

Occurrence of the peculiar ammonites *Phlycticeras* and *Oecoptychius* in the Callovian (Middle Jurassic) of the Villány Hills (South Hungary)

In memory of Ivo Sapunov – colleague and friend

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Abstract. New fossil collections from two Callovian (Middle Jurassic) localities of the South Hungarian Villány Hills (Villány, Templom Hill Quarry and Siklós, Rózsa Quarry) include specimens of the rare ammonite genus *Phlycticeras* and the sporadic *Oecoptychius*. A review is given herein on the previously published and newly found Villány specimens. Dimorphism, as well as the palaeogeographical distribution of the genera, is also briefly discussed.

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INTRODUCTION

Phlycticeras Hyatt, 1900 is a genus of ammonites with spiral striation as sculpture – a type of ornament rare in Jurassic (and other Mesozoic) ammonoids. The Callovian species of this genus are of wide geographical distribution but are generally represented by a few specimens, even in rich, large collections. Their peculiarity is probably one of the reasons for those comprehensive treatments, which have discussed different aspects of *Phlycticeras* and related forms recently.

Phlycticeras was recorded from the famous Villány ammonite fauna by both Till (1910–1911) and Lóczy (1915). In the early 1970s, a new collection in the classic locality of Villány resulted in findings of new specimens: one of the genus *Phlycticeras*, and one of the genus *Oecoptychius*. Recently, in a private collection, some additional examples ap-

peared, including an exceptionally large specimen. It seemed worth introducing these new findings to a wider audience.

PREVIOUS RECORDS OF *PHLYCTICERAS* FROM VILLÁNY HILLS

The first to record *Phlycticeras* from Villány was A. Till in his 1910–1911 monograph. The description of the specimen, under the name *Lophoceras* cf. *schaumburgi* (Waagen), is in the second volume (1911, p. 1), while the figures (pl. 2, figs 11–12) are in the first part (1910) of the published work. The images seem to be retouched, however, showing a beautiful well-preserved specimen. Originally, it was a part of Till's material, which was placed in the collections of the Geologische Reichsanstalt in Vienna (for details of Till's activities and collect-

ing in Villány, see Géczy and Galácz, 1998). Schweigert and Dietze (1998, p. 19) determined this specimen as *Phlycticeras waageni* Buckman, 1914.

L. Lóczy, Jr, in his monograph from 1915, described and figured *Phlycticeras* as '*Strigoceras pustulatum* Reinecke: (Lóczy, 1915, p. 60, pl. 1, fig. 7; text-fig. 38, showing a suture line). The specimen belonged to the collections of the Geological Institute, where it is now stored under number J15. It is an incomplete fragment but shows the important sculptural elements. Lóczy's species determination was correct based on the shape of the whorl section, the two rows of tubercles and the somewhat irregularly appearing secondary ribs (see also Schweigert and Dietze, 1998, p. 17). The specimen that belongs to *Phlycticeras pustulatum* (Reinecke, 1818) is re-figured herein (Fig. 1a). Based on its infilling rock matrix, it, evidently, came from the fossiliferous layer above the stromatolitic limestone of the Templomhegy Member within the Villány Formation, according to the scheme of Vörös (2012). In this part of the ammonite-bearing bank, the main fossil bed (layer no. 4 in text-fig. 1 of Géczy and Galácz, 1998) belongs to the *Erymnoceras coronatum* and *Peltoceras athleta* zones (see Vörös, 2012, fig. 4). Probably for the reason of completeness, Lóczy (1915, p. 61) gave an account also on the above-mentioned specimen, which Till described shortly before.

After the publication of Lóczy's monograph, there were no new data related to the Villány Callovian strata for a long time, probably because Lóczy (1915, p. 4), and later Rakusz and Strausz (1953, p. 31) who made mapping in the region, stated that the ammonite-bearing bed was completely exploited and no fossils can be collected anymore.

