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*Teschenicera*s gen. nov. (Ammonoidea) and the definition of the Valanginian/Hauterivian boundary in Butkov Quarry (Central Western Carpathians, Slovakia)

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ABSTRACT:

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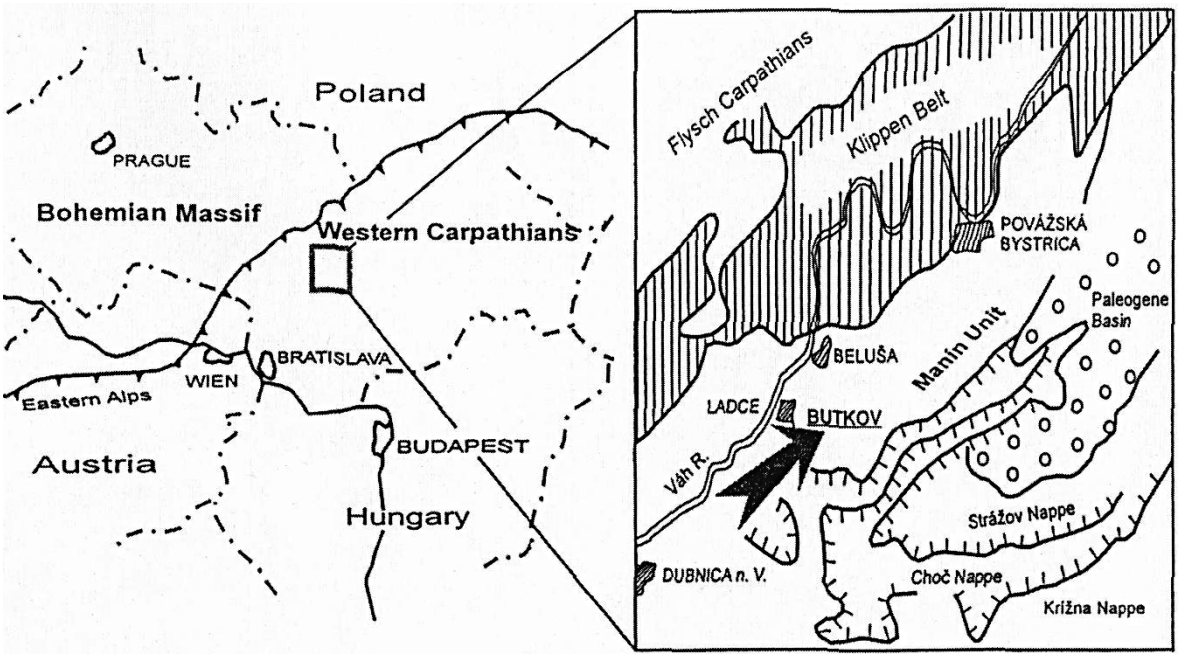
Jurassic and Lower Cretaceous successions of the Manín Unit of the Central Western Carpathians are exposed in Butkov Quarry in the Middle Váh Region, Slovakia. A significant part of the macrofauna belonging to neocomitid ammonites, formerly classified under the genus *Teschenites* Thieuloy, 1971, occurs in deposits spanning the Valanginian/Hauterivian boundary. The original definition of *Teschenites* was accompanied by uncertainties in the taxonomic and stratigraphic position of its original type species, i.e., *Hoplites neocomiensiformis* Uhlig, 1902. The present contribution focuses on and provides a possible taxonomic solution by establishing the new genus *Teschenicera*s. In Butkov Quarry, the new genus includes five species. *Teschenicera*s *flucticulum* (Thieuloy, 1977), the type species, is the most abundant. *Teschenicera*s *callidiscum* (Thieuloy, 1971), the subzonal species for the uppermost Valanginian (Thieuloy 1971b), occurs only sporadically. Because *Acanthodiscus radiatus* (Bruguiére, 1789), the index species for the basal Hauterivian (*radiatus* Zone) in the international ammonite zonation, does not occur in the locality, the basal Hauterivian is indicated by the first appearance of the genus *Spitidiscus* Kilian, 1910.

Key words: *Teschenicera*s gen. nov.; Manín Unit; Valanginian/Hauterivian boundary; Taxonomy; Western Carpathians.

INTRODUCTION

Lower Cretaceous marly deposits exploited as raw material for cement manufacture in the active Butkov Quarry near the municipality of Ladce (Slovakia) are rich in ammonites. They belong to the Manín Unit of the Central Western Carpathians. The quarry, which at present has fifteen levels, provides on nine of them suitably exposed sections in which faunas may be collected bed-by-bed. The collecting and detailed stratigraphy are somewhat complicated by the geology of the Manín Nappe which is associated with the fold structure of the deposits accompanied by many local tectonic phenomena and faults. '*Teschenites*'-type ammonites occur in beds spanning the Valanginian/Hauterivian boundary, where olive coloured marlstones of the Ladce Formation alternate with grey marls of the Mráznica Formation.

The first macropalaeontological collections in Butkov Quarry combined with detailed documentation of sections and the taking of samples for thin sections began in 1982. The first results of a consequent long-lasting study of the Lower Cretaceous ammonites were given by Vašíček and Michalík (1986). In that paper, basic knowledge of the local ammonite association documenting the Valanginian and Early



Text-fig. 1. Geographic and geological position of Butkov Quarry, Slovakia (after Vašíček 2010).

Hauterivian age was presented and two new species were established. Previous results were complemented by a comprehensive taxonomic study of the cephalopod fauna (Vašíček *et al.* 1994), i.e., the study of ammonites, aptychi and belemnites. Amongst other things, our previous knowledge was extended by the finding of evidence of the wider stratigraphic range of the Lower Cretaceous deposits from the Valanginian to the Barremian (the Neocomian in the older concept). Later, Late Valanginian representatives of the subfamily Crioceratitinae were studied, including a new collection of Early Barremian ammonites including also four new species (Vašíček 2006). Consequently, it turned out that the so-called Neocomian in Butkov Quarry yields also ammonites of Late Berriasian age (Vašíček 2010). This record of the first occurrence of boreal (cold-water) species in this locality was remarkable.

The objective of the present contribution on Butkov Quarry was to establish the boundary between the Valanginian and Hauterivian stages. It was assumed that this boundary should be determined on the basis of the succession of representatives of *Teschenites* Thieuloy, 1971, given that the index species *Acanthodiscus radiatus* (Bruguière, 1879) does not occur in Butkov Quarry. A detailed taxonomic study of the *Teschenites*-group fauna has resulted in the definition of *Teschenicera*s gen. nov. (see below). Furthermore, the significance of this new taxon for the definition of the Valanginian/Hauterivian boundary in Butkov Quarry is discussed.

GEOLOGICAL SETTING

Butkov Quarry (Text-fig. 1) is situated near the municipality of Ladce, about 10 km NE of the town of Dubnica upon Váh, Slovakia. Jurassic and Cretaceous deposits of the Manín Nappe of the Central Western Carpathians are exposed in the quarry. The Manín Unit is in tectonic contact with the Pieniny Klippen Belt. The structural interpretation of the unit was discussed in Michalík and Vašíček (1987), who considered the Manín Unit as a part of the Fatricum Super Unit.

The Lower Cretaceous succession exposed in the quarry is assigned to several lithostratigraphic units. According to Borza *et al.* (1987), Cretaceous strata start with the beige-coloured marly pelagic deposits of the Ladce Formation. In the upper part, the formation alternates with the grey-coloured marly-calcareous Mráznica Formation. Above follows the pale grey limestone of the Kališčo Formation, characterised by the occurrence of cherts. A comprehensive summary of the geological setting and structure, detailed biostratigraphy and sequence stratigraphy based on mi-

crofossils (nannoplankton, dinoflagellate cysts, foraminifera, tintinnids, radiolarians) and macrofossils (sponges, brachiopods, bivalves, ammonites, aptychi, belemnites, echinoderms, trace fossils, etc.) in Butkov Quarry was presented by Michalík *et al.* (2013).

