

## On the Age of the "Serpulite" from Tomaszów Mazowiecki (Central Poland)

by

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Almost everywhere in Poland the sediments of the Volgian are covered by Cretaceous, Tertiary and Quaternary deposits. In the area of Central Poland the Volgian deposits crop out only in the NW margins of the Holy Cross Mountains. In that region, the best exposures occur near Tomaszów Mazowiecki. They are of particular importance for the Volgian stratigraphy in Poland. In that locality the presence of Volgian deposits was established for the first time in Poland, and a stratigraphic synthesis of the Polish Volgian presented by Lewiński [9] in 1923 was almost entirely based on investigations carried out at Tomaszów.

In his work of 1923 Lewiński has expressed the view that there are no Lower Volgian deposits either at Tomaszów or elsewhere in Poland. After the Second World War, however, the presence of these deposits was stated in some exposures in the Holy Cross margins as well as in numerous bore-holes in the Polish Lowland (Central and Northern Poland). On this basis the present author [7], [8] advocated the opinion that the Lower Volgian deposits also occur near Tomaszów, beneath the cover of the Quaternary. It was recently confirmed by the discovery of some Lower Volgian deposits at Brzostówka (a suburb of Tomaszów). They represent the *Subplanites pseudoscythicus* zone and contain ammonites both of the Russian and Tithonian types (a.o. *Pectinatites ianschini*). These ammonites will be described in a separate paper.

In the present paper, only the problem of the age of the youngest Volgian deposits occurring at Tomaszów will be discussed. It was dealt with in some previous papers of the author [7], [8]. Now, in the light of some findings of new ammonites it can be presented with more details.

The subdivision of the Volgian stage presented by N. P. Mikhailov [13] is adopted in this paper. According to that author the Lower Volgian includes the *Subplanites klimovi*, *S. sokolovi* and *S. pseudoscythicus* zones, the Middle Volgian -- the *Zaraiskites scythicus*, *Virgatites virgatus* and *Epivirgatites nikitini* zones, and the Upper Volgian -- the *Kachpurites fulgens*, *Craspedites subditus* and *C. nodiger* zones, respectively.

## The "serpulite"

The Volgian deposits that crop out at Tomaszów have been subdivided by Lewiński [9] into four horizons. The earliest ones have been ascribed to horizon I. They are developed as clays and marls with abundant ammonites proper to the *Zaraiskites scythicus* zone [9]. The upper part of these deposits corresponds to the *Zaraiskites zarajskensis* subzone (upper subzone of the *Z. scythicus* zone). The clay-marly deposits are covered by a limestone complex which corresponds to horizons II, III and IV. Horizon II is developed as limestones with ammonites, and horizon III — as platy limestones with corbulids. Horizon IV yielding numerous serpulids was named "serpulite" by Lewiński.

In horizon II Lewiński has found *Zaraiskites zarajskensis* and some badly preserved specimens of other ammonites, the taxonomic position of which is difficult to determine. Unfortunately Lewiński's collection from Tomaszów Mazowiecki was destroyed during World War II and the limestones of horizon II are not visible now at Tomaszów. Hence, the paleontological elaboration of ammonites from horizon II is now impossible.

No ammonites have been found by Lewiński in horizons III and IV, so the age of the limestone complex of Tomaszów was estimated by this author on the basis of complicated correlations with various Uppermost Jurassic deposits of other regions of Europe. The horizons II and III were ascribed to the *Virgatites virgatus* zone, and the horizon IV — to the *Epivirgitites nikitini* zone. Lewiński supposed that the horizon IV ("serpulite") of Tomaszów is synchronous with the serpulite of NW Germany.

