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New records of Norian coiled nautiloids from the Timon Klippe (Rarău Syncline, Eastern Carpathians, Romania)

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Abstract

Nautiloids were cosmopolitan species during the Mesozoic, being well-known from the worldwide realms. They could often be found togheter with the ammonites in the same beds, but the nautiloid fauna is much scarcer in the taxonomic diversification and frequency of records than the ammonites have been documented. Given this general background, on the one hand, and its diversity and particular records, on the other, the Timon Klippe could be regarded as important instance of Late Triassic nautiloids in the Eastern Carpathians. The present paper adds new coiled nautiloid records (*Grypoceras sp. ?G. mesodicum* HYATT, 1883), *Syriongonautilus sp.* (one of the latest occurrences of this genus), *Syringoceras sp., Paranautilus simonyi* (HAUER, 1849), and *Proclydonautilus sp.* (specimen with intermediate features between several *Proclydonautilus* species) to the previously-known fauna.

Keywords: Late Triassic, coiled nautiloids, previous and new records.

Introduction

The Triassic nautiloid fauna is mostly a continuation of Late Paleozoic evolutionary trends, the following lineages having been distinguished: Liroceratidae-(Paranautilidae in Kummel, 1959)-Clydonautilidae-(Gonionautilidae)-Siberionautilidae, Tainoceratidae, and Grypoceratidae-Syringonautilidae, respectively (Kummel, 1959). Dzik (1984) suggested several interesting modifications to the systematics of Triassic nautiloids. His point of view may be validated or not in the future, pending the collection of more specimens.

The dynamics of genera development in the Boreal Realm suggested two major phases (Sobolev, 1994), which could be extended worldwide. The first is the Early and Middle Triassic interval, characterized by the dominance of the Tainoceratidae, Grypoceratidae and Liroceratidae families, and the second covers the Late Triassic, when, together with the previously-mentioned taxa, the typical Triassic families (e.g. Cydonautilidae), along with the only lineage (Nautilidae) to survive the mass extinction at the end of the Triassic, occurred.

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The Rhaetian stage should be regarded as a third phase, given that the nautiloids decreased drastically in diversity and frequency within the marine fauna. The theory according to which Rhaetian seas were devoid of nautiloids, with the exception of the evolutionary lineage which gave rise to Early Jurassic cenoceratids (Kummel, 1953; Teichert and Matsumoto, 1987; Teichert, 1988 etc., *fide* Engeser and Reitner, 1992) was questioned by Dzik (1984, pp. 177) and invalidated by Engeser and Reitner (1992). The latter authors outlined several previous records of different lineages in the Rhaetian (the Grypoceratidae and Tainoceratidae families), even if the specimens were neither accurately described, nor illustrated (Gümbel, 1861 and Mojsisovics, 1873; Muller, 1934, and Kozur, 1980, *fide* Engeser and Reitner, 1992), and proposed a new species – *Grypoceras rhaeticum* – from the Fonsjoch section (NE of Innsbruck, Austria). In the Rhaetian rocks of the Boreal Realm, Sobolev (1989, 1994) also introduced *Grypoceras* (initially *Germanonautilus?*) *bytschkovi*.

Historical approach of nautiloid-based research in the Rarău Syncline

In the Rarău Syncline, nautiloids were first recorded by Mojsisovics (1882), who quoted *Orthoceras (= Virgoceras/Trematoceras) politum* (KLIPSTEIN, 1843/McCOY, 1851), and *Nautilus sp.* from the limestone of the Dealul Cailor Klippe. Later, Simionescu (1913, pp. 17) assigned the last taxon to *Syryngonautilus zinae* (AIRAGHI, 1902).

Mutihac (1968), Turculeţ and Bosancu Poptămaş (1979), and Turculeţ (1980, 1986, 2004) added new nautiloids, generally describing orthoceratid and coiled nautiloid taxa from the following three areas: the Dealul Cailor – Pârâul Cailor klippen (Ladinian-Carnian), the Măcieş Hill klippen (Carnian up to Norian), and the Timon Klippe (Norian). Orthoceratid specimens seem to be more frequent, being represented, in the Timon and Dealul Cailor – Pârâul Cailor klippen, by the Orthoceratinae and Michelinoceratinae subfamilies *sensu* Kummel, 1953. Coiled nautiloids are listed as taxa belonging to all of the three Triassic lineages (Kummel, 1959). More varied are the groups of Grypoceratidae-Syringonautilidae, and Liroceratidae-Clydonautilidae-(Gonionautilidae), respectively. The Tainoceratidae family, consisting of the most ornamented Triassic nautiloids, is quoted less frequently.

