The Early Miocene (Burdigalian) mollusc fauna of the North Bohemian Lake (Most Basin)

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We present a critical evaluation of the Early Miocene terrestrial and aquatic mollusc fauna of the North Bohemian Lake in the Most Basin in the Czech Republic. In total, 90 species (8 aquatic and 81 terrestrial gastropods, one bivalve) are documented from that lake system that had formed within the North Bohemian Rift. Only three of these species are newly recorded for the Most Basin, suggesting that the fauna is well sampled. Based on historical collections of the Natural History Museum in Vienna, which were partly acquired by quantitative bulk samples from Tuchořice, a rough estimate of the composition of the terrestrial assemblage can be presented. More than 80% of the >30,400 shells are represented by carychiids, vertiginids and valloniids, suggesting the presence of densely forested wetlands fringing the North Bohemian Lake. About 57% of the terrestrial species are known so far exclusively from the Most Basin. This high degree of "endemism", however, is rather a result of the still very fragmentary knowledge of coeval European faunas. *Discus rasseri* Harzhauser, Neubauer & Georgopoulou sp. nov. and *Discus zagorseki* Harzhauser, Neubauer & Georgopoulou sp. nov. are described as new species and *Esuinella* Harzhauser, Neubauer & Georgopoulou gen. nov. (Valloniidae), *Nordsieckula* Harl & Harzhauser gen. nov. (Orculidae), and *Manganellia* Harzhauser, Neubauer & Georgopoulou gen. nov. (Discidae) are introduced as new genera. *Serrulastra* (*Serruplica*) *tuchoricensis* nom. nov. is proposed as replacement name for *Clausilia laevigata* Frankenberger, 1914. • Key words: Gastropoda, Bivalvia, Miocene, Burdigalian, terrestrial ecosystems, Most Basin.

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The terrestrial and lacustrine mollusc assemblages from the Most Basin in Bohemia comprise one of the most diverse Early Miocene (Burdigalian) non-marine mollusc faunas of Europe. Many extinct genera are based on species from Tuchořice and numerous authors referred to species from this locality when describing other European Cainozoic mollusc faunas. The exceptionally well-preserved fauna was initially described by Reuss *in* Reuss & Meyer (1849a, b). During the next decades additions and revisions were presented by Reuss (1861, 1868), Slavík (1869a, b), Boettger (1870a, 1877), Sandberger (1875), and Klika (1890). A first comprehensive synopsis of this pioneer phase was given by Klika (1891, 1892), followed by additional contributions by Babor (1897), Flach (1889, 1891), Frankenberger (1912, 1914), Wenz (1915a), Thuma (1916, 1922) and Petrbok (1925). The wealth of data and references were summarised again by Wenz (1923–1930). Since then no comprehensive evaluation of the fauna was performed. Instead, many authors discussed certain taxa – often with focus on other regional faunas or addressing specific taxonomic problems – introducing numerous new combinations (*e.g.* Pfeffer 1930; Wenz & Zilch 1959–1960; Schlickum 1968, 1970a, b; Schlickum & Truc 1972; Nordsieck 1972, 1981a, b, 1986; Schlickum & Strauch 1975; Strauch 1977; Moayedpour 1977; Falkner 1974, 1986; Richardson 1980; Prisyazhnyuk 1984; Čejchan 1985; Boeters *et al.* 1989; Kadolsky 1993; Stworzewicz 1999a, b; Esu 1999; Manganelli & Giusti 2000a; Kadolsky & Piechocki 2000; Kókay 2006; Schnabel 2006; Binder 2008). This kind of information is often hidden in the publications as the relation to the Most Basin faunas is not always obvious from the titles. Moreover, only a very small percentage of the species has been depicted so far by photographs and SEM-micrographs. We present a synopsis of the Early Miocene molluscs from the North Bohemian Rift. We aim for an updated documentation and illustration of the fauna but do not consider this paper a critical revision of all taxa.

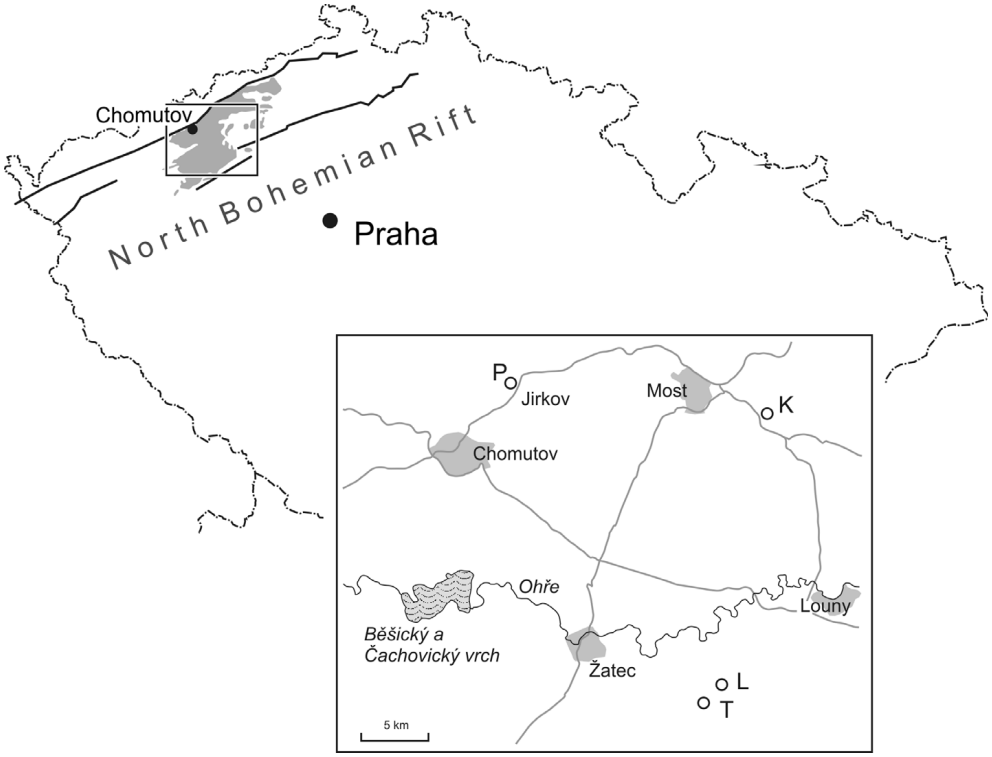


Figure 1. Position of the North Bohemian Rift in Czech Republic with distribution of Lower Miocene fluvial and lacustrine deposits in the Chomutov and Most basins (after Kvaček *et al.* 2004) and position of the most important mollusc-bearing localities: Tuchořice (T), Lipno (L), Korozluky (K) and Pyšná (P). For much more detailed informations on regional geology and geographic maps see Heissig & Fejfar (2007).

Material

The studied material derives mainly from the collections of the Natural History Museum in Vienna (NHMW). This collection comprises a large suite of shells that were bought during the "gold rush" phase of investigations of the fauna from the local Czech teacher Karl Ihl in the late 1880s. Additional collections were bought during this time from Oskar Ritter von Troll-Obergfell, Josef Florian Babor, and Franz Thuma. Only few species, which were listed by Klika (1891) and others from the Most Basin, are missing in the NHMW collections; these species were studied in the collections of the National Museum in Prague (NM-PM-P) and the Senckenberg Naturmuseum in Frankfurt (SMF). All illustrated and studied NHMW material derives from Tuchořice, if not stated otherwise.

Geological setting and stratigraphy

The Early Miocene mollusc fauna of the Most Basin was collected during the late 19th century at the four villages Tuchořice, Lipno (= Groß Lippen), Korozluky, and Pyšná (= Stolzenhahn) in northern Bohemia (Czech Republic) [the fauna from Dvérce (= Wärzen), as described by Klika (1891), is of Rupelian age (Fejfar 1987, Heissig & Fejfar 2013) and is not considered herein]. The villages Tuchořice and Lipno are situated about 9 km south east of Žatec; Korozluky is about 2 km east of Most; the "Stolzenhahn" locality was situated near Pyšná about 11 km west of Most (see Heissig & Fejfar 2007 for detailed geographic and geologic maps of the area and Klika 1891, Thuma 1922 and Boeters *et al*. 1989 for data on "Stolzenhahn"). Additional material was detected in drillings in the area of Chomutov (Čtyroký *et al*. 1964).

All localities belong to the 870 km^2 large Most Basin, which is part of the North Bohemian Rift (= Ohře-Eger Rift). This tectonic structure formed as result of volcano-tectonic subsidence and is delimited by two roughly SW-NE trending tectonic lines (Fig. 1) (Kasiński 1991, Fejfar *et al.* 2003). Sedimentation in the rift occurred in several sedimentary cycles from Eocene to Plio-Pleistocene times (Suhr 2003). In the Most Basin, the Early Miocene cycle is characterised by thick brown coal seams ("main seam member") along with fluvial and lacustrine sediments and volcanogenic deposits attaining up to 700 m thickness (Fejfar *et al*. 2003, Kvaček *et al*. 2004, Grygar & Mach 2013). Dark grey calcareous marls in the base of the main seam contained a limnic mollusc fauna with *Staadtiellopsis rubeschi*, which was also detected in drillings close to Chomutov (Čtyroký *et al.* 1964). Slightly younger aquatic and terrestrial mollusc faunas were collected from bedded limestones, which are exposed on isolated fault blocks along the southern margin of the Most Basin (Tuchořice, Lipno) (Fejfar & Sabol 2005). Closeby, travertines that formed along tectonically induced hot thermal springs are devoid of molluscs (Fejfar *et al*. 2003). Poisonous CO_2-exhalations are discussed as trigger for the

considerable taphonomic bias towards carnivorous vertebrates (Mlíkovský 2002, Fejfar *et al*. 2003, Fejfar & Sabol 2005) and might also explain the absence of terrestrial molluscs.

The rich vertebrate fauna of Tuchořice and several other localities in the Most Basin allows a correlation with the European Mammal Zone MN3b, corresponding to the Early Burdigalian (= Eggenburgian) and an absolute age of ~19–18 Ma (Fejfar *et al*. 2003; Kvaček *et al*. 2004; Heissig & Fejfar 2007, 2013).

Palaeogeography and palaeoecology

Kvaček *et al*. (2004) coined the term "North Bohemian Lake" for the Early Miocene wetlands of the Most Basin and estimated an original extent of roughly 1700 km^2 based on the erosional relics of the lake deposits. It was initiated during the Burdigalian by increasing subsidence of the basin, resulting in the formation of swamps and shallow lakes. The North Bohemian Lake was an open system, fed from the south by a stream which entered the basin at Žatec. Towards the north, streams drained into the North Sea Basin. Outflow is considered to have been much lower and evaporation kept the lake level stable (Suhr 2003, Kvaček *et al.* 2004). The excellent palaeobotanic record of the area suggests dense riparian forests with maples and palms in the Tuchořice area with high precipitation and a mean annual temperature of >18 °C (Fejfar *et al*. 2003). The lowlands of central and northern Florida were discussed as modern counterpart by Fejfar *et al.* (2003), whilst Kvaček *et al*. (2004) proposed the wetlands of the Okavango River in Botswana as modern analogues. A compilation of the manifold fauna and flora of the Miocene Most Basin with numerous environmental reconstructions and a detailed summary on the investigation history is given in Dvořák *et al*. (2010).

Discussion

Composition of the fauna

In total, 81 terrestrial and 8 aquatic gastropod species and 1 bivalve species are known so far from the Most Basin (Table 1). The NHMW collection – comprising more than 30,400 terrestrial and >30,000 aquatic shells – contains 68 of the terrestrial species, whilst 11 species described by previous authors could not be detected in this "sample" but were available at the collection of the National Museum in Prague. Only three species are documented for the first time from the Most Basin: *Punctum propygmaeum* Andreae, 1904, *Vitrea* cf. *procrystallina* (Andreae, 1902), and *Discus rasseri* sp. nov. The latter one was lumped with other species and the small *Punctum* and *Vitrea* were probably overlooked due to the small size and the lack of SEM-techniques. This suggests that the fauna is well studied and is a reliable example of an Early Miocene terrestrial gastropod assemblage during the Mammal Zone MN3. The huge number of shells and the quantitative sampling method applied by Oskar Ritter von Troll-Obergfell, who washed and sieved large amounts of sediment picking out all shells, allow also to estimate the quantitative composition of the assemblage. Regarding individual numbers, more than 70% of the terrestrial assemblage is represented by only two tiny species: *Carychiella eumicrum* (Bourguignat, 1857) (~43%) and *Vertigo callosa* (Reuss *in* Reuss & Meyer, 1849) (~28%). These are followed by *Spermodea plicatella* (Reuss *in* Reuss & Meyer, 1849) (~6%), *Esuinella nana* (Braun *in* Walchner, 1851), and *Negulus suturalis* (Sandberger, 1858) (both ~3%); *Acicula fusca frici* (Flach, 1889), *Klikia labiata* (Klika, 1891), and *Discus euglyphus* (Reuss *in* Reuss & Meyer, 1849) range between 1–2%. The remaining 71 species each comprise distinctly less than 1% in individual numbers. This pattern is indicative for forested wetlands. Modern carychiids inhabit permanently moist environments such as riparian zones, meadows, and swamps (Weigand & Jochum 2010). Recent *Spermodea* species are typically found in deciduous woodlands, in humid leaf litter and need continuously moist conditions (Neubert 2011, Welter-Schultes 2012). Forest leaf litter is also the habitat of the African species of *Negulus* (van Bruggen 1994).

The freshwater fauna in turn is low diverse. It is dominated by pulmonates, including one species of each *Radix*, *Stagnicola*, *Acroloxus*, *Gyraulus*, *Hippeutis*, and *Planorbarius*. Concerning abundance, *Gyraulus dealbatus* (Braun *in* Walchner, 1851) is by far the most common with several ten thousands of shells, followed by the frequent *Planorbarius cornu* (Brongniart, 1810). Such a composition is today typically found in stagnant to lentic, highly vegetated environments (Glöer 2002). In contrast, prosobranch gastropods are rare, including *Bythinella*? *scalaris* (Slavík, 1869) and the rissooid *Staadtiellopsis rubeschi* (Reuss *in* Reuss & Meyer, 1849). The latter species probably derives from a different stratum or area in the lake, as it is not found in our material. There is nothing known about the ecology of the fossil genus *Staadtiellopsis*. As even its systematic position is still doubtful (variably affiliated with the families Amnicolidae, Micromelaniidae, Pomatiopsidae, and Truncatellidae; Kadolsky 1993, 2008; Kadolsky & Piechocki 2000), it is impossible to infer its ecological preferences. *Staadtiellopsis rubeschi* appears in huge numbers at the open cast mine Merkur North, where it is always associated with planorbids and lymnaeids (as seen in the illustration in Heissig & Fejfar 2013). Therefore, a preference for lentic conditions may be deduced.

Taxa indicating riverine influx, like *Theodoxus* or *Ancylus*, are absent. Concluding, the composition of the studied assemblages confirms the palaeoenvironmental reconstruction of the North Bohemian Lake as extensive wetlands proposed by Kvaček *et al*. (2004).

Biostratigraphic and biogeographic significance of the fauna

Our knowledge of the compositions and interrelations of the European Neogene terrestrial gastropod faunas is still strongly influenced by the milestone catalogus of Wenz (1923–1930). Despite the enormous value of his compilation, it should not be overlooked that many of his references listed in the synonymies have been compiled uncritically. Therefore, historical misidentifications and species-lumping resulted in geologically long-lived and geographically wide-spread "species", distorting biostratigraphic and biogeographic patterns.

Based on the data compiled by Wenz (1923–1930), the Burdigalian fauna from the Most Basin suggested tight relations with the roughly coeval assemblage from Theobaldshof/Rhön and the Chattian assemblages of the Mainz Basin and comparable links to the Middle Miocene, such as those from Opole in Poland and from Rein in Austria. During the last 20 years, new data for several old and new key localities of European terrestrial mollusc faunas have become available (*e.g*. Moayedpour 1977; Stworzewicz 1993, 1995, 1999a, b; Binder 2002, 2004; Kókay 2006; Salvador 2013; Harzhauser *et al*. 2014). These data facilitate a critical evaluation of alleged occurrences of Most Basin taxa in other faunas. Based on this survey, the number of shared species of these faunas with those of the Most Basin turned out to be low. Only ~14% of the species occur already in the late Oligocene fauna of Hochheim and only 5–8% of the species occur in the Middle Miocene faunas of Rein and Opole. Even more striking is the rather low percentage of shared species with other Early Miocene faunas. Only 11–15% of the species contribute to the assemblages of Somlóvásárhely (Hungary), Bełchatów (Poland), and Theobaldshof/Rhön (Germany); faunistic relations to the mid- and late Burdigalian faunas of Oberdorf and Teiritzberg in Austria are nearly absent. In total, 45 species (57%) of the terrestrial fauna are known so far exclusively from the Most Basin and only 34 species (43%) are known from other regions as well. For the freshwater fauna, the percentage of endemic taxa is much lower, including only 3 of 9 species (*Staadtiellopsis rubeschi* is treated as endemic although it is also known from the Cheb and Chomutov basins. These basins, however, were part of the North Bohemian Rift).

These observations suggest two conclusions:

1. The turn-over rates in the terrestrial mollusc faunas during the Oligocene and Miocene were probably as high as those of the vertebrate faunas but the lack of critical revisions of nearly all important faunas does not yet allow serious estimates. This assumption is in good agreement with the patterns documented for the Clausiliidae. Due to the detailed investigations by Nordsieck (1972, 1981a, b, 2000), the door snails are currently the only well-studied Neogene group of terrestrial gastropods in Europe and turned out to be stratigraphically highly significant.

2. Even within time slices, the faunas were not homogenous at all. The surprisingly low similarities between the Most Basin assemblages and roughly coeval ones may largely reflect different palaeoecological settings, such as swamps/backswamps (*e.g*. Oberdorf), carbonate-dominated forested wetlands (*e.g*. Tuchořice), and coastal marshlands (*e.g*. Teiritzberg).

Conclusions

The terrestrial and aquatic mollusc fauna of the Most Basin is among the most important records of the Early Miocene and comprises 90 species. The aquatic assemblages are dominated by planorbids in individual numbers; carychiids, vertiginids, and valloniids characterise the terrestrial assemblages. The composition suggests the presence of densely forested wetlands surrounding a carbonate-dominated lake system, which is in accordance with previous interpretations based on palaeobotanical records (Fejfar *et al.* 2003).

Many species from the Most Basin have been reported also from other Early and Middle Miocene localities of Europe. Most of these turned out to be based on misidentifications and even those accepted herein will need confirmation in many cases. This critical survey reveals that the alleged long stratigraphic ranges of many terrestrial gastropods – which would be in complete opposition to the fast turnover rates observed in Miocene mammal faunas – are largely artefacts due to inadequate taxonomy.

Systematic palaeontology

The systematic arrangement follows largely Nordsieck (1986, 1987), Hausdorf (2000), Bouchet *et al.* (2005), and Welter-Schultes (2012). We present a critical chresonymy with main focus on citations referring to occurrences from the Most Basin. The references are reproduced strictly as originally provided by the authors without modification; text in square brackets indicates text that was obviously intended by the author but not fully written at the cited point; *e.g*. the abbreviation *H*. when clearly used for *Helix* is referred to as *H*.[*elix*] in the chresonymy. This strict use may be of importance in cases of problematic priority, available combinations, and homonyms.

Table 1. List of all Early Miocene mollusc species from the Most Basin accepted herein. Specimen numbers refer to the NHMW collection.