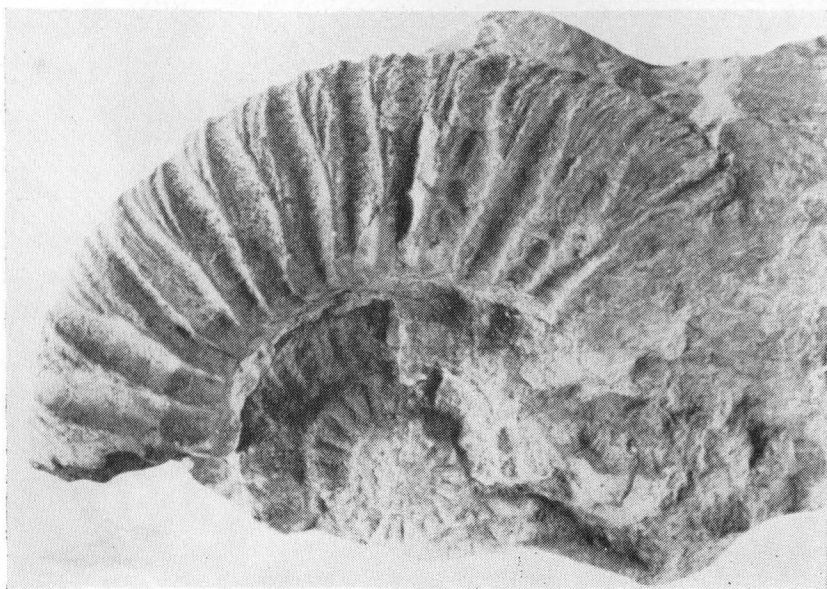
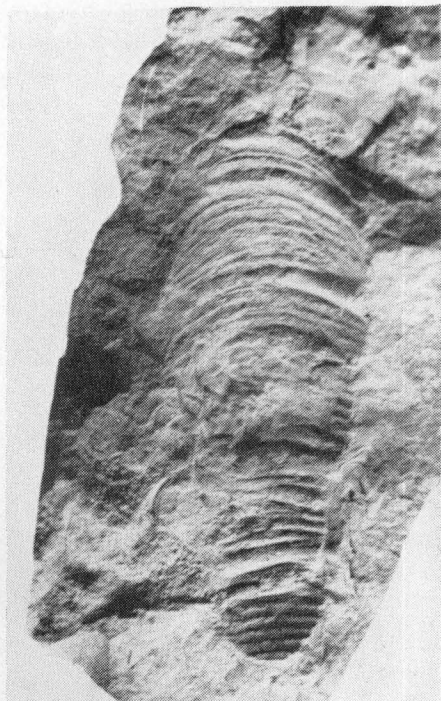
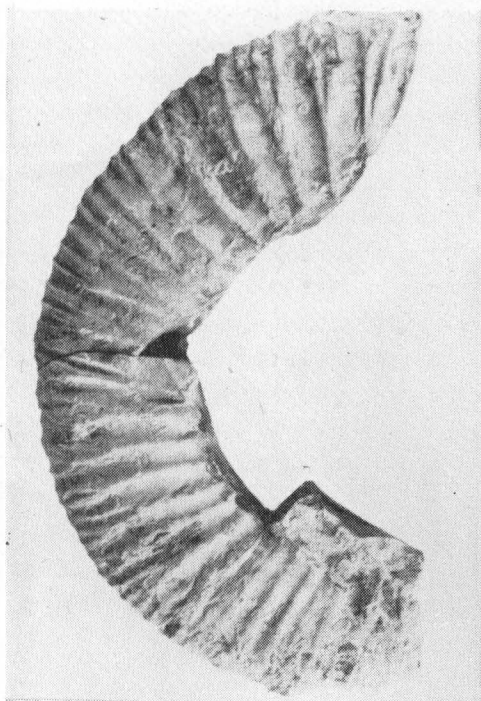
In 1923 only a layer of limestones 2 m. thick was assigned by Lewiński to horizon IV. Jurassic deposits younger than that layer were unknown to Lewiński. Such deposits, and also the Neocomian ones, were discovered by him some years later. The lowermost deposits of the Neocomian were ascribed by Lewiński [10] to the Infravalanginian (some ammonites proper to the *Riasanites rjasanensis* zone have been found in these deposits after World War II). All the Jurassic deposits involved between the top of horizon III and the bottom of the Neocomian deposits were assigned by Lewiński [10] to horizon IV.