However, in the late 1950s, G. Kopek, and in 1962 G. Vigh, geologists from the Geological Institute, made a smaller collecting in the Villány Templom Hill Quarry and they distinguished separate layers within the formerly undivided ammonite-

bearing bank. An important step toward distinguishing separate layers within the ammonite-bearing bank was the result of Radwański and Szulczewski (1966), who clearly identified a continuous stromatolitic layer in the middle. On the basis of these previous works and his field studies, Vörös (1972) demonstrated that the different layers yield age-different faunal assemblages.

In the 1950s, a new Callovian locality was discovered in the Villány Hills. In its western end, close to Siklós, in the so-called Rózsa (Rose) Quarry, a 30–50-cm thick ferruginous limestone bed represents the Callovian. Similarly as in the Villány Templom Hill, the deposits of this bed with episodic sedimentation lie upon the Triassic dolostone and are covered by the Upper Jurassic pelagic limestone. The Callovian bed yielded a rich ammonite material (Kaszap, 1958, 1959, 1961). Despite the close similarity to the classic Templom Hill assemblage, this Rózsa Quarry fauna did not yield *Phlycticeras* then.

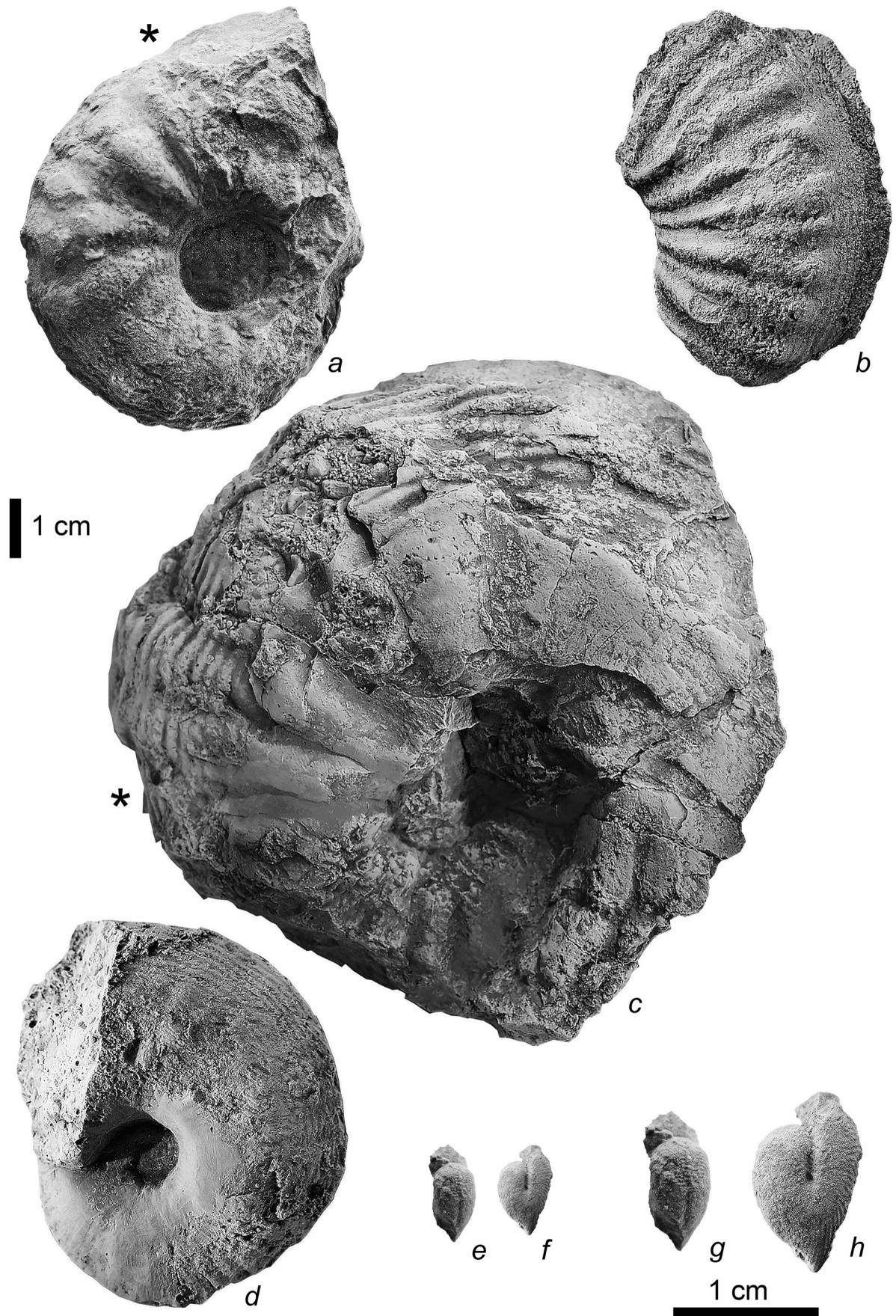
NEW FINDS OF *PHLYCTICERAS* AND *OECOPTYCHIUS* IN THE VILLÁNY TEMPLOM HILL QUARRY AND IN THE RÓZSA QUARRY