No.	Species	Specimens
1	*Bythinella*? *scalaris* (Slavík, 1869)	0
2	*Staadtiellopsis rubeschi* (Reuss *in* Reuss & Meyer, 1849)	0
3	*Craspedopoma leptopomoides* (Reuss, 1868)	9
4	*Acicula fusca frici* (Flach, 1889)	571
5	*Acicula limbata* Reuss, 1861	11
6	*Platyla callosa* (Boettger, 1870)	51
7	*Platyla subfusca* (Flach, 1889)	4
8	*Radix subovata* (von Zieten, 1832)	9
9	*Stagnicola subpalustris* (Thomä, 1845)	68
10	*Acroloxus decussatus* (Reuss *in* Reuss & Meyer, 1849)	1
11	*Gyraulus dealbatus* (Braun *in* Walchner, 1851)	>10,000
12	*Hippeutis ungeri* (Reuss *in* Reuss & Meyer, 1849)	1
13	*Planorbarius cornu* (Brongniart, 1810)	432
14	*Carychiopsis schwageri* (Reuss, 1868)	161
15	*Carychiopsis prisyazhnyuki* Stworzewicz, 1999	3
16	*Carychiella eumicrum* (Bourguignat, 1857)	13,2
17	*Azeca pumila* Slavík, 1869	8
18	*Azeca monocraspedon* Slavík, 1869	3
19	*Hypnophila subrimata* (Reuss *in* Reuss & Meyer, 1849)	60
20	*Cochlicopa dormitzeri* (Reuss *in* Reuss & Meyer, 1849)	5
21	*Mastus complanatus* (Reuss *in* Reuss & Meyer, 1849)	63
22	*Mastus filocinctus* (Reuss, 1861)	2
23	*Paracoryna diezi* (Flach, 1891)	8
24	*Strobilops* (*Eostrobilops*) *fischeri* (Wenz *in* Fischer & Wenz, 1914)	44
25	*Strobilops* (*Eostrobilops*) *elasmodonta* (Reuss, 1861)	59
26	*Strobilops* (*Discostrobilops*) *uniplicatus* (Braun *in* Walchner, 1851)	201
27	*Pleurodiscus falciferus* (Boettger, 1870)	19
28	*Vallonia lepida* (Reuss *in* Reuss & Meyer, 1849)	18
29	*Acanthinula tuchoricensis* (Klika, 1891)	202
30	*Acanthinula* sp.	0
31	*Esuinella nana* (Braun *in* Walchner, 1851)	843
32	*Spermodea plicatella* (Reuss *in* Reuss & Meyer, 1849)	1,915
33	*Granaria intrusa* (Slavík, 1869)	13
34	*Ptychalaea flexidens* (Reuss, 1861)	1
35	*Vertigo angulifera* Boettger, 1884	0
36	*Vertigo minor* Boettger, 1870	3
37	*Vertigo callosa* (Reuss *in* Reuss & Meyer, 1849)	8,6
38	*Vertigo tuchoricensis* Pilsbry *in* Pilsbry & Cooke, 1919	1
39	*Negulus suturalis* (Sandberger, 1858)	842
40	*Negulus raricosta* (Slavík, 1869)	7
41	*Gastrocopta* (*Albinula*) *turgida* (Reuss *in* Reuss & Meyer, 1849)	106
42	*Truncatellina splendidula* (Sandberger, 1875)	268
43	*Nordsieckula subconica* (Sandberger, 1858)	1
44	*Oxyloma affinis* (Reuss *in* Reuss & Meyer, 1849)	128
45	*Triptychia vulgata* (Reuss *in* Reuss & Meyer, 1849)	13
46	*Serrullella schwageri* (Boettger, 1877)	2
47	*Serrulastra* (*Serrulastra*) *amphiodon* (Reuss, 1861)	21
48	*Serrulastra* (*Serrustigma*) *polyodon* (Reuss, 1861)	5
49	*Serrulastra* (*Serruplica*) *tuchoricensis* nov. nom.	0
50	*Laminifera mira* (Slavík, 1869)	5
51	*Baboria slaviki* (Babor, 1897)	0
52	*Constricta tenuisculpta* (Reuss, 1861)	11
53	*Cochlodina* (*Miophaedusa*) *perforata* (Boettger, 1877)	0
54	*Canalicia attracta* (Boettger, 1870)	1
55	*Canalicia klikai* (Babor, 1897)	0
56	*Pseudocalaxis*? *insignis* (Babor, 1897)	0
57	*Palaeoglandina gracilis* (von Zieten, 1832)	11
58	*Pseudoleacina oligostropha* (Reuss *in* Reuss & Meyer, 1849)	151
59	*Pseudoleacina producta* (Reuss *in* Reuss & Meyer, 1849)	162
60	*Punctum propygmaeum* Andreae, 1904	102
61	*Discus bohemicus* (Wenz *in* Fischer & Wenz, 1914)	27
62	*Discus euglyphus* (Reuss *in* Reuss & Meyer, 1849)	432
63	*Discus rasseri* sp. nov.	283
64	*Discus stenospira* (Reuss *in* Reuss & Meyer, 1849)	6
65	*Discus zagorseki* sp. nov.	3
66	*Manganellia alata* (Klika, 1891)	17
67	*Janulus* sp.	0
68	*Vitrea* cf. *procrystallina* (Andreae, 1902b)	2
69	*Oxychilus mendicus* (Slavík, 1869)	22
70	*Aegopinella denudata* (Reuss *in* Reuss & Meyer, 1849)	248
71	*Aegopinella vetusta* (Klika, 1891)	0
72	*Lyrodiscus ihli* (Klika, 1891)	17
73	*Miozonites algiroides* (Reuss *in* Reuss & Meyer, 1849)	60
74	*Limacus crassitesta* (Reuss, 1868)	1
75	*Phenacolimax intermedius* (Reuss *in* Reuss & Meyer, 1849)	9
76	*Phenacolimax crassitesta* (Andreae, 1902)	0
77	*Leucochroopsis apicalis* (Reuss, 1861)	140
78	*Pseudomonacha zippei* (Reuss *in* Reuss & Meyer, 1849)	150
79	*Pseudomonacha homalospira* (Reuss, 1861)	83
80	*Praeoestophorella petersi* (Reuss *in* Reuss & Meyer, 1849)	31
81	*Protodrepanostoma involuta nordsiecki* Falkner, 1986	87
82	*Protodrepanostoma hecklei* (Klika, 1891)	6
83	*Metacampylaea papillifera* (Klika, 1891)	0
84	*Pseudochloritis robusta* (Reuss *in* Reuss & Meyer, 1849)	52
85	*Klikia labiata* (Klika, 1891)	447
86	*Apula devexa* (Reuss, 1861)	60
87	*Apula prominens* (Babor, 1897)	0
88	*Creneatachea obtusecarinata* (Sandberger, 1858)	151
89	*Megalotachea macrocheila* (Reuss *in* Reuss & Meyer, 1849)	175
90	*Sphaerium prominulum* (Reuss *in* Reuss & Meyer, 1849)	15

Most of the taxa have been described in great detail by Klika (1891). This milestone paper is freely available online. Therefore, we will not repeat all the descriptions but focus mainly on taxonomic problems and distribution data.

Class Gastropoda Cuvier, 1795
Subclass Orthogastropoda Ponder & Lindberg, 1995
Superorder Caenogastropoda Cox, 1960
Order Neotaenioglossa Haller, 1892

Superfamily Rissooidea Gray, 1847
Family Amnicolidae Tryon, 1863

Genus *Bythinella* Moquin-Tandon, 1856

Type species. – *Bulimus viridis* Poiret, 1801; subsequent designation by ICZN Opinion 2161 (Case 3321). Recent, France.

***Bythinella*? *scalaris* (Slavík, 1869) species inquirenda**

*1869a	*Paludinella scalaris*	sp. nov.; Slavík, p. 267, pl. 4, figs 24, 25.
1869b	*Paludinella scalaris*	sp. nov.; Slavík, p. 269, pl. 4, figs 24, 25.
1891	*Bythinella scalaris*	Slavík. – Klika, p. 115, text-figs 114a, b.
1892	*Bythinella scalaris*	Slavík. – Klika, p. 110, text-figs 114a, b.
1911	*Bythinella scalaris*	Sl. – Kafka, p. 69.
1917	*Bythinella scalaris*	Slavik. – Wenz, p. 77.
1926	*Bythinella* (*Bythinella*) *scalaris*	(Slavik). – Wenz, p. 2030 (cum syn.).

Material. – No material available.

Dimensions (after Klika 1891). – Diameter: 0.75 mm, height: 2.5 mm.

Discussion. – We have tried to find the type specimen in the collection of the National Museum in Prague. Klika (1891) mentions a single well preserved shell. The available specimen, however, is a poorly preserved shell of a hydrobiid, which cannot be identified at all. *Bythinella* species are bound to springs and rarely to caves and groundwater (Bichain *et al.* 2007). Therefore, its presence at the springs of Tuchořice is not unrealistic. Unfortunately, the descriptions of Slavík (1869a, b) do not allow any generic identification.

Occurrence. – Only known from Tuchořice.

Superfamily Truncatelloidea Gray, 1840
Family Emmericiidae Brusina, 1870

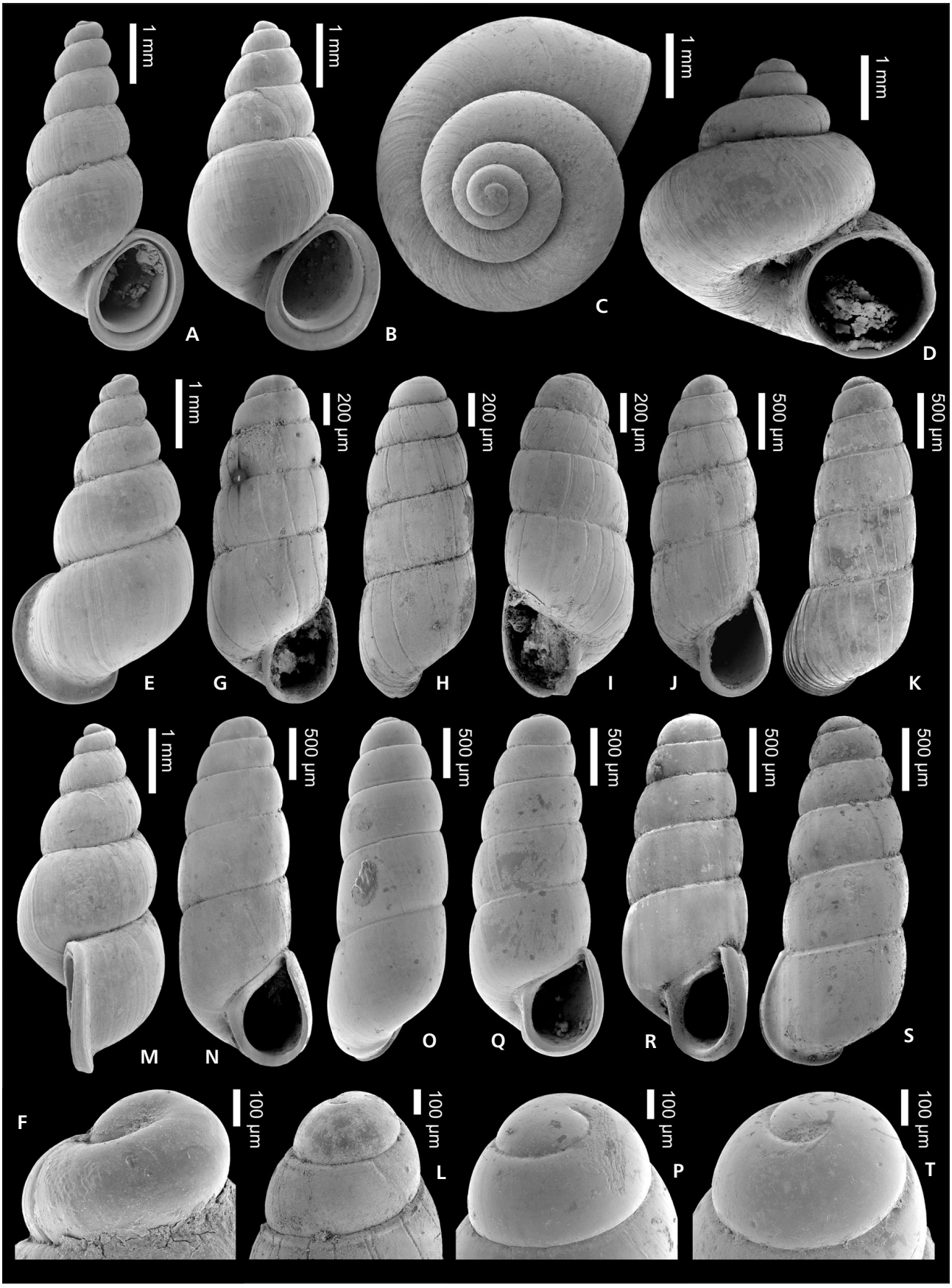
Genus *Staadtiellopsis* Schlickum, 1968

Type species. – *Cyclostoma rubeschi* Reuss, 1849; original designation. Early Miocene, Czech Republic.

***Staadtiellopsis rubeschi* (Reuss *in* Reuss & Meyer, 1849)**
Figure 2A, B, E, F, M

1849a	*Cyclostoma Rubeschi*	Rss.; Reuss *in* Reuss & Meyer, p. 12 (nomen nudum).
*1849b	*C.*[*yclostoma*] *Rubeschi*	m.; Reuss *in* Reuss & Meyer, p. 40, pl. 4, fig. 12.
1861	*C.*[*yclostoma*] (*Pomatias*) *Rubeschi*	Reuss. – Reuss, p. 62.
1875	*Euchilus? Rubeschi*	Reuss. – Sandberger, p. 423, pl. 24, figs 31–31b.
1891	*Euchilus Rubeschi*	Reuss. – Klika, p. 113, text-figs 112a, b.
1892	*Euchilus Rubeschi*	Reuss. – Klika, p. 108, text-figs 112a, b.
1911	*Euchilus rubeschi*	Rss. – Kafka, p. 69.
1916	*Euchilus Rubeschi*	Reuss. – Thuma, p. 84.
1917	*Staliola rubeschi*	(Reuss). – Wenz, p. 77.
1923	*Staliola* (*Staliola*) *rubeschi*	(Reuss). – Wenz, p. 2189.
1964	*Nystia rubeschi*	(Reuss, 1849). – Čtyroký *et al.*, p. 138, figs 6, 7.
1968	*Nystia* (*Staadtiellopsis*) *rubeschi*	(Reuss). – Schlickum, p. 45, pl. 5, figs 10, 11.
1970b	*Nystia* (*Staadtiellopsis*) *rubeschi*	(Reuss). – Schlickum, p. 292, fig. 14.
1993	*Staadtiellopsis rubeschi*	(Reuss, 1849) *sensu* Schlickum, 1968. – Kadolsky, p. 385, fig. 92.

Figure 2. A – *Staadtiellopsis rubeschi* (Reuss *in* Reuss & Meyer, 1849), NM-PM-P 1964. • B – *Staadtiellopsis rubeschi* (Reuss *in* Reuss & Meyer, 1849), NM-PM-P 1965. • C – *Craspedopoma leptopomoides* (Reuss, 1868), NHMW 2013/0572/0001. • D – *Craspedopoma leptopomoides* (Reuss, 1868), NHMW 2013/0572/0001.• E, F – *Staadtiellopsis rubeschi* (Reuss *in* Reuss & Meyer, 1849), NM-PM-P 1966. • G, H – *Acicula fusca frici* (Flach, 1889), NHMW 2013/0572/0002. • I – *Acicula fusca frici* (Flach, 1889), NHMW 2013/0572/0002 (sinistral specimen). • J – *Acicula limbata* Reuss, 1861, NHMW 2013/0572/0003. • K – *Acicula limbata* Reuss, 1861, NHMW 2013/0572/0003. • L – protoconch of J. • M – *Staadtiellopsis rubeschi* (Reuss *in* Reuss & Meyer, 1849), NM-PM-P 1967. • N–P – *Platyla callosa* (Boettger, 1870), NHMW 2013/0572/0004. • Q, R – *Platyla subfusca* (Flach, 1889), NHMW 2013/0572/0005. • S – *Platyla subfusca* (Flach, 1889), NHMW 2013/0572/0005. • T – protoconch of Q, R.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2000 *Staadtiellopsis rubeschi* (Reuss, 1849). – Kadolsky & Piechocki, p. 225, figs 15, 16.
2013 *Nystia*. – Heissig & Fejfar, p. 8, fig. 2b.
non 1997 *Staadtiellopsis rubeschi* (Reuss, 1849) (?). – Piechocki, p. 109, text-figs 6, 7 (= *Staadtiellopsis schlickumi* Kadolsky & Piechocki, 2000).
non? 2006 *Staadtiellopsis rubeschi* (Reuss), 1849 var. – Kókay, p. 43, pl. 13, figs 13, 14, text-fig. 1.

Material. – 5 specimens in the Prague collection (NM-PM-P 1964–1968) from the Merkur-North mine in the Chomutov Basin; no material available in the NHM collection.

Dimensions. – Diameter: 2.8 mm, height: 5.5 mm (Fig. 2A); diameter: 3.1 mm, height: 5.2 mm (Fig. 2B).

Discussion. – Kadolsky & Piechocki (2000, p. 225) and Kadolsky (2008) gave an overview about the status of this species, which they understand as *Staadtiellopsis rubeschi* (Reuss, 1849) *sensu* Sandberger (1875) and Schlickum (1968). An important feature is the complex internal structure of the aperture with a deep groove terminated by a free-ending internal shell layer. The illustration in Klika (1891) is a poor drawing and does not show the characteristic aperture (Čtyroký *et al.* 1964). The protoconch is bulbous and entirely smooth and consists of *ca* 1 whorl. Some specimens have a decollate apex.

Occurrence. – Only mentioned from Korozluky and Pyšná in the Most Basin. Alleged occurrences at Tuchořice are doubtful. This species is most abundant in the Chomutov Basin. It was detected in all drillings described by Čtyroký *et al.* (1964) and in marls intercalated in lignite seams of Merkur-North and Ahníkov in the Chomutov Basin, where it is among the dominant species in the lacustrine assemblages. These lignite seams are older than the Tuchořice assemblages (MN3a according to Heissig & Fejfar 2013). Also recorded from Horní Ves (Oberndorf) in the Cheb Basin (Wenz 1923); a further occurrence might be represented in the Burdigalian deposits of the Szercców lignite in Poland, mentioned without description by Wagner & Matl (2007). Kókay (2006) described this species as "var." from the late Badenian (Serravallian) of Hungary. These specimens lack the aperture and are much smaller than the Bohemian specimens. In respect to the conchological differences and the large stratigraphic gap of *ca* 5 Ma between both occurrences, the Hungarian shells are most probably not conspecific with *S. rubeschi.*

Clade Architaenioglossa Haller, 1890
Superfamily Cyclophoroidea Gray, 1847
Family Craspedopomatidae Kobelt & Möllendorff, 1898

Genus *Craspedopoma* Pfeiffer, 1847

Type species. – *Cyclostoma lucidum* Lowe, 1831; by monotypy. Recent, Madeira.

Craspedopoma leptopomoides (Reuss, 1868)
Figure 2C, D

*1868 *Valvata leptopomoides* sp. nov.; Reuss, p. 83, pl. 1, fig. 4.
1869a *Valvata leptopomoides* Reuss. – Slavík, p. 267.
1869b *Valvata leptopomoides* Rss. – Slavík, p. 270, pl. 4, figs 26–28.
1870a *Valvata leptopomoides* Rss. – Boettger, p. 299.
1875 *Craspedopoma leptopomoides* Reuss. – Sandberger, p. 445, pl. 24, figs 33a, b.
1891 *Craspedopoma leptopomoides* Reuss. – Klika, p. 15, text-fig. 5.
1892 *Craspedopoma leptopomoides* Reuss. – Klika, p. 15, text-fig. 5.
? 1902a *Craspedopoma leptopomoides* (Reuss). – Andreae, p. 7.
? 1902b *Craspedopoma leptopomoides* (Rss.). – Andreae, p. 22.
1911 *Craspedopoma leptopomoides* Rss. – Kafka, p. 66.
1917 *Bolania* (*Bolania*) *leptopomoides* (Reuss). – Wenz, p. 77.
1923 *Bolania* (*Bolania*) *leptopomoides* (Reuss). – Wenz, p. 1768.

Material. – 2 specimens (NHMW 2013/0572/0001), 7 specimens (NHMW 1909/0001/0001).

Dimensions. – Diameter: 5.9 mm, height: 5.8 mm (Fig. 2C); diameter: 5.1 mm, height: 5.2 mm (Fig. 2D).

Discussion. – This species was traditionally placed in *Craspedopoma* Pfeiffer, 1847, which is restricted today to the Eastern Atlantic region (Madeira, Azores, Portugal). The absence of any opercula in the fossil record would fit to the corneous nature of the opercula of the Craspedopomatidae. Nevertheless, a detailed revision is needed to decide whether all the Miocene-Pliocene European species, which have been assigned to *Craspedopoma*, really belog to this genus. Among the Recent species, *Craspedopoma hespericum* (Morelet & Drouët, 1857) from the Azores is most similar to *C. leptopomoides* concerning the shell outline, thin peristome, and wide umbilicus. *Craspedopoma handmanni* Troll, 1907 from the Late Miocene of the Vienna Basin differs in its higher shell and the ovoid aperture. As discussed by Lueger (1981) it might rather represent a Bithyniidae.

Wenz (1917, 1923) placed this species in *Bolania* Gray, 1840, which he considered a senior synonym of *Craspedopoma* Pfeiffer, 1847. This assignment is incorrect

because *Bolania* Gray, 1840 is a nomen nudum (see Bouchet *et al.* 2005). The Bohemian shells are reminiscent of the Early Miocene "*Procyclotella*?" *glazeki* Stworzewicz, 1995 from Bełchatów in Poland (see note on *Procyclotella* below). They differ especially in the higher spire and less turbinate outline and lack the typical microscopic spiral sculpture. In addition, the Bohemian species lacks the thickened inner labrum close to the aperture as is characteristic for *Procyclotopsis* Wenz, 1924.

Note on Procyclotella. – Wenz (1924, p. 223) introduced *Procyclotopsis* as replacement name for *Cyclotellina* Wenz, 1923a, which is preoccupied by *Cyclotellina* Cossmann, 1886. Unfortunately, in his corrigenda chapter to his catalogue, Wenz (1930, p. 3040) erroneously wrote *Procyclotella*, which was used by subsequent authors such as Wenz (1938) and Stworzewicz (1995).

Occurrence. – Only known from Tuchořice. Andreae (1902a, b) mentioned this species from Opole (Poland) without description or illustration. These specimens could also represent one of the Craspedopomatidae species described by Stworzewicz (1995) from Bełchatów in Poland. Similarly, Winkler-Hermaden (1951) listed this species from the Ottnangian (~mid-Burdigalian) of Oberdorf (Styrian Basin, Austria), from where it could not be detected again by Binder (2004).

Family Aciculidae Gray, 1850

Genus *Acicula* Hartmann, 1821

Type species. – *Auricula lineata* Draparnaud, 1805; by monotypy. Recent, France.

***Acicula fusca frici* (Flach, 1889)**
Figure 2G–I

*1889	*Acme frici*	n.; Flach, p. 72, fig. 6.
1891	*Acme friči*	Flach. – Klika, p. 19, text-fig. 10.
1892	*Acme friči*	Flach. – Klika, p. 19, text-fig. 10.
1911	*Acme Friči*	Flach. – Kafka, p. 67.
1917	*Acme* (*Pupula*) *frici*	(Flach). – Wenz, p. 77.
1923	*Pupula friči*	(Flach). – Wenz, p. 1856 (cum syn.).
1964	*Acme friči*	(Flach, 1889). – Čtyroký *et al.*, table for p. 149.
1977	*Acicula* (*Acicula*) *frici*	(Flach). – Moayedpour, p. 57, pl. 1, figs 13, 14.
1989	*Acicula fusca*	(Montagu, 1803). – Boeters *et al.*, p. 43 (pars), text-fig. 41.

