	Late Oxfordian
56	<i>Lamellaptychus (Beyrichiamellaptychus) praecuneiformis</i>	Turculeț, 1973	Idem	Izvorul Alb stream	Early Malm
57	<i>Lamellaptychus (Beyrichiamellaptychus) beyrichi pseudoundocostatus</i>	Turculeț, 1973	Idem	Valea Seacă stream	Kimmeridgian - Tithonian
58	<i>Lamellaptychus (Thorolamellaptychus) cinctus</i>	Turculeț, 1964	Idem	Valea Seacă stream	Kimmeridgian - Tithonian
59	<i>Punctaptychus (Beyrichipunctaptychus) pseudocinctus</i>	Turculeț, 1971	Idem	Pojorâta	Kimmeridgian - Tithonian

Rarău syncline (Romania) – Region type of new mesozoic taxa and parataxa

Nr. crt.	Names of new taxa and parataxa	Author/ Year	Systematics	Locus typicus	Age
60	<i>Punctaptychus</i> (<i>Beyrichipunctaptychus</i>) <i>punctatus undocostatus</i>	Turculeț, 1964	Idem	Valea Seacă stream	Kimmeridgi- an - Tithonian
61	<i>Punctaptychus</i> (<i>Beyrichipunctaptychus</i>) <i>punctatus carpathicus</i>	Turculeț, 1992	Idem	Măgura hill, Pojorâta	Tithonian
62	<i>Punctaptychus</i> (<i>Beyrichipunctaptychus</i>) <i>monsalvensis divergens</i>	Turculeț, 1989	Idem	Valea Seacă stream	Kimmerid- gian
63	<i>Punctaptychus</i> (<i>Beyrichipunctaptychus</i>) <i>monsalvensis fracto-divergens</i>	Turculeț, 1989	Idem	Valea Seacă stream	Kimmerid- gian
64	<i>Punctaptychus</i> (<i>Beyrichipunctaptychus</i>) <i>monsalvensis longus</i>	Turculeț, 2000	Idem	Muncelu hill, Pojorâta	Kimmeridgi- an - Tithonian
65	<i>Turbo</i> (<i>Werfenella</i>) <i>rectecostatus altograndis</i>	Turculeț, 1987	<i>Gastropoda</i>	Klippe of Runc hill	“Campilian”
66	<i>Brouzetia carpathica</i>	Turculeț, 2004	Idem	Izvorul Alb stream, wildflisch	Barremian- Aptian
67	<i>Daonella</i> (<i>Pichlerella</i>) <i>pauli</i>	Mojsisovics, 1874	<i>Bivalvia</i> <i>Pteriomorphia</i>	Pârâul Cailor Klippe	Ladinian - Carnian
68	<i>Daonella</i> (<i>Pichlerella</i>) <i>pichleri minima</i>	Turculeț, 2004	Idem	Pârâul Cailor Klippe	Ladinian
69	<i>Halobia</i> (<i>Austrihalobia</i>) <i>bukowinensis</i>	Kittl, 1912	Idem	Izvorul Malului stream	Carnian
70	<i>Halobia</i> (<i>Rugohalobia</i>) <i>ocevjana</i>	Kittl, 1912	Idem	Izvorul Malului stream	Carnian
71	<i>Bakevellia bucovinensis</i>	Turculeț, 1971	Idem	Klippe of Runc hill	“Campilian”
72	<i>Leptochondria bucovinensis</i>	Turculeț, 1990	Idem	Pârâul Cailor	Carnian
73	<i>Entolium demissum</i> <i>postplicatum</i>	Turculeț, 1998	Idem	Tâtarca stream, Breaza	Middle Jurassic
74	<i>Entolium demissum</i> <i>semistriatum</i>	Turculeț, 1998	Idem	Tâtarca stream, Breaza	Middle Jurassic
75	<i>Monotis haueri semistriata</i>	Turculeț, 2004	Idem	Timon Klippe, Ciungi (Fundu Moldovei)	Norian
76	<i>M. haueri convexa</i>	Turculeț, 2004	Idem	Timon Klippe, Ciungi (Fundu Moldovei)	Norian
77	<i>Spiriferina aequilobata</i>	Uhlig, 1900	<i>Brachiopoda</i> , <i>Articulata</i>	Prașca Klippe	Sinemurian