So far, the Timon Klippe has delivered both the most diverse and the most frequent Triassic nautiloids within the framework of the Rarău Syncline (Tab. 1)

Geological framework of the Timon Klippe

The Rarău Syncline is generally made up of autochthonous and allochthonous nappes belonging to the Median Dacides (*sensu* Săndulescu, 1984), or, informally, the Crystalline-Mesozoic zone of the Eastern Carpathians. Either one or two autochthonous nappes are recognized as part of the synclinal framework. The Bucovinian Nappe is the most prevalent, being recognized by all researchers. On the other hand, Săndulescu (1984) delineated the Infrabucovinian Nappes, represented by the Mesozoic outliers occurring north of Sadova, at the contact with the flysch of the Moldavides (initially assigned to the Subbucovinian Nappe by Săndulescu, 1974, 1976). According to Săndulescu, 1984, the allochthonous nappes are represented by the Transylvanides, which are only known through sedimentary and volcanic klippen embedded in the Early Cretaceous Wildflysch of the Bucovinian Nappe.

The Timon Klippe occurs in the northern part of the Rarău Syncline, in the Ciungi–Fundu Moldovei area, located on the left bank of one of the tributaries of Moldova River (Fig. 1) In the literature, even if the locals call the brook the "Timăn," it is known as the Timen klippe (Mutihac, 1968; Turculeţ, 1972c), the Timon – Ciungi klippe (Turculeţ, 1971), the Ciungi klippe (Turculeţ, 1972a,b, 1976b, 1983, 2001), the Timoi (Ciungi) klippe (Săndulescu, 1976), the Timon – Ciungi olistolith (Grădinaru and Sobolev, 2010), or the Timon Klippe (Popescu and Popescu, 2010).

Tab. 1 Nautiloid taxa quoted up to the present moment in the Timon Klippe (Eastern Carpathians, Romania), according to the original papers

No.	Families	Name of taxa	Reference	Age
1	Orthoceratidae	*Orthoceras campanile* (MOJSISOVICS, 1869)	Mutihac (1968)	?Ladinian Carnian-Norian
2		*O. dubium* (HAUER, 1847)	Mutihac (1968)	?Ladinian Carnian-Norian
3		*O. aff. austriacum* (MOJSISOVICS) Inv. nr. MPCO 1790-TT 14	Turculeț (1980)	Norian
4		*Michelinoceras sp.* Inv. nr. MPCO MC 624	Turculeț (2004)	Norian/Sevatian
5	Tainoceratidae	? *Germanonautilus sp.* Inv. nr. MPCO 2211-MC 79	Turculeț (2004)	Norian/Sevatian
6	Grypoceratidae	*Grypoceras mesodicum* (QUENSTEDT-HAUER, 1845/1846) Inv. nr. MPCO 1858-TT 15	Turculeț (1986)	Norian/Sevatian
7		*G. aff. mesodicum* (HAUER), *Grypoceras mesodicum subsulcatum* (TURCULEȚ, 1986) Inv. nr. MPCO 1859-TT 16	Turculeț (1980, 1986)	Norian/Sevatian
8	Syringonautilidae	*Nautilus zinae* (AIRAGHI, 1902)	Mutihac (1968)	?Ladinian Carnian-Norian
9		*Juvavionautilus heterophyllus* (HAUER, 1849) Inv. nr. MPCO 1789-TT 13	Turculeț (1980)	Norian
10		*Juvavionautilus aff. trapezoidalis* (HAUER, 1860) Inv. nr. MPCO 2210-TT 56, 2210-MC 465	Turculeț (2004)	Norian/Sevatian
11	Liroceratidae	*Paranautilus simonyi* (HAUER, 1849) Inv. nr. MPCO 1788-TT 12	Turculeț (1980)	Norian
12	Clydonautilidae	*Clydonautilus (Proclydonautilus) triadicus* (MOJSISOVICS, 1873) Inv. nr. MPCO 1861-TT 25	Turculeț (1986)	Norian/Sevatian
13	Gonionautilidae	*Gonionautilus securis* (DITTMAR, 1866) Inv. nr. MPCO 1861-TT 25	Turculeț (1986)	Norian/Sevatian

Abbreviations: Inv. nr.–Inventory number; MPOC–Museum of Paleontology-Original Collections, University "Alexandru Ioan Cuza" of Iași.

Throughout the present paper, given its frequency in the literature and its ability to singularize (e.g., there is another area called Ciungi, with a fossil Miocene delta, in Neamț County), the phrase "Timon Klippe" will be used. Since the block is supposed to have tectonic contact with the wildflysch, we regard it as a klippe, even it is more or less embedded into the wildflysch mass and the soil.

The Timon Klippe belongs to the Perşani Nappe of the Transylvanides, having been discovered by Mutihac (1966, 1968), who listed the first paleontological data (nautiloids, ammonoids, bivalves and brachiopods), and assigned it a ?Ladinian, Carnian-Norian age.

In several papers (1966-2005, excluding the 1971 monograph), Turculeț focused on different fossil taxa of the klippe: foraminifera (1970b, 1972a, 1972b), brachiopods (1976b, 1984), nautiloids (1980, 1986, 2004), ammonoids (1976a, 1983, 2000, 2001, 2004), bivalves (2004a, b; 2005), outlining the great paleontological significance of the klippe and suggesting it be recognized as a natural

reserve (1970a, 1972c, 1981, 2004).

Iordan (1978, 1993) improved the knowledge of the brachiopod fauna, and Popescu (2008), Grădinaru and Sobolev (2010), Popescu and Popescu (2010) added the most recent data on the klippe.

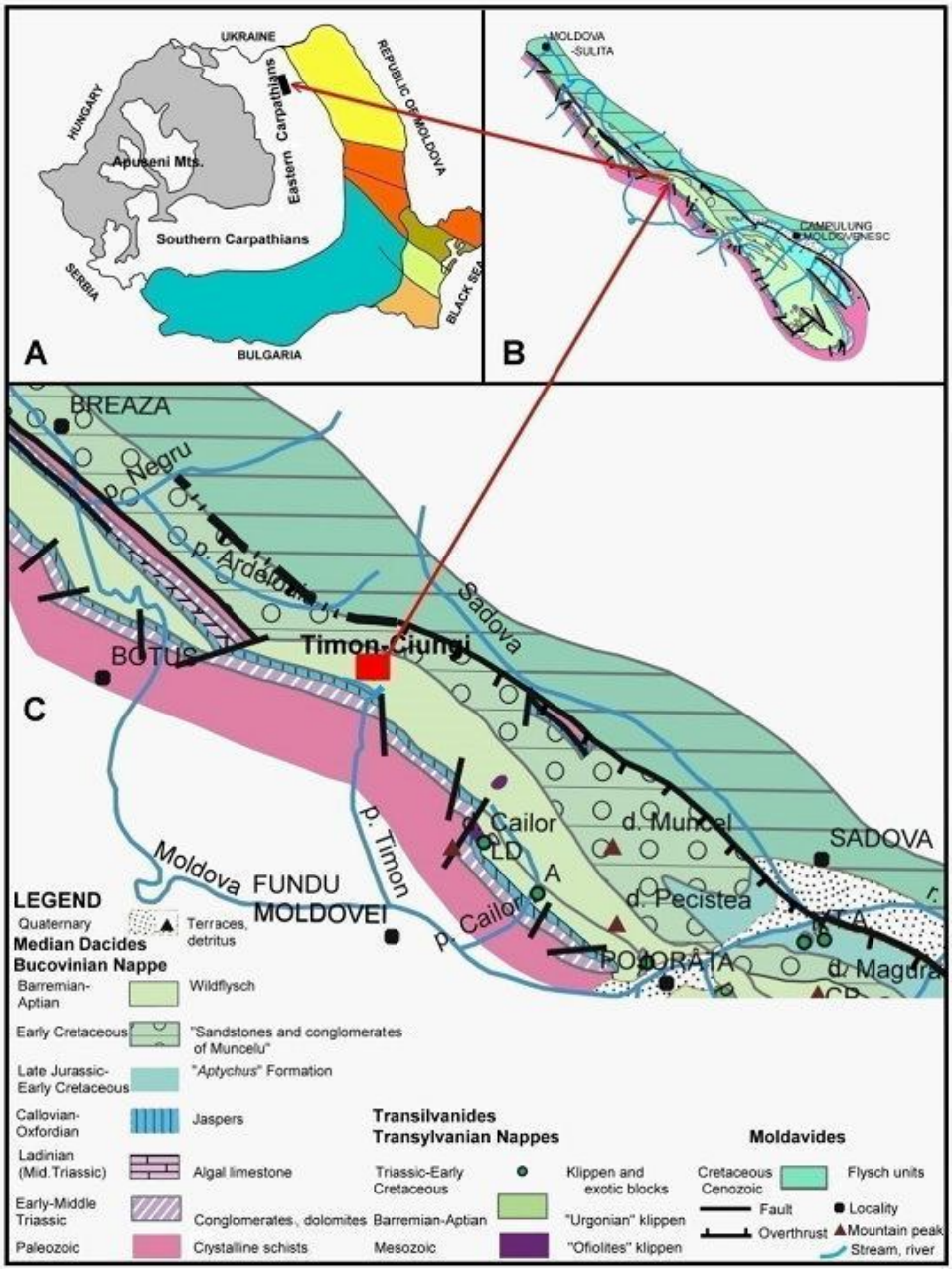

Fig. 1 Geological setting of the Timon Klippe. A–General map of Romania; B–General outline of the Rarău Syncline; C–Geological sketch of the Breaza-Pojorâta sector of the Rarău Syncline (according to Turculeț, 1971).

Neither the stratigraphic position in the wildflysch, nor the accurate biostratigraphy can be established by means of specimens collected bed by bed because recent outcrops seem to be only the isolated remnants of a large and facies-varied limestone block after it was largely quarried for lime in the past. The main limestone types can still be recognized (Popescu and Popescu, 2010): light-grey, yellow and white massive limestone, dark-red to violet massive limestone, sometimes with nodular or breccious intercalations, and light-red limestone breccias. The first type was the main focus of the exploitation in the old quarry. The red-colored types, on the other hand, were largely by-passed during this process, and they have delivered almost the entire fauna currently known.

The latter is largely represented by ammonites and brachiopods, along with bivalves, gastropods, crinoids, nautiloids, foraminifera etc. Several particular records deserve highlighting: the holotype of the foraminifer *Turrispirillina carpatho-rumana* (Turculeț, 1970b), the Himalayan ammonoid immigrants (Turculeț, 2000, 2001), and the only record of heteromorphic Triassic ammonoid documented up to the present in the Romanian Carpathians, namely *Rhabdoceras suessi* (Grădinaru and Sobolev, 2010) etc.

New records of Norian nautiloids from the Timon Klippe

The new records of nautiloids were collected from the main level of dark-red nodular limestone, where they occur along with a relatively rich fauna represented by brachiopods (mainly *Oxycolpella* species), ammonoids (haloritids, cladiscitids, pinacoceratids, arcestids, discophyllitids etc.), bivalves (*Monotis*), orthoceratids (*Trematoceras*) etc.

Subclass Nautiloidea AGASSIZ, 1849
Order Nautilida AGASSIZ, 1847
Family Grypoceratidae HYATT, 1900

Genus *Grypoceras* HYATT, 1883

Type species: *Grypoceras mesodicum* HYATT, 1883

Grypoceras sp.
Pl. I, Fig. 1

Material: 1 specimen

Description: The specimen consists of a small fragment of phragmocon and the beginning of the body chamber, which exhibits some of the morphological features of the genus: a subtrapezoidal whorl section whose height is almost equal with its width, a flattened venter, and moderate convex flanks; the ventral edges are more or less angular. The siphuncle is placed near the middle of the septum height, towards the dorsal part. The suture line exhibits a clear ventral lobe and a broad, deeper lateral one, developed on the main part of the flank. The ventral saddle is placed right on the ventral edge, and the internal saddle has the same disposition on the umbilical edge. This suture pattern is typical for *Grypoceras mesodicum* (HYATT, 1883), as pointed out by Engeser and Reitner (1992 – see also the observations on the author of the species). The taxonomic uncertainty arises from the fragmentary material.

Observations: Turculeț (1980) first described a specimen with a ventral sulcus as *G. aff. mesodicum*, and later (1986) proposed it as holotype for a new subspecies: *G. mesodicum subsulcatum*. In the second paper, a new record of *G. mesodicum*, lacking the sulcus, was also described. The specimens are stored in the MPCO-University of "Alexandru Ioan Cuza" Iași, and they should be prepared with modern tools for a better observation of their morphology.

Age: In the Timon Klippe, the specimen was collected from the red Sevatian level.

Family Syringonautilidae MOJSISOVICS, 1902
Genus *Syringonautilus* MOJSISOVICS, 1902

Type species: *Nautilus lilianus* MOJSISOVICS, 1882

Syringonautilus sp.
Pl. I, Fig. 2

Material: 1 specimen

Description: The specimen is distorted, most likely as a result of a process facilitated by the umbilicus opening. One can, nevertheless, notice its main features: the phragmocon displays an oval whorl section, with a well-rounded venter and convex flanks. The umbilical edges are also rounded, and the walls are almost vertical. The small siphuncle is placed in the upper half of the septum height shifted towards the dorsal part. On the venter and flanks, the partly-preserved shell exhibits the fine and dense longitudinal ribs which are typical for the genus. The suture line displays a noticeable ventral lobe, and a better-developed lateral one; there are also a ventral and a lateral saddle. A very small annular lobe can be observed, as well.

Observations: The morphological features connect the specimen with *Syringonautilus lilianus*, confined to the Anisian (the *Paraceratites trinodosus* Zone – Mojsisovics, 1882, pp. 286). The latter differs, however, through pronounced angular umbilical edges (Mojsisovics, 1882, Pl. LXXXII, Fig. 4) or a quadrangular whorl section (Mojsisovics, 1882, Pl. LXXXII, Fig. 3) in the early whorls.

Mutihac (1968) listed *Nautilus (= Syringonautilus) zinae* (AIRAGHI, 1902) in the Timon Klippe, but did not provide a description or a figure. This species was documented in the Ladinian (the *Trachyceras aon* Zone, Airaghi, 1902, pp. 28). It has a subtrapezoidal whorl section, and the siphuncle lies near the center of the septum (Airaghi, 1902). Attempts to locate this specimen have been unsuccessful.

Age: In the Timon Klippe, the specimen was collected from the red Sevatian level.

Genus *Syringoceras* HYATT 1894

Type species: *Nautilus granulosostriatus* KLIPSTEIN 1843

Syringoceras sp.
Pl. I, Fig. 3

Material: 1 specimen

Description: The specimen consists of a fragment of body chamber beginning, pointing to a size larger than that of previous records. The whorl section is subtrapezoidal, with a rounded venter and flattened flanks. The suture line display only inferred lobes and saddles, more noticeable being the lateral lobe and the lateral saddle. The siphuncle nearly touches the base of the septum, its small diameter contrasting with the presumed larger shell.

Observations: In the literature, only *Syringoceras spurri* (SMITH, 1927) was recorded in Norian rocks. This species is strikingly different from our specimen, having an oval whorl section, "somewhat compressed laterally" (Smith, 1927).

Age: In the Timon Klippe, the specimen was collected from the red Sevatian level.

Family Liroceratidae MILLER and YOUNGQUIST, 1949
Genus *Paranautilus* MOJSISOVICS, 1902

Type species: *Nautilus simonyi* HAUER, 1849

Paranautilus simonyi HAUER, 1849
Pl. II, Figs. 1, 2

1849 *Nautilus Simonyi n. sp.* Hauer, pp. 5, Tab. I, Figs. 12–14.
1902 *Paranautilus Simonyi* Pr. v. Hauer. Mojsisovics, pp. 207, Suppl. Tab. I, Figs. 2 and 3. (*cum syn.*)
1965 *Paranautilus* cf. *simonyi* (Hauer), Zapfe, pp. 300.
1980 *Paranautilus simonyi* Turculeț, pp. 28, Pl. II, Figs. 1 and 2.
1986 *Paranautilus simonyi* (Hauer, 1849). Shimansky, pp. 85–86, Tab. XXXI, Figs. 1 and 2.
1988 *Paranautilus simonyi* (Hauer, 1846). Schastlivtseva, pp. 86, Figs. 30 and 31.

Material: 3 specimens.

Description: The most complete conch includes the phragmocon and a part of the body chamber, but this specimen has been broken and strongly weathered. The typical features of the species are, nevertheless, visible: a smooth involute shell which displays two types of whorl sections – in the earlier whorls, the shape is subtrapezoidal, with a rounded venter, while in the last one it becomes broad, semi-oval or rounded-quadrangular (the height is slightly smaller than the width). The suture line is almost straight on the venter, and then forms an inferred saddle, followed by a broad, gentle lateral lobe; the dorsal saddle is clearly developed.

The second specimen also consists of a part of the phragmocon and the body chamber, with a typical suture line, while the third one is only represented by a smaller phragmocon fragment.

Observations: Turculeț (1980) has already described a whole specimen of *Paranautilus simonyi* (in the Plate II, there are two photos which seem to represent two different conchs, but in the collection of MPOC, a single specimen can be found only, respectively that one illustrated in Fig. 2). Turculeț (personal communication, 2013) has remembered that he only collected one specimen, and, most probably, the figure 1 is the illustration of the other side of the same specimen (Fig. 2), before a further processing.

Age: In the Timon Klippe, the specimens were collected from the red Sevatian level.

Family Clydonautilidae HYATT, 1900
Genus *Proclydonautilus* MOJSISOVICS, 1902

Type species: *Nautilus griesbachi* MOJSISOVICS, 1896

Proclydonautilus sp.
Pl. II, Fig. 3

Material: 1 specimen.

Description: The specimen is a mold representing a phragmocon and, possibly, the beginning of a body chamber. It displays involute coiling, with an occluded umbilicus; the last whorl section has a subtrapezoidal shape, with flared umbilical edges. No typical sculpture was fossilized, and the position of the siphuncle could not be observed. The suture line displays a

deep, angular ventral lobe, followed by a developed ventral saddle; the suture continues with a deep, broad, asymmetric lateral lobe with an angular ending, and a lateral saddle comparable in development with the ventral one, but with a tendency to flatten on top. The second lateral lobe is also asymmetric and deep. No annular lobe was noticed.

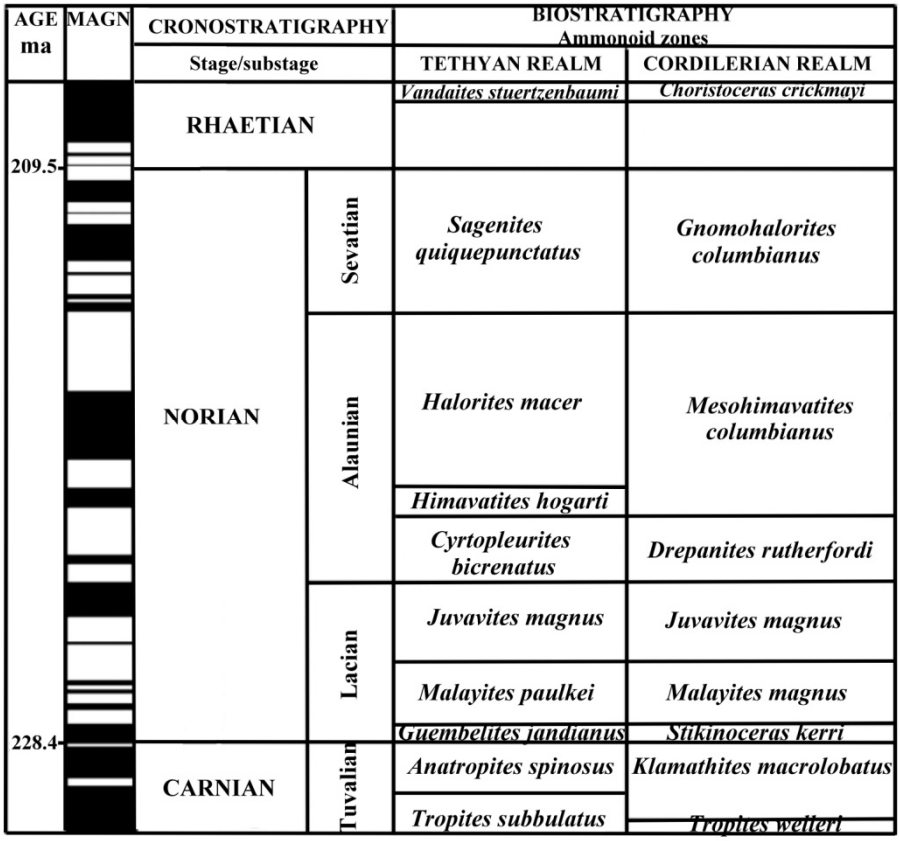

Fig. 2 Time scale of the Norian and correlative ammonoid zones for the Tethyan and Cordilerian Realms (according to Balini et al., 2010; age in Ma according to the International Stratigraphic Chart, 2012).

Observations: The specimen exhibits several intermediate features: the general conch shape is similar with that of *P. goniatites* (HAUER, 1849; Carnian), *P. pseudoseimkanensis* (SOBOLEV, 1989; late Carnian), *P. spirolobus* (DITTMAR, 1866), *P. natosini* (McLEARN, 1946; Norian), but it displays a flattened venter with more or less angular edges. This pattern can be found at *P. angustus* (KIESLINGER, 1926) and *P. seimkanensis* (BYTSCHKOV, 1976), species which show, however, a more discoid conch shape (they have a higher height/width ratio on the whorl section).

The suture line also displays several similitudes with *P. goniatites*, *P. angustus*, and *P. seimkanensis*. The depth of the angular ventral lobe is nearly equal to that of the lateral one, which is broad and angular (the more rounded lobes have resulted after an improper

preparation). It should be noted that, for all of these species, the siphuncle is positioned under the center of the septum.

Sobolev (1994) noted the phylogenetic sequence initiated by the Tethyan immigrant *Proclydonautilus goniaties* in the Boreal Realm, namely *P. goniatites* (early-middle Carnian) – *P. pseudoseimkanensis* (late Carnian) – *P. seimkanensis* (early Norian). The evolutionary trends are the changing of the conch shape from subspherical to discoidal, and the flattening of the venter.

At this stage of the research, the singularity of the specimen collected from the Timon Klippe can only allow speculations, the most plausible of which is consistent with a similar evolutionary trend of *P. goniatites* in the Tethyan Realm.

Age: In the Timon Klippe, the specimen was collected from the red Sevatian level.

Discussion

Compared to their relatives, the ammonites, nautiloids evolved more slowly during the Triassic, being less diversified, with a longer stratigraphic range, and very scanty records in the marine fauna. Consequently, sufficient data is not currently available so as to delineate intraspecific variability or sexual dimorphism, as in the case of ammonites or, recent *Nautilus*. The paleogeographic patterns of nautiloids also remain obscured in their geological history. (The recent studies conducted on *Nautilus* have emphasized differences in terms of nepionic size and in the size and weight of the shell for populations of different habitats – Tanabe et al., 1985).

Given this context, the importance of the nautiloid fauna from the Timon Klippe lies in their relative diversity, correlated with the age of the nautiloid-bearing limestone.

Taxonomic diversity

Even if several of the previous nautiloid records (Turculeţ, 1980, 1986, 2004) require a better examination of their morphology (suture lines and umbilicus features in certain cases) and, if possible, a more accurate determination, one can, nevertheless, note the presence of the main Triassic lineages (Table 1).

Tainoceratidae are less represented, only two debatable records of *Germanonautilus* sp. having been listed (Turculeţ, 2004).

The Liroceratidae – Clydonautilidae – (Gonionautilidae) – Siberionautilidae lineage is represented by all its Tethyan families. *Parnautilus simonyi* (Liroceratidae) is the most frequent species, only *Proclydonautilus triadicus, Proclydonautilus sp.* (Clydonautilidae) and *Gonionautilus securis* (Gonionautilidae) having been quoted so far.

The third lineage, Grypoceratidae – Syringonautilidae, is known through previous taxa of *Juvavionautilus heterophyllus* and *J. aff. trapezoidalis* (Table 1), as well as through the newly described *Syringonautilus* sp. and *Syringoceras* sp.

Age of the nautiloid fauna

Based on diversified fauna, Mutihac (1968) suggested a Carnian-Norian age for the klippe (Fig. 2), with the possible presence of a subjacent Ladinian. The author argued that the Timon Klippe and the Măcieşului Hill and Pârâul Cailor klippen were formed under similar environmental conditions as those of the Hallstatt facies (Northern Calcareous Alps, Austria).

Turculeţ (1971) pointed out a calcite diaclase (0.25 m) within the klippe, acting as the boundary between the white Carnian limestone and the red-violet nodular limestone (Late Triassic). Several taxa of mollusks and brachiopods, as well as the presence of crinoid stalks, were also listed. A Norian age was advanced for several ammonite taxa and the bivalve *Monotis haueri*, and a passing Norian-Rhaetian zone was supposed in conformity with the brachiopod fauna.

Later, Turculeţ (1976) documented the biostratigraphic rank of the taxa previously quoted by Mutihac (1968), reaching the conclusion that a revision was necessary, as the condensation of nearly the entire Triassic (the Anisian-Norian

interval) into the klippe is "very difficult to believe." The author also briefly described an ammonite fauna which argue the Norian age.

Among the series of papers centered on the fauna of the Timon klippe, Turculeţ (e.g., 1976a,b, 1980, 1981, 1983, 1986, 2000, 2004) regarded the former as Sevatian (Late Norian) or Norian-Rhaetian (based on the brachiopod fauna).

Grădinaru and Sobolev (2010) argued the presence of the Middle Norian and the Late Norian-Rhaetian based on the previously rich ammonite fauna. The authors suggested that the main mass was built by light-grey thick-bedded limestone, and that the ammonoid-bearing reddish nodular limestone represents a Neptunian dyke. The relationship between the *Monotis*-bearing reddish limestone and the klippe is uncertain. The ammonite fauna quoted in previous papers would reflect a "rucksack-condensation" *sensu* Krystyn, 2008.

This historical overview was necessary so as to highlight again that the succession and the stratigraphic position of the klippe within the Early Cretaceous Wildflysch have not been satisfactorily depicted, mainly as a result of it having been largely quarried in the past. However, the nautiloid fauna was collected from the dark-red nodular limestone, from which Turculeţ (1976 up to 2004) quoted only ammonites which either represent index taxa for the Sevatian or have a longer stratigraphic range.

Consequently, the specimens of *Syringonautilus* and *Syringoceras* are among the latest occurrences of these genera. In the available literature, we have found few mentions: (Mojsisovics, 1896 – *fide* Mojsisovics 1902, pp. 221), for instance, assigned to *Syringonautilus* an indeterminable specimen from the Sevatian limestone of Dernö (Hungary). *Syringoceras* is also rare in the Norian, as we mentioned above only *S. spurri* (SMITH, 1927) having been quoted so far, from the rocks of the Star Peak Formation (Lovelock, Nevada).

Proclydonautilus sp. is also an interesting record. In the Norian, the genus *Proclydonautilus* is relatively diversified, without paleobiogeographical restrictions. Additional specimens from the Timon Klippe would tip the balance towards a more accurate determination and significance.

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CAPTIONS OF PLATES

Plate I

All the records were collected from the red Sevatian level of Timon Klippe.Only 2c with scale B

Fig. 1 *Grypoceras sp.* (*?G. mesodicum* HYATT 1883).
Fig. 2 *Syringonautilus sp.* (2c – the sculpture consisting of fine longitudinal ribs).
Fig. 3 *Syringoceras sp.* (3c – the position of siphuncle).

Plate II

All the records were collected from the red Sevatian level of Timon Klippe.

Fig.1,2 *Paranautilus simonyi* (HAUER, 1849). The different whorl section shapes: 1b subtrapezoidal to quadrangular-rounded shape within the body chamber; 2b subtrapezoidal to broad semi-oval shape between the penultimate whorl and the body chamber. Scale A.
Fig. 3 *Proclydonautilus* sp. (3d – flattened venter, and the angular venter edges). Scale B.

Plate I

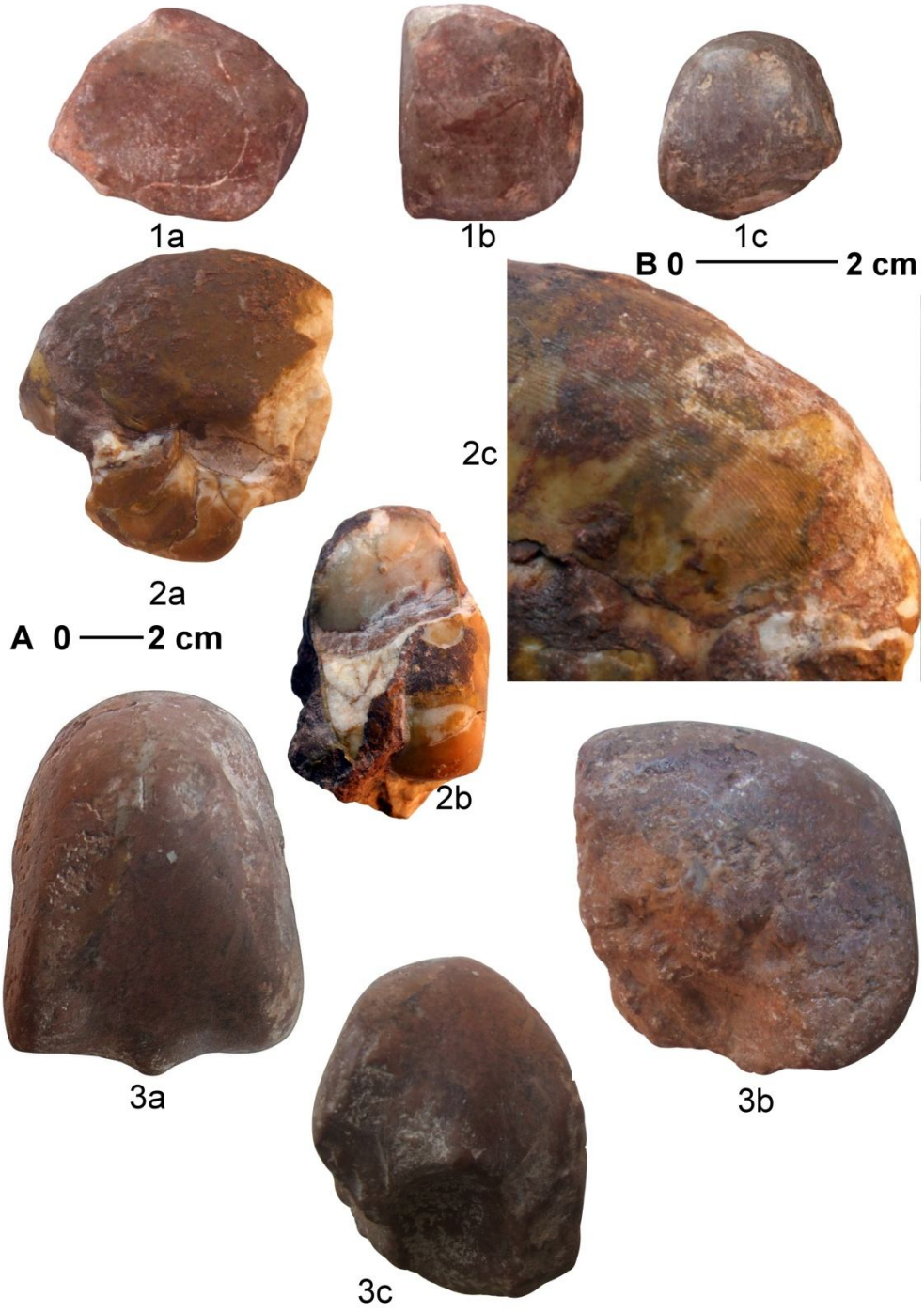

Plate II