MATERIAL AND METHODS

The predominantly marly Lower Cretaceous pelagic deposits in Butkov Quarry provide finds of deformed ammonites only, usually preserved as external moulds. The inner whorls are rarely preserved. The specimens are usually simply flatly deformed, more or less compressed along the bedding plane. The following parameters were measured: *D* – shell diameter, *H* – whorl height, and *U* – umbilicus width. Values of the measured parameters and the calculated values of ratios *H/D* and *U/D* are, in comparison with the true values, affected by an unknown deformation coefficient that depends on the degree of rock compaction. The whorl breadth *B* could not be measured on shells preserved in this way. Table 1 presents the parameter values for measurable compressed specimens of four of the species studied.

In addition to the flatly deformed specimens, some specimens are affected by lateral shear, which is manifested in the deformation of the original circular outline into an ellipsoid, in which two major deformation axes are apparent: the axis of elongation and the axis of shortening. The axis of shortening corresponds to the direction of lateral shear, whereas the axis of elongation is perpendicular to this direction. In some cases, the axis of shortening can run in the vicinity of the aperture, i.e., in places of the maximum size of the original shell. The measured *D*, *H* and *U* values, and the *H/D* and *U/D* ratios measured along several various diameters of an individual specimen vary considerably. Such measurements cast doubt on the measurement of size parameters and the use of calculated values for the diagnosis of such specimens.

The specimens illustrated and measured herein are deposited in the Slovak National Museum in Bratislava, under the depository numbers with the prefix SNM Z (40060–40069) and also by other symbols mentioned in my field diary deposited in Ostrava. The latter symbols refer to the exact localisation of the specimens in the documented sections of the quarry (e.g., BK10-20 refers to Butkov Quarry, Level 10, from 20 m in the succession). In addition to the above-mentioned specimens with SNM numbers, the material from the collection under study consists of other specimens mentioned under Material with symbols of the locality (presented also in the field diary). These specimens are housed in the collections of the Geological Pavilion of Prof. F. Pošepný of VŠB – Technical University of Ostrava with numbers mentioned in the field diary.

RESULTS

Description of the succession

The Lower Cretaceous marly-calcareous strata in Butkov Quarry represent pelagic deposits. According to the macrofaunal content, they belong to the cephalophod facies characterised by the occurrence of ammonites, aptychi and belemnites. Brachiopods occur only occasionaly (for more information, see Michalík *et al.* 2013). Neocomitid ammonites, formerly classified under the genus *Teschenites*, occur sporadically to abundantly in Levels 1 and 5–12 in documented horizons at the transition between the Ladce and Mráznica Formations. Based on the evaluation of ammonite associations in the nine sections under study, the findings classifiable by stratigraphic meth-

Specimen		figured herein	*D*max	*D*phr	*D*	*H*	*U*	*H/D*	*U/D*	*U/R*	*H/R*
Teschenicera flucticulum	SNM Z 40069 (m)	–	56.5	~35.0	54	25.7	12.4	0.47	0.23	14	42
	SNM Z 40063 (m)	Text-fig. 3A	46.0	~37.0	45	19.8	11.8	0.44	0.24	13	49
Teschenicera subflucticulum	SNM Z 21133 (m)	–	~60.0		47.4	20.3	15.2	0.43	0.32	11	
	SNM Z 40064 (M)	Text-fig. 2D	88.5	52.0	88.5	42.0	28.8	0.47	0.32	20	~60
					78.0	35.0	~26.0	0.45	~0.33		
Teschenicera pachydicranum	SNM Z 40065 (m)	Text-fig. 2B	67.0		65.2	27.3	17.7	0.42	0.26	17	45
Teschenicera subpachydicranum	SNM Z 40068 (m)	Text-fig. 3B	59.0	~35.0	57.0	23.3	20.0	0.41	0.35	16	~34

Table 1. Measurements of some species of *Teschenicera* gen. nov. from Butkov Quarry, Slovakia. Symbols: *D*max – maximal preserved shell diameter; *D*phr – approximate diameter at the end of the phragmocone or presupposed end of phragmocone; *D* – whorl diameter; *H* – whorl height; M – macroconch; m – microconch; *U* – umbilicus diameter; calculated ratios of *H/D* and *U/D*; *UR* – number of ribs near umbilicus per half-whorl; *V/R* – equivalent number of ribs at whorl periphery; ~ probable value.

ods are related to the most fully documented section, e.g., the section in Level 10. The section thickness around the Valanginian/Hauterivian boundary exceeds 20 m. The section length in meters related to the horizontal level of the quarry wall base is 50 m. The bedding dip reaches about 60º. With regard to the current activities in the quarry, preservation of the original numbering of the inclined layers visible in the wall was not possible.

Systematic part

The history of the study of the old genus *Teschenites* and its numerous species (about 20 species according to Klein 2005) represents a complicated, in places contradictory matter. The genus *Teschenites* (originally a subgenus of the genus *Neocomites* Uhlig, 1905) with type species *Hoplites neocomiensiformis* Uhlig, 1902 was established by Thieuloy (1971a) based on the material of Uhlig (1902) which was collected by Hohenegger from the Silesian Unit of the Outer Western Carpathians. In the original description of the material by Uhlig (1902, p. 54), the name '*Hoplites neocomiensis* d'Orb. sp.' appears first. In the following text on p. 56, Uhlig admitted that part of the described material should represent a new species, i.e., '*Hoplites neocomiensiformis*' referring here to specimens in the collection of Hohenegger. In reality, the name '*A. neocomiensiformis* Hohenegger msc.' occurs on Hohenegger's original labels. In particular, this is the case with two specimens illustrated by Uhlig (1902, pl. 3, figs 1 and 2a, b). In Uhlig's explanatory notes to plate 3, these specimens already occur under Hohenegger's species name. As the type specimen of *H. neocomiensiformis*, Uhlig (1902) selected a specimen from pl. 3, fig. 2a, b (its suture line is figured in his pl. 4, fig. 11). Thieuloy (1971a, p. 2298) accepted the mentioned specimen and species as the type species of his subgenus *Teschenites* (which in the last 25 years is treated at generic rank).

As revealed by Reboulet (1996), and later confirmed by Busnardo *et al.* (2003, p. 43), the type specimen of *H. neocomiensiformis* described by Uhlig differs both morphologically and stratigraphically from the French specimens from the Upper Valanginian to the lowermost Hauterivian designated by Thieuloy (1977, pl. 2, figs 1–3) as *Neocomites* (*Teschenites*) *neocomiensiformis.* As far as the stratigraphic value of the original Hohenegger material processed by Uhlig (1902) is concerned, it should be added that the exact stratigraphic position of the Silesian *H. neocomiensiformis* is unclear (it can be only stated that Early Valanginian species prevail in the same strata).

Busnardo *et al*. (2003) established a new type species for the genus *Teschenites*, namely *Neocomites* (*Teschenites*) *flucticulus* Thieuloy, 1977. According to Busnardo *et al.* (2003, p. 43), the specimens identified as *Teschenites neocomiensiformis* in Thieuloy (1977) belongs to a new species, namely *Teschenites robustus* Busnardo, Charollais, Weidmann and Clavel, 2003. Although Busnardo *et al.* (2003) chose the specimen illustrated by Thieuloy (1977, pl. 2, fig. 1) as the holotype for their new species *T. robustus*, they stated that the species was better illustrated by the specimen illustrated by Thieuloy (1977) in pl. 2, fig. 3. Analysis of pl. 2 in Thieuloy (1977) shows that the specimen in fig. 1, which is laterally deformed, has a narrow umbilicus, whereas the flatly deformed specimen in fig. 3, as well as the fragment of the whorl in fig. 2, have a wider umbilicus and also somewhat vigorous ribbing. These morphological differences were already described by Reboulet (1996, p. 112), who put both specimens of *Neocomites* (*Teschenites*) *neocomiensiformis* illustrated by Thieuloy (1977, pl. 2, figs 2, 3) in synonymy with *Teschenites subpachydicranus* Reboulet, 1996. Moreover, Reboulet (1996) considered the specimen of *N.* (*T.*) *neocomiensiformis* illustrated by Thieuloy (1977, pl. 2, fig. 1) as *Teschenites flucticulus* Thieuloy, 1977. He also suggested (Reboulet 1996, p. 104) that *N.* (*T.*) *neocomiensiformis* and *N.* (*T.*) aff. *neocomiensiformis sensu* Thieuloy could be the macroconchs of *Teschenites subpachydicranus* (now *Teschenicerasubpachydicranum*) and *Teschenites pachydicranus* (now *Teschenicerasubpachydicranum*), respectively. Consequently, the establishment of the species *T. robustus* by Busnardo *et al*. (2003) is groundless; it is rather the synonym of *Teschenites flucticulus* (now *Teschenicerasflucticulum*).

According to Reboulet (1996, p. 104), the lectotype of *T. neocomiensiformis* corresponds to the inner whorls of a macroconch of *Busnardoites campylotoxus* (Uhlig, 1902). Busnardo *et al.* (2003) considered *Hoplites neocomiensiformis sensu* Uhlig as a species of the genus *Busnardoites* Nikolov, 1966. Moreover, Company and Tavera (2015) assigned *Hoplites neocomiensiformis sensu* Uhlig to the genus *Neocomites* and used *Neocomites neocomiensiformis* to characterise the middle ammonite zone of the Lower Valanginian zonation in southern Spain. Their proposal was accepted by the Kilian Group and incorporated into the current version of the standard Mediterranean ammonite zonation (Reboulet *et al*. 2018).

The original designation of *Hoplites neocomiensiformis* by Thieuloy (1971a) as the type species of

the subgenus *Teschenites* fulfils the requirements of the ICZN (articles 13.1, 13.3, 67.5 and 68.2), and therefore, the valid name *Teschenites* may be used (if necessary) for a group of neocomitid species of Early Valanginian age. However, the change of the type species proposed by Busnardo *et al*. (2003) is not valid; it is explicitly against article 67.2 of the ICZN. Their proposal is not justified, as the nominal species *Teschenites flucticulus* was originally not included in the genus (or subgenus) *Teschenites.*

Consequently, there are 4 possibilities for the solution of these taxonomical problems:

1) When Thieuloy (1971a) defined the subgenus *Teschenites*, he assigned to it the following nominal species: *Hoplites neocomiensiformis*, *Neocomites* (*Teschenites*) *scioptychus* (Uhlig, 1902), *Neocomites* (*Teschenites*) *paraplesius* (Uhlig, 1902), *Neocomites* (*Teschenites*) *transsylvanicus* (Jekelius, 1915), *Neocomites* (*Teschenites*) *jodariensis* (Douvillé, 1906), *Neocomites* (*Teschenites*) *muretensis* (Breistroffer, 1936) and *Neocomites* (*Teschenites*) aff. *scioptychus.* For a better definition of *Teschenites,* it may be preferable to select another type species from this list of species. However, all mentioned species (except *Hoplites neocomiensiformis*) are poorly known or partly identified with doubt. It is thus impossible to find a suitable type species for *Teschenites* among these nominal species.

2) Another possibility is to retain using the genus name *Teschenites* based on an approved request submitted to the International Commission on Zoological Nomenclature. However, the reply of the Commission (to a hypotethical request) could take many years and it is probable that the reply will be rather negative. Considering my advanced age, this is clearly an inappropriate solution.

3) *Teschenites* could be considered as a synonym of the genus *Neocomites.* However, I prefer to restrict the use of *Neocomites* only for neocomitids from around the Lower/Upper Valanginian boundary, and to use *Teschenicera*s gen. nov. for neocomitids around the Valanginian/Hauterivian boundary.

4) I prefer to establish a new genus for the studied group of neocomitids of Valanginian/Hauterivian age due to the morphological differences with the genus *Neocomites* (described below) and especially due to the different stratigraphic position of both species that has already been mentioned above. In my opinion, this option, presented below in more detail, seems to be the best solution.

Stratigraphic data used for the distribution of the species are based on the ammonite zonation according to Reboulet *et al.* (2018).

Superfamily Perisphinctoidea Steinmann, 1980
Family Neocomitidae Salfeld, 1921
Subfamily Neocomitinae Salfeld, 1921

Genus *Teschenicera*s gen. nov.

TYPE SPECIES: *Neocomites* (*Teschenites*) *flucticulus* Thieuloy, 1977 (p. 98, pl. 3, fig. 7).

DERIVATIO NOMINIS: From the historical name of the city of Teschen lying on the Czech-Polish national border, the current double city – Cieszyn (Poland) and Český Těšín (Czech Republic). The generic name for the neocomitid ammonites around the Valanginian/Hauterivian boundary should recall the old name *Teschenites.*

DIAGNOSIS: A semi-involute shell with narrow, slightly arched whorls. Neocomitid ornamentation of phragmocone is created by ribs that begin individually or in pairs in weak umbilical tubercles on the umbilicus edge. The falcoid ribs can be bifurcated on flanks, or inserted ribs also occur. All ribs inflate and form weak ventrolateral tubercles followed by a smooth siphonal band. In some species, the ribs on the body chamber disappear on the flanks. The ribs on the body chamber bear weak ventrolateral tubercles and cross the ventral side without interruption in form of a chevron. Some species show dimorphism.

DESCRIPTION: Semi-involute shells with thin, rather high whorls. The base of whorls is accompanied by the umbilical edge. The ornamentation of the phragmocone is typically neocomitid. Juvenile ribs are thin and dense. They begin in umbilical tubercles. S-shaped bent ribs are bifurcated on the flanks. Inserted ribs also occur. All ribs bear weak ventrolateral tubercles followed by a smooth siphonal band. On the body chamber, the ribs cross the venter without interruption in the form of chevron. The ribs are thicker and more sparsely distributed. Umbilical tubercles can become bullate. In some species, the ribs on the flanks dissaper in the adult stage. Macroconchs reach the diameter of 90 mm and more (for example, the diameter of *Teschenicera*s *pachydicranum* in Uhlig 1902, pl. 8, fig. 2 is $D = 155$ mm). *Teschenicera*s gen. nov. differs from the closely related genus *Neocomites* in that the ribs on the body chamber of *Teschenicera*s gen. nov. cross the venter without interruption, tritubercular ribs do not develop in all stages of growth, and in some specimens the ribs become thinner or disappear on flanks of the adult whorls. In addition, the adult specimens are

usually bigger in size. The morphological differences compared to *Neocomites* are not very significant, similarly as in the case of the previously established genera *Eristavites* Nikolov, 1966 or *Varlheideites* Rawson and Kemper, 1978, which are currently considered as synonyms of *Neocomites* (see e.g., Reboulet 1996). The main difference is represented by a different stratigraphical range (*Neocomites* is from the Lower to Lower/Upper Valanginian, *Teschenicera*s gen. nov. is from around the Valaginian/Hauterivian boundary).

OCCURRENCE: *Teschenicera*s occurs in the Mediterranean region from the uppermost Valanginian (*furcillata* Zone) to the Lower Hauterivian (*radiatus* Zone).

*Teschenicera*s *callidiscum* (Thieuloy, 1971)
(Text-fig. 2C)

1971b. *Neocomites* (*Teschenites*) *callidiscus* n. sp.; Thieuloy, p. 104, pl. 1, figs 1–4, text-fig. 1.
1996. *Teschenites callidiscus* (Thieuloy); Reboulet, p. 108, pl. 10, figs 1–8.
2004. *Neocomites callidiscus* Thieuloy; Ettachfini, p. 134, pl. 16, figs 1–6.
2005. *Neocomites* (*Teschenites*) *callidiscus* Thieuloy; Klein, p. 315 (cum syn.).

MATERIAL: A single fragment of an external mould of a poorly preserved microconch (SNM Z 40062 = BK10-65/5).

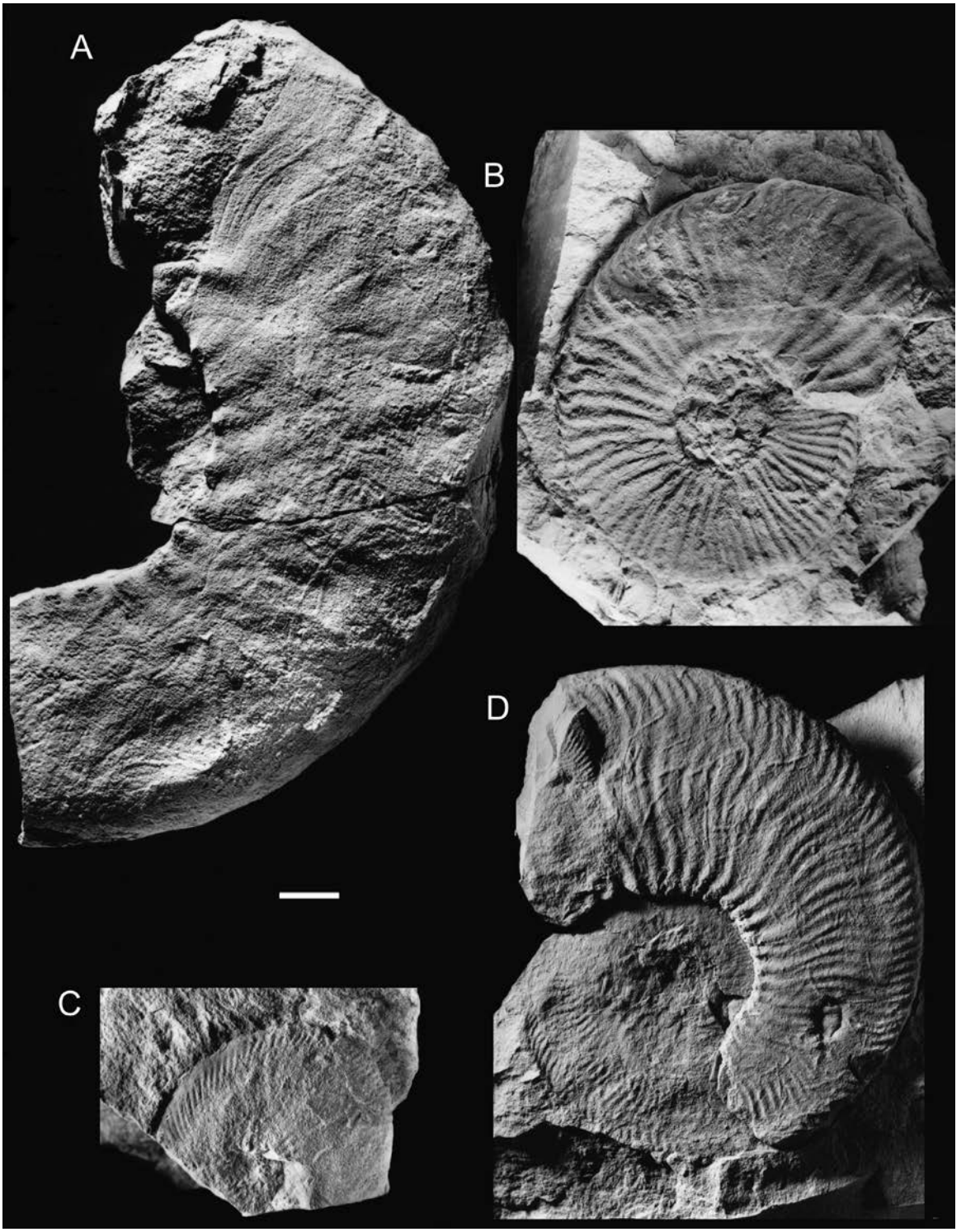
DESCRIPTION: Semi-involute small specimen with a narrow umbilicus and a high whorl. The ribbing is apparent especially in the ventral area and partially around the umbilicus. The whorl flanks are relatively smooth. The ribs in the peripheral area are thin and dense. Near the umbilicus, the ribs bear weak umbilical tubercles. The specimen reaches a diameter of about 35 mm.

REMARKS: The incomplete specimen from Butkov Quarry is characterised by a narrow umbilicus and suppressed (weakened) ribbing on the flanks. In general, *Teschenicera*s *callidiscum* differs from other related species by a considerably surpressed ribbing in maturity.

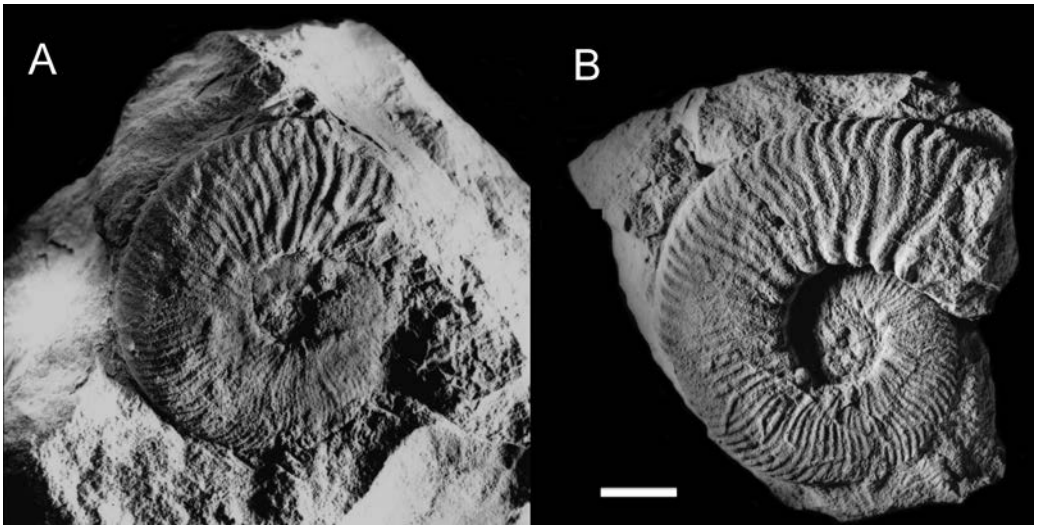
OCCURRENCE: *Teschenicera*s *callidiscum* is a subzonal species for the uppermost Valanginian (Reboulet *et al.* 2018). The mentioned species occurs mainly in France and Switzerland, and furthermore in Morocco and in the Silesian Unit of the Western Outer Carpathians. The only microconch comes from the Ladce Formation, Level 10, from 65 m of the section (uppermost Valanginian).

*Teschenicera*s *flucticulum* (Thieuloy, 1977)
(Text-fig. 3A)

1901. *Hoplites thurmanni* Pictet et Campiche; Sarasin and Schöndelmayer, p. 67, pl. 8, figs 4, 5, ?6.
1901. *Hoplites neocomiensis* d'Orb.; Sarasin and Schöndelmayer, p. 70, pl. 9, figs 2, 3.
pars 1901. *Hoplites regalis* Bean (in Paulow); Sarasin and Schöndelmayer, p. 71, pl. 8, fig. 8 [non pl. 9, fig. 1 = *Teschenicera*s *pachydicranum* (Thieuloy, 1977)].
pars 1977. *Neocomites* (*Teschenites*) *flucticulus* n. sp.; Thieuloy, p. 98, pl. 3, figs 7 (holotype), 8, 10, 11 [non fig. 9 = *Teschenicera*s *subflucticulum* (Reboulet, 1996)].
pars 1977. *N.* (*Teschenites*) *neocomiensiformis* (Uhlig); Thieuloy, p. 95, pl. 2, fig. 1 [non pl. 2, figs 2, 3 = *Teschenicera*s *subpachydicranum* (Reboulet, 1996)].
1981. *Teschenites flucticulus* Thieuloy; Charollais *et al*., p. 90, pl. 5, fig. 2.
1983. *Neocomites* (*Teschenites*) cf. *jodariensis* Douvillé; Vašíček *et al*., p. 474, pl. 1, fig. 7.
1986. *Neocomites* (*Teschenites*) cf. *jodariensis* Douvillé; Vašíček and Michalík, p. 462, pl. 2, fig. 1 (figure copied from Vašíček *et al*. 1983).
1986. *Neocomites* (*Teschenites*) *flucticulus* Thieuloy; Wyssling, p. 197, pl. 8, figs 4, 5.
1987. *Neocomites flucticulus* Thieuloy; Company, p. 139, pl. 11, fig. 10.
1993. *Neocomites* (*T.*) *flucticulus* Thieuloy; Autran, pl. 2, fig. 10.
non 1994. *Neocomites* (*Teschenites*) *flucticulus* Thieuloy; Vašíček *et al.*, p. 58, pl. 17, fig. 8 [= *Teschenicera*s *subflucticulum* (Reboulet, 1996)].
1995. *Neocomites* (*Teschenites*) cf. *flucticulus* Thieuloy; Avram, pl. 1, fig. 16.
non 1995. *Neocomites* (*Teschenites*) *flucticulus* Thieuloy; Vašíček, pl. 1, fig. 7 [= *Teschenicera*s *subflucticulum* (Reboulet, 1996)].
1996. *Teschenites flucticulus* (Thieuloy); Reboulet, p. 110, pl. 9, figs 1–13, pl. 10, fig. 14.
1997. *Teschenites flucticulus* Thieuloy; Vašíček, pl. 1, fig. 6.
1997. *Neocomites* (*Teschenites*) *flucticulus* Thieuloy; Faraoni *et al*., pl. 7, figs 7, 11.
1999. *Teschenites flucticulus* Thieuloy; Vašíček and Michalík, p. 254, fig. 6/2, 3.



Text-fig. 2. Representatives of *Teschenicera*s gen. nov. from Butkov Quarry, Slovakia. **A–B** – *Teschenicera*s *pachydicranum* (Thieuloy, 1977). A – SNM Z 40061, fragment of body chamber (M). Ladce Formation, Level 10, from 80 m of the succession, uppermost Valanginian; B – SNM Z 40065 (m). Ladce Formation, Level 8, from 450 m of the succession, uppermost Valanginian. **C** – *Teschenicera*s *callidiscum* (Thieuloy, 1971), SNM Z 40062 (m). The first grey layer in the transition between the Ladce and Mráznica Formations. Level 10, from 65 m of the succession, uppermost Valanginian. **D** – *Teschenicera*s *subflucticulum* (Reboulet, 1996), SNM Z 40064. Ladce Formation, Level 11, from 33.8 m of the succession, uppermost Valanginian. All specimens coated with ammonium chloride before photography. M – macroconch, m – microconch. Scale bar equals 1 cm.



Text-fig. 3. Representatives of *Teschenicera*s gen. nov. from Butkov Quarry, Slovakia. **A** – *Teschenicera*s *flucticulum* (Thieuloy, 1977), SNM Z 40063 (m). Mráznica Formation, Level 10, 83 m of the succession, lowermost Hauterivian. **B** – *Teschenicera*s *subpachydicranum* (Reboulet, 1966), SNM Z 40068 (m). Note decreased parameter *U* due to deformation, with the termination of the final whorl pressed into the umbilicus. Grey layer in the transition between the Ladce and Mráznica formations, Level 11 A, uppermost Valanginian. M – macroconch, m – microconch. Scale bar equals 1 cm.

2002. *Teschenites flucticulus* Thieuloy; Vašíček, p. 190, pl. 1, figs 6, 7.
2003. *Teschenites flucticulus* Thieuloy; Busnardo *et al*., p. 44, pl. 2, fig. 12, pl. 3, fig. 3, pl. 4, ?fig. 1, ?pl. 1, fig. 6.
2004. *Neocomites flucticulus* Thieuloy; Ettachfini, pl. 17, figs 1–3.
non 2009. *Teschenites flucticulus* Thieuloy; Vašíček *et al*., p. 134, figs 3.5, 3.6 [= *Teschenicera*s *subflucticulum* (Reboulet, 1996)].
2010. *Teschenites flucticulus* Thieuloy; Vašíček, pl. 3, fig. 5.
2013. *Teschenites flucticulus* Thieuloy; Michalík *et al*., p. 113, fig. 93/4.

MATERIAL: About twenty flatly deformed external moulds of microconchs (SNM Z 40063 = BK10-83/1, SNM Z 40069 = BK11A-28, SNM Z 40070 = BK7Z-63/2, SNM Z 24740 = BK6-2/1. Moreover, specimens BK1-75/1, BK1-80/23, BK6-2/3, BK8-470/9, 16, 23, 24, 35, BK8-480/13, BK10-80/7, BK10-82/8, 13 and BK10-83/1 usually only with the ultimate whorl preserved. The final parts of most specimens under study belong to body chambers.

DESCRIPTION: Semi-involute specimens, with a slightly arched ultimate whorl, low and steep umbilical wall separated from the flanks by an indicated edge and a narrow umbilicus. The venter is narrow (which is often caused by deformation) and quite arched. The phragmocone bears thin and closely spaced, slightly S-shaped ribs. The ribs usually begin in pairs on the umbilical edge in weak umbilical tubercles. Some ribs are simple and without tubercles and are inserted between the paired ribs. Ribs on the whorl flanks, with an exception of some final ribs on the phragmocone, do not bifurcate. On the ventral margin, tiny ventrolateral tubercles are indicated on all ribs. On the body chamber, more distinctly S-shaped ribs are stronger and more widely spaced. They begin in pairs in distinct umbilical tubercles. In vicinity of the venter, the ribs incline markedly towards the aperture and become stronger towards somewhat bullate ventrolateral tubercles. The ribs on the body chamber cross the weathered venter without interruption in the form of the letter S. Sporadically, simple inserted ribs running as far as the lower quarter of whorl height occur between the pairs of ribs. The measurements are presented in Table 1.

REMARKS: *Teschenicera*s *flucticulum* is close to the specimens under the original names of *Teschenites jodariensis* and *Teschenites muretensis*. The distinguishing interspecific feature is the different diameter of the umbilicus (*U/D*): *U/D* of *T. flucticulum* ranges from 0.23 to 0.25; the *U/D* ratio for *T. jodariensis* ranges from 0.17 to 0.19 according to my measurement of the figured holotype by Douvillé (1906, pl. 13, fig. 7). Similarly, the *U/D* ratio for *T. muretensis* ranges from 0.17 to 0.20 (according to my

measurement of the holotype designated as *Hoplites* sp. illustrated by Douvillé 1906, pl. 13, fig. 4). Based on the suggestion of Company (1987), Reboulet (1996, p. 111) considered that the microconchs of *T. flucticulum* could correspond to *T. jodariensis. Teschenicerasflucticulum* differs from the closely related *Teschenicerassubflucticulum* (see below) by a narrower umbilicus and a retroverse ribbing in the umbilicus area.

OCCURRENCE: According to Reboulet (1996), the type material of *T. flucticulum* comes from south-eastern France from the *radiatus* Zone (Lower Hauterivian). Company (1987) states the uppermost Valanginian (*pachydicranum* Zone) and the Lower Hauterivian from the Betic Cordillera in Spain. Busnardo *et al.* (2003) state the Upper Valanginian to the basal Hauterivian in Switzerland. Other finds come from Morocco, Romania, Italy, western Austria, the Pieniny Klippen Belt in Slovakia, usually from the Lower Hauterivian (according to synonymies of Klein 2005). In Butkov Quarry, *Teschenicerasflucticulum* occurs sporadically in Level 10 (from 80 m of the succession), more frequently to abundantly in Levels 1, 6, 7 West, Level 8 from 470 m of the succession, Level 10 from 82–83 m of the succession in the transition between the Ladce to Mráznica formations (Valanginian/Hauterivian) and Level 11 in deposits of the Mráznica Formation (basal Hauterivian).

Teschenicerassubflucticulum (Reboulet, 1996)
(Text-fig. 2D)

1977. *Neocomites* (*Teschenites*) *flucticulus* n. sp.; Thieuloy, pl. 3, fig. 9.
1994. *Neocomites* (*Teschenites*) *flucticulus* Thieuloy; Vašíček *et al*., p. 58, pl. 17, fig. 8.
1995. *Neocomites* (*Teschenites*) *flucticulus* Thieuloy; Vašíček, pl. 1, fig. 7.
1996. *Teschenites subflucticulus* n. sp.; Reboulet, p. 106, pl. 8, figs 1–9.
?2004. *Neocomites* cf. *subflucticulus* Reboulet; Ettachfini, pl. 17, fig. 8.
2005. *Neocomites* (*Teschenites*) *subflucticulus* (Reboulet); Klein, p. 320 (cum syn.).
2009. *Teschenites flucticulus* Thieuloy; Vašíček *et al*., p. 134, fig. 3.5, 3.6.
2013. *Teschenites subflucticulus* Reboulet; Michalík *et al.*, p. 113, fig. 93/5.

MATERIAL: Two incomplete, flatly deformed microconch specimens preserved as external moulds coated with limonite (SNM Z 40071 = BK7Z-51/5, SNM Z 21133 = BK12-debris). Moreover, one larger, similarly preserved specimen SNM Z 40064 = BK11-33.8/1 (macroconch) with the impression of juvenile whorls. The terminal half of the ultimate whorl belongs to the body chamber.

DESCRIPTION OF MICROCONCHS: Specimens semi-evolute, medium in size, with little arched whorl flanks, comparatively high whorls, with a wider umbilicus. Most thin, closely spaced, S-shaped ribs begin in short bullate umbilical tubercles. A simple rib reaching the lower part of the flanks is inserted in places between the isolated ribs on the body chamber. In vicinity of the venter, all ribs incline towards the aperture and have very thin bullate ventral tubercles. In the terminal part of the ultimate whorl, the ribs are stronger and more widely spaced. The ribs cross the venter without interruption. Exceptionally, rib bifurcation may occur in the upper part of the flanks.

DESCRIPTION OF MACROCONCH: The body chamber bears a high whorl with slightly arched flanks. Inner whorls bear thin and closely spaced, S-shaped ribs. Around the line of coiling, there are distinct umbilical tubercles. On the body chamber, ribs are still closely spaced, but more robust. They begin on the umbilical seam in distinct bullate umbilical tubercles. Primary ribs that are concavely bent towards the aperture over a rather short distance run out from them. On their posterior side, thinner ribs split off or are inserted a little higher above the tubercles; the ribs are S-shaped similarly as the stronger primary ribs. Some ribs bifurcate even in the upper fifth of the whorl height. On the venter, all ribs are equally strong and highly inclined towards the aperture. The ribs cross the venter without interruption in the form of a chevron. The figured macroconch from Butkov Quarry has a more closely spaced ribbing than the specimens of Reboulet (1996, pl. 8, figs 1–9). The measurements of a microconch and a macroconch are presented in Table 1.

REMARKS: Reboulet (1996) states a possibility that *Teschenites subflucticulus* (now *Teschenicerassubflucticulum*) could be the initial species for *Teschenites callidiscus* (now *Teschenicerascallidiscum*).

OCCURRENCE: The type material comes from the Vocontian Basin, where it occurs mainly in the *furcillata* Zone and terminates in the lowermost part of the *radiatus* Zone (across the Valanginian/Hauterivian boundary); in Serbia (*radiatus* Zone) and probably also in Morocco in the uppermost Valanginian (Ettachfini

2004). In Butkov Quarry, *T. subflucticulum* occurs in Level 7 West, Levels 11 and 12 in the uppermost part of the Ladce Formation (Upper Valanginian).

Teschenicerasa pachydicranum (Thieuloy, 1977)
(Text-fig. 2A, B)

1901. *Hoplites regalis* Bean (in Paulow); Sarasin and Schöndelmayer, pl. 9, fig. 1.
1902. *Hoplites* n. sp. ind.; Uhlig, p. 58, pl. 8, fig. 2 a, b.
?1976. *Neocomites* (*Teschenites*) *transsylvanicus* (Jekelius); Mandov, p. 75, pl. 12, fig. 6.
non 1977. *Neocomites* (*Teschenites*) *pachydicranus* n. sp.; Thieuloy, p. 100, pl. 1, fig. 2, pl. 3, figs 1–4, pl. 3, ?figs 5, 6 [= *Teschenicerasa subpachydicranum* (Reboulet, 1996)].
?1981. *Teschenites pachydicranus* Thieuloy; Charollais *et al.*, p. 90, pl. 5, figs 5, 6.
1986. *Neocomites* (*Teschenites*) *pachydicranus* Thieuloy; Wyssling, p. 197, pl. 8, figs 1, 2.
1987. *Neocomites pachydicranus* Thieuloy; Company, p. 135, pl. 11, figs 6, 7, pl. 19, fig. 8, ?pl. 11, fig. 5.
1988. *Neocomites* (*Teschenites*) *pachydicranus* Thieuloy; Wilke, p. 12, pl. 1, fig. 1.
non 1991. *Neocomites* (*Teschenites*) *pachydicranus variant A* Thieuloy; Thieuloy *et al*., p. 68, pl. 1, fig. 6 [= *Teschenicerasa subpachydicranum* (Reboulet, 1996)].
non 1993. *Neocomites* (*Teschenites*) *pachydicranus* Thieuloy; Autran, pl. 2, fig. 2 [= *Teschenicerasa subpachydicranum* (Reboulet, 1996)].
1993. *Neocomites* (*Teschenites*) *neocomiensiformis* (Uhlig); Autran, pl. 2, fig. 13.
1995. *Neocomites* (*Teschenites*) *pachydicranus* Thieuloy; Avram, pl. 2, fig. 1a, b.
1996. *Teschenites pachydicranus* (Thieuloy); Reboulet, p. 114, pl. 12, figs 1, 3, 5, pl. 13, figs 1–7, 9.
1996. *Neocomites pachydicranus* Thieuloy; Vašíček and Faupl, p. 109, pl. 2, figs 5, 6.
2003. *Teschenites pachydicranus* Thieuloy; Busnardo *et al.*, p. 44, pl. 1, fig. 8, pl. 2, fig. 11.
2004. *Neocomites pachydicranus* Thieuloy; Ettachfini, p. 137, pl. 17, figs 4a, b, 5, pl. 17, ?figs 6, 7.
2005. *Neocomites* (*Teschenites*) *pachydicranus* Thieuloy; Klein, p. 318 (cum syn.).
2013. *Teschenites pachydicranus* Thieuloy; Michalík *et al.*, p. 113, fig. 93/3.

MATERIAL: Comparatively large external moulds, sometimes coated with limonite on the ultimate whorl, usually slightly deformed by lateral shear (SNM Z 40065 = BK8-450/22, SNM Z 40061 = BK 10-80/6, SNM Z 40066 = BK6-1/9 – fragment of the last whorl). Moreover, specimens BK5-270/17, 22 and BK8-450/7.

DESCRIPTION: Semi-involute specimens, with medium-high whorls and a comparatively narrow umbilicus. On the beginning half of the ultimate whorl, medium strong, slightly S-shaped ribs begin in umbilical tubercles. Occasionally, two ribs run out from the tubercles. Some ribs bifurcate at different whorl heights, somewhere at one to three fifths of whorl height. All ribs bear only weak ventrolateral tubercles. The ribs gradually strengthen in the direction of the aperture. In the final part of the whorl, the ribs are more distinctly S-shaped. On some specimens, feeble constrictions are indicated. The ribs cross the venter in the form of a chevron. Towards the venter, the ribs disappear. In wider or narrower interspaces bounded by ribs running out from the tubercles, incomplete to indistinct subsidiary ribs occur. The body chamber of macroconch (Text-fig. 2A) bears distinct umbilical tubercles. On the venter, the ribs are inclined towards the aperture. The whorl flanks seem to be smooth. Only in the place of the expected aperture, several S-shaped growth lines are evident. This macroconch could reach a diameter of about 155 mm. The measurements are presented in Table 1.

REMARKS: *Teschenicerasa pachydicranum* is, in contrast to the previous species, characterised by coarser and more widely spaced ribs of somewhat falcoid shape. It differs from the closely related *T. subpachydicranum* by a narrower umbilicus and by the dominance of simple ribs in vicinity of the umbilicus. The microconch of *T. pachydicranum* illustrated in Vašíček and Faupl (1996, pl. 2, fig. 5) has a preserved rostrum. The fragment of the macroconch from Butkov Quarry illustrated herein (Text-fig. 2A) corresponds to the macroconch of *T. pachydicranum* illustrated by Reboulet (1996, pl. 13, fig. 1).

OCCURRENCE: *Teschenicerasa pachydicranum* comes mainly from strata encompassing the uppermost Valanginian to the basal Hauterivian in France, Spain, Western Austria, Romania and Morocco (e.g., Reboulet 1996). Company (1987) states *T. pachydicranum* as the zonal species of the uppermost Valanginian, similar as Reboulet *et al.* (1992). In Butkov Quarry, the specimens come from the Ladce Formation and from the layers where the Ladce Formation multiply alternates with the Mráznica Formation: Level 8, from 450 m of the succession

(Ladce Formation, approximately the uppermost Valanginian), Level 6 (Mráznica Formation), Level 5, from about 270 m of the succession, and Level 10, from about 80 m of the succession near the Valanginian/Hauterivian boundary.

Teschenicerascubpachydicranum (Reboulet, 1996)
(Text-fig. 3B)

pars 1977. *Neocomites* (*Teschenites*) *neocomiensiformis* (Uhlig); Thieuloy, p. 95, pl. 2, figs 2, 3 [non pl. 2, fig. 1 = *Teschenicerasflucticulum* (Reboulet, 1996)].
?1977. *Neocomites* (*Teschenites*) *pachydicranus* Thieuloy *variant A*; Thieuloy, p. 101, pl. 3, figs 5, 6.
1991. *Neocomites* (*Teschenites*) *pachydicranus Variant A*; Thieuloy *et al*., p. 68, pl. 1, fig. 6.
1993. *Neocomites* (*Teschenites*) *pachydicranus variant A*; Autran, pl. 2, fig. 1.
1993. *Neocomites* (*Teschenites*) *pachydicranus* Thieuloy; Autran, pl. 2, fig. 2.
1996. *Teschenites subpachydicranus* n. sp.; Reboulet, p. 112, pl. 11, figs 1–7, pl. 12, figs 2, 4, 6, pl. 13, fig. 8.
1996. *Teschenites* aff. *subpachydicranus* n. sp.; Reboulet, p. 116, pl. 14, fig. 22.
1996. *Teschenites subpachydicranus* Reboulet; Atrops *et al*., p. 724, fig. 19 (figure copied from Reboulet 1996, pl. 14, fig. 22), 20.
2005. *Neocomites* (*Teschenites*) *subpachydicranus* (Reboulet); Klein, p. 320 (cum syn.).
2013. *Teschenites subpachydicranus* Reboulet; Michalík *et al*., p. 94, fig. 66/6.
2018. *Neocomites subpachydicranus*; Aguado *et al*., p. 128, fig. 5 F.

MATERIAL. Comparatively favourably preserved, flatly deformed external moulds (SNM Z 40067 = BK11A-11, SNM Z 40068 = BK11A-17; and specimen BK11-34/3) with the end of the phragmocone and part of the body chamber, and similarly preserved juvenile external moulds (SNM Z 40072 = BK11/10-04/9; and specimen BK11/10-04/6).

DESCRIPTION. Umbilicus rather wide. Juvenile whorls bear thin and closely spaced, equally strong, proverse, slightly S-shaped ribs. The ribs run out from the umbilical tubercles. Between the bundled ribs, one rib may be inserted in places. On the periphery, ventrolateral tubercles are indicated. Gradually, ribs become somewhat stronger, and from the umbilical tubercles, one or two ribs run out. At the beginning of the not high ultimate whorl, ribbing changes with the beginning of the body chamber. The ribs and the umbilical tubercles gradually strengthen, gaps between them increase. From the umbilical tubercles, two S-shaped ribs run out. Sporadically, some of the ribs bifurcate on the flank, at about two thirds of whorl height. On the final half of the whorl, the S-shaped ribs are distinctly stronger and more widely spaced. They begin individually or in pairs in distinct umbilical tubercles. The tubercles are somewhat bullate, concavely bent towards the aperture. Majority of the ribs bifurcate at about half the whorl height or even higher. They cross the venter without interruption in the form of a chevron. The measurements are presented in Table 1.

OCCURRENCE: *Teschenicerassubpachydicranum* is known from the Vocontian Basin in France (uppermost Valanginian), from southern Spain (Pérez Valera and Company 2001) and Butkov Quarry (Slovakia), Level 11, layer of grey limestones in the transition between the Ladce and Mráznica formations (uppermost Valanginian).

Biostratigraphic implications

The classical area for the study of biostratigraphy and development of ammonites across the Valanginian/Hauterivian boundary is the Vocontian Basin in SE France. For example, Reboulet *et al*. (1992) and Bulot *et al*. (1993) analysed the distribution of species of the genus *Teschenites* occurring there. According to these authors, the first teschenitids appear in the *callidiscum* Subzone (*sensu* Reboulet *et al.* 2018). Text-fig. 4 shows the recent international ammonite zonation of the studied part of the Lower Cretaceous.

Based on the stratigraphic evaluation of all the ammonites in Butkov Quarry correlated with equivalent findings made in significant European localities, it can be stated that the studied succession (Text-fig. 5) belongs to the *furcillata* Zone (uppermost Valanginian) and the *radiatus* Zone (lowermost Hauterivian) according to Reboulet *et al.* (2018).

The distribution of ammonite species in deposits across the Valanginian/Hauterivian boundary in Level 10 in Butkov Quarry is presented in Text-fig. 5. From among the neocomitid species determined in the quarry, only *Teschenicerascallidiscum* occurs sporadically in the lower part of the succession in Level 10 (65 m). The index species *Himantoceras trinodosum* Thieuloy, 1965 and *Olcostephanus nicklesi* Wiedmann and Dieni, 1968 (*peregrinus* Zone) are known from the underlying deposits with the first

STAGES		ZONES	SUBZONES	HORIZONS
HAUTERIVIAN	lower	*Lyticoceras nodosoplicatum*		*Olcostephanus* (*O.*) *variegatus*
		Crioceratites loryi	*Olcostephanus* (*J.*) *jeanotti*	
		Acanthodiscus radiatus		*Breistrofferella castellanensis*
VALANGINIAN	upper	*Criosarasinella furcillata*	*Teschenicerasc callidiscum*	
			C. furcillata	
		Neocomites peregrinus	*Olcostephanus* (*O.*) *nicklesi*	
			N. peregrinus	
		Saynoceras verrucosum	*Karakaschiceras pronecostatum*	
			S. verrucosum	

Text-fig. 4. Ammonite zonation of the Upper Valanginian and Lower Hauterivian (modified after Reboulet *et al*. 2018). Following the present study, the subzonal species *Teschenites callidiscus* is renamed as *Teschenicerasc callidiscum*.

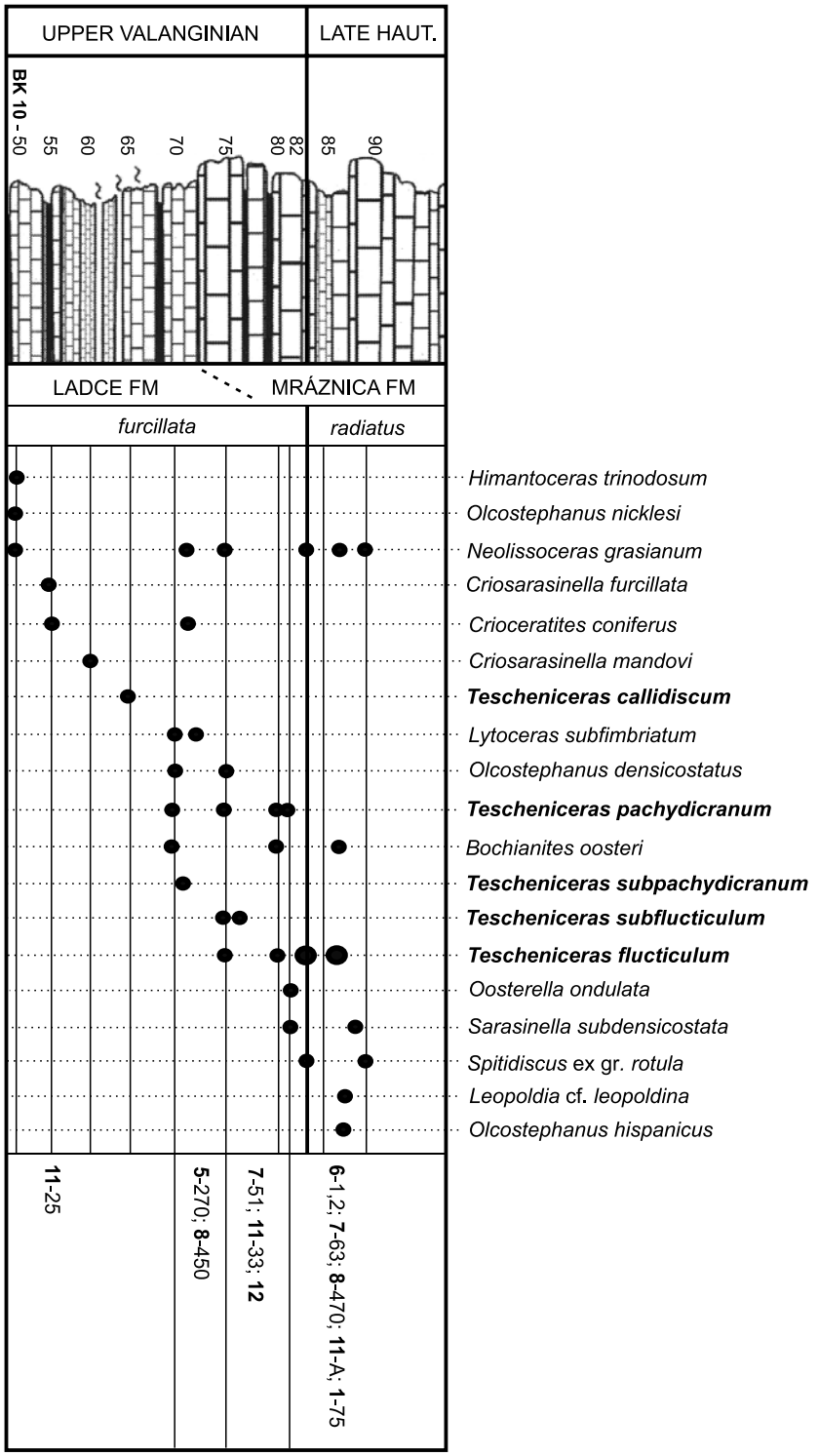
representative of *Teschenicerasc* gen. nov.; followed by the sporadic *Criosarasinella furcillata* Thieuloy, 1977 (Level 10, from 55 m of the succession; Level 11, from 25 m of the succession). *Teschenicerasc subflucticulum* and *T. subpachydicranum* (*furcillata* Zone) sporadically occur in stratigraphically higher quarry levels. Compared to the previously mentioned species, *Teschenicerasc pachydicranum* has a wider stratigraphic range. It occurs in deposits of the Ladce Formation as well as, rarely, in deposits corresponding to the overlying Mráznica Formation, thus spanning the interval between the uppermost Valanginian and the Valanginian/Hauterivian boundary. *Teschenicerasc flucticulum* comes from the highest parts of the studied succession; at first rarely in Level 10 (80 m), then relatively abundantly above 82 m in the same Level.

The upper boundary of the *callidiscum* Subzone in the classical areas (such as the Vocontian Basin) is marked by the first occurrence (FO) of *Acanthodiscus radiatus* (Bruguière, 1789) and related species, e.g., *Breistrofferella castellanensis* (d'Orbigny, 1840). Representatives of *Acanthodiscus* and *Breistrofferella*, classically used to indicate the base of the Hauterivian, have not been found in Butkov Quarry. Vašíček (2010, p. 410) stated that, instead of *Acanthodiscus radiatus*, *Teschenites flucticulus* (now *Teschenicerasc flucticulum*) could be used as an index taxon for the basal Hauterivian in the Carpathian Region.

The *radiatus* Zone, in which *Teschenicerasc* spp. occur most frequently, is evidenced by some Lower Hauterivian species accompanying *Teschenicerasc flucticulum*, such as *Leopoldia* cf. *leopoldina* (d'Orbigny, 1840), *Olcostephanus hispanicus* Mallada, 1882, *Sarasinella subdensicostata* Vašíček, 2010, *Spitidiscus* ex gr. *rotula* (Sowerby, 1827), and *Oosterella ondulata* Reboulet, 1996 (*O. ondulata* occurs already in the *furcillata* Zone). With the exception of *S. subdensicostata*, all other taxa are represented by single specimens.

According to Reboulet (1996), Busnardo *et al*. (2003) and Melliti *et al*. (2019), the first representatives of the genus *Spitidiscus* Kilian, 1910 occur in the base of Hauterivian. The first occurrence of *Spitidiscus* (Level 10, from 82 m) is thus used for the determination of the base of the Hauterivian in Butkov Quarry.

Altogether, the ammonite association occurring in Butkov Quarry across the Valanginian/Hauterivian boundary is similar to other successions in Europe, especially in the Vocontian Basin in France, Spain, and others. However, with regard to the composition of the index species, some substantial species of the basal Hauterivian, especially *Acanthodiscus radiatus* and *Breistrofferella castellanensis*, are missing in Butkov Quarry. Both mentioned species are connected with a more shallow-water environment in SE France. According to Reboulet (1996, 2002), repre-



Text-fig. 5. Composite distribution of ammonites across the Valanginian/Hauterivian boundary in Butkov Quarry, Slovakia. The main source of the material is a section in Level 10 (BK 10) with the lithology presented graphically. The left part of the figure represents basic stratigraphy, ammonite zones and position of faunal horizons in meters. The species of *Teschenicerasa* gen. nov. are in bold. Larger black circles indicate the abundant occurrence of *Teschenicerasa flucticulum.* In the right part of the figure, numerical symbols are used to indicate the stratigraphic equivalents in other levels bearing representatives of *Teschenicerasa* gen. nov. and other stratigraphically important species. For reasons of space, the symbol BK is omitted in this part of the figure. Only the number of the level (as the first number) and its particular length are marked (e.g., **8**-450 = Level 8, 450 m).

sentatives of *Breistrofferella* and *Acanthodiscus* are more frequent in shallow platforms than in basinal settings. In Butkov Quarry, they do not occur because the pelagic deposits are of more deep-water type, which is indicated by the character of sediments, layers of turbidites, and composition of macrofauna.

CONCLUSIONS

Neocomitid ammonites from Butkov Quarry (a total of 5 species) which occur in the succession across the Valanginian/Hauterivian boundary are assigned to *Teschenicera*s gen. nov., with *Teschenicera*s *flucticulum* as the type species. The older name *Teschenites* used for this group of neocomitids is not valid. It is considered here that *Teschenites robustus* is a synonym of *Teschenicera*s *flucticulum*.

As the first species in the Ladce Formation there appear *Teschenicera*s *callidiscum* and *Teschenicera*s *subflucticulum*, in the uppermost Valanginian (*furcillata* Zone, *callidiscum* Subzone; Reboulet *et al.* 2018). Roughly at the same stratigraphic level, within the grey-coloured Mráznica Formation, occurs *Teschenicera*s *subpachydicranum*. In the vicinity of the expected Valanginian/Hauterivian boundary, *Teschenicera*s *pachydicranum* appears as well. The most abundant is *Teschenicera*s *flucticulum*, whose maximum abundance in the quarry indicates the base of the Hauterivian (*radiatus* Zone). As representatives of *Acanthodiscus* and *Breistrofferella* are absent from the succession in the quarry, the first occurrence of *Spitidiscus* is used to characterise the base of the Hauterivian. The presented paper contributes to the extention of knowledge concerning the ammonite association across the Valanginian/Hauterivian boundary in the pelagic realm.

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