It should be pointed out that only slight lithologic differences exist between horizons III and IV. Horizon IV similarly as III consists of platy limestones, yielding in some layers numerous corbulids. Horizon IV contains beds with serpulids but the latter occur also in horizon III and serpulids can be found even in horizon I. The boundary of horizons III and IV can be only traced on the basis of the presence of layer 1.5 m. thick that is crowded with serpulids and occurs at the bottom of horizon IV.

In Lewiński's article of 1932, the term "serpulite" was used in various meanings. In one case it meant a type of sediment (layers crowded with serpulids). In another case this term referred to a stratigraphic formation occurring not only at Tomaszów but also in the Polish Lowland. This formation includes horizon IV (and perhaps horizon III) from Tomaszów.



Pl. 1. *Zaraiskites zarajskensis* (Michalski),  $\times 1$



Pl. 2 Fig. 1. *Zaraiskites zarajskensis* (Michalski),  $\times 0.5$

Pl. 2 Fig. 2. *Zaraiskites zarajskensis* (Michalski),  $\times 1$

Pl. 2 Fig. 3. *Virgatinae* gen. et sp. indet.,  $\times 0.9$

The age of the serpulite formation was not explicitly determined by Lewiński [10] but he mentioned that at Tomaszów the Neocomian rested without any longer gap on the serpulite and that no gap probably existed in the Polish Lowland between the serpulite and the Cretaceous. On this basis one could assume that the serpulite corresponds to the Upper Volgian and to a part of the Middle Volgian.

Lewiński's opinion that horizon IV ("serpulite") from Tomaszów is synchronous with the serpulite of NW Germany was repeated by several authors after World War II. As the age of the German serpulite was variously evaluated, the horizon IV from Tomaszów was also ascribed either to the Lower or to the Middle Purbeckian, or else to the Riazanian [1], [2], [4].

#### The ammonites from horizons III and IV

The ammonites presented below are the only ones hitherto found in the limestones of horizons III and IV in the vicinity of Tomaszów Mazowiecki. All of them are preserved as slightly flattened moulds, or imprints. The suture line is not preserved on them.

Eight specimens have been found in the Brzostówka quarry at Tomaszów, in a 1.5 metre serpulite layer comprising the lowermost part of horizon IV. Seven of these ammonites have been collected by the author. One specimen, a particularly well preserved one, was found by Dr. R. Casey of London and kindly offered to the author during their excursion to Tomaszów in 1966.

The latter specimen, representing the species *Zaraiskites zarajskensis* (Mich.), is shown on Pl. 1. Its diameter is 112 mm. The last preserved whorl shows strongly developed virgatotome ribbing, with up to seven secondaries in a virgatotome rib (the number of secondaries seems to be apparently larger in cases of joining of two primary ribs). The ribbing is of the type proper to *Z. zarajskensis* and the specimens here described closely correspond to those of *Z. zarajskensis*, illustrated by Michalski ([12], pl. 6, figs. 1, 5) and Lewiński ([9], pl. 11, fig. 2).

Fig. 1, Pl. 2 shows a fragment of a whorl covered with triplicate and biplicate ribs. A fragment of an adjacent inner whorl, showing some distant virgatotome ribs with up to 5 secondaries, has been destroyed during extraction from the rock. This specimen can be interpreted as an adult individual of *Z. zarajskensis*. A specimen of *Z. zarajskensis* of similar diameter has been figured by Lewiński ([9], pl. 11, fig. 1).

Besides, two whorl fragments of *Z. zarajskensis* showing "ultravirgatotome" ribbing have been found at Brzostówka. Such a ribbing can be also observed in one imprint of a whorl fragment (Pl. 2, Fig. 2). It was previously referred by the author [7], [8] as belonging to *Zaraiskites zarajskensis* or *Virgatites virgatus*. After examination of Russian collections of *Virgatitinae* in 1966 it became clear that this specimen should be evidently classified as *Z. zarajskensis*.

Fig. 3, Pl. 2 shows another specimen, of about 110 mm. diameter. The outer whorl shows distinct virgatotome ribbing. Except the ribs bordering constrictions, only triplicate and quadruplicate ribs occur. The interspaces between adjacent

sheaves of secondaries are distinctly broader than those in-between the secondaries. The umbilicus is preserved as an imprint, so it can be only stated that the primary ribs occurring on the inner whorls are rather broadly spaced and divide into a few secondaries. There is no doubt that this specimen belongs to the *Virgatitinae* subfamily but more precise determination is not possible. In the opinion of Dr. P. A. Gerassimov who has examined this specimen in Moscow, its assignation to *Zaraiskites pillicensis* (Mich.) or *Virgatites pusillus* (Mich.) can be taken into account.

Two other, badly preserved, fragments of *Virgatitinae* have been found in horizon III at Owadów (about 20 km. to the southeast from Tomaszów). One of these specimens was referred to by the author [7], [8] as representing an intermediate form between *Z. zarajskensis* and *Virgatites virgatus*, but now there is no doubt that this specimen should be classified as *Z. zarajskensis*.

Up to date only 10 specimens of ammonites have been found in horizons III and IV from the vicinity of Tomaszów. All of them belong to the *Virgatitinae* subfamily and some of them may be assigned to the species *Zaraiskites zarajskensis*. Not a single specimen of *Virgatites virgatus* has been found. It seems also that no ammonites of the *Zaraiskites scythicus* group (*sensu* Michalski, 12, p. 166, 437) occur in horizons III and IV.

#### The age of the limestone complex from Tomaszów

The horizons II, III and IV from Tomaszów constitute a set of layers in which *Zaraiskites zarajskensis* occurs, while *Z. scythicus* is not present any more and *Virgatites virgatus* does not appear yet. These layers can be regarded as the passage beds between the *Zaraiskites scythicus* and *Virgatites virgatus* zones. These beds have no stratigraphic analogues in the type section of the Russian Volgian [13]. In Russia the beds with *V. virgatus* rest directly on those with *Z. scythicus*. *Z. zarajskensis* appears in the uppermost beds of the *Z. scythicus* zone (*Z. zarajskensis* subzone), and does not occur in the *V. virgatus* zone. The difference between the Russian sections and that of Tomaszów is easy to explain, as in Russia a distinct sedimentary gap exists between the deposits of the *V. virgatus* and *Z. scythicus* (*Dorsoplanites panderi*) zones.

According to Kobyłecki [6], who had bore-hole data, the thickness of the limestone complex (horizonts II—IV) from Tomaszów is slightly more than 20 m. Similar results were obtained by the present author on the basis of field investigations. The thicknesses given by Lewiński [19] seem to be much exaggerated.

Ammonites have been found only in the lowermost layer of horizon IV. Above this layer and under the Neocomian there is a portion of Jurassic limestones a few m. thick. It does not seem probable that these limestones could already represent the proper *Virgatites virgatus* zone, since all the Kimmeridgian and Volgian deposits attain considerable thicknesses in Central Poland (e.g. the deposits representing the Lower Volgian and the *Zaraiskites scythicus* zone reach 150 m. in some places, and the *Ataxioceras hypselocyclum* zone is about 100 m. thick in the Holy Cross margins).

There is no doubt now that in the vicinity of Tomaszów the Neocomian deposits rest on Middle Volgian ones, and that a considerable gap exists there between the Jurassic and the Cretaceous. Sedimentary features are in agreement with this statement. The ferruginous clay deposits of the *Riasanites rjasanensis* zone distinctly differ from the underlying Volgian deposits, and a conglomeratic layer consisting of allochthonous pebbles occurs in some places at the base of the Neocomian.

Owing to numerous bore-holes carried out after the Second World War, the lithological sequence of the Volgian deposits occurring in the Polish Lowland is well known now. In this area the limestones with serpulids and corbulids are also present, and they rest on clay-marly deposits of the *Zaraiskites scythicus* zone. In some parts of the Polish Lowland some younger deposits occur over the "serpulite". Their thickness reaches 100 m. and they are developed as clays, limestones, gypsum and lumachelles with *Cyrena*. These brackish deposits gradually pass into marine ones of the *Riasanites rjasanensis* zone (Lowermost Cretaceous). As there is no evidence of any sedimentary gaps in the Jurassic deposits, it can be stated that deposits corresponding to the uppermost parts of the Volgian occur in the Polish Lowland. This statement can be supported by micropalaeontological data [3], [11].

On the other hand, however, the "serpulite" of Poland represents neither the Lowermost Cretaceous nor the uppermost parts of the Volgian. Besides, it is not a transgressive formation; nowhere has a sedimentary gap been stated at its base. So the Polish "serpulite" is neither a stratigraphic nor a paleogeographic equivalent of the serpulite of NW Germany.

#### The problem of the *Virgatites virgatus* zone in Poland

At Tomaszów the Neocomian deposits rest on passage beds of the *Zaraiskites scythicus* and *Virgatites virgatus* zones. The deposits which could represent the *Virgatites virgatus* zone have been eroded in this region. In some parts of the Polish Lowland, however, complete Volgian deposits occur, and thus a part of them should correspond to the *Virgatites virgatus* zone.

On the basis of lithological correlation with the Tomaszów profile, it can be assumed that the upper parts of the limestone complex containing serpulids and/or some deposits directly overlying this complex in the Polish Lowland are of the above indicated age. The lower part of this complex should correspond to the passage beds of the *Zaraiskites scythicus* and *Virgatites virgatus* zones, and the underlying clay-marly deposits — to the *Zaraiskites scythicus* zone. In the Polish Lowland, ammonites are known only from the latter deposits.

Formerly, the papers by Pawłowska [14] and Dembowska [5] expressed a different opinion in this matter. According to these authors, ammonites proper to the *Virgatites virgatus* zone appear as early as in the uppermost part of the above mentioned clay-marly deposits. In the opinion of the present author, however, a misidentification of these ammonites may be taken into account.

According to [14] *Virgatites virgatus* and *V. pallasi* have been found in clay-marly deposits passing gradually into limestones in the bore-hole Zagłoba near

Łódź. These ammonites, however, were neither figured nor described (the specimen of *V. virgatus* of which the picture bears no indication of locality in Pawłowska's paper, comes from Russia, according to the information obtained by the present author).

According to a recent paper [5] in the Kujawy region (Polish Lowland) such ammonites as *Virgatites virgatus*, *V. cf. pusillus* and *V. cf. pallasii* occur in clay-marly deposits yielding also zaraiskitids proper to the *Zaraiskites scythicus* zone. Only two specimens determined as *V. virgatus* have been figured from the above mentioned forms. One of these specimens ([15], fig. 2), however, does not allow any exact determination and the second one (fig. 1) does not represent the species *V. virgatus* (that specimen does not (though it should, taking into account its diameter) display virgatitome ribbing at all).

As a matter of fact, the *Virgatitinae* from the clay deposits of the Polish Volgian are relatively poorly preserved, and exact investigation of their ontogenic development is not possible. It is therefore, difficult to distinguish some zaraiskitids from some virgatitids displaying similar ribbing.

So far the presence of ammonites proper to the *Virgatites virgatus* zone seems not to be confirmed in Poland. In the present author's opinion, the beds from which the ammonites ascribed to the genus *Virgatites* have been mentioned, correspond in fact to the *Zaraiskites zarajskensis* subzone (upper part of the *Z. scythicus* zone), while some younger deposits of the Polish Lowland should be correlated to the *Virgalites virgatus* zone.

Finally, it may be suggested that the *Zaraiskites zarajskensis* subzone is more completely developed and bears more complete zaraiskitids assemblages in Poland than in the type sections of the Volgian stage in Russia.

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