

On the status of *Pecten burdigalensis* Lamarck var. *polonica* Pusch, 1837 (Bivalvia: Pectinidae)

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ABSTRACT:

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The well-known *Pleuromectia badensis* Fontannes, 1882 (currently classified as *Cristatopecten cristatus badense*) is declared as a *nomen protectum* against the older synonym *Pecten burdigalensis* var. *polonica* Pusch, 1837 considered a *nomen oblitum*. It ranges from the early to the late Miocene (Burdigalian–Messinian) of the NE Atlantic and Mediterranean. In the Central Paratethys it appeared in the early Miocene (Karpatian, correlating with the latest Burdigalian) and became extinct in the middle Miocene (Late Badenian, correlating with the early Serravallian). In Poland – the northernmost part of Central Paratethys – the occurrence of this taxon is limited to the late Early Badenian (late Langhian).

Key words: Pectinidae; Taxonomy; Badenian (middle Miocene); Central Paratethys; Pusch Collection.

INTRODUCTION

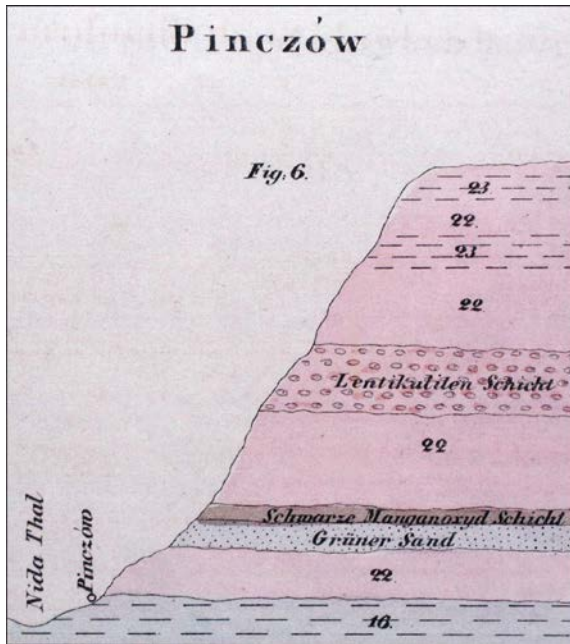
In the winter of 1816/1817, Georg Gottlieb Pusch (1790–1846), immediately after arriving in the Kingdom of Poland to take up the position of professor at the newly established Kielce Academic School of Mining (*Szkola Akademiczno-Górnicza w Kielcach*) and assessor of the Main Mining Directorate in Kielce, began pioneering geological work aimed at recognizing the geology of this country. The result of his numerous geological expeditions in 1816–1826 was the fundamental two-volume book entitled *Geognostische Beschreibung von Polen* (Pusch 1831–1836), the geological atlas of the Kingdom of Poland (Pusch 1837a) and the palaeontological monograph presenting selected fossils of various age from the territory of the Kingdom of Poland (Pusch 1837b).

During the expedition in the summer of 1818, Pusch visited Pińczów and described in detail the exposure of Tertiary deposits visible at Castle Hill

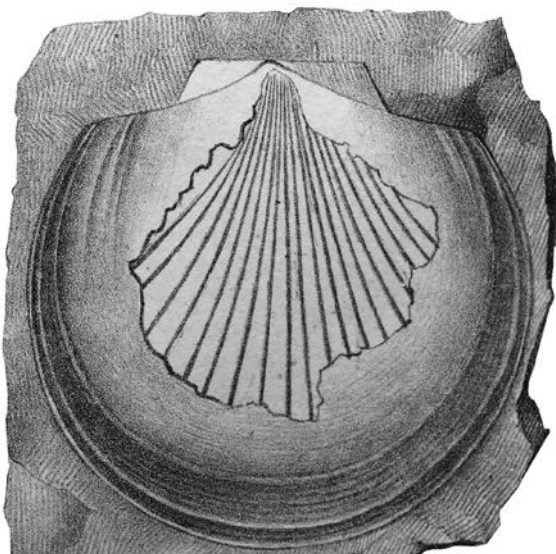
(Pusch 1836, p. 460). He also provided the first illustration of the studied exposure in Pińczów (Text-fig. 1), which is one of the five profiles of natural exposures of Tertiary deposits from the territory of the Kingdom of Poland, published in the *Geognostischer Atlas von Polen* (Pusch 1837a, pl. 6, fig. 6). According to Pusch (1830, p. 37), the set of fossils found in Pińczów is second in terms of diversity after Korytnica. The catalogue of the Tertiary fossils prepared by Pusch (1836, pp. 495–549) contained 400 species-level names, of which 29 were recorded in Pińczów. They were collected from sandy limestones emerging just above the layer with larger foraminifera, named by Pusch (1837b, pp. 164–165, pl. 12, fig. 18) as *Nummulina discorbiformis*, subsequently recognized by Zejszner (1861) as *Heterostegina Puschii*, which was considered a junior synonym of *Heterostegina costata* d’Orbigny, 1846.

The collected fossil assemblage included two left valves of smooth representatives of the family Pectinidae (Text-fig. 2), which Pusch (1836, p. 500)





Text-fig. 1. The first ever drawing of a lithological profile of a natural Tertiary exposure on the Castle hill in Pińczów. Copies from the *Geognostische Atlas von Polen* (Pusch 1837a, pl. 6, fig. 6). Selective explanations: 16 – Cretaceous marl; 22 – Tertiary “sandiger Grobkalk” (sandy limestones); 23 – Tertiary “pisolithenartiger Grobkalk” (coralline algal limestones); “Lenticuliten Schicht” – a layer about 3 m thick, composed almost entirely of tests of the large species of foraminifera named by Pusch (1837b, p. 164, pl. 12, fig. 18a, b) as *Nummulina discorbiformis* (presently informally referred to the *Heterostegina* beds). From the collection of the Library of the Polish Geological Institute-National Research Institute, Warszawa, Poland.



Text-fig. 2. *Pecten Burdigalensis* var. *polonica* Pusch, 1837, lectotype, Pińczów. The left valve partially damaged in its central part is still embedded in sandy limestone. Copied from *Polens Paläontologie* (Pusch 1837b, pl. 6, fig. 1).

originally named *Pecten Burdigalensis*, and later *Pecten Burdigalensis* var. *Polonica* (Pusch 1837b, p. 42, pl. 6, fig.1).

The purpose of this paper is to present how one imprecisely recorded name of a taxon given in a list of synonyms provided by an eminent recognized palaeontologist may cause, according to the International Code of Zoological Nomenclature, the oldest name of a described and illustrated taxon to be considered invalid.

The Tertiary deposits at Castle Hill in Pińczów presently referred to the Pińczów Limestones (Studencki 1988) correspond to the main Badenian transgressive pulse of Central Paratethys, dated at the late Early Badenian (correlating with the late Langhian) based on calcareous nannoplankton Zone NN5 (Studencka and Studencki 1988) and foraminiferal Zone *Orbulina suturalis* (Chruszcz 2002).

HISTORICAL REVIEW – FATE OF *PECTEN BURDIGALENSIS* LAMARCK VAR. *POLONICA* PUSCH, 1837

Based on the available literature, it is known that the two left valves of this unusual pectinid collected by Pusch in Pińczów were purchased together with other fossils, minerals and rock samples for the collection of the Mineralogical Cabinet of the former Royal University of Warsaw, and were available for research at the beginning of the 1930s. Friedberg (1936, p. 255), who examined the type material of *Pecten burdigalensis* Lamarck var. *polonica* kept in the Pusch Collection, indicated that one specimen closely corresponds to the size given by Pusch (1836, p. 500), and the other – to the specimen figured by Pusch (1837b, pl. 6, fig. 1). The original illustration clearly shows a smooth left valve, 62 mm long and 58 mm high with a 20 mm long hinge margin, partially damaged in its central part still embedded in sandy limestone, revealing regularly spaced radial ribs ornamenting its inner surface.

It is evident that Pusch (1836, p. 500) had doubts about the specific assignment of specimens he had found; he described them as follows: “Testa suborbicularis aequalvalvis, complanata et paulo utrinque convexa, extus laevis, intus radiis sexdecim duplicatis, auriculis aequalibus.” Pusch (1836, p. 500) reported that these fragile suborbicular shells, up to c. 75 mm high, with nearly equal ears, smooth outer surface and 16 pairs of thin ribs on the inner surface are reminiscent to both the fossil species *Pecten Burdigalensis* Lamarck, 1806 (currently classified as

Flabellipecten burdigalensis) and the extant species *Pecten Laurenti* (Gmelin, 1791) (currently classified as *Euvola laurenti*), and considered them only a variety of *Pecten Burdigalensis*. At that time, however, he refrained from creating a varietal name, but did so in 1837.

By introducing the varietal name *Polonica*, Pusch (1837b, pp. 42, 43) emphasized its greater similarity to two other modern species, i.e., *Pecten Pleuronectes* (Linnæus, 1758) (now classified as *Amussium pleuronectes*) and *Pecten japonicus* (Gmelin, 1791) (now classified as *Ylistrum japonicum*) than to *Pecten laurenti*, as he previously believed. Despite the fact that the Pińczów specimens (Text-fig. 2), like all the aforementioned modern species, have the external surface smooth and the shells shiny with very delicate growth lines, differing from Lamarck's species *burdigalensis* which has a distinct radial ornamentation, Pusch considered them a variety of this fossil species which was known from Saucats in the Aquitaine Basin in France (Basterot 1825). For unknown reasons, he did not decide to create a new species despite such conspicuous differences between the Pińczów and Saucats specimens. One can only assume that it was probably the only fossil species known to him with which he could compare the Pińczów specimens, although the first illustrations of the Saucats specimens were published later by Sacco (1897, p. 53, tab. 15, fig. 1a, b), who established a new subgenus *Amussiopecten* and designated *Pecten burdigalensis* as its type species. Moreover, the most closely related species, i.e., Bronn's species *Pecten cristatus*, was illustrated in 1834 (Goldfuss 1834, pl. 99, fig. 13a–d), already after Pusch had sent *Polens Paläontologie* to the E. Schweizerbart publishing house in Stuttgart.

The existence of significant differences in the ornamentation of the external surface between the Polish and French specimens, which Lamarck (1806) and Basterot (1825) referred to *Pecten burdigalensis*, was emphasized by Bronn (footnote in Pusch 1837b, p. 42). Moreover, this footnote proves that Bronn doubted that the specimens from Pińczów were conspecific with those from Castell'Arquato and Andona (Pliocene of Italy), which he named *Pecten cristatus* (Bronn 1827, p. 542), and later also described (Bronn 1831, p. 116). It should be added that Goldfuss illustrated under the name *Pecten cristatus* not only the Pliocene specimen from Italy (Goldfuss 1834, pl. 99, fig. 13c, d), but also a Miocene specimen collected in Baden, Austria (Goldfuss 1834, pl. 99, fig. 13a, b). Following him, a rather broad species concept of *Pecten cristatus* was widely applied by many re-

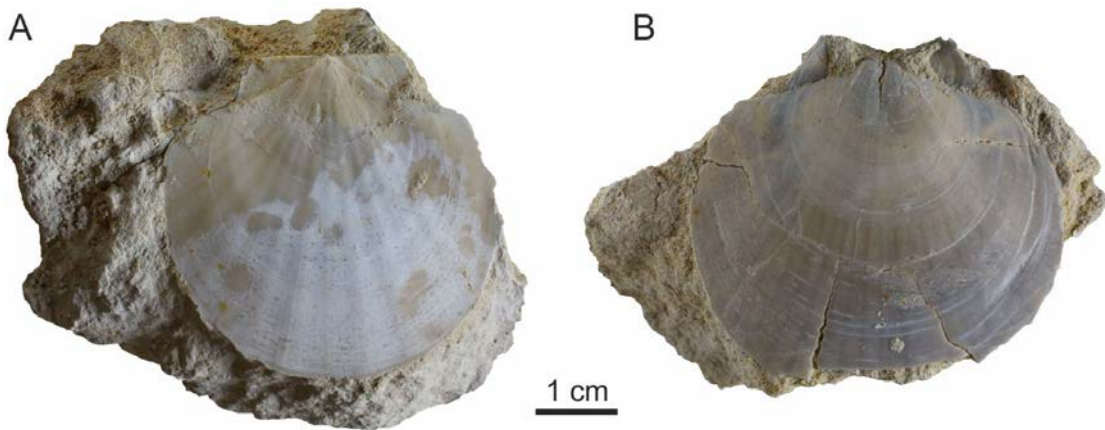
searchers in the study of Miocene specimens. One of them was Hörnes (1867, pp. 419–420), who assigned pectinids from several Miocene localities of Austria to this species. Moreover, contrary to the statement by Bronn (in Pusch 1837b), Hörnes believed that Pusch's taxon was conspecific with Bronn's species. Unfortunately, in his synonymy list of *Pecten cristatus*, Hörnes mentioned merely the specific name *burdigalensis* without giving its varietal name *polonica*, which contributed to the fact that Pusch's taxon was practically completely omitted by all researchers.

The taxonomic status and affinities of Bronn's species *cristatus* was discussed by Fontannes (1882, p. 199), who restricted the use of *cristatus* to Pliocene specimens, while assigning the Miocene specimens, referred to by Hörnes (1867) as *Pecten cristatus*, to his new species *Pleuronectia badensis*. By introducing a new specific name, clearly referring to the Miocene specimen from Möllersdorf illustrated by Hörnes (1867, pl. 66, fig. 1a–d), Fontannes was apparently not aware of the name given to this Miocene taxon by Pusch (1837b).

The species *Pleuronectia badensis* recognized by Fontannes (1882) as the Miocene ancestor of the Pliocene *Pecten cristatus* was amply discussed by Depéret and Roman (1928, pp. 174–176).

At the same time, Depéret and Roman (1928) and Kautsky (1928, p. 253) concluded that Fontannes' species *badensis* is only a mutation or variety of *Pecten cristatus*. Considering the taxonomic position of the specimen illustrated by Hörnes (1867) from the Miocene in Möllersdorf, Depéret and Roman (1928) and Kautsky (1928) completely omitted Pusch's taxon *Pecten burdigalensis* var. *polonica*, nor did they mention its occurrence in the Miocene of Poland.

As mentioned previously, Friedberg in the early 1930's studied the original material of Pusch stored in the collection of the University of Warsaw. Having Pliocene material from Italy at hand, Friedberg (1936, p. 255) confirmed the opinion of Fontannes (1882, p. 199) that the Miocene specimens from Austria which Hörnes (1867, pp. 419–420, p. 66, fig. 1) referred to *Pecten cristatus*, whose characters essentially agree with those of Miocene specimens from Poland named by Pusch (1837b) as *Pecten burdigalensis* var. *polonica*, clearly differ from the typical Pliocene *Pecten cristatus* specimens mainly in the shell outline (being more antero-posteriorly elongated), a greater apical angle and a longer hinge edge accounting for almost 60% of the shell length. The separation between the Pliocene and Miocene specimens is clearly supported by differences in shell characters, particularly in the sculpture of the outer surface: smooth in *cri-*



Text-fig. 3. *Crisatopecten cristatum badense* (Fontannes, 1882) embedded in sandy limestone from Pińczów, the type locality of *Pecten Burdigalensis* var. *polonica* Pusch, 1837. A – Exterior of left valve with weak ribs visible mainly in the umbonal part, completely suppressed in the ventral region (MZ VIII MI 4151/1); B – Exterior of the right valve missing the portion of the ventral disc (MZ VIII MI 4151/2).

Photographs by Dariusz Nast.

status from Italy and decorated with 12 very faint poorly elevated flat wide ribs that disappear towards the ventral margin in both *cristatus* mut. *badensis* from Austria and *burdigalensis* var. *polonica* from Poland. Moreover, according to Friedberg (1936), the same type of ornamentation is also visible in the specimens from the Miocene of France named by Cossmann and Peyrot (1914, pp. 306–308, table 16, figs 1–4) as *Amussium miogallicum*. Thus, Friedberg (1936, pp. 254, 255) confirmed Bronn's opinion (in Pusch 1837b) regarding the differences between the Pińczów specimens and those from the Pliocene of Italy.

Surprisingly, and at the same time astonishingly, Friedberg (1936, pl. 42, fig. 10) illustrated one of the syntypes of *Pecten burdigalensis* var. *polonica* (whose name takes precedence over *Pleuonectia badensis* Fontannes, 1882) under the name *Pecten cristatus* Bronn mut. *badensis*. As a consequence, the name erected by Pusch (1837b) was completely forgotten and since its origins, has never been raised to a valid status in the scientific community. More recently, it was not even included in the comprehensive synonymy list of *Amussium cristatum badense* (Fontannes, 1882) provided by Schultz (2001, pp. 157, 158). Pusch's taxon was also omitted by Bongrain and Cahuzac (2004, pp. 502–504) in the list of species belonging to a new genus *Crisatopecten*, among which the Fontannes' species was mentioned.

On the other hand, since 1973, many authors have discussed (and not just mentioned) the status of this European Miocene taxon. My records indicate that in the publications from the last 50 years, the name

cristatum badense has been used 25 times (Báldi and Seneš 1975; Nicorici 1977; Steininger *et al.* 1978; Krach 1979; Kochansky-Devidé and Bajraktarević 1981; Švagrovský 1981; Bohn-Havas *et al.* 1987; Dermitzakis and Georgiades-Dikeoulia 1987; Vrabac 1987; Studencka and Studencki 1988; Dulai 1996; Mikuž 1998; Schultz 1998, 2001; Studencka 1999, 2015; Mandić 2003, 2004; Bongrain and Cahuzac 2004; Nagymarosy and Hámor 2012; Studencka and Zieliński 2013; Križnar and Mikuž 2014; Mikuž and Gašparič 2014; Bošnjak 2017; Jovanović 2018), and no publication from this period uses the name erected by Pusch.

Therefore, to my knowledge, the conditions for the application of Article 23.9.1.1 of the ICZN (1999) and Article 23.9.1.2 of the ICZN (1999) have been met and the well-known *Pleuonectia badensis* Fontannes, 1882 (now *Crisatopecten cristatum badense*) has been recognized as a *nomen protectum* against the older synonym *Pecten burdigalensis* var. *polonica* Pusch, 1837, considered a *nomen oblitum*.

STRATIGRAPHIC AND GEOGRAPHIC RANGE

Crisatopecten cristatum badense is characteristic of the Early to late Miocene (Burdigalian–Messinian) of the North-Eastern Atlantic and the Mediterranean areas. In Central Paratethys it appeared in the Karpatian (late Burdigalian) of the North-Alpine-Carpathian Foredeep and became extinct in the Late Badenian (early Serravallian) (Schultz 2001).

DISTRIBUTION IN POLAND

Cristatopecten cristatus badense is known from the Lower Badenian (corresponding to the upper Langhian; middle Miocene) of the:

- Silesian Upland: Zabrze, Makoszowy, Czechowice near Gliwice, Imielin, Krywałd (Krach 1957 – as *Amussium cristatum* mut. *badense*);
- Miechów Upland: Chmielów near Działoszyce, Częstoszwice, Raclawice (Michalski 1884 – as *Pecten cristatus*); Boczkowice, Częstoszwice, Giebułtów, Małoszów, Sancygniów, Trzonów (Krach 1947 – as *Amussium cristatum* mut. *badense*);
- Wójcza-Pińczów Range: Pińczów (Pusch 1837b – as *Pecten burdigalensis* var. *polonica*; this paper, Text-fig. 3), Krzyżanowice, Wola Zagojska (Kontkiewicz 1882 – as *Pecten cristatus*), Nadole near Busko, Pińczów, Szczaworyż, Wełecz near Busko (Kowalewski 1930 – as *Pleuronectia cristata*);
- southern slopes of the Holy Cross Mts.: Jawór, Karsy, Wierzbica, Korytnica (Kowalewski 1930 – as *Pleuronectia cristata*); Korytnica, Chomentów (Friedberg 1936 – as *Amussium cristatum* mut. *badensis*); Korytnica (Jakubowski in Jakubowski et al. 1996 – as *Amussium cristatum*);
- marginal part of the Carpathians: Bóbrka [Hilber 1882 – as *Pecten (Pleuronectis) cristatus*].

PALAEOENVIRONMENT

In the Pińczów site (the type locality of Pusch's taxon *Pecten burdigalensis* var. *polonica*), the specimens of this species (Text-fig. 3) were found in the marls and algal-bryozoan facies of the Pińczów Limestones (Studencka and Studencki 1988). According to Studencki (1988), the algal-bryozoan facies was formed in a shallow-marine environment at a depth of 30–40 m, which is supported by the considerable percentages of both cellariiform and celleporiform bryozoans along with brachiopods and large foraminifers. The Pińczów Limestones largely originated under moderate to strong water agitation, but the underlying marls accumulated in quiet-water conditions.

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