In the early 1970s, with the help of the Hungarian Geological Institute, a collecting campaign was organized in the old collecting sites of the Templom Hill Quarry, and in a new locality on the neighbouring Somssich Hill. A group was formed, with Barnabás Géczy and Attila Vörös, and we made serious effort to amass a collection big enough to characterise the formerly distinguished separate levels within the fossiliferous bank. It was also expected that, with a better-controlled collecting, the source levels of the previously collected specimens might be determined.

The collecting resulted in several hundred Callovian ammonite specimens, including *Phlycticeras*. Géczy (1984), in a short paper written with the

Fig. 1. a) *Phlycticeras pustulatum* (Reinecke), Villány, Templom Hill Quarry, *Coronatum* Zone (specimen figured formerly by Lóczy, 1915, pl. 1, fig. 7), Hungarian Geological Institute collections, J13); b) *Phlycticeras polygonium* (Zieten), Villány, Templom Hill Quarry, *Coronatum* Zone (collected in 1972; in the collections of Eötvös L. University, Department of Palaeontology, Budapest); c) *Phlycticeras polygonium* (Zieten), Siklós, Rózsa Quarry, *Gracilis* Zone (in the G. Földváry Collections, Kővágóörs); d) *Phlycticeras polygonium* (Zieten), Rózsa Quarry, *Gracilis* Zone (in the G. Földváry Collections, Kővágóörs). e–h) *Oecoptychius refractus* (Reinecke), Villány, Templom Hill Quarry, *Coronatum* Zone (collected by A. Vörös in 1972; in the collections of Eötvös L. University, Department of Palaeontology, Budapest).

All figures in natural size except for g–h, which are in double size. Asterisks indicate end of septation.



knowledge of the newly collected and determined elements, gave a complete list of species that he identified in the fauna. He mentioned that the ammonite-bearing bank could be subdivided into different Bathonian and Callovian layers and corresponding chronostratigraphic units, but still gave a united list for the whole represented Middle Jurassic.

In the list, he mentioned three *Phlycticeras* specimens. *Phlycticeras* cf. *schaumburgi* (Waagen, 1875) is simply a repetition of the record of Till. *Phlycticeras* cf. *waageni* Buckman, 1914 is a revised determination that refers to Lóczy's (1915) specimen, as it is shown by the label Géczy put into the box of the ammonite. However, Lóczy identified the species as *P. pustulatum* correctly (see above). The third item in the list is '*Phlycticeras* n. sp. aff. *polygonium* (Zieten, 1831)' that refers to the newly found example. This specimen belongs to *Phlycticeras polygonium* (Zieten, 1833) indeed, by its wider whorl section, sharper inner ribs and few outer ribs. In ribbing, it is close to *P. waageni* Buckman, but the latter has an undulating ('hahnenkammartig') carina, while the Villány specimen shows a continuous, knife-edge keel. With these features, it is well within the variability shown by the examples figured by Schweigert and Dietze (1998) and in the previous literature. It is refigured herein in Fig. 1b.

Another particular and important new element in the new collection was an *Oecoptychius* specimen (found by A. Vörös). This find was included in the revised faunal list of Géczy (1984, p. 194) as *Oecoptychis refractus* (Reinecke, 1818; see Fig. 1e–h).

In the past 50–60 years, private collectors frequently visited the Rózsa Quarry and, in one collection, some interesting new ammonites turned up (see Galácz, 2021). In the collection of Gabriella Földvári of Kővágóórs, some new specimens of *Phlycticeras* also appeared.

These new *Phlycticeras* specimens came from the lower, iron oolitic layer of the Rózsa Quarry fossil bed, which belongs to the lower Callovian *Macrocephalites gracilis* Zone (Galácz, 2021). One of the specimens is a medium-sized (60 mm in diameter) form, with narrow umbilicus, very weak ribbing and a poorly developed keel on the convergent, blunt venter of the internal mould. All characteristics indicate *Phlycticeras polygonium* (Zieten). The specimen is figured here in Fig. 1d. Schweigert and Dietze (1998, pl. 7, fig. 3) figured an almost smooth specimen as '*Phlycticeras polygonium* (Zieten) var. *laevigatum* Quen-

stedt', referring to the weakly sculptured form that Quenstedt (1887, p. 757, pl. 86, figs 17–18, 20) distinguished as *Ammonites pustulatus laevigatus*. This is the most similar to the specimen from the Rózsa Quarry.

The other specimen is a large one. Its blunt, wide, rounded, tapering ribs and two rows of tubercles clearly indicate *Phlycticeras polygonium* (Zieten) and, if regarding varieties, *P. polygonium* var. *nodosum* Quenstedt (see Schweigert *et al.*, 2003, p. 16) is most similar. It is figured here in Fig. 1c. The specimen is an extremely large example concerning the species: its diameter is ~160 mm, and the half of the last preserved whorl is the proximal part of the body chamber. Originally, the specimen could have been an adult individual because it shows the sculpture on the body chamber smoothing out. However, the terminal part of the shell with the aperture is missing, thus the adult size cannot be given.

Big Callovian *Phlycticeras* specimens are fairly common. Schweigert and Dietze (1998) mentioned the holotype of *P. polygonium* as 220 mm in size, and a *P. waageni* specimen as 175 mm of size. Jeannet (1951) mentioned a large *P. pustulatum* specimen, under the name "*Stadium giganteum* Qu. sp.". He estimated the diameter of the incomplete specimen as 110 mm. Bardhan *et al.* (2010, p. 274) mentioned their biggest specimen from Kutch as 148 mm in diameter. However, the coarsely ribbed *P. polygonium* specimens in the literature are all smaller than 80 mm, thus the Villány specimen seems to be truly exceptional.

DIMORPHISM

The dimorphic relationship between *Phlycticeras* and *Oecoptychius* was an early recognition (see Donovan *et al.*, 1981, p. 144). The most conclusive arguments for the dimorphism of *Phlycticeras* were presented later by Schweigert and Dietze (1998). They confirmed *Oecoptychius* Neumayr, 1878 as the microconch pair of the macroconch *Phlycticeras*. One of the important supporting elements was the demonstration of the wide temporal distribution of *Oecoptychius* (including *Oecoptychoceras* Buckman, 1920), which was previously regarded as a monospecific genus with *O. refractus* (Reinecke) as restricted to the middle Callovian *Coronatum* Zone. Now, at least four species are known, and the range of the genus cov-

ers the late Bajocian–late Callovian interval, just as *Phlycticeras*.

On the basis of the comparatively rich material, said to be an assemblage from the Callovian of Kutch, NW India, different conclusion was drawn on the dimorphism. Bardhan *et al.* (2010) argued at some length against pairing *Phlycticeras* with *Oecoptychius*. They suggested dimorphic pairing based on size differences of known species, *e.g.*, *Phlycticeras schauburgi* (m) – *P. polygonium* (M). At the same time, they called attention to possible similar pairing of other forms, also from the lower Callovian.

In a later paper on *Phlycticeras* from Kutch, all above-mentioned suggestions and conclusions were seriously undermined when demonstrating the imprecise age determinations and other inconsistencies in the previous paper (Jain, 2017, pp. 127–128). Jain refigured the specimens (apparently with the same photographs) and assigned most of them to *P. polygonium* (Zieten, 1833), regarding the different forms as varieties. He suggested intraspecific dimorphism within the forms of different sizes determined as *P. polygonium* var. *polygonium*.

The Villány *Oecoptychius* is an internal mould, which lost its original shell; its aperture is also incomplete, notwithstanding other features indicating determination as *O. refractus* (Reinecke). The presence of this species in the fauna is a very strong additional argument to support the dimorphic pairing with *Phlycticeras*.

DISTRIBUTION

Traditionally, *Phlycticeras* was regarded as a Callovian ammonite genus (see Arkell *et al.*, 1957, p. L283). However, Schweigert and Dietze (1998, text-fig. 2) extended its temporal range from the late Bajocian *Garantiana garantiana* Zone up to the late Callovian *Peltoceras athleta* Zone. The Callovian lineage started with *Phlycticeras mexicanum* Sandoval and Westermann, 1990, which replaced the late Bathonian *P. scheurlenae* Schweigert and Dietze, 1998 (see also Schweigert, 2015, p. 395).

In spite of the fact that *Phlycticeras* and particularly *Oecoptychius* (*sensu* Schweigert and Dietze, 1998) are rare ammonites, they are of wide geographical distribution. Both genera occur in NW Europe in the Sub-Mediterranean Province,

and *Phlycticeras* probably migrated on the northern margin of Gondwana to reach the Indo-Madagascar Province, and through the Hispanic corridor to reach the Eastern Pacific (see also Jain, 2017, fig. 19). The record from the northern Gondwana margin is Sicily (Wendt, 1963; Schweigert *et al.*, 2003) and the Indo-Madagascar occurrences are well known since the works of Waagen (1875) from Kutch, and Collignon (1958) from Madagascar. Remarkably, both localities also yielded *Oecoptychius*. The East Pacific occurrences of *Phlycticeras* are in Mexico (Sandoval *et al.*, 1990, p. 121) and northern Chile (Westermann, 1981, p. 479; Fernández-López *et al.*, 1994, p. 195, pl. 1, fig. 3).

The Jurassic of Villány, as discussed in details recently by Vörös (2012), belongs to the Mesozoic sequence of the Intra-Carpathian Tisza Unit. This palaeogeographic region was a part of the southern European margin of the Laurasian continent. This marginal segment, after having been under terrestrial then shallow-marine depositional regime, became a pelagic area, where only episodic sedimentation took place during the Middle Jurassic. Together with the record of *Phlycticeras* from the Kraków Upland, south Poland (Myczyński, 1970), Villány is another indication that *Phlycticeras* migrated eastward not only on the southern, but also along the northern margin of the Mediterranean Tethys.

The Villány *Phlycticeras* and *Oecoptychius* represent occurrences where these ammonites appear as sporadic, ancillary elements in otherwise rich assemblages. These ammonites were most probably rare animals even in their time, so one can only hope to discover a new locality with specimens in quantity big enough to know more about their palaeobiology, especially ontogeny and dimorphism.

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