Material. – 2 specimens (NHMW 2013/0572/0002), 570 specimens (NHMW 1909/0001/0005).

Dimensions. – Diameter: 0.8 mm, height: 1.95 mm (Fig. 2G); diameter: 0.75 mm, height: 2.05 mm (Fig. 2H).

Discussion. – Two aciculid species with axial grooves are recorded from the Most Basin: *Acicula fusca frici* (Flach, 1889) and *Acicula limbata* Reuss, 1861. As already defined by Flach (1889), both species can be clearly distinguished by the characteristic sutural thread and larger size of *A. limbata*. Moreover, *A. limbata* displays a distinctly less convex transition from periphery into base, its aperture is adapically acuminate-elongate, and its protoconch is much lower.

Boeters *et al.* (1989) treat *Acme frici* Flach, 1889 as a synonym of the Recent *Acicula fusca* but state that it is more slender. This would make this species a surprisingly long-lived species, which persisted for more than 18 Ma. In our opinion this "genetic stasis" is not very likely and therefore, we propose to keep the slender Bohemian Early Miocene specimens separate at least as chrono-subspecies.

Within the 572 specimens, a single sinistral specimen was detected as well (Fig. 2I).

Occurrence. – Known from Tuchořice and the Chomutov drillings and from the Aquitanian of Theobaldshof/Rhön in Germany (Moayedpour 1977). A further occurrence from the Lower Oligocene of Detaň (Czech Republic), mentioned by Mikuláš *et al.* (2003), needs verification but seems unlikely in respect to the very large age difference.

***Acicula limbata* Reuss, 1861**
Figure 2J–L

1849a	*Acme fusca*	Walk. – Reuss *in* Reuss & Meyer, p. 11 (non [*Turbo*] *fuscus* Montagu, 1803).
1849b	*A.*[*cme*] *fusca*	Walk. – Reuss *in* Reuss & Meyer, p. 40, pl. 3, fig. 16 (non [*Turbo*] *fuscus* Montagu, 1803).
*1861	*A.*[*cicula*] *limbata*	Reuss; Reuss, p. 61.
1869a	*Acicula limbata*	Reuss. – Slavík, p. 266.
1870a	*Acicula limbata*	Rss. – Boettger, p. 284.
1875	*Acicula limbata*	Reuss. – Sandberger, pp. 410, 445, pl. 24, figs 30a, b.
1889	[*Acme*] *limbata*	Reuss. – Flach, p. 71, fig. 3.
1891	*Acme laevissima*	n.; Klika, p. 18, text-fig. 8.
1891	*Acme limbata*	Reuss. – Klika, p. 18, text-fig. 9.
1892	*Acme laevissima*	Klika. – Klika, p. 18, text-fig. 8.
1892	*Acme limbata*	Reuss. – Klika, p. 18, text-fig. 9.
? 1902b	*Acme limbata*	Rss. – Andreae, p. 24.
1911	[*Acme*] (*Tudora*) *limbata*	Rss. – Kafka, p. 67.
1911	[*Acme*] *laevissima*	Kl. – Kafka, p. 67.
1916	[*Acme*] *limbata*	Reuss. – Thuma, p. 82.

1917 *Acme* (*Pupula*) *limbata* (Reuss). – Wenz, p. 76.
1922 *Acme laevissima* Kl. – Thuma, p. 5.
1923 *Acme* (*Acme*) *laevissima* Klika. – Wenz, p. 1853.
1923 *Pupula limbata* (Reuss). – Wenz, p. 1857 (cum syn.).
1989 *Acicula limbata* Reuss, 1860. – Boeters *et al.*, p. 56, text-figs 60, 61, non fig. 56.
1989 [*Platyla*] *laevissima*. – Boeters *et al.*, p. 217.

Material. – One specimen (NHMW 2013/0572/0003), 10 specimens (NHMW 1909/0001/0004).

Dimensions. – Diameter: 1.1 mm, height: 2.8 mm (Fig. 2J); diameter: 1.15 mm, height: 2.9 mm (Fig. 2K).

Discussion. – *Acicula limbata* is easily recognised by its deep axial grooves and the typical sutural band along the upper suture of the teleoconch whorls. This species was originally described by Reuss (1861) from the Early Miocene of Bohemia. Nevertheless, Boeters *et al.* (1989) consider also a Recent species from the Caucasus in Georgia to be conspecific with *A. limbata*. The only Recent specimen illustrated by Boeters *et al.* (1989, fig. 56) is stouter, bullet-shaped, the sutural band is broader, its columellar-lip is more concave and the axial grooves are more oblique compared to *A. limbata*. Therefore, – and also with respect to the huge stratigraphic gap – we doubt that both taxa are conspecific.

Klika (1891) described a poorly preserved specimen from Pyšná as *Acme laevissima.* Based on this description and the very poor illustration, Boeters *et al.* (1989) placed *Acme laevissima* in *Platyla*. Unfortunately, the original description and illustrations are misleading. The type specimen in the collection of the National Museum Prague (NM-PM-P 449) shows axial grooves and a poorly preserved sutural band, which have not been mentioned by Klika (1891). Thus, sculpture, size and overall shape range well within *Acicula limbata* Reuss, 1861.

Acicula crassistoma Stworzewicz & Sołtys, 1996 from the Early/Middle Miocene of Bełchatów was partly lumped with *A. limbata* but differs clearly in its smaller size and stout shell (Stworzewicz & Sołtys 1996).

Occurrence. – Known from Korozluky, Pyšná and Tuchořice. The record from Opole in Poland, mentioned by Andreae (1902b), needs confirmation and might also represent species such as *Acicula crassistoma* Stworzewicz & Sołtys, 1996.

Genus *Platyla* Moquin-Tandon, 1856

Type species. – *Acme dupuyi* Paladilhe, 1868; subsequent designation by Boeters *et al.* (1989). Recent, France.

Platyla callosa (Boettger, 1870)

Figure 2N–P

*1870a *Acicula callosa* Boettg.; Boettger, p. 284, pl. 13, figs 1a, b.
1889 [*Acme*] *callosa* Böttg. – Flach, p. 71, fig. 2.
1891 *Acme callosa* Boettger. – Klika, p. 16, text-fig. 6.
1892 *Acme callosa* Boettger. – Klika, p. 16, text-fig. 6.
1911 *Acme callosa* Bttg. – Kafka, p. 67.
1916 *Acme callosa* Boettger. – Thuma, p. 82.
1917 *Acme* (*Platyla*) *callosa* Boettger. – Wenz, p. 76.
1923 *Acme* (*Acme*) *callosa* Boettger. – Wenz, p. 1851.
1976 *Acicula* (*Platyla*) *callosa* (Boettger). – Zilch, p. 123, pl. 11, fig. 2.
1989 *Platyla callosa* (O. Boettger, 1870). – Boeters *et al.*, p. 100, text-figs 92, 94.
? 2006 *Platyla callosa* (Boettger), 1870 var. – Kókay, p. 44, pl. 14, figs 3, 4 (? = *Platyla falkneri* Boeters *et al.*, 1986).

Material. – 3 specimens (NHMW 2013/0572/0004), 48 specimens (NHMW 1909/0001/0002).

Dimensions. – Diameter: 1.4 mm, height: 3.4 mm (Fig. 2N); diameter: 1.35 mm, height: 3.4 mm (Fig. 2O).

Discussion. – Platyla callosa (Boettger, 1870) differs from *Platyla subfusca* (Flach, 1889) in its larger size, it lacks the delicate sutural thread, has an acuminate adapical aperture, develops only a weak cervical callus, is more subcylindrical, and its whorls are less convex.

The illustration in Boettger (1870a) is not precise and suggests a bullet-shaped, cylindrical shell, whilst the lectotype in Zilch (1976) has incised sutures and convex whorls. Kókay (2006) reports this species also from the Early Miocene of Hungary based on two fragments of the last whorl. The prominent umbilical callus (*sensu* Boeters *et al.* 1989) and the broad external peristomal varix of these specimens might point rather to *Platyla falkneri* Boeters *et al.* (1989) as discussed by Kókay (2006).

Occurrence. – Only known from Korozluky and Tuchořice.

Platyla subfusca (Flach, 1889)

Figure 2Q–T

*1889 [*Acme*] *subfusca* n.; Flach, p. 71, fig. 1.
1891 *Acme subfusca* Flach. – Klika, p. 17, text-fig. 7.
1892 *Acme subfusca* Flach. – Klika, p. 17, text-fig. 7.
1904 *Acme callosiuscula* sp. nov.; Andreae, p. 14, fig. 13.
1911 [*Acme*] *subfusca* Flach. – Kafka, p. 67.

1917 *Acme* (*Platyla*) *subfusca* Flach. – Wenz, p. 76.
1923 *Acme* (*Acme*) *subfusca* Flach. – Wenz, p. 1853 (cum syn.).
1976 *Acicula* (*Platyla*) *callosiuscula* Andreae. – Schlickum, p. 3, pl. 1, fig. 4.
1989 *Platyla subfusca* (Flach, 1889). – Boeters, p. 169, text-figs 170, 171.
2006 *Platyla subfusca* (Flach), 1889. – Kókay, p. 44, pl. 14, fig. 5.

Material. – 2 specimens (NHMW 2013/0572/0005), 2 specimens (NHMW 1909/0001/0003).

Dimensions. – Diameter: 1.15 mm, height: 2.9 mm (Fig. 2Q); diameter: 1.2 mm, height: 2.9 mm (Fig. 2S).

Discussion. – The most characteristic feature of this species is the prominent external peristomal varix, which is absent in all other aciculids of the Most Basin.

Occurrence. – The species was described from the Early Miocene of Tuchořice and from Somlóvásárhely in Hungary (Kókay 2006). It is also reported from the Late Oligocene of Hochheim-Flörsheim in Germany (Wenz 1923). Tentatively, Boeters *et al.* (1989) considered *Platyla callosiuscula* (Andreae, 1904) as synonym, which would increase the range of the species to the Middle Miocene (*e.g.* Zwiefaltendorf, Germany and Opole, Poland).

Clade Panpulmonata Jörger *et al.*, 2010
Superorder Basommatophora Keferstein *in* Bronn, 1864
Order Hygrophila Férussac, 1822
Suborder Branchiopulmonata Morton, 1955
Infraorder Lymnaeoinei Minichev & Starobogatov, 1975

Superfamily Lymnaeoidea Rafinesque, 1815
Family Lymnaeidae Rafinesque, 1815

Genus *Radix* Montfort, 1810

Type species. – *Helix Auricularia* Linnaeus, 1758; original designation. Recent, Europe.

***Radix subovata* (von Zieten, 1832)**
Figure 3A–C, F

*1832 *Limnaea subovata* Hartmann; von Zieten, p. 39, pl. 30, figs 2a, b.
1845 *Limnaeus pachygaster* Nob.; Thomä, p. 155, pl. 4, fig. 1.
1849a *L.*[*imnaeus*] *vulgaris* Pfr. – Reuss *in* Reuss & Meyer, p. 1 (non *Limnaeus vulgaris* Pfeiffer, 1821).
1849b *L.*[*imnaeus*] *vulgaris* Pfr. – Reuss *in* Reuss & Meyer, p. 37, pl. 4, fig. 6 (non *Limnaeus vulgaris* Pfeiffer, 1821).
1849a *Limnaeus Thomae* Rss. – Reuss *in* Reuss & Meyer, p. 11 (nomen nudum).
1849b *L.*[*imnaeus*] *Thomae* m.; Reuss *in* Reuss & Meyer, p. 36, pl. 4, fig. 4.
1858 *Limnaeus pachygaster* Thomæ. – Sandberger, p. 67, pl. 7, figs 1, 4.
1861 *L.*[*imnaeus*] *pachygaster* Thom. – Reuss, p. 78.
1861 *L.*[*imnaeus*] *Thomaei* [sic] Reuss. – Reuss, p. 79.
1875 *Limnaeus pachygaster* Thomae. – Sandberger, p. 494, pl. 25, fig. 13.
1891 *Limnaeus pachygaster* Thomae. – Klika, p. 103, text-figs 99a, b.
1891 *Limnaeus Thomaei* Reuss. – Klika, p. 104, text-fig. 101.
1891 *L.*[*imnaeus*] *Klikae* Bttgr. – Boettger, p. 231.
1892 *Limnaeus pachygaster* Thomae. – Klika, p. 98, text-figs 99a, b.
1892 *Limnaeus Thomaei* Reuss. – Klika, p. 100, text-fig. 101.
1911 *Limnaeus pachygaster* Tho. – Kafka, p. 69.
1915 *Limnaea* (*Limnus*) *pachygaster* Tho. – Fischer & Wenz, p. 56, pl. 2, figs 10a, b.
1916 *Limnaeus pachygaster* Thomae. – Thuma, p. 84.
1916 [*Limnaeus*] *Thomaei* Reuss. – Thuma, p. 84.
1917 *Limnaea* (*Limnaea*) *pachygaster* (Thomae). – Wenz, p. 74.
1923 *Radix* (*Radix*) *subovata* (Zieten). – Wenz, p. 1291.
1923 *Radix* (*Radix*) *subovata thomaei* (Reuss). – Wenz, p. 1310 (cum syn.).
1977 *Radix* (*Radix*) *subovata* (Zieten). – Moayedpour, p. 59.

Material. – 2 specimens (NHMW 2013/0572/0006), 3 specimens (NHMW 2013/0572/0007), 2 specimens (NHMW 1909/0001/0085), 2 specimens (NHMW 1909/0001/0087), 1 specimen (NM-PM-P 885).

Dimensions. – Diameter: 11.5 mm, height: 19.5 mm (Fig. 3A, F); diameter: 15.5 mm, height: 28 mm (Fig. 3B, C).

Discussion. – This species is difficult to distinguish from the co-occurring *Stagnicola subpalustris* (Thomä, 1845). Both species exhibit a considerable degree of (overlapping) morphological variability, making a strict delimitation almost impossible. Generally, *R. subovata* has a broader and higher last whorl, producing a more bulbous appearance, with a strong columellar fold, while *S. subpalustris* has a slender shape and one additional whorl. Each of these characters varies strongly among the studied material and might also depend on the individual age. As both forms have been cited from the same localities in the Most Basin (except Lipno,

where only *S. subpalustris* was recorded), they might turn out to reflect one highly polymorphic species (as is known for lymnaeids in general; *e.g.* Glöer 2002).

The specimens, which were identified as "*Limnaeus Thomae*" by Reuss *in* Reuss & Meyer (1849) and ranked as subspecies of *R. subovata* by Wenz (1923), range fully within the variability of *R. subovata*. This regards especially the slightly inflated last whorl. As any delimitation appears arbitrary we synonymise these records.

Occurrence. – Recorded for Korozluky, Tuchořice, and Pyšná in the Most Basin. Additionally recorded for the Lower Miocene of the Aquitaine Basin, the Mainz and Hanau basins, the Rhön Mountains, Southern Germany, and Switzerland (Wenz 1923, Moayedpour 1977).

Genus *Stagnicola* Jeffreys, 1830

Type species. – *Lymnaea communis* Jeffreys, 1830, by monotypy. Recent, Europe.

Stagnicola subpalustris (Thomä, 1845)

Figure 3D, E

- *1845 *Limnæus subpalustris* Nob.; Thomä, p. 156, pl. 4, figs 9a, b.
- 1845 *Limnæus minor* Nob.; Thomä, p. 157.
- 1849a *Limaeus acutus* Braun. – Reuss *in* Reuss & Meyer, p. 11.
- 1849a *L.*[*imnaeus*] *medius* Rss. – Reuss *in* Reuss & Meyer, p. 11 (nomen nudum).
- 1849b *L.*[*imnaeus*] *acutus* Braun. – Reuss *in* Reuss & Meyer, p. 35, pl. 4, fig. 3.
- 1849b *L.*[*imnaeus*] *medius* m.; Reuss *in* Reuss & Meyer, p. 36, pl. 4, fig. 5.
- 1858 *Limnaeus subpalustris* Thomæ. – Sandberger, p. 68, pl. 7, figs 2–2b.
- 1858 *Limnaeus minor* Thomæ. – Sandberger, p. 70, pl. 7, figs 6–6b.
- 1861 *L.*[*imnaeus*] *subpalustris* Thom. – Reuss, p. 78.
- 1861 *L.*[*imnaeus*] *minor* Thom. – Reuss, p. 79.
- 1875 *Limnaeus subpalustris* Thomae. – Sandberger, p. 495, pl. 25, fig. 14.
- 1878 *L.*[*imneus*] *subpalustris* Tho. – Boettger, p. 2.
- 1878 *Limneus minor* Tho. – Boettger, p. 4.
- ? 1878 *Limneus Dupuyanus* Noulet. – Boettger, p. 5 (non *Limnaea Dupuyana* Noulet, 1854).
- 1891 *Limnaeus subpalustris* Thomae. – Klika, p. 104, text-figs 100a, b.
- 1891 *Limnaeus minor* Thomae. – Klika, p. 99, text-figs 102a, b.
- 1892 *Limnaeus subpalustris* Thomae. – Klika, p. 104, text-figs 100a, b.
- 1892 *Limnaeus minor* Thomae. – Klika, p. 101, text-figs 102a, b.
- 1911 [*Limnaeus*] *minor* Th. – Kafka, p. 69.
- 1916 [*Limnaeus*] *subpalustris* Thomae. – Thuma, p. 84.
- 1916 [*Limnaeus*] *minor* Thomae. – Thuma, p. 84.
- 1917 *Limanea* (*Limnophysa*) *subpalustris* (Thomae). – Wenz, p. 50, p. 74.
- 1923 *Galba* (*Galba*) *subpalustris subpalustris* (Thomae). – Wenz, p. 1398.
- 1923 *Galba* (*Galba*) *subpalustris minor* (Thomae). – Wenz, p. 1403 (cum syn.).
- 1977 *Stagnicola* (*Stagnicola*) *subpalustris* (Thomae). – Moayedpour, p. 59, pl. 2, fig. 6.

Material. – One specimen (illustrated, NHMW 2013/0572/0008), 62 specimens (NHMW 2013/0572/0009), 2 specimens (NHMW 1909/0001/0086), 3 specimens (NHMW 1909/0001/0088), 3 specimens (NHMW 1890/0013/0416).

Dimensions. – Diameter: 11.3 mm, height: 25.3 mm.

Discussion. – Reuss (1861) mentioned *L. minor* Thomä, 1845 as rare element in Tuchořice. This record as well as the status of this species, which was described from the Early Miocene of the Mainz Basin, is doubtful. It was not illustrated and only poorly described by Thomä (1845), who did not discuss any differences from other co-occurring lymnaeids. Sandberger (1858) and Boettger (1878) depicted small ovoid shells that roughly correspond to Thomä's description. Yet these specimens are apparently juvenile shells and do not differ from comparable ontogenetic stages of herein studied specimens of *S. subpalustris*. The "always distinctly lipped peristome" characterising *L. minor* after Boettger (1878), is also found in several of our subadult specimens. Therefore, we synonymise both taxa.

Boettger (1878) determined some specimens from Tuchořice as *L. Dupuyanus* Noulet. Such ovoid shells with small aperture and thickened peristome are not found in our material. As this species was originally described by Noulet (1854) from the Middle Miocene of Sansan (France), this record is probably a misidentification and is tentatively synonymised with *S. subpalustris*.

For differences to the co-occurring *Radix subovata* see discussion above.

Occurrence. – Known from Korozluky, Tuchořice, Pyšná, and Lipno in the Most Basin. It was described from the Late Aquitanian-Early Burdigalian of the Mainz Basin and is additionally recorded for the Early Miocene of the Aquitaine Basin, the Hanau Basin, the Rhön Mountains, Southern Germany, and Moravia (Wenz 1923, Moayedpour 1977).

Infraorder Planorboinei Nordsieck, 1993

Superfamily Acroloxoidea Thiele, 1931
Family Acroloxidae Thiele, 1931
Subfamily Acroloxinae Thiele, 1931

Genus *Acroloxus* Beck, 1838

Type species. – *Patella lacustris* Linnaeus, 1758; subsequent designation by Herrmannsen (1846). Recent, Europe.

***Acroloxus decussatus* (Reuss *in* Reuss & Meyer, 1849)**
Figure 3G, H

1849a *Ancylus decussatus* Rss. – Reuss *in* Reuss & Meyer, p. 11 (nomen nudum).
*1849b *A.*[*ncylus*] *decussatus* m.; Reuss *in* Reuss & Meyer, p. 17, pl. 1, fig. 1.
1861 *A.*[*ncylus*] *decussatus* Reuss. – Reuss, p. 80.
1874 *Ancylus* (*Velletia*) *decussatus* Reuss. – Sandberger, p. 424, pl. 24, figs 2–2c.
1891 *Ancylus* (*Velletia*) *decussatus* Reuss. – Klika, p. 110, text-figs 109a–c.
1892 *Ancylus* (*Velletia*) *decussatus* Reuss. – Klika, p. 106, text-figs 109a–c.
1911 *Ancylus* (*Velletia*) *decussatus* Rss. – Kafka, p. 69.
1915 *Velletia decussata* (Reuss). – Fischer & Wenz, p. 57, unnumbered text-fig. on p. 58.
? 1915b *Velletia decussata* (Reuss). – Wenz, p. 43.
1916 *Ancylus* (*Velletia*) *decussatus* Reuss. – Thuma, p. 84.
1916 *Acroloxus decussatus* (Reuss). – Wenz, p. 181.
1917 *Acroloxus decussatus* (Reuss). – Wenz, p. 75.
1923 *Acroloxus decussatus* (Reuss). – Wenz, p. 1684 (pars).
? 1977 *Acroloxus decussatus* (Reuss). – Moayedpour, p. 62, pl. 3, figs 9, 10.

Material. – One specimen (NHMW 1909/0001/0095).

Dimensions. – Length: 2.5 mm, width: 1.8 mm, height: *ca* 0.8 mm.

Description. – Apex raised, cap-like, inclined to the left; initial part of protoconch *ca* 200 µm in diameter, with smooth surface; surrounded by dense, collar-like pattern of radial and spiral threads; entire protoconch measuring *ca* 850 µm in maximum diameter; transition to teleoconch marked by distinct flattening of shell and almost abrupt cessation of radial-spiral pattern. Teleoconch regularly oval, covered by moderately distinct spiral growth lines.

Discussion. – The clearly leftwards-inclined apex classifies this species as a true *Acroloxus*. It is the only *Acroloxus* species known from the Early Miocene of Europe. The Middle Miocene *A. deperditolacustris* (Gottschick, 1911) from Lake Steinheim can be distinguished by the rather ovoid shape with narrow posterior part. *Acroloxus ucrainicus* Gozhik & Prysjazhnjuk, 1978, from the late Sarmatian (Tortonian) of Mykolayiv, Ukraine, differs in the presence of several regularly- spaced spiral ridges on the teleoconch; the shape of the apex is not discernible from the illustration.

Moayedpour (1977) follows the determinations by Fischer & Wenz (1914) and lists "*A. decussatus*" from Theobaldshof/Rhön, Germany. The illustrated specimen deviates slightly from ours in the higher-domed shell reminding of *Ancylus* and the higher apex. It remains unclear whether both specimens are conspecific.

Occurrence. – Tuchořice, Korozluky, and Pyšná in the Most Basin. The records from the late Oligocene-Early Miocene of the Mainz and Hanau basins, the Burdigalian of the Rhön, the Aquitanian Öpfingen beds of Ehingen (Donau), and the Oligocene of Recollaine in Switzerland (Wenz 1923) are partly doubtful and need confirmation.

Superfamily Planorboidea Rafinesque, 1815
Family Planorbidae Rafinesque, 1815
Subfamily Planorbinae Rafinesque, 1815

Genus *Gyraulus* Charpentier, 1837

Type species. – *Planorbis albus* Müller, 1774; subsequent designation by Dall (1870). Recent, Europe.

***Gyraulus dealbatus* (Braun *in* Walchner, 1851)**
Figure 3I–N

1849a *Planorbis applanatus* Thom. – Reuss *in* Reuss & Meyer, p. 11 (non *Planorbis applanatus* Thomä, 1845).
1849a *Planorbis exiguus* Rss.; Reuss *in* Reuss & Meyer, p. 11 (nomen nudum).
1849b *Pl.*[*anorbis*] *applanatus* Thom. – Reuss *in* Reuss & Meyer, p. 38, pl. 4, fig. 8 (non *Planorbis applanatus* Thomä, 1845).
1849b *Pl.*[*anorbis*] *exiguus* m.; Reuss *in* Reuss & Meyer, p. 38, pl. 4, fig. 9.
*1851 *Planorbis dealbatus* A. Braun; Braun *in* Walchner, p. 1134 (p. 50 in offprint), No. 264.
1861 *Pl.*[*anorbis*] *cognatus* Rss.; Reuss, p. 79, pl. 3, fig. 15.
1861 *Pl.*[*anorbis*] *declivis* A. Br. – Reuss, p. 79 (non *Planorbis declivis* Braun *in* Walchner, 1851 = *Planorbis applanatus* Thomä, 1845).
1861 *Pl.*[*anorbis*] *exiguus* Reuss. – Reuss, p. 80.
? 1869a *Ptychospira deloplecta* gen. et sp. nov.; Slavík, p. 261, pl. 4, figs 14, 15.

? 1869b *Ptychospira deloplecta* gen. et sp. nov.; Slavík, p. 267, pl. 4, figs 14, 15.
1891 *Planorbis cognatus* Reuss. – Klika, p. 108, text-figs 106a–c.
1891 *Planorbis declivis* al. Braun. – Klika, p. 107, text-figs 104a, b (non *Planorbis declivis* Braun *in* Walchner, 1851 = *Planorbis applanatus* Thomä, 1845).
1891 *Planorbis laevis* Klein. – Klika, p. 109, text-figs 107a–c (non *Planorbis laevis* Klein, 1846 = *Planorbis kleini* Gottschick & Wenz, 1916).
1892 *Planorbis cognatus* Reuss. – Klika, p. 104, text-figs 106a–c.
1892 *Planorbis declivis* al. Braun. – Klika, p. 102, text-figs 104a, b (non *Planorbis declivis* Braun *in* Walchner, 1851 = *Planorbis applanatus* Thomä, 1845).
1892 *Planorbis laevis* Klein. – Klika, p. 104, text-figs 107a–c (non *Planorbis laevis* Klein, 1846 = *Planorbis kleini* Gottschick & Wenz, 1916).
1911 [*Planorbis*] *declivis* A. Br. – Kafka, p. 69 (non *Planorbis declivis* Braun *in* Walchner, 1851 = *Planorbis applanatus* Thomä, 1845).
1911 [*Planorbis*] *laevis* Kl. – Kafka, p. 69 (non *Planorbis laevis* Klein, 1846 = *Planorbis kleini* Gottschick & Wenz, 1916).
1916 [*Planorbis*] *declivis* Al. Braun. – Thuma, p. 84 (non *Planorbis declivis* Braun *in* Walchner, 1851 = *Planorbis applanatus* Thomä, 1845).
1916 [*Planorbis*] *laevis* v. Klein. – Thuma, p. 84.
1917 *Gyraulus multiformis applanatus* (Thomae). – Wenz, p. 75 (non *Planorbis applanatus* Thomä, 1845).
1923 *Gyraulus* (*Gyraulus*) *trochiformis applanatus* (Thomae). – Wenz, p. 1579 (only Most Basin records).
1923 *Gyraulus* (*Gyraulus*) *trochiformis dealbatus* (A. Braun). – Wenz, p. 1591 (cum syn.).
? 1923 *deleplecta* [sic] Slavik. – Wenz, p. 1111.
? 1925 *Planorbis declivis* Al. Braun for *scalaris.* – Petrbok, p. 3, unnumbered pl., figs 4, 6 (non *Planorbis declivis* Braun *in* Walchner, 1851 = *Planorbis applanatus* Thomä, 1845).
1964 *Gyraulus trochiformis applanatus* (Thomae, 1845). – Čtyroký *et al.*, p. 138, fig. 4.
1977 *Gyraulus* (*Gyraulus*) *trochiformis dealbatus* (Braun). – Moayedpour, p. 60, pl. 2, figs 7–9.

Material. – Several ten thousands of individuals (NHMW 1909/0001/0092, 2013/0572/0070–0072).

Dimensions. – Diameter: 4.5 mm, height: 1.1 mm (Fig. 3I, J, N); diameter: 4.5 mm, height: 1.1 mm (Fig. 3K, M); diameter: 4.4 mm, height: 1.2 mm (Fig. 3L).

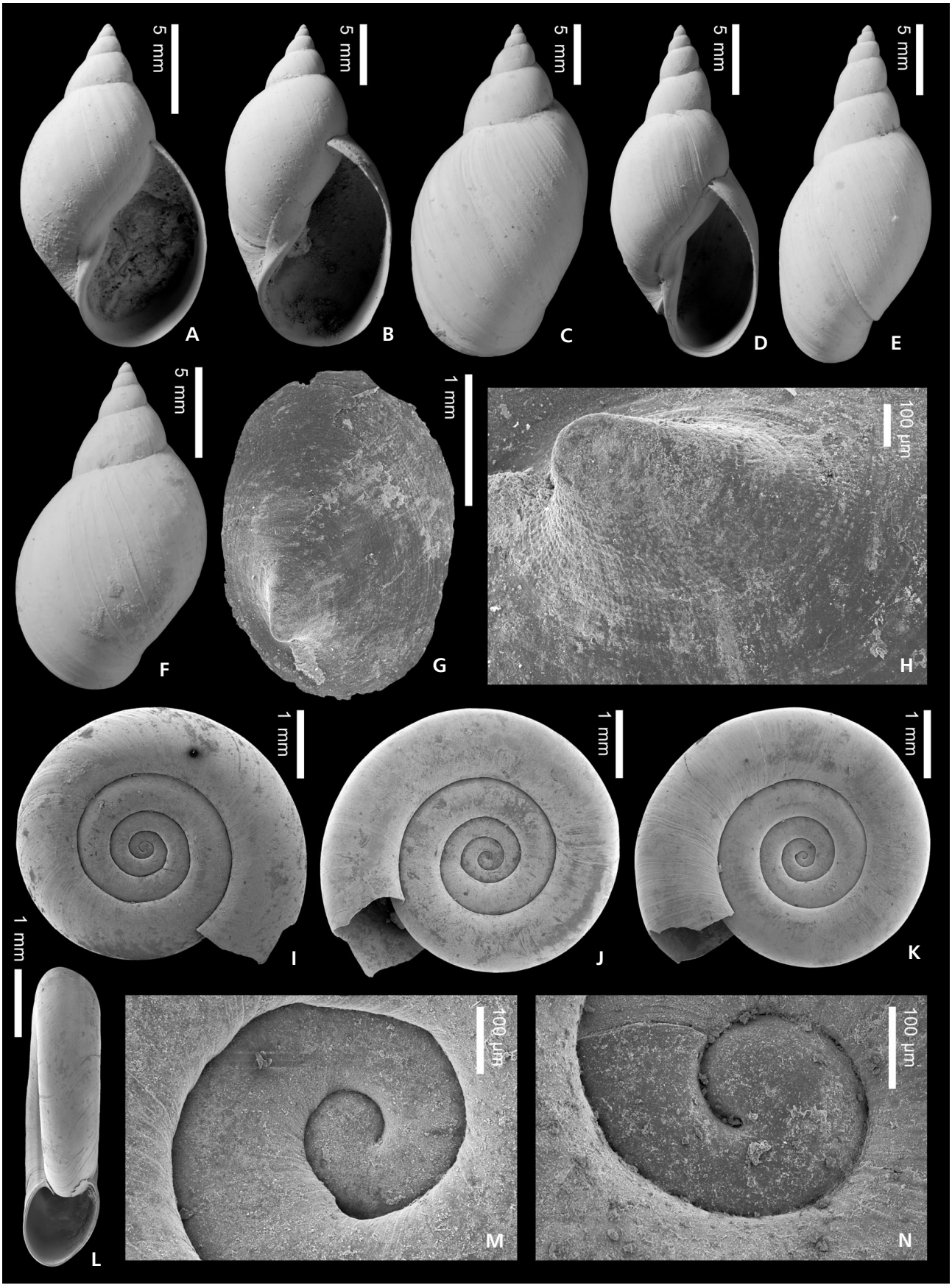
Discussion. – Among the freshwater gastropods, *Gyraulus dealbatus* clearly dominates the assemblage concerning individual number. The morphological plasticity of this group of planorbids prompted earlier workers to split it into several species. Only three of these are today accepted, *i.e. G. applanatus* (including the synonym *declivis*), *G. dealbatus* (including the synonym *cognatus* and *exiguus*), and *G. kleini* (see Wenz 1923). After careful assessment of the rich material of the Vienna and Prague museums collections it was still not possible to detect and separate distinct morphological units. The differences mentioned and/or illustrated by several authors often correspond to different growth stages. In early ontogeny the shell is higher convex with less pronounced angle, the last whorl is distinctly larger in relation to the preceding whorls, and both umbilicus and apex seem deeper immersed. Because of allometric growth, whorl width outpaces whorl height, producing a flatter shell during ontogeny and forming a relatively wider umbilicus and apical concavity.

Although some uncertainty remains, we regard all records of the Most Basin to refer to a single species. A determination as *Gyraulus applanatus* is clearly wrong as the typical pronounced basal keel (*e.g.* Gottschick 1920b) is absent in the studied material and was also never described or illustrated from Most Basin shells; they rather correspond to *G. dealbatus*.

Petrbok (1925) described several irregularly scalariform shells, which he considered conspecific with the normally coiled *Gyraulus* from Tuchořice. Although we agree with Petrbok (1925), the poor preservation of the specimens, stored in the Prague collection, does not allow a clear identification. Comparable decoiled and scalariform shells were also described by Moayedpour (1977) from the Early Miocene of the Rhön Mountains, Germany, supporting Petrbok's interpretation. *Ptychospira deloplecta* Slavík, 1869 was considered a juvenile Pupilloidea by Boettger (1870a) and Wenz (1923). Later, Petrbok (1925) identified the specimens as scalariform planorbids and suggested that they are conspecific with *Gyraulus declivis* (synonym of *G. applanatus*).

Occurrence. – Known from Korozluky, Tuchořice, Lipno, and Pyšná in the Most Basin. Additionally recorded from the Early-Middle Miocene of the Aquitaine Basin, the

Figure 3. A, F – *Radix subovata* (von Zieten, 1832), NHMW 2013/0572/0006. • B, C – *Radix subovata* (von Zieten, 1832), NHMW 2013/0572/0006. • D, E – *Stagnicola subpalustris* (Thomä, 1845), NHMW 2013/0572/0008. • G, H – *Acroloxus decussatus* (Reuss *in* Reuss & Meyer, 1849), NHMW 1909/0001/0095. • I, J, N – *Gyraulus dealbatus* (Braun *in* Walchner, 1851), NHMW 2013/0572/0070. • K, M – *Gyraulus dealbatus* (Braun *in* Walchner, 1851), NHMW 2013/0572/0071. • L – *Gyraulus dealbatus* (Braun *in* Walchner, 1851), NHMW 2013/0572/0072.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Mainz and Hanau basins, the Rhön Mountains, Southern Germany, Austria, Moravia, Hungary, Poland, Serbia, and Ukraine (Wenz 1923, Schlickum 1964, Čtyroký 1972, Moayedpour 1977, Gozhik & Prysjazhnjuk 1978, Piechocki 1997, Binder 2004, Kókay 2006, Prysjazhnjuk 2008). Many of these records need confirmation.

Genus *Hippeutis* Charpentier, 1837

Type species. – *Helix complanata* Linnaeus, 1758; subsequent designation by Zilch *in* Wenz & Zilch (1959; see Welter-Schultes 2012 for discussion). Recent, Sweden.

Hippeutis ungeri (Reuss *in* Reuss & Meyer, 1849)
Figure 4A–C

1849a *Pl.*[*anorbis*] *Ungeri* Rss.; Reuss *in* Reuss & Meyer, p. 11 (nomen nudum).
*1849b *Pl.*[*anorbis*] *Ungeri* m.; Reuss *in* Reuss & Meyer, p. 39, pl. 4, fig. 10.
1861 *Pl.*[*anorbis*] *Ungeri* Reuss. – Reuss, p. 79.
1874 *Planorbis Ungeri* Reuss. – Sandberger, p. 424, pl. 24, figs 1–1c.
1891 *Planorbis ungeri* Reuss. – Klika, p. 108, text-figs 105a, b.
1892 *Planorbis ungeri* Reuss. – Klika, p. 103, text-figs 105a, b.
1911 [*Planorbis*] *Ungeri* Rss. – Kafka, p. 69.
1916 [*Planorbis*] *Ungeri* Reuss. – Thuma, p. 84.
1916 *Hippeutis ungeri* (Reuss). – Wenz, p. 181.
1917 *Hippeutis ungeri* (Reuss). – Wenz, p. 75.
1923 *Hippeutis* (*Hippeutis*) *ungeri* (Reuss). – Wenz, p. 1649 (cum syn.).
? 2008 *Hyppeutis* (*Hyppeutis*) *ungeri* (Reuss, 1849). – Prysjazhnjuk, p. 88, pl. 1, figs 5, 6.

Material. – One specimen (NHMW 1909/0001/0094), 6 specimens (NM-PM-P 768).

Dimensions. – Diameter: 3.2 mm, height: 0.8 mm (Fig. 4A, C).

Description. – Protoconch indiscernible, covered with sediment. Shell with distinct median angle, forming a weak but not offset keel. Aperture heart-shaped, with thin peristome. Moderately distinct, dense sigmoidal (in apertural view) growth lines cover the shell.

Discussion. – Hippeutis subfontanus (Clessin, 1877) from the latest Burdigalian–early Langhian Silvana beds of Undorf, Hohenmemmingen, Mörsingen, and Zwiefaltendorf (Clessin 1877, Wenz 1923, Schlickum 1976) has a much stronger, blade-like keel and the last whorl is covering up to 50% of the preceding whorl. Additionally, there seems to be an angulation on both sides near the suture, producing a small funnel-shaped concavity. *Hippeutis fasciatus* Gottschick, 1920 from the Middle Miocene of Lake Steinheim is characterised by strong growth lines (see also Finger 1998). Moreover, the angulation is not central and the aperture not symmetrical in apertural view.

Occurrence. – Korozluky and Tuchořice in the Most Basin. It was also mentioned from the Aquitanian Öpfingen beds of Donaurieden, Baden-Württemberg (Wenz 1916). The record from the middle-late Burdigalian locality Trijebine in Serbia by Prysjazhnjuk (2008) can be only tentatively assigned to *H. ungeri*. The poor illustrations do not allow a clear classification.

Genus *Planorbarius* Duméril, 1806

Type species. – *Helix cornea* Linnaeus, 1758; subsequent designation by Froriep (1806). Recent, Europe.

Planorbarius cornu (Brongniart, 1810)
Figure 4D–K

*1810 *Planorbis Cornu*; Brongniart, p. 371, pl. 22, fig. 6.
1845 *Planorbis solidus* Nob. – Thomä, p. 153.
1849a *Pl.*[*anorbis*] *pseudoammonius* Voltz. – Reuss *in* Reuss & Meyer, p. 11 (non *Helicites pseudammonius* von Schlotheim, 1820).
1849a *Pl.*[*anorbis*] *decussatus* Rss.; Reuss *in* Reuss & Meyer, p. 11 (nomen nudum).
1849b *Pl.*[*anorbis*] *pseudoammonius* Voltz. – Reuss *in* Reuss & Meyer, p. 37, pl. 4, fig. 7 (non *Helicites pseudammonius* von Schlotheim, 1820).
1849b *Pl.*[*anorbis*] *decussatus* m.; Reuss *in* Reuss & Meyer, p. 39.
1849b *Pl.*[*anorbis*] *excavatus* Rss.; Reuss *in* Reuss & Meyer, pl. 4, fig. 11 (error pro *decussatus*).
1858 *Planorbis solidus* Thomæ. – Sandberger, p. 71, pl. 7, figs 8–8b.
1861 *Pl.*[*anorbis*] *solidus* Thom. – Reuss, p. 79.
1861 *Pl.*[*anorbis*] *decussatus* Reuss. – Reuss, p. 80.
1875 *Planorbis cornu* Brongniart. – Sandberger, p. 370 (pars).
1891 *Planorbis cornu* Brongniart. – Klika, p. 106, text-figs 103a, b.
1891 *Planorbis cornu* Brongniart. – Klika, p. 101, text-figs 103a, b.
1911 *Planorbis cornu* Brggt. – Kafka, p. 69.
1915 *Planorbis cornu* Brong. var. *solida* Tho. – Fischer & Wenz, p. 56.
1916 *Planorbis cornu* Brongniart. – Thuma, p. 84.
1917 *Planorbis cornu* Brongniart var. – Wenz, p. 74.

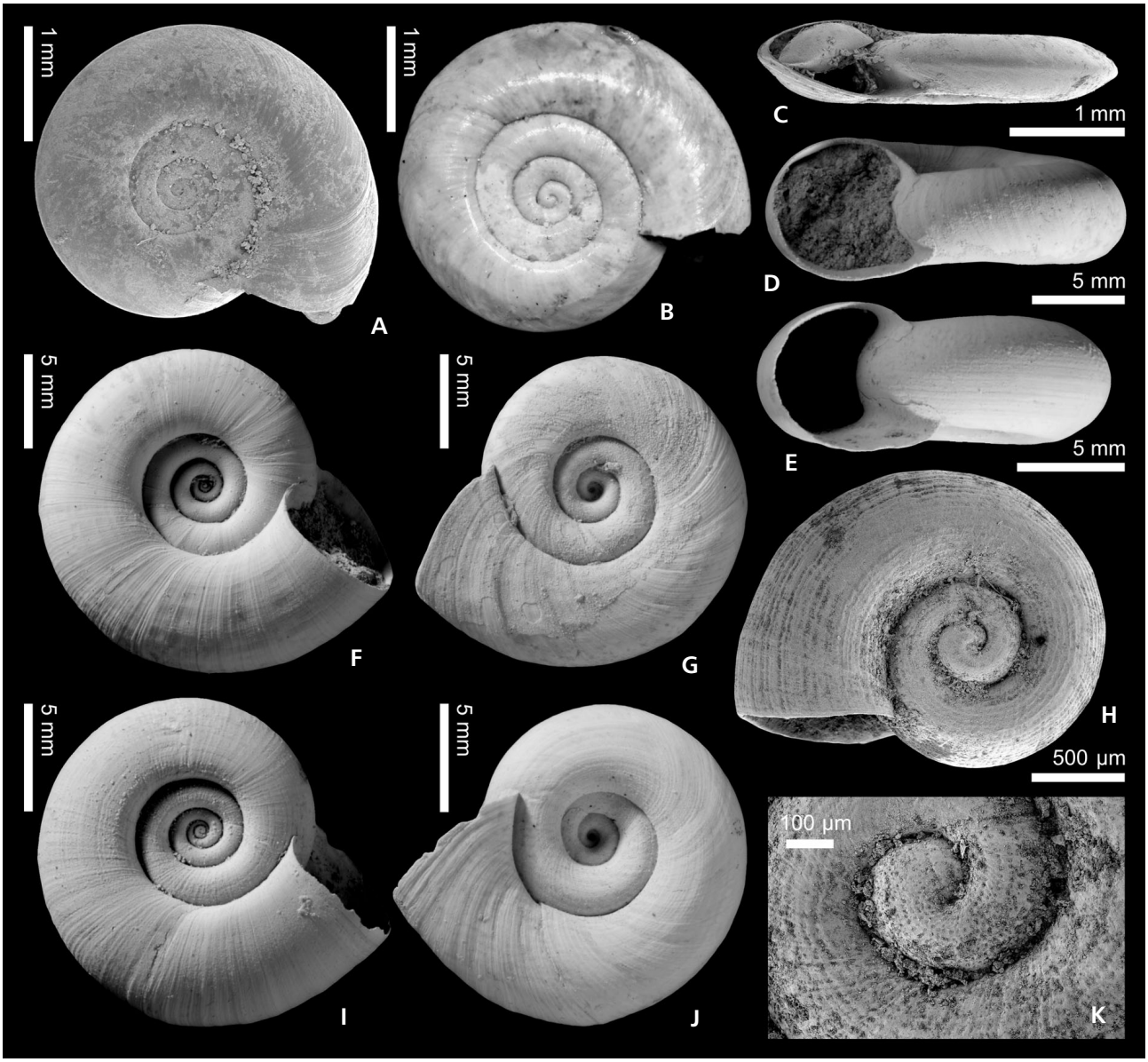


Figure 4. A, C – *Hippeutis ungeri* (Reuss *in* Reuss & Meyer, 1849), NHMW 1909/0001/0094. • B – *Hippeutis ungeri* (Reuss *in* Reuss & Meyer, 1849), NM-PM-P 768. • D, F–G – *Planorbarius cornu* (Brongniart, 1810), NHMW 2013/0572/0010. • E, I, J – *Planorbarius cornu* (Brongniart, 1810), NHMW 2013/0572/0010. • H – *Planorbarius cornu* (Brongniart, 1810), NHMW 2013/0572/0073 (juvenile specimen). • K – *Planorbarius cornu* (Brongniart, 1810), NHMW 2013/0572/0074 (protoconch).

1923 *Coretus cornu cornu* (Brongniart). – Wenz, p. 1426.
1966 *Planorbarius cornu* (Brongniart). – Schlickum, p. 326, pl. 13, fig. 27.
1977 *Planorbarius cornu cornu* (Brongniart). – Moayedpour, p. 61, pl. 3, figs 7, 8.
2004 *Planorbarius cornu* (Brongniart, 1810). – Binder, p. 193, pl. 2, figs 2, 3.

Material. – 3 specimens (NHMW 2013/0572/0010, 2013/0572/00073–0074), 429 specimens (NHMW 1909/0001/089).

Dimensions. – Diameter: 18.0 mm, height: 7.2 mm (Fig. 4E, I, J); diameter: 20.5 mm, height: 8.0 mm (Fig. 4D, F, G).

Discussion. – This species reminds of its (supposed) phylogenetic descendent, the Middle Miocene *P. mantelli*. Both species share the same general shape, the protoconch with spirally arranged pits, and the optional occurrence of more or less distinct spiral striae on the teleoconch (Harzhauser *et al.* 2014). However, adult shells of *P. mantelli* can be separated from those of *P. cornu* for being flatter with less bulbous whorls.

Wenz (1917) stated that the Bohemian shells have a rather flat body whorl in contrast to "typical" *P. cornu* from the Aquitanian–early Burdigalian of the Mainz Basin. However, this opinion cannot be followed herein as already the illustrations of Brongniart (1810) show a rather flat shell. Similarly, Thomä (1845) indicated a flattened "upper" (actually umbilical) part for specimens of Wiesbaden (Mainz Basin). Obviously unaware of the existence of *P. cornu* he introduced a new taxon for these shells, *i.e.* "*Planorbis*" *solidus*. It is considered a synonym of *P. cornu* by Wenz (1923) and this is followed herein.

The record of the (Eocene!) species *Planorbis pseudoammonius* by Reuss *in* Reuss & Meyer (1849) is a misidentification and refers to *P. cornu* as well. Likewise, the "new species" *Planorbis decussatus* Reuss *in* Reuss & Meyer, 1849 represents juvenile individuals of *P. cornu*.

Occurrence. – This taxon is wide-spread throughout the Late Oligocene and Early Miocene of Europe (Wenz 1923). Many records in the literature, especially those referring to Eocene or Middle Miocene localities, have to be checked. Known from Korozluky, Tuchořice, and Lipno in the Most Basin.

Superorder Eupulmonata Haszprunar & Huber, 1990
Infraorder Acteophila Dall, 1885

Superfamily Ellobioidea H. & A. Adams, 1855
Family Carychiidae Jeffreys, 1830

Genus *Carychiopsis* Sandberger, 1872 *sensu* Strauch, 1977

Type species. – *Pupa Dhorni* Deshayes, 1863; subsequent designation by Tryon, 1884. Paleocene, France.

Discussion. – The genus *Carychiopsis* was introduced by Sandberger (1872) without designating a type species. As he discussed two species (*Pupa dhorni* Deshayes, 1863 and *P. alternans* Deshayes, 1863) the principle of monotypy (ICZN Article 68.3) does not apply in contrast to the opinion of subsequent authors (*e.g.* Wenz & Zilch 1959). To our knowledge, the first author who listed *Pupa dhorni* as type species was Tryon (1884, p. 95). Although it is obvious that Tryon (1884) considered the single species listed with each genus as type, he did never explicitly define these as type species. Therefore, it may be disputable if this is in accordance with the ICZN. In this case the next author explicitly designating the type species of *Carychiopsis* was Cossmann (1889a, p. 340).

No detailed analysis of the Paleocene *Carychiopsis dhorni* is available so far and therefore it remains unclear if the much younger Late Oligocene and Early Miocene species treated by Strauch (1977) as *Carychiopsis* are really congeneric with the type species.

***Carychiopsis schwageri* (Reuss, 1868)**
Figure 5A–D

*1868	*Pupa Schwageri* sp. nov.; Reuss, p. 82, pl. 1, figs 5a–c.
1869a	*Carychium Schwageri* Reuss sp. – Slavík, p. 265, pl. 4, figs 20, 21.
1869b	*Carychium Schwageri* Reuss sp. – Slavík, p. 268, pl. 4, figs 20, 21.
1870a	*Carychium costulatum* Sandb. – Boettger, p. 297.
1891	[*Carychiopsis costulata* Sandberger] var. *schwageri* Reuss. – Klika, p. 101, text-fig. 96.
1892	[*Carychiopsis costulata* Sandberger] var. *schwageri* Reuss. – Klika, p. 96, text-fig. 96.
1911	*Carychiopsis costulata* Sandb. var. *Schwageri.* – Kafka, p. 69.
1917	*Carychiopsis costulata* var. *schwageri* (Reuss). – Wenz, p. 73.
1923	*Carychiopsis schwageri schwageri* (Reuss). – Wenz, p. 1181.
1964	*Carychiopsis schwageri schwageri* (Reuss, 1868). – Čtyroký *et al.*, p. 137, fig. 3.
1977	*Carychium* (*Carychiopsis*) *schwageri* (Reuss, 1868). – Strauch, p. 161 (pars), pl. 14, fig. 23, pl. 20, figs 7, 8.
1984	*Carychium* (*Carychiopsis*) *schwageri* (Reuss). – Prisyazhnyuk, p. 117, fig. 1a.
1995	*Carychiopsis schwageri* (Reuss, 1868). – Prisyazhnyuk & Stworzewicz, p. 268, fig. 1A.
1999	*Carychiopsis schwageri* (Reuss). – Esu, p. 332.
non 1977	*Carychium* (*Carychiopsis*) *schwageri* (Reuss 1868). – Strauch, p. 161 (pars), pl. 20, figs 7–9 (= *Carychium surai* Stworzewicz, 1999a).
non 1993	*Carychium schwageri* (Reuss, 1868). – Stworzewicz, p. 398 (= *Carychiopsis prisyazhnyuki* Stworzewicz, 1999a).

Material. – 2 specimens (NHMW 2012/0572/0011), 159 specimens (NHMW 1909/0001/0082) (mixed with C. *prisyazhnyuki* Stworzewicz, 1999).

Dimensions. – Diameter: 0.9 mm, height: 2.25 mm (Fig. 5A); diameter: 0.85 mm, height: 2.15 mm (Fig. 5B).

Discussion. – Prisyazhnyuk (1984), Prisyazhnyuk & Stworzewicz (1995) and Stworzewicz (1999a) pointed out that two species from Tuchořice have been lumped as *Carychiopsis schwageri.* Of these, *Carychiopsis schwageri* is slender high-spired and has folded and wide columellar and parietal lamellae, whilst *Carychiopsis prisyazhnyuki*

Stworzewicz, 1999 is smaller, stout, low-spired and has simple lamellae. In addition, our SEM-investigations suggest that the protoconch of *Carychiopsis schwageri* is distinctly larger, higher and less convex (diameter: 260 µm, height: 180 µm) than in *C. prisyazhnyuki*, which attains about 200 µm in diameter and only 100 µm in height. Both species display a dense pattern of vaguely spirally arranged, tiny pits covering the entire protoconch.

Due to the striking similarity in teleoconch morphology with near identical axial and spiral sculpture and the identical protoconch microsculpture, we refrain from placing both species in different (sub)genera as proposed by Prisyazhnyuk & Stworzewicz (1995). The main arguments for that were the "*Saraphia*-like" columellar and parietal lamellae in *C. schwageri*. The width and degree of undulation of the lamellae, however, are quite variable in our material of *C. schwageri*.

Occurrence. – This species is known only from Tuchořice, Pyšná and the Kralupy drilling; occurrences from the Middle Miocene of Opole (Poland) mentioned by Strauch (1977) represent *Carychium surai* Stworzewicz, 1999.

Carychiopsis prisyazhnyuki Stworzewicz, 1999
Figure 5E–G

1977 *Carychiopsis schwageri* (Reuss). – Moayedpour, p. 58, pl. 2, figs 4, 5 (non *Pupa Schwageri* Reuss, 1868).
1984 *Carychium* (*Carychiopsis*) sp. – Prisyazhnyuk, p. 117, fig. 1b.
1995 *Carychiopsis* sp. nov. – Prisyazhnyuk & Stworzewicz, p. 268, fig. 1B.
*1999a *Carychiopsis prisyazhnyuki* sp. nov.; Stworzewicz, p. 262, figs 1–4 (cum syn.).

Material. – 3 specimens (NHMW 2012/0572/0012).

Dimensions. – Diameter: 0.9 mm, height: 1.9 mm (Fig. 5E, F).

Discussion. – See *C. schwageri.* Prisyazhnyuk (1984) was the first who described this rather stout species as *Carychium* (*Carychiopsis*) sp. and later Stworzewicz (1999a) introduced *prisyazhnyuki* as name for this species, which is based on a holotype from Bełchatów (Poland) and numerous paratypes including one specimen from Tuchořice. Therefore, parts of the references listed with *C. schwageri* may refer also to *Carychium prisyazhnyuki* Stworzewicz, 1999.

Occurrence. – Known from Tuchořice and the middle to late Burdigalian locality Bełchatów (Bel-C). The stout outline and low protoconch of the shells from Theobaldshof/Rhön in Germany, described by Moayedpour (1977) as *C. schwageri*, suggest that they represent *C. prisyazhnyuki* Stworzewicz, 1999.

Genus *Carychiella* Strauch, 1977

Type species. – *Carychium eumicrum* Bourguignat, 1857; by original designation. Miocene, Europe.

Carychiella eumicrum (Bourguignat, 1857)
Figure 5H–J

*1857 *Carychium eumicrum* Bourguignat, p. 223.
1860 *Carychium eumicrum* Bourguignat. – Bourguignat, p. 53, pl. 11, figs 3, 4.
1869a *Carychium nanum* Sandb. – Slavík, p. 266, pl. 4, figs 22, 23.
1869b *Carychium nanum* Sandb. – Slavík, p. 269, pl. 4, figs 22, 23.
1870a [*Carychium nanum*] Varietät *major* m. – Boettger, p. 297, pl. 13, figs 8a, b.
1891 [*Carychium minutissimum* Al. Br.] *Böttgeri.* – Flach, p. 58.
1891 *Car.*[*ychium*] *majus* Böttg. – Flach, p. 58.
1891 *Carychium maius* Boettger. – Klika, p. 102, text-figs 98a, b.
1891 [*Carychium minutissimum* Al. Braun] var. *boettgeri* Flach. – Klika, p. 102, text-figs 97a, b.
1892 *Carychium maius* Boettger. – Klika, p. 98, text-figs 98a, b.
1892 [*Carychium minutissimum* Al. Braun] var. *boettgeri* Flach. – Klika, p. 97, text-figs 97a, b.
1911 *Carychium minutissimum* Al. Br. var. *Boettgeri* Fl. – Kafka, p. 69.
1911 *Carychium maius* Bttg. – Kafka, p. 69.
1917 *Carychium nanum boettgeri* Flach. – Wenz, p. 73.
1923 *Carychium eumicron eumicron* [sic] Bourguignat. – Wenz, p. 1187.
1923 *Carychium eumicron boettgeri* Flach. – Wenz, p. 1189.
1923 *Carychium majus* Boettger. – Wenz, p. 1191.
1964 *Carychium cf. majus* Boettger, 1870. – Čtyroký *et al.*, table for p. 149.
1977 *Carychium* (*Carychiella*) *eumicron* [sic] Bourguignat, 1857 s.l. – Strauch, p. 159, pl. 14, figs 13–15, pl. 17, fig. 53, pl. 19, fig. 76.
1995 *Carychium eumicrum* Bourguignat, 1860. – Prisyazhnyuk & Stworzewicz, p. 270.
1999a *Carychium eumicrum* Bourguignat. – Stworzewicz, p. 264, figs 5, 6 (cum syn.).
2006 *Carychium* (*Carychiella*) *eumicron eumicron* [sic] Bourguignat, 1857. – Kókay, p. 48, pl. 16, fig. 5.
2013 *Carychium* (*Carychiella*) *eumicron* [sic] Bourguignat, 1857. – Salvador, p. 2, fig. 1.

Material. – 3 specimens (NHMW 2013/0572/0013), >13,200 specimens (NHMW 1909/0001/0083, 1909/0001/0084).

Dimensions. – Diameter: 0.55 mm, height: 1.05 mm (Fig. 5J); diameter: 0.5 mm, height: 0.78 mm (Fig. 5I); diameter: 0.55 mm, height: 1.05 mm (Fig. 5H).

Discussion. – This is the smallest and by far most abundant species at Tuchořice (based on the NHMW collections). It is the type species of *Carychiella* Strauch, 1977, which was defined by Strauch (1977) based on the minute size, smooth shell, simple columellar and parietal lamellae and characteristic aperture with only three denticles. In addition, the punctate microsculpture of the proto- and teleoconch, as revealed by SEM studies on herein presented material and on Middle Miocene shells from the Rein Basin (Harzhauser *et al.* 2014), might be characteristic for this genus.

Occurrence. – *Carychium eumicrum* appears during the Late Oligocene (Hochheim, Germany) and is recorded from the Early Miocene of Tuchořice, Lipno and Kralupy drilling (Czech Republic) and Early/Middle Miocene of Undorf and Sandelzhausen (S Germany) and from the Middle Miocene of Poland (Bełchatów, Opole), Austria (Rein Basin) and Hungary (Stworzewicz 1999a, Kókay 2006, Salvador 2013, Harzhauser *et al.* 2014).

Infraorder Stylommatophora Schmidt, 1855
Clade Orthuretha Pilsbry, 1900b

Superfamily Cochlicopoidea Pilsbry, 1900b (1879)
Family Azecidae Watson, 1920

Genus *Azeca* Fleming, 1828

Type species. – *Turbo tridens* Pulteney, 1799 [= *Azeca goodalli* (Férussac, 1821)]. Recent, Europe.

***Azeca pumila* Slavík, 1869**
Figure 5K–M

*1869a *Azeca pumlia* sp. nov.; Slavík, p. 252, pl. 4, figs 18, 19.
1869b *Azeca pumlia* sp. nov.; Slavík, p. 264, pl. 4, figs 18, 19.
1891 *Azeca pumila* Slavík. – Klika, p. 73, text-figs 70a, b.
1892 *Azeca pumila* Slavík. – Klika, p. 70, text-figs 70a, b.
1911 *Azeca pumila* Sl. – Kafka, p. 68.
1917 *Azeca pumila* Slavik. – Wenz, p. 71.
1923 *Azeca* (*Azeca*) *monocraspedon pumila* Slavik. – Wenz, p. 1095 (cum syn.).
1925 *Azeca danesi* sp. nov.; Petrbok, p. 2, unnumbered pl., fig. 2.
1925 *Azeca pumila* Slavík. – Petrbok, p. 2, unnumbered pl., fig. 1.

Material. – 2 specimens (NHMW 2013/0572/0014), 6 specimens (NHMW 1909/0001/0056, 1909/0001/0060, 1909/0001/0062), 1 specimen (NM-PM-P 440, holotype of *Azeca danesi* Petrbok, 1925).

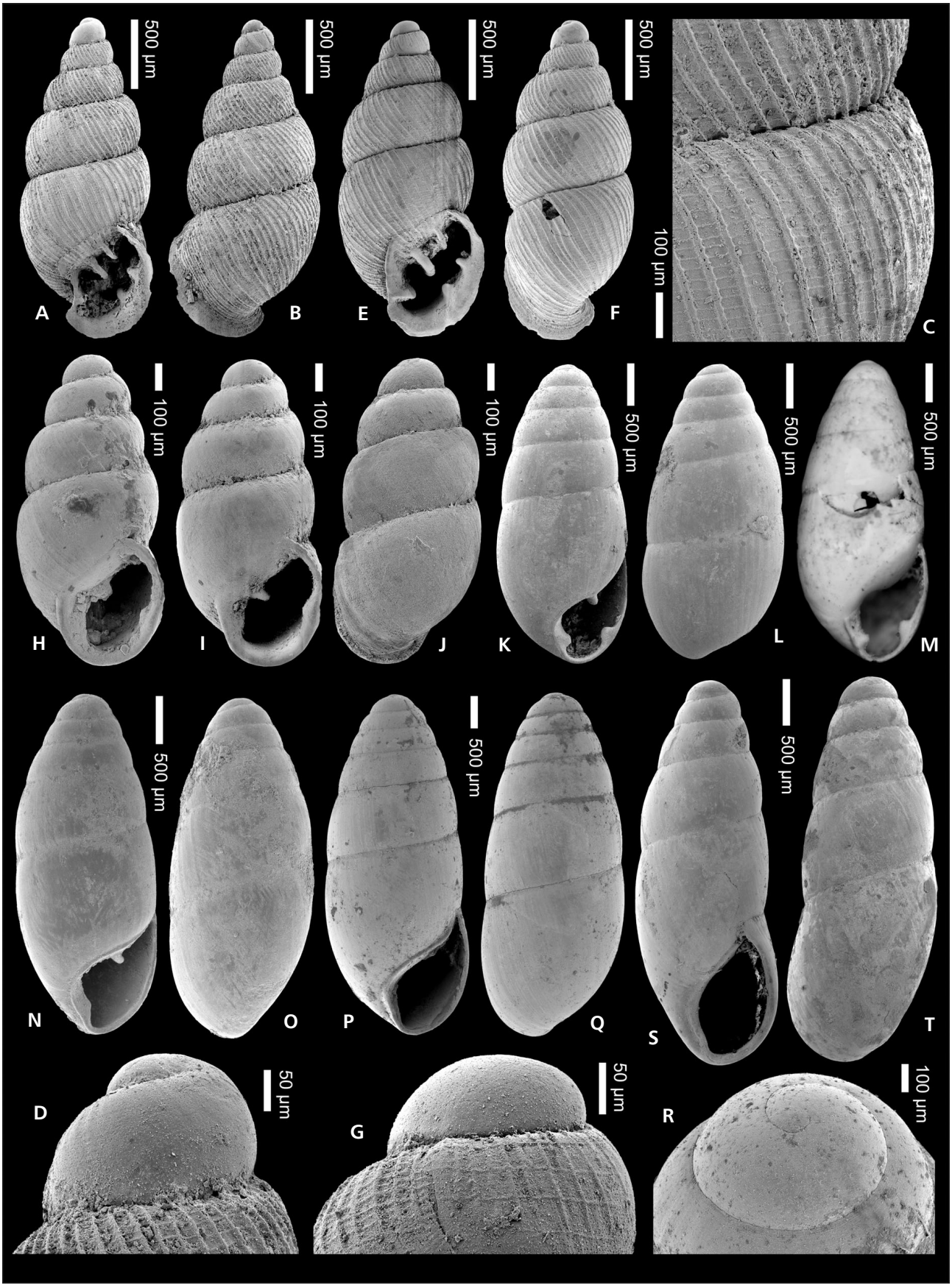
Dimensions. – Diameter: 1.6 mm, height: 3.7 mm (Fig. 5K); diameter: 1.6 mm, height: 3.4 mm (Fig. 5L); diameter: 1.7 mm, height: 3.9 mm (= *Azeca danesi* Petrbok, 1925, Fig. 5M).

Discussion. – The status of *Azeca pumila* Slavík, 1869, and *A. monocraspedon* Slavík, 1869 as distinct species was doubted by Boettger (1870a) and Wenz (1917, 1923). Nevertheless, both species differ considerably in the presence of well-developed columellar and palatal denticles in *A. pumila*. These are absent in *A. monocraspedon*, which has a broad and low columellar swelling, a narrow but strongly protruding parietal denticle and completely smooth outer lip.

Azeca danesi Petrbok, 1925 is based on a single specimen, which is re-illustrated herein. It differs from *Azeca pumila* only in the absence of the parietal denticle and the slightly swollen parietal area. The re-investigation of the specimen, however, showed that parts of the columellar and parietal callus are broken off. This element forms a thin sheet in *A. pumila* bearing the parietal denticle. Therefore, *A. danesi* is most probably only an incompletely preserved *Azeca pumila*.

Occurrence. – Only known from Tuchořice; a further occurrence was mentioned from the Middle Miocene of Opole by Andreae (1902b) without illustration and sufficient description.

Figure 5. A–C – *Carychiopsis schwageri* (Reuss, 1868), NHMW 2013/0572/0011 (C – detail of the microsculpture). • D – *Carychiopsis schwageri* (Reuss, 1868) (protoconch of A–C). • E, F – *Carychiopsis prisyazhnyuki* Stworzewicz, 1999, NHMW 2013/0572/0012. • G – *Carychiopsis prisyazhnyuki* Stworzewicz, 1999 (protoconch of E, F). • H–J – *Carychiella eumicrum* (Bourguignat, 1857), NHMW 2013/0572/0013. • K, L – *Azeca pumila* Slavík, 1869, NHMW 2013/0572/0014. • M – *Azeca pumila* Slavík, 1869, NM-PM-P 440 (holotype of *Azeca danesi* Petrbok, 1925). • N, O – *Azeca monocraspedon* Slavík, 1869, NHMW 2013/0572/0015. • P–R – *Hypnophila subrimata* (Reuss *in* Reuss & Meyer, 1849), NHMW 2013/0572/0016. • S, T – *Cochlicopa dormitzeri* (Reuss *in* Reuss & Meyer, 1849), NHMW 2013/0572/0017.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***Azeca monocraspedon* Slavík, 1869**
Figure 5N–O

*1869a *Azeca monocraspedon* sp. nov.; Slavík, p. 252, pl. 4, figs 16, 17.
1869b *Azeca monocraspedon* sp. nov.; Slavík, p. 263, pl. 4, figs 16, 17.
1875 *Azeca monocraspedon* Slavíc [sic]. – Sandberger, p. 434, pl. 24, figs 20–20b.
1891 *Azeca monocraspedon* Slavík. – Klika, p. 74, text-figs 71a, b.
1892 *Azeca monocraspedon* Slavík. – Klika, p. 71, text-figs 71a, b.
1911 [*Azeca*] *monocraspedon* Sl. – Kafka, p. 68.
1923 *Azeca* (*Azeca*) *monocraspedon monocraspedon* Slavík. – Wenz, p. 1094 (cum syn.).
1925 *Azeca monocraspedon* Slavík. – Petrbok, p. 2, unnumbered pl., fig. 3.

Material. – One specimen (NHMW 2013/0572/0015), 2 specimens (NHMW 1909/0001/0061).

Dimensions. – Diameter: 1.45 mm, height: 3.5 mm (Fig. 5N); diameter: 1.5 mm, height: 3.5 mm (Fig. 5O).

Discussion. – See above.

Occurrence. – Only known from Tuchořice.

Genus *Hypnophila* Bourguignat, 1858

Type species. – Bulimus pupaeformis Cantraine, 1835; subsequent designation by Letourneux & Bourguignat, 1887. Recent, S Europe, N Africa.

***Hypnophila subrimata* (Reuss *in* Reuss & Meyer, 1849) comb. nov.**
Figure 5P–R

1849a *Achatina subrimosa* Rss.; Reuss *in* Reuss & Meyer, p. 11 (nomen nudum).
*1849b *A.*[*chatina*] *subrimata* m.; Reuss *in* Reuss & Meyer, p. 31, pl. 3, fig. 9.
1861 *Gl.*[*andina*] *lubricella* A. Br. sp. – Reuss, p. 70 (non *Bulimus lubricus* var. *lubricella* Porro, 1838).
1891 [*Cionella lubricella* A. Braun] var. *subrimata* Reuss. – Klika, p. 73, text-fig. 69.
1892 [*Cionella lubricella* A. Braun] var. *subrimata* Reuss. – Klika, p. 70, text-fig. 69.
1897 *Cionella splendens* A. Braun. – Babor, p. 17 (non *Achatina splendens* Braun *in* Walchner, 1851).
1911 [*Cionella*] *lubricella* A. Br. – Kafka, p. 68 (non *Bulimus lubricus* var. *lubricella* Porro, 1838).
1911 [*Cionella lubricella* A. Br.] var. *subrimata* Rss. – Kafka, p. 68.
1914 *Cochlicopa subrimata* (Reuss). – Wenz, p. 111, pl. 8, fig. 35.
1916 *Cochlicopa subrimata* (Reuss). – Wenz, p. 177.
1917 *Cochlicopa subrimata* (Reuss). – Wenz, p. 72.
1923 *Cochlicopa subrimata subrimata* (Reuss). – Wenz, p. 1102 (pars).
non 1977 *Cochlicopa subrimata* (Reuss). – Moayedpour, p. 62, pl. 3, figs 11, 12.
non 1998 *Cochlicopa subrimata* (Reuss, 1852). – Finger, p. 18, pl. 12, fig. F.

Material. – 2 specimens (NHMW 2013/0572/0016), 58 specimens (NHMW 1909/0001/0058, 1909/0001/0059), 1 specimen (NM-PM-P 451).

Dimensions. – Diameter: 2.3 mm, height: 5.3 mm (Fig. 5P); diameter: 2.1 mm, height: 5.1 mm (Fig. 5Q).

Discussion. – This species was traditionally treated as *Cochlicopa* Férussac, 1821. The stout pupoid shell with nearly flat whorls and weakly incised sutures, however, suggest a relation with the Azecidae. Consequently, we place it in *Hypnophila* based on the simple aperture. The species differs clearly from the more slender *Cochlicopa dormitzeri* (Reuss *in* Reuss & Meyer, 1849), which has a much more elongate aperture and more convex whorls. For the first time, SEM studies of *H. subrimata* document the presence of densely spaced spiral grooves and of a delicate spiral thread along the upper suture of the first teleoconch whorl. Both elements fade out within the second teleoconch whorl and the rest of the shell is smooth aside from faint growth lines.

Occurrence. – Known from Tuchořice, Lipno and Korozluky. The shell fragment from the Middle Miocene of Steinheim (Germany) identified as *Cochlicopa subrimata* by Finger (1998) is clearly not conspecific due to its conical spire and the convex whorls. Similarly, the specimen from Theobaldshof/Rhön illustrated by Moayedpour (1977) differs clearly in its convex whorls and the deeply concave columella. Therefore, the numerous Oligocene and early Miocene records listed by Wenz (1923) should be treated with caution.

Family Cochlicopidae Pilsbry, 1900b

Genus *Cochlicopa* Férussac, 1821

Type species. – *Helix lubrica* Müller, 1774; subsequent designation by Westerlund, 1902. Recent, Europe.

***Cochlicopa dormitzeri* (Reuss *in* Reuss & Meyer, 1849)**
Figure 5S–T

1849a *Achatina Dormitzeri* Rss.; Reuss *in* Reuss & Meyer, p. 12 (nomen nudum).
*1849b *A.*[*chatina*] *Dormitzeri* m.; Reuss *in* Reuss & Meyer, p. 31, pl. 3, fig. 10.
1861 *Gl.*[*andina*] *Dormitzeri* Reuss. – Reuss, p. 70.
1891 *Cionella Dormitzeri* Reuss. – Klika, p. 71, text-fig. 68a, b.
1891 *Cionella dormitzeri* Reuss. – Thuma, p. 83.
1892 *Cionella Dormitzeri* Reuss. – Klika, p. 69, text-fig. 68a, b.
1911 *Cionella Dormitzeri* Rss. – Kafka, p. 68.
1923 *Cochlicopa subrimata dormitzeri* (Reuss). – Wenz, p. 1106.

Material. – 2 specimens (NHMW 2013/0572/0017), 3 specimens (NHMW 1909/0001/0057).

Dimensions. – Diameter: 1.7 mm, height: 4.5 mm (Fig. 5S); diameter: 1.7 mm, height: 4.3 mm (Fig. 5T).

Discussion. – This rare species is recognised easily by its slender shell, high spire, slightly convex whorls and high, elongate aperture. In contrast to all Azecidae and Cochlicopidae of the Most Basin, it has a comparatively high and convex protoconch.

Occurrence. – Only known from Korozluky and Tuchořice.

Superfamily Enoidea Woodward, 1903
Family Enidae Woodward, 1903

Genus *Mastus* Beck, 1837

Type species. – *Helix pupa* Linnaeus, 1758; subsequent designation by Herrmannsen (1846). Recent, S Europe, N Africa.

***Mastus complanatus* (Reuss *in* Reuss & Meyer, 1849)**
Figure 6A–D

1849a *Bulimus complanatus* Rss.; Reuss *in* Reuss & Meyer, p. 11 (nomen nudum).
1849a *Bulimus Meyeri* Rss.; Reuss *in* Reuss & Meyer, p. 11 (nomen nudum).
*1849b *Bulimus complanatus* m.; Reuss *in* Reuss & Meyer, p. 29, pl. 3, fig. 4.
1849b *B.*[*ulimus*] *Meyeri* m.; Reuss *in* Reuss & Meyer, p. 29, pl. 3, fig. 5.
1855 *Bulimus complanatus* Reuss. – Pictet, p. 27, pl. 57, fig. 14.
1861 *B.*[*ulimus*] *complanatus* Reuss. – Reuss, p. 69.
1875 *Bulimus* (*Petraeus*) *complanatus* Reuss. – Sandberger, p. 433, pl. 24, figs 11, 11a.
1891 *Buliminus* (*Medaea*?) *complanatus* Reuss. – Klika, p. 69, text-figs 64a, b.
1891 *Buliminus* (*Petraeus*) *turgidulus* (Sandberger). – Klika, p. 69, text-figs 65a, b [non *Bulimus* (*Petraeus*) *turdigulus* Sandberger, 1875].
1892 *Buliminus* (*Medaea*?) *complanatus* Reuss. – Klika, p. 66, text-figs 64a, b.
1892 *Buliminus* (*Petraeus*) *turgidulus* (Sandberger). – Klika, p. 67, text-figs 65a, b [non *Bulimus* (*Petraeus*) *turdigulus* Sandberger, 1875].
1916 *Buliminus* (*Medaea*?) *complanatus* Reuss. – Thuma, p. 83.
1917 *Buliminus* (?*Napaeus*) *complanatus* (Reuss). – Wenz, p. 64.
1923 *Ena* (*Napaeus*) *complanata* (Reuss). – Wenz, p. 1074.
? 2004 *Napaeus* cf. *complanatus* (Reuss, 1849). – Binder, p. 196, pl. 5, figs 2a, b.
non 1911 *Bulimus* (*Petræus*) *complanatus* Reuss. – Gaál, p. 70, pl. 2, figs 9, 12 (= *Ena gaali* Wenz, 1919).
non 2006 *Napaeus complanatus* (Reuss), 1849. – Kókay, p. 73, pl. 27, figs 10–12.

Material. – 2 specimens (NHMW 2013/0572/0018), 61 specimens (NHMW 1909/0001/0055).

Dimensions. – Diameter: 8.5 mm, height: 17.9 mm (Fig. 6A, B); diameter: 8.4 mm, height: 16.9 mm (Fig. 6C, D).

Description. – A stout ovate-conic shell with weakly cyrtoconoid spire and weakly convex whorls and moderately dome-shaped protoconch. The glossy shell bears densely spaced, strongly prosocline growth lines with a narrow and shallow prosocyrt sulcus close to the weakly incised upper suture. Broadly flared outer and columellar lips are connected by a moderately developed parietal callus. The reflected columellar lip delimitates a narrow and moderately deep umbilical chink. A delicate central swelling appears at the transition from the wide inner lip into the thin and straight columella. The transition from the convex protoconch whorl to the weakly convex early teleoconch is much less abrupt than in most extant *Mastus* and *Ena* species, which often display somewhat bulbous protoconchs.

Discussion. – Since Wenz (1917) this species has been assigned to *Napaeus* Albers, 1850, which is a genus endemic to the Canary Islands (Henriquez *et al.* 1993). Although Wenz (1923) considered most Eocene to Miocene Eninae as *Napaeus*, it seems doubtful that Central and South-Eastern European fossil species are indeed congeneric with this genus. Aside from this palaeogeographic argument, the

Bohemian species lacks the prominent microsculpture of the early whorls of *Napaeus* as documented by Henriquez *et al.* (1993) for six different species. In addition, the protoconchs of these species are distinctly more erect. As already discussed by Klika (1891) the shell outline of the Bohemian species is highly reminiscent of the extant *Ena raddei* (Kobelt, 1880) from the Caucasus region, which is the type species of the subgenus *Caucasicola* Hesse, 1917. This species lacks the reflected peristome of the Bohemian species and displays a delicate radial sculpture on early spire whorls. Therefore, we refrain from assigning the Miocene species to *Caucasicola*. According to Eike Neubert (pers. comm.) this species does not belong to the genus *Ena* Turton, 1831. In his online checklist on the genera of fossil land snails (Stylommatophora) of western and central Europe, Hartmut Nordsieck (http://www.hnords.de/) lists this species as *Mastus*, which is provisionally followed herein. As pointed out by Nordsieck (written comm. 2014) this genus is represented during the Miocene by several similar species in the Caucasus region described by Steklov (1966). The specimen described as *Buliminus turgidulus* by Klika (1891, 1892) is a poorly preserved internal mould and is most probably conspecific with *Mastus complanatus.*

Occurrence. – Known from Korozluky, Tuchořice, Lipno and Pyšná. This species was also described from the Ottnangian of Oberdorf in Austria (Binder 2004). The status of these poorly preserved specimens is difficult to evaluate. The occurrence from the Lower Miocene of the Somlóvásárhely drilling in Hungary (Kókay 2006) is most probably not conspecific as the subsutural furrow below the suture, as described by Kókay (2006), does not occur in the Bohemian species.

***Mastus filocinctus* (Reuss, 1861)**
Figure 6E–G

*1861 *B.*[*ulimus*] *filocinctus* Reuss; Reuss, p. 69, pl. 2, fig. 5.
1875 *Bulimus* (*Petraeus*) *filocinctus* Reuss. – Sandberger, p. 433, pl. 24, figs 12–12b.
1891 *Buliminus* (*Petraeus*) *filocinctus* Reuss. – Klika, p. 68, text-figs 63/1, 2a, b.
1892 *Buliminus* (*Petraeus*) *filocinctus* Reuss. – Klika, p. 65, text-figs 63/1, 2a, b.
1911 *Buliminus* (*Petraeus*) *filocinctus* Rss. – Kafka, p. 68.
1917 *Buliminus* (*Napaeus*) *filocinctus* (Reuss). – Wenz, p. 64.
1923 *Ena* (*Napaeus*) *filocincta* (Reuss). – Wenz, p. 1075 (cum syn.).

Material. – One specimen (NHMW 2013/0572/0019), one specimen (NHMW 1909/0001/0054), 4 specimens (NM-PM-P 751–754).

Dimensions. – Diameter: 4.8 mm, height: 13.1 mm (Fig. 6E, NHMW 2013/0572/0019), diameter: 5.2 mm, height 15 mm (Fig. 6F, NM-PM-P 753), diameter: 5.5 mm, height 13 mm (Fig. 6G, NM-PM-P 752).

Discussion. – A rare species, which is characterised by a slender shell, a dome-shaped protoconch, densely spaced, prominent, prosocline growth lines, a thickened and reflected, ovate and moderately wide peristome, connected by a thickened parietal callus and a conspicuous spiral thread along the upper suture. The seemingly canaliculate suture between the third and fourth spire whorls of specimen NHMW 2013/0572/0019 is an artefact from incorrect gluing. This species is rather variable concerning slenderness.

Occurrence. – Only known from Tuchořice.

Superfamily Pupilloidea Turton, 1831
Family Pupillidae Turton, 1831

Genus *Paracoryna* Flach, 1891

Type species. – *Pupa* (*Coryna*) *Diezi* Flach, 1891; subsequent designation by Pilsbry (1924). Early Miocene, Czech Republic.

***Paracoryna diezi* (Flach, 1891)**
Figure 6H–J

*1891 *Pupa* (*Coryna* Westl.) *Diezi* n. form; Flach, p. 49, pl. 3, figs 1a, b.
1891 *Coryna diezi* Flach. – Klika, p. 94, text-figs 89a, b.
1892 *Coryna diezi* Flach. – Klika, p. 90, text-figs 89a, b.
1911 *Coryna diezi* Flach. – Kafka, p. 69.
1917 *Agardhia diezi* (Flach). – Wenz, p. 66.
1923 *Agardhia diezi* (Flach). – Wenz, p. 1037 (cum syn.).
1924 *Agardhia* (*Paracoryna*) *diezi.* – Pilsbry, p. 133, pl. 19, figs 17, 18.

Material. – 2 specimens (NHMW 2013/0572/0020), 6 specimens (NHMW 1909/0001/0075).

Dimensions. – Diameter: 1.15 mm, height: 1.75 mm (Fig. 6H); diameter: 1.1 mm, height: 1.85 mm (Fig. 6I).

Description. – Stout pupoid shell consisting of 3–4 strongly convex whorls, separated by deeply incised sutures, and a moderately convex protoconch whorl with coarsely malleated surface. Teleoconch covered by densely spaced, prosocline, wrinkle-like and discontinuous axial ribs. Narrow umbilicus; wide aperture with thin peristome, slightly widened lips; no denticles or lamellae are developed.

Discussion. – This species is rather rare and our shells do not fully agree with the original description of Flach (1891), who presents a shell with an additional whorl, a higher last whorl and higher aperture. The size relation suggests that our shells might rather be subadult specimens. This species was placed by several authors in *Coryna* Westerlund, 1887 (non Bosc, 1802) and *Agardhia* Gude, 1911 (pro *Coryna* Westerlund), which are synonyms of *Argna* Cossmann, 1889b according to Aellen & Finet (1990). Even Pilsbry (1924) placed it under the subgenus *Paracoryna* Flach within *Agardhia*. The protoconch morphology and sculpture of our specimens differ considerably from that of Miocene *Argna* species, such as *A. oppoliensis* (Andreae, 1902) with depressed domical and smooth protoconch (see Stworzewicz 1999b and Harzhauser & Binder 2004). Comparable protoconch structures, however, are present in several Miocene Pupillidae (see Finger 1998, Harzhauser *et al.* 2008).

Occurrence. – Only known from Tuchořice.

Family Strobilopsidae Wenz, 1915

Genus *Strobilops* Pilsbry, 1893
Subgenus *Eostrobilops* Pilsbry, 1927

Type species. – *Strobilops hirasei* Pilsbry, 1908b; original designation. Recent, Korea.

***Strobilops* (*Eostrobilops*) *fischeri* (Wenz *in* Fischer & Wenz, 1914)**
Figure 6R–W

1891 *Strobilus diptyx* Boettger. – Klika, p. 34, text-figs 26a–c (non *Helix diptyx* Boettger, 1870b).
1892 *Strobilus diptyx* Boettger. – Klika, p. 33, text-figs 26a–c (non *Helix diptyx* Boettger, 1870b).
1911 [*Strobilus*] *diptyx* Bttg. – Kafka, p. 67 (non *Helix diptyx* Boettger, 1870b).
*1914 *Strobilops fischeri* sp. nov.; Wenz *in* Fischer & Wenz, p. 107.
1915a *Strobilops* (*Strobilops*) *fischeri* sp. nov. – Wenz, p. 78, fig. 6, pl. 4, fig. 5.
1917 *Strobilops* (*Strobilops*) *fischeri* Wenz. – Wenz, p. 70.
1916 [*Strobilus*] *diptix* Boettger. – Thuma, p. 83 (non *Helix diptyx* Boettger, 1870b).
1923 *Strobilops* (*Strobilops*) *fischeri* Wenz. – Wenz, p. 1047.
1927 *Strobilops fischeri* Wenz. – Pilsbry, p. 6.
1977 *Strobilops* (*Strobilops*) *fischeri* Wenz. – Moayedpour, p. 64, pl. 4, figs 10–12, pl. 5, figs 1, 2.
1999 *Eostrobilops fischeri* Wenz. – Esu, p. 332.
1999b *Strobilops fischeri* Wenz, 1914. – Stworzewicz, p. 157, figs 48–50.
2006 *Strobilops fischeri* Wenz, 1915. – Kókay, p. 71, pl. 26, figs 5, 6.

Material. – 2 specimens (NHMW 2013/0572/0021), 42 specimens (NHMW 1909/0001/0021).

Dimensions. – Diameter: 2.0 mm, height: 1.15 mm; diameter: 2.3 mm, height: 1.3 mm.

Discussion. – This species was described in great detail by Wenz *in* Fischer & Wenz (1914) and Wenz (1915a). It is characterised by a smooth protoconch, a low spire and its sculpture consists of low and somewhat irregular axial ribs, often separated by weaker and discontinuous secondary ribs; the umbilicus is narrow but deep. The aperture reveals two prominent and thin parietal lamellae with weak knots, two short basal folds and a weak and narrow columellar fold. Aside from the depressed outline, its sculpture and apertural features correspond fully to *Eostrobilops* as defined by Pilsbry (1927).

Occurrence. – Known from Tuchořice and Korozluky. Additional occurrences are documented from the Early Miocene of Hungary (Somlóvásárhely drilling, Kókay 2006), Theobaldshof/Rhön in Germany (Moayedpour 1977) and Bełchatów in Poland (Stworzewicz 1999b). The youngest records are mentioned from the Middle Miocene of Bełchatów-B by Stworzewicz (1999b).

***Strobilops* (*Eostrobilops*) *elasmodonta* (Reuss, 1861)**
Figure 6K–M

*1861 *H.*[*elix*] *elasmodonta* Reuss; Reuss, p. 66, pl. 1, fig. 6.
1870a *Hyalinia elasmodonta* Reuss. – Boettger, p. 287.
1875 *Strobilus elasmodonta* Reuss. – Sandberger, p. 442, pl. 24, figs 24–24b.
1891 *Strobilus elasmodonta* Reuss. – Klika, p. 33, text-figs 24a, 25b, c (non 25a = *Discostrobilops uniplicatus*).
1892 *Strobilus elasmodonta* Reuss. – Klika, p. 33, text-figs 24a, 25a–c.
1911 [*Strobilus*] *elasmodonta* Rss. – Kafka, p. 67.
1912 *Str.*[*obilus*] *elasmodonta* (Reuss). – Jooss, p. 35.
1915a *Strobilops* (*Str.*[*obilops*]) *elasmodonta* (Reuss). – Wenz, p. 77, pl. 4, figs 7a–c.
1916 *Strobilus elasmodonta* Reuss. – Thuma, p. 83.
1917 *Strobilops* (*Strobilops*) *elasmodonta* (Reuss). – Wenz, p. 70.
1923 *Strobilops* (*Strobilops*) *elasmodonta* (Reuss). – Wenz, p. 1046.
1927 *Strobilops elasmodonta* (Reuss). – Pilsbry, p. 6.
1964 *Strobilops elasmodonta* (Reuss, 1860). – Čtyroký *et al.*, table for p. 149.

1970a *St.*[*robilops*] *elasmodonta* (Reuss). – Schlickum, p. 83.
1977 *Strobilops* (*Strobilops*) cf. *elasmodonta* (Reuss). – Moayedpour, p. 64, pl. 5, figs 3, 4.
non 2003 *Strobilus elasmodonta* Reuss. – Mikuláš *et al.*, p. 94.

Material. – 2 specimens (NHMW 2013/0572/0022), 57 specimens (NHMW 1909/0001/0020).

Dimensions. – Diameter: 2.1 mm, height: 1.3 mm (Fig. 6K); diameter: 2.1 mm, height: 1.35 mm (Fig. 6L).

Discussion. – This species is readily distinguished from the syntopic *Strobilops* (*Eostrobilops*) *fischeri* by its higher, conical spire and narrower umbilicus. In contrast to *S. fischeri*, its protoconch is weakly granulose on the initial part; these granules grade into faint, axially arranged wrinkles towards the teleoconch, which bears densely spaced and low axial ribs.

Pilsbry (1927) discussed *S*. (*E*.) *elasmodonta* to belong probably to the *Strobilops diptyx-fischeri-boettgeri-subconoidea-duvali* lineage, which would imply a position within *Eostrobilops* after Pilsbry (1927). Doubts remained because of the presence of an interparietal lamella in *S*. (*E*.) *elasmodonta*. Similarly, Schlickum (1970) doubted that *S*. (*E*.) *elasmodonta* belongs to *Eostrobilops* although he kept his newly described "*elasmodonta*-like" *Strobilops senckenbergi* within *Eostrobilops.* In contrast to the statement of Schlickum (1970a), the Bohemian species has a narrow umbilicus, which may be covered by the reflected lip in some specimens. Therefore, only the weak interparietal fold remains as problematic feature. Herein, we provisionally assign *S*. (*E*.) *elasmodonta* to the subgenus *Eostrobilops* based on its general shell shape, reduced sculpture and narrow umbilicus.

Occurrence. – Known from Korozluky, Tuchořice, Lipno and the Chomutov drillings in the Most Basin. The occurrence from the Lower Oligocene of Dětaň (Czech Republic), mentioned by Mikuláš *et al.* (2003), needs verification but seems unlikely in respect to the age difference. A further occurrence from the Burdigalian of Theobaldshof/Rhön (Germany), described by Moayedpour (1977), is likely based on the characteristic outline although the preservation excludes a clear identification.

Subgenus *Discostrobilops* Pilsbry, 1927

Type species. – *Helix Hubbardi* Brown, 1861; original designation. Recent, Mexico and southern USA.

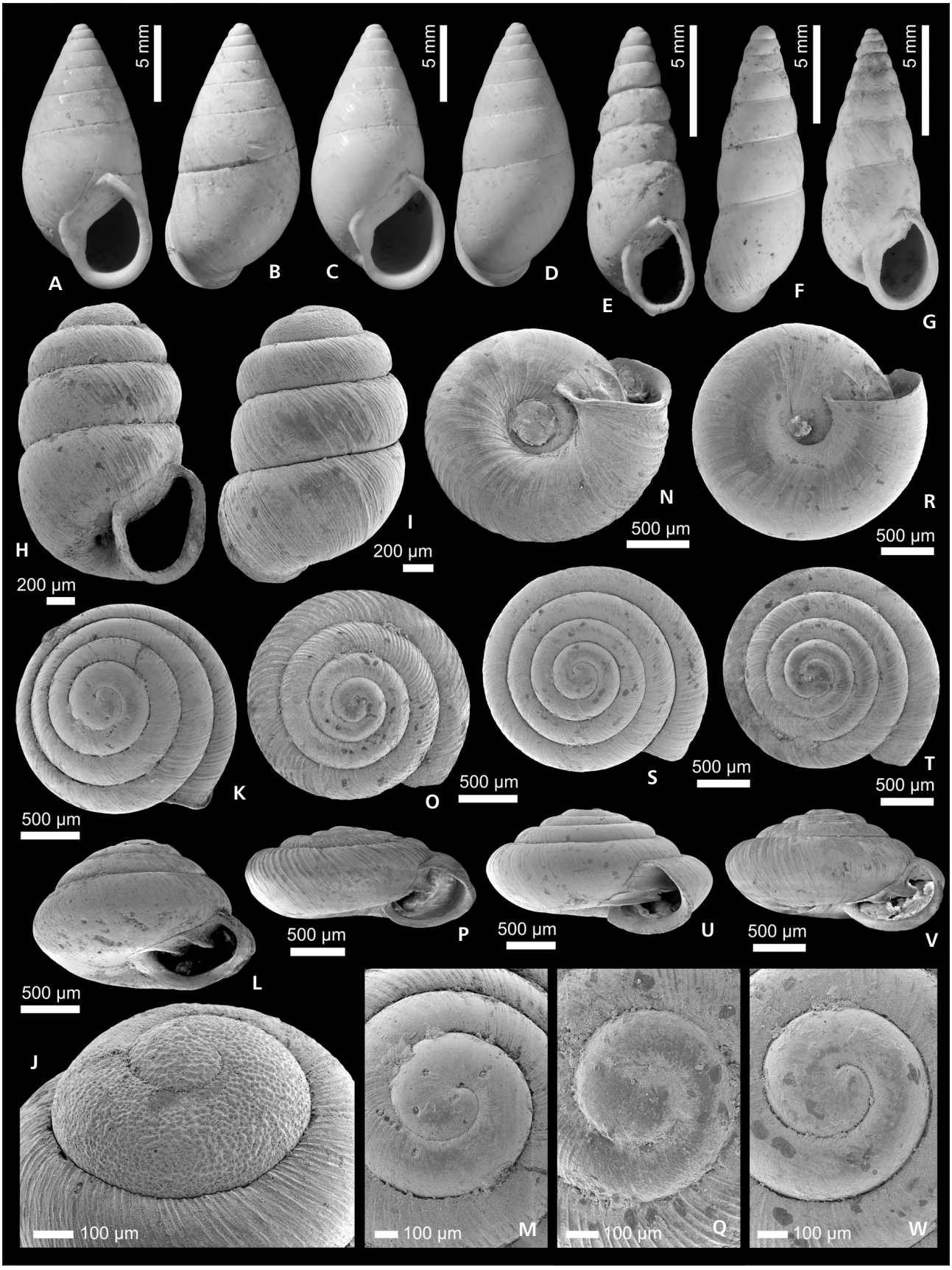
Strobilops (*Discostrobilops*) *uniplicatus* (Braun *in* Walchner, 1851)

Figure 6N–Q

*1851 *Helix uniplicata* A. Braun; Braun *in* Walchner, p. 1138, p. 54 in offprint, No. 320.
1858 *Helix uniplicata* Al. Braun. – Sandberger, p. 35, pl. 3, figs 7–7c.
1861 *H.*[*elix*] *uniplicata* A. Br. – Reuss, p. 68.
1875 *Strobilus uniplicatus* A. Braun. – Sandberger, p. 406, pl. 23, figs 24–24b.
1891 *Strobilus uniplicatus* Al. Braun. – Klika, p. 32, text-figs 24b, c, 25a (non 24a = *Eostrobilops elasmodonta*).
1892 *Strobilus uniplicatus* Al. Braun. – Klika, p. 31, text-figs 24a–c.
1911 *Strobilus uniplicatus* A. Br. – Kafka, p. 67.
1914 *Strobilops uniplicata* (Sdbg.). – Wenz *in* Fischer & Wenz, p. 106, pl. 7, fig. 33.
1915a *Strobilops* (*Str.*[*obilops*]) *uniplicata* (Sandberger). – Wenz, p. 76, pl. 4, figs 8a–c.
1916 *Strobilops uniplicata* (Sandberger). – Wenz, p. 175.
1917 *Strobilops* (*Strobilops*) *uniplicata* (Sandberger). – Wenz, p. 69.
1918 *Strobilops uniplicata* (Sandberger). – Wenz, p. 20.
1923 *Strobilops* (*Strobilops*) *uniplicata uniplicata* (A. Braun). – Wenz, p. 1057 (cum syn.).
1927 *S.* [*trobilops*] *uniplicata* (Sdbg.). – Pilsbry, p. 47, pl. 8, figs 10–13.
1948 *S.* [*trobilops*] *uniplicata* (Sandberger). – Pilsbry, p. 865, text-figs 468/10–13.
1999 *Discostrobilops uniplicatus* (Braun). – Esu, p. 331.
1999b *Strobilops uniplicata* (A. Braun, 1851). – Stworzewicz, p. 156, figs 44, 45.
2009 *S.*[*trobilops*] (*Discostrobilops*) *uniplicatus* (Braun, 1851). – Moser *et al.*, p. 47.
non 1891 *Gasterodonta uniplicata* Braun sp. – Penecke, p. 358 (= *Strobilops planus* Clessin, 1885).

Material. – 2 specimens (NHMW 2013/0572/0023), 199 specimens (NHMW 1909/0001/0019).

Figure 6. A–D – *Mastus complanatus* (Reuss *in* Reuss & Meyer, 1849), NHMW 2013/0572/0018. • E – *Mastus filocinctus* (Reuss, 1861), NHMW 2013/0572/0019. • F – *Mastus*? *filocinctus* (Reuss, 1861), NM-PM-P 753. • G – *Mastus filocinctus* (Reuss, 1861), NM-PM-P 752. • H, I – *Paracoryna diezi* (Flach, 1891), NHMW 2013/0572/0020. • J – *Paracoryna diezi* (Flach, 1891) (protoconch of H). • K, L – *Strobilops* (*Eostrobilops*) *elasmodonta* (Reuss, 1861), NHMW 2013/0572/0022. • M – *Strobilops* (*Eostrobilops*) *elasmodonta* (Reuss, 1861) (protoconch of K). • N–Q – *Strobilops* (*Discostrobilops*) *uniplicatus* (Braun *in* Walchner, 1851), NHMW 2013/0572/0023. • R–V – *Strobilops* (*Eostrobilops*) *fischeri* (Wenz *in* Fischer & Wenz, 1914), NHMW 2013/0572/0021. • W – *Strobilops* (*Eostrobilops*) *fischeri* (Wenz *in* Fischer & Wenz, 1914) (protoconch of S).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Dimensions. – Diameter: 2.2 mm, height: 0.95 mm (Fig. 6U); diameter: 2.25 mm, height: 1.0 mm (Fig. 6V).

Discussion. – In contrast to the other Strobilopsidae from the Most Basin, this species has a slightly malleated protoconch. As stated by Klika (1891), many of the Bohemian shells are slightly flatter, have a wider umbilicus and a thinner peristome compared with typical shells from the Mainz Basin. In addition, Wenz (1915a) observed that the infraparietal fold disappears earlier in the shells from Tuchořice. These features, however, are quite variable in our material and do not allow a convincing separation of the Bohemian shells as distinct species. Rupelian shells from Dvérce, tentatively referred to as *Strobilops uniplicatus* by Klika (1891), represent most probably a different species as indicated already by Klika himself, referring to the much finer and irregular ribs.

Occurrence. – A widespread species, which is known in the Most Basin only from Tuchořice. Wenz (1923) lists numerous Late Oligocene and Early Miocene occurrences from Germany (*e.g.* Hochheim, Wiesbaden, Mainz, Budenheim, Thalfingen, and Donaurieden). This species was also mentioned from the Early Miocene of Bełchatów and Szczerców (Poland) by Stworzewicz (1999b) and Wagner & Matl (2007).

Family Pleurodiscidae Wenz, 1923

Genus *Pleurodiscus* Wenz, 1919

Type species. – *Helix Balmei* Potiez & Michaud, 1838; original designation. Recent, Southern Europe.

***Pleurodiscus falciferus* (Boettger, 1870)**
Figure 7A–D

*1870a *Helix* (*Patula*) *falcifera* Boettg.; Boettger, p. 288, pl. 13, figs 3a–d.
1891 *Patula falcifera* Boettger. – Klika, p. 36, text-figs 28a–d.
1892 *Patula falcifera* Boettger. – Klika, p. 35, text-figs 28a–d.
1911 [*Patula*] *falcifera* Bttg. – Kafka, p. 67.
1916 *Patula falcifera* Boettger. – Thuma, p. 83.
1917 *Pyramidula* (*Gonyodiscus*) *falcifera* (Boettger). – Wenz, p. 55.
1918 *Pyramidula* (*Gonyodiscus*) *falcifera* (Boettger). – Wenz, p. 12.
1923 *Pleurodiscus falcifera* (Boettger). – Wenz, p. 1069 (cum syn.).
1930 *Goniodiscus falcifera* Böttg. – Pfeffer, p. 43.
? 1933 *Pleurodiscus falciferus* (O. Boettger). – Wenz, p. 8.
1935 *Pleurodiscus falciferus* (Bttg.). – Pilsbry, p. 179.
1999 *Pleurodiscus falciferus* (Boettger). – Esu, p. 332.

Material. – 2 specimens (NHMW 2013/0572/0024), 17 specimens (NHMW 1909/0001/0023).

Dimensions. – Diameter: 13 mm, height: 7.5 mm.

Discussion. – Wenz (1923) and Pilsbry (1935) discussed this species to be probably conspecific with *Pleurodiscus orbicularis* (Klein, 1846). The descriptions and illustrations of that Early Miocene species as given in Klein (1846) and Quenstedt (1884), however, are very poor. Jooss (1918) emended the definition of that species, referring to it as "*Pyramidula* (*Gonyodiscus*) *orbicularis* Klein emend. Jooss". Following Jooss, that species differs from the Bohemian species clearly in the sculpture of the last whorl, which comprises amalgamated and weak axial ribs persisting on the base. Confusion with the rather smooth *Hyalinia orbicularis* Klein *sensu* Sandberger, 1875, which is placed in *Aegopinella* by Lueger (1981), is impossible.

Occurrence. – Known from Tuchořice and Korozluky. Occurrences from the Early Miocene of Thalfingen, Hauchenberg at Missen, Eggingen and Ulm in Germany, listed by Wenz (1923, 1933), need verification and might partly represent *Pleurodiscus orbicularis*.

Family Valloniidae Morse, 1864

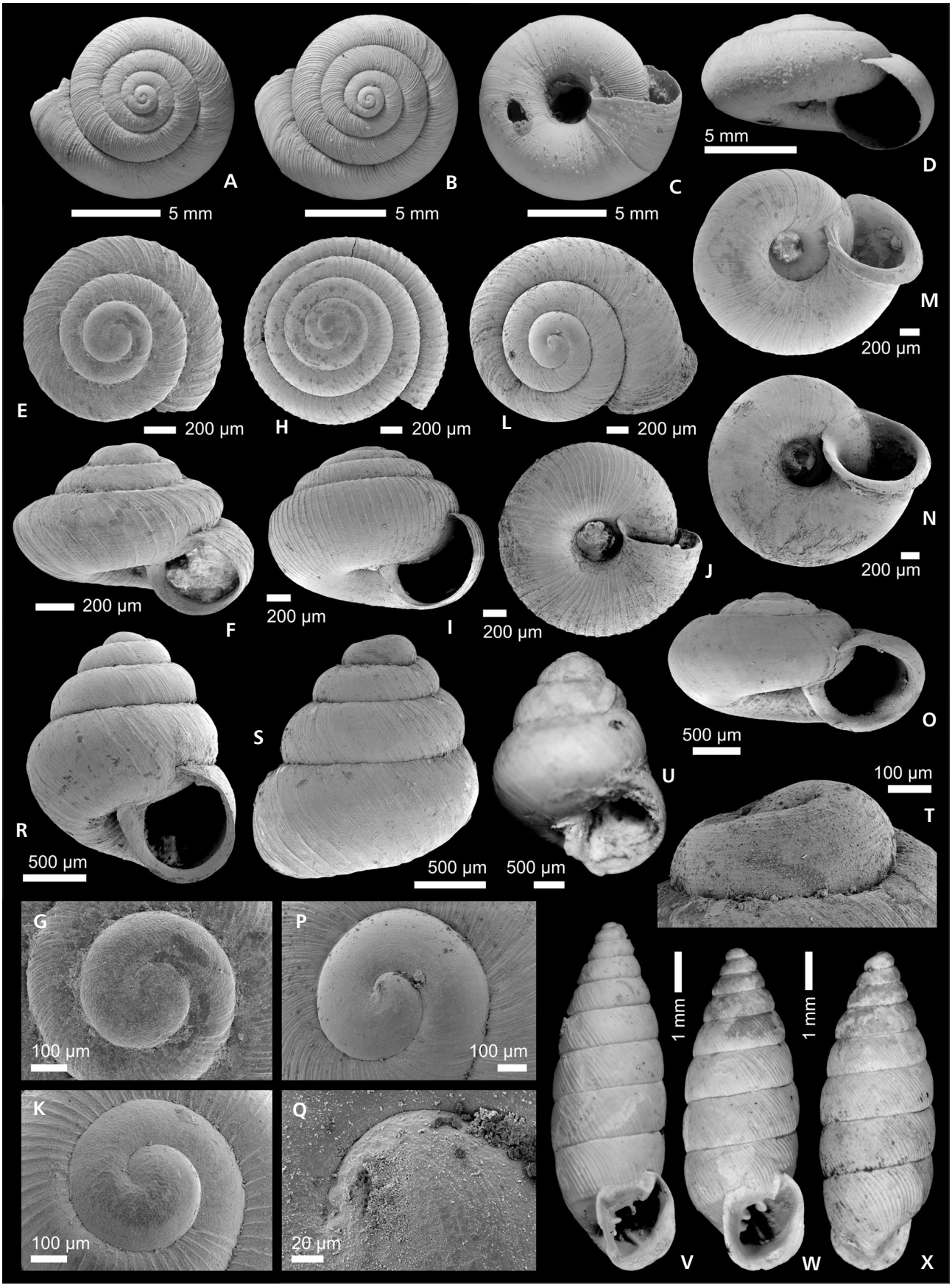
Genus *Vallonia* Risso, 1826

Type species. – *Vallonia rosalia* Risso, 1826 [= *Vallonia pulchella* (Müller, 1774)]; by monotypy. Recent, France.

***Vallonia lepida* (Reuss *in* Reuss & Meyer, 1849)**
Figure 7L–Q

1849a *H.*[*elix*] *lepida* Rss.; Reuss *in* Reuss & Meyer, p. 12 (nomen nudum).

Figure 7. A, B–D – *Pleurodiscus falciferus* (Boettger, 1870), NHMW 2013/0572/0024. • E, F – *Esuinella nana* (Braun *in* Walchner, 1851), NHMW 2013/0572/0027. • G – *Esuinella nana* (Braun *in* Walchner, 1851) (protoconch of E). • H–K – *Spermodea plicatella* (*Reuss in* Reuss & Meyer, 1849), NHMW 2013/0572/0028. • L–O – *Vallonia lepida* (Reuss *in* Reuss & Meyer, 1849), NHMW 2013/0572/0025. • P, Q – *Vallonia lepida* (Reuss *in* Reuss & Meyer, 1849) (protoconch of L). • R, S – *Acanthinula tuchoricensis* (Klika, 1891), NHMW 2013/0572/0026. • T – *Acanthinula tuchoricensis* (Klika, 1891) (protoconch of S). • U – *Acanthinula* sp., NM-PM-P 448. • V–X – *Granaria intrusa* (Slavík, 1869), NHMW 2013/0572/0029.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*1849b *H.*[*elix*] *lepida* m.; Reuss *in* Reuss & Meyer, p. 24, pl. 2, fig. 4.
1861 *H.*[*elix*] *lepida* Reuss. – Reuss, p. 68.
1869a *Helix* (*Glaphyra*) *lepida* Rss. – Slavík, p. 244, pl. 4, figs 1, 2.
1869b *Helix* (*Glaphyra*) *lepida* Rss. – Slavík, p. 261, pl. 4, figs 1, 2.
1875 *Helix* (*Vallonia*) *lepida*. – Sandberger, p. 375, pl. 22, figs 16–16b.
1891 *Helix* (*Vallonia*) *lepida* Reuss. – Klika, p. 44, text-fig. 37.
1892 *Helix* (*Vallonia*) *lepida* Reuss. – Klika, p. 43, text-fig. 37.
1911 [*Helix*] (*Vallonia*) *lepida* Rss. – Kafka, p. 67.
1916 *Helix* (*Vallonia*) *lepida* Reuss. – Thuma, p. 83.
1917 *Vallonia lepida* (Reuss). – Wenz, p. 70.
1923 *Vallonia lepida lepida* (Reuss). – Wenz, p. 903.
1996 *Vallonia lepida* (Reuss, 1849). – Gerber, p. 88, figs 3d, 29a–g, 31a–f, 32a–c, 33.
2008 *Vallonia lepida* (Reuss, 1849). – Prysjazhnjuk, p. 95, pl. 3, fig. 23, pl. 6, figs 51, 52.
2013 *Vallonia lepida* (Reuss, 1849). – Salvador, p. 14, figs 15, 16.

Material. – 2 specimens (NHMW 2013/0572/0025), 16 specimens (NHMW 1909/0001/0032).

Dimensions. – Diameter: 2.6 mm, height: 1.4 mm; diameter: 2.3 mm, height: 1.6 mm.

Discussion. – As already discussed by Harzhauser *et al.* (2014), the enormous stratigraphic and geographic range of this species as given by Gerber (1996) seems unlikely. Morphologically, however, no distinction was possible so far (see Gerber 1996). The protoconch of the Bohemian species displays a prominent sculpture consisting of numerous spiral threads developing from a granulose initial part. This sculpture is much weaker in Middle and Late Miocene specimens, as described by Harzhauser & Kowalke (2002), Harzhauser & Binder (2004) and Harzhauser *et al.* (2014). This indicates either variability in protoconch sculpture or the presence of another distinct species, such as *Vallonia subpulchella* (Sandberger, 1875). As *Vallonia lepida* is based on Early Miocene specimens from Korozluky, the identity of the herein described specimens is without any doubt.

Occurrence. – *Vallonia lepida* (Reuss *in* Reuss & Meyer, 1849) *sensu* Gerber (1996) appears during the Oligocene and persists up to the Pliocene. Geographically it was distributed from France to China; the record of Mongolia by Stworzewicz (2007) refers to another species as revised by Neubauer *et al.* (2013). In the Most Basin it is known from Korozluky, Tuchořice and Lipno.

Genus *Acanthinula* Beck, 1847

Type species. – *Helix aculeata* Müller, 1774; subsequent designation by Albers & Martens (1860). Recent, Europe.

Acanthinula tuchoricensis (Klika, 1891)
Figure 7R–T

1870a *Patula* sp. nov. – Boettger, p. 288.
*1891 *Helix* (*Acanthinula*) *tuchořicensis* n.; Klika, p. 42, text-figs 35a–c.
1892 *Helix* (*Acanthinula*) *tuchořicensis* Klika. – Klika, p. 41, text-figs 35a–c.
1911 [*Helix* (*Acanthinula*)] *Tuchořicensis* Kl. – Kafka, p. 67.
1917 *Acanthinula tuchoricensis* (Klika). – Wenz, p. 69.
1923 *Acanthinula tuchoricensis* (Klika). – Wenz, p. 978 (cum syn.).
1972 *Helix* (*Acanthinula*) *tuchoricensis* Klika. – Schlickum & Truc, p. 189.
non 1902b *Acanthinula tuchoricensis* Klika. – Andreae, p. 10 [= *Pupa* (*Modicella*) *trochulus* Sandberger, 1875].
non 1911 *Theba* (*Acanthinula*) *tuchoricensis* Klika. – Gaál, p. 66, pl. 2, fig. 5 [= *Pupa* (*Modicella*) *trochulus* Sandberger, 1875].
non 1944 *Acanthinula tuchoricensis* Klika. – Troll-Obergfell, p. 383 [= *Pupa* (*Modicella*) *trochulus* Sandberger, 1875].
non 2006 *Acanthinula tuchoricensis* (Klika), 1891. – Kókay, p. 70, pl. 25, fig. 15.

Material. – 2 specimens (NHMW 2013/0572/0026), 200 specimens (NHMW 1909/0001/0030).

Dimensions. – Diameter: 1.7 mm, height: 2.0 mm (Fig. 7R); diameter: 1.5 mm, height: 1.6 mm (Fig. 7S).

Description. – This stout, pupoid-conical species is characterised by its densely spaced prosocline axial threads and wide-spaced ribs. A much weaker spiral sculpture appears between the axial elements, developing a nearly cancellate pattern on the last whorl. Its protoconch has a slightly immersed initial part followed by a bulbous, convex whorl with prominent spiral threads.

Discussion. – These features are reminiscent of the Late Miocene *Acanthinula trochulus* (Sandberger, 1875), which differs in its broad conical shell. Similarly, the Oligocene *A. paludinaeformis* (Sandberger, 1858) and the Pliocene *A. clairi* Schlickum & Truc, 1972 are distinguished by their more conical outlines.

Occurrence. – Only known from Tuchořice and Lipno. The

shells from the Middle Miocene of Austria, Poland and Hungary described as *Acanthinula tuchoricensis* by Troll-Obergfell (1944), Andreae (1902b) and Gaál (1911) represent *A. trochulus* (see also Wenz 1923, Stworzewicz 1999b). The Early Miocene whorl fragment from the Hungarian Somlóvásárhely drilling, identified as *A. tuchoricensis* by Kókay (2006), differs clearly in its straight primary ribs and the absence of spiral sculpture.

***Acanthinula* sp.**
Figure 7U

1925 *Helix* (*Acanthinula*) *paludinaeformis* Sandb. var. – Petrbok, p. 1, unnumbered pl., fig. 7.

Material. – 1 specimen (NM-PM-P 448).

Dimensions. – Diameter 2.7 mm, height: 3.5 mm.

Discussion. – The only available specimen was described by Petrbok (1925) as unnamed variety of *Acanthinula paludinaeformis* (Sandberger, 1875). This Oligocene species, as described by Wenz (1914) from the Oligocene of Germany, has a distinctly lower and more conical spire. The specimen differs also from the frequent *A. tuchoricensis* in its much larger size and higher, more convex last whorl but agrees well in spire outline and macro-sculpture. Therefore, it might represent a new species. As we do not have any information on micro-sculpture and protoconch morphology of the rather poorly preserved specimen, we list this species in open nomenclature.

Occurrence. – Only known from Tuchořice.

Genus *Esuinella* Harzhauser, Neubauer & Georgopoulou gen. nov.

Type species. – *Helix nana* Braun *in* Walchner, 1851 (Oligocene, Germany).

Etymology. – In honour of Daniela Esu, palaeontologist at the University of Rome and well-known specialist for Neogene molluscs.

Diagnosis. – Minute valloniid consisting of 1.25 bulbous protoconch whorls with strongly malleated sculpture and *ca* 2.5 convex teleoconch whorls with deeply incised sutures. Sculpture consisting of prosocline axial ribs, separated by broad interspaces with faint axial threads, crossed by weak spiral furrows. The rather high (for confamiliar taxa), conical spire is contrasted by a broad last whorl with a convex adapical part separated by a weak angulation from the weakly convex lower part of the whorl. Aperture semicircular; thin peristome; outer lip is attached to the lower third of the last whorl; deep and moderately wide umbilicus.

Discussion. – *Helix nana* was revised by Falkner (1974), and was placed in *Planogyra* Morse, 1864, which is based on the extant American species *Helix asteriscus* Morse, 1857. This decision was based on comparison with shells of the type species but especially on comparisons with shells of the European *Vallonia astoma* Boettger, 1909 (considered as *Planogyra* by Falkner 1974). The latter species is now generally considered to be a junior synonym of *Helix sororcula* Benoit, 1859 (*e.g.* Welter-Schultes 2012), which is the type species of *Gittenbergia* Giusti, Castagnolo & Manganelli, 1985. Falkner (1974) recognised the huge stratigraphic gap between "*Helix*" *nana* and the extant species and discussed the possibility that a (sub)generic separation might be necessary. His main argument to maintain the fossil species in the Recent genus was the similarity of the malleated protoconch of "*Helix*" *nana* and "*Vallonia astoma*" and the idea to indicate a phylogenetic relation by applying a broad genus concept.

Despite this superficial similarity, the protoconch of *Gittenbergia sororcula* is less bulbous, consists of more whorls (1.5 versus 1.25), which are only moderately convex and its sculpture is weaker. The spire is distinctly lower than in *E. nana* and the predominating last whorl is regularly convex, resulting in a *Vallonia*-like outline. The umbilicus is wider and the outer lip is attached to the middle of the last whorl but placed distinctly lower in *Esuinella nana*. The similar extant SW European *Plagyrona palucida* (Shuttleworth, 1852) differs in its immersed protoconch and its striate sculpture (Cianfanelli *et al.* 2012). Thus, aside from similarities in sculpture, the Oligocene and Miocene genus *Esuinella* has little in common with extant European valloniids and spelaeodiscinids.

Included species. – *Helix nana* Braun *in* Walchner, 1851 (Oligocene, Germany).

Occurrence. – The new genus *Esuinella* is only known from the Late Oligocene to Middle Miocene of Central Europe.

***Esuinella nana* (Braun *in* Walchner, 1851) comb. nov.**
Figure 7E–G

*1851 *Helix nana* A. Braun; Braun *in* Walchner, p. 1140, p. 56 in offprint, No. 340.

? 1869a *Helix* (*Hyalina*) *euristhmia* sp. nov.; Slavík, p. 248, pl. 4, figs 5, 6.
? 1869b *Helix* (*Hyalina*) *euristhmia* sp. nov.; Slavík, p. 263, pl. 4, figs 5, 6.
1875 *Patula* (*Acanthinula*) *nana* A. Braun. – Sandberger, p. 374, pl. 22, figs 14–14c.
1891 *Helix* (*Acanthinula*) *nana* A. Braun. – Klika, p. 41, text-figs 34a–c.
1892 *Helix* (*Acanthinula*) *nana* A. Braun. – Klika, p. 40, text-figs 34a–c.
1902b *Acanthinula nana* (Al. Braun). – Andreae, p. 10.
1911 *Helix* (*Acanthinula*) *nana* Br. – Kafka, p. 67.
1914 *Acanthinula nana* (Sdbg.). – Wenz *in* Fischer & Wenz, p. 195, pl. 7, fig. 32.
1917 *Acanthinula nana* (Sandberger). – Wenz, p. 69.
1923 *Acanthinula nana* (A. Braun). – Wenz, p. 972.
1974 *Planogyra nana*. – Falkner, p. 240, pl. 10, fig. 4, pl. 11, figs 9, 10.
1999b *Planogyra nana* (A. Braun, 1851). – Stworzewicz, p. 149, figs 32, 33.
2006 *Planogyra nana* (A. Braun), 1843. – Kókay, p. 71, pl. 26, figs 3, 4.

Material. – 2 specimens (NHMW 2013/0572/0027), 841 specimens (NHMW 1909/0001/0029).

Dimensions. – Diameter: 1.15 mm, height: 0.85 mm (Fig. 7E); diameter: 1.25 mm, height: 0.9 mm (Fig. 7F).

Description. – This tiny species has a very characteristic shape with depressed conical spire and broad last whorl with a slight angulation in its upper third. It has a strongly convex, malleated protoconch of 440 μm diameter. The teleoconch sculpture starts abruptly, consisting of strongly prosocline, sharp and raised axial ribs with 3–5 weaker secondary threads and intercalations of various tertiary axial threads crossed by delicate spiral furrows. The axial elements fade out on the base where the spiral furrows become dominant.

Discussion. – The Bohemian specimens are probably conspecific with the Oligocene *Helix nana* Braun *in* Walchner, 1851 from Hochheim-Flörsheim in Germany (*e.g.* Wenz 1923), based on the illustrations and descriptions in Sandberger (1875). Some doubts may arise from the fact that the microscopic spiral sculpture was never mentioned for the Oligocene shells. Unfortunately, we were not able to study any topotypic specimens from Hochheim. Similarly, Falkner (1974) investigated only shells from Tuchořice and Zwiefaltendorf but did not study Oligocene *nana*-specimens. Wenz (1923) treated *Helix* (*Hyalina*) *euristhmia* Slavík, 1869 as synonym of *H. nana*. The illustrations of this species in Slavík (1869a, b) are extremely poor and show a rather turbinoid shell.

Occurrence. – *Esuinella nana* is known from the Late Oligocene of Hochheim-Flörsheim in Germany and the Early Miocene of Tuchořice, Bełchatów in Poland (Stworzewicz 1999b) and Somlóvásárhely in Hungary (Kókay 2006), as well as from the Middle Miocene of Opole in Poland and from Undorf and Zwiefaltendorf in Germany (Falkner 1974).

Genus *Spermodea* Westerlund, 1902

Type species. – *Helix lamellata* Jeffreys, 1830; subsequent designation by Pilsbry (1922–1926). Recent, Great Britain.

Spermodea plicatella (Reuss *in* Reuss & Meyer, 1849)

Figure 7H–K

1849a *H.*[*elix*] *plicatella* Rss.; Reuss *in* Reuss & Meyer, p. 11 (nomen nudum).
*1849b *H.*[*elix*] *plicatella* m.; Reuss *in* Reuss & Meyer, p. 21, pl. 1, fig. 10.
1861 *H.*[*elix*] *paludinaeformis* A. Br. – Reuss, p. 63 (non *Helix paludinaeformis* Sandberger, 1858).
1861 *H.*[*elix*] *plicatella* Reuss. – Reuss, p. 63.
1891 *Helix* (*Acanthinula*) *plicatella* Reuss. – Klika, p. 43, text-figs 36a–c.
1892 *Helix* (*Acanthinula*) *plicatella* Reuss. – Klika, p. 42, text-figs 36a–c.
1911 [*Helix* (*Acanthinula*)] *plicatella* Rss. – Kafka, p. 67.
1914 *Acanthinula plicatella* (Rss.). – Wenz *in* Fischer & Wenz, p. 105, pl. 7, fig. 31.
1916 *Acanthinula plicatella* (Reuss). – Wenz, p. 174.
1917 *Acanthinula plicatella* (Reuss). – Wenz, p. 69.
1923 *Acanthinula plicatella* (Reuss). – Wenz, p. 974 (cum syn.).
1972 *Spermodea plicatella*. – Schlickum & Truc, p. 189.
1974 [*Spermodea*] *plicatella* (Reuss). – Falkner, p. 233 (pars).
? 1977 *Spermodea plicatella* (Reuss). – Moayedpour, p. 64, pl. 4, figs 8, 9; non figs 2–5.
1981 *Spermodea plicatella* (Reuss). – Lueger, p. 35.

Material. – 2 specimens (NHMW 2013/0572/0028), 1913 specimens (NHMW 1909/0001/0031).

Dimensions. – Diameter: 1.85 mm, height: 1.5 mm (Fig. 7I); diameter: 2.0 mm, height: 1.6 mm (Fig. 7H).

Description. – The protoconch consists of 1.25 moderately convex whorls and is covered by a dense and irregular groove-ridge pattern, causing a low-relief malleated surface. The sculpture of the teleoconch consists of regularly spaced, thin axial ribs with very faint axial threads in the broad interspaces. Weak and densely spaced spiral

grooves are most prominent on the base and the lower part of the last whorl close to the periphery, indenting the axial ribs.

Discussion. – This species is among the most common gastropods in the Most Basin. Based on this rich material, it becomes obvious that the shape and especially the axial ribbing display only moderate variability. This is in contrast to the statement of Falkner (1974), who included also Middle Miocene specimens from Opole in this species. These stratigraphically much younger specimens from Poland might represent a separate species. The poorly preserved specimens from the Early Miocene of Theobaldshof/Rhön illustrated by Moayedpour (1977, pl. 4, figs 8, 9) might indeed represent *S. plicatella* although the depressed spire would be very untypical. The specimen illustrated by Moayedpour (1977, pl. 4, figs 3–6), however, differ considerably from *S. plicatella* in the somewhat angulated last whorl and the very weak sculpture on the base.

Spermodea plicatella is reminiscent of the Pliocene *S. demarcqui* Schlickum & Truc, 1972, which differs mainly in its higher shell and the delicate protoconch sculpture. A separation based on shell size as discussed by Schlickum & Truc (1972) is not possible. The stratigraphically closer Middle Miocene *Spermodea candida* Falkner, 1974 differs clearly in its narrower umbilicus and the much denser axial ribbing.

Occurrence. – Aside from Tuchořice, Wenz (1923), Falkner (1974) and Moayedpour (1977) cite *Spermodea plicatella* also from the Oligocene of Hochheim-Flörsheim and Hoppetenzell (Germany), the Early Miocene of Donaurieden, Theobaldshof/Rhön (Germany), and the Middle Miocene of Opole (Poland). As discussed above, most of these occurrences need verification.

Family Chondrinidae Steenberg, 1925

Genus *Granaria* Held, 1837

Type species. – *Pupa frumentum* Draparnaud, 1801; subsequent designation by Herrmannsen (1847). Recent, Europe.

***Granaria intrusa* (Slavík, 1869)**
Figure 7V–X

1861 *P.*[*upa*] *subvariabilis* Sandb. – Reuss, p. 70 (non *Pupa subvariabilis* Sandberger, 1858).
*1869a *Pupa* (*Torquilla*) *intrusa* sp. nov.; Slavík, p. 259, pl. 4, figs 12, 13.
1869b *Pupa* (*Torquilla*) *intrusa* sp. nov.; Slavík, p. 267, pl. 4, figs 12, 13.
1870a *Pupa* (*Torquilla* Stud.) *subvariabilis* Sandb. – Boettger, p. 295 (non *Pupa subvariabilis* Sandberger, 1858).
1891 *Torquilla intrusa* Slavík. – Klika, p. 87, text-fig. 83.
1892 *Torquilla intrusa* Slavík. – Klika, p. 84, text-fig. 83.
1889 *T.*[*orquilla*] *intrusa* (Slav.). – Boettger, p. 20.
1911 *Torquilla intrusa* H. [sic]. – Kafka, p. 68.
1917 *Torquilla intrusa* (Slavik). – Wenz, p. 65.
1923 *Abida intrusa* (Slavik). – Wenz, p. 944 (cum syn.).
2013 *Granaria intrusa* (Slavik, 1869). – Höltke & Rasser, p. 191.

Material. – 2 specimens (NHMW 2013/0572/0029), 11 specimens (NHMW 1909/0001/0070).

Dimensions. – Diameter: 3.1 mm, height: 8.8 mm (Fig. 7V); diameter: 3.1 mm, height: 8.4 mm (Fig. 7W, X).

Description. – This broad-fusiform shell is characterised by its conical spire and the nearly conical last three whorls; the last whorl develops a marked, sometimes even keel-like, angulation on the base. The broad-ovoid aperture bears a very prominent angular tooth, a thickened parietal tooth, two close-set columellar folds and 3–4 palatal folds. The latter appear deep in the aperture and aside from the prominent lower one are very weak; especially the fourth uppermost one is almost completely reduced in some species.

Discussion. – This species was recently transferred to *Granaria* by Höltke & Rasser (2013) in their revision of Miocene Chondrinidae. Boettger (1870a) and Sandberger (1875) considered this species as synonym of *Granaria subvariabilis* (Sandberger, 1863) from the Oligocene of the Mainz Basin. Later, this idea was rejected by Klika (1891), Wenz *in* Fischer & Wenz (1914) and even Boettger (1889) himself. Despite the similarities concerning the apertural features, *Granaria intrusa* can be distinguished from *G. subvariabilis* based on its larger size, by having more teleoconch whorls and especially due to its characteristic angulation close to the base of the last whorl.

Erroneously, Wenz (1923, p. 948) listed "*Torquilla subvariabilis* Klika" in his synonymy of *Granaria subvariabilis*, although Klika (1891) clearly described the Bohemian shells as *Torquilla intrusa* (Klika in turn erroneously listed *Pupa subvariabilis* Sandberger in his synonymy of *T. intrusa*, although he discussed the differences between both species in great detail). This confusion might have deduced Höltke & Rasser (2013) to list *Granaria subvariabilis* also from Tuchořice.

Occurrence. – Only known from Tuchořice and Lipno.

Family Vertiginidae Fitzinger, 1833

Genus *Vertigo* Müller, 1774

Type species. – *Vertigo pusilla* Müller, 1774; by monotypy. Recent, Europe.

***Vertigo minor* Boettger, 1870**
Figure 8A–D

*1870a [*Vertigo callosa*] Varietät *minor* m.; Boettger, p. 296, pl. 13, fig. 7.
1889 *V.*[*ertigo*] (*Alaea*) *minor*. – Boettger, p. 305.
1891 *Vertigo* (*Alaea*) *minor* Boettger. – Klika, p. 97, text-fig. 92.
1892 *Vertigo* (*Alaea*) *minor* Boettger. – Klika, p. 93, text-fig. 92.
1911 [*Vertigo* (*Alaea*)] *minor* Bttg. – Kafka, p. 68.
1917 *Vertigo* (*Alaea*) *minor* Boettger. – Wenz, p. 67, unnumbered figure on p. 68.
1919 *Vertigo minor* Boettger. – Pilsbry & Cooke, p. 216.
1923 *Vertigo* (*Vertigo*) *minor* Boettger. – Wenz, p. 996 (cum syn.).
1999b *Nesopupa minor* (Boettger, 1870) comb. nov.; Stworzewicz, p. 144, figs 21, 22 (figs 19, 20?).

Material. – 3 specimens (NHMW 1909/0001/0078).

Dimensions. – Diameter: 1.16 mm, height: 1.5 mm; diameter: 1.05 mm, height: 1.45 mm (Fig. 8A); diameter: 1.05 mm, height: 1.45 mm (Fig. 8C).

Description. – A tiny, very stout ovoid shell comprising 1.5 high and convex protoconch whorls with deep sutures and granulose-malleated surface. This sculpture is crossed by several weak spiral furrows which are best developed on the late part of the protoconch and in its adapical half. The teleoconch consists of 2.5 convex whorls with incised sutures; the first 1.5 whorls bear a dense sculpture of prominent, regularly spaced prosocline axial ribs; these become much weaker and irregular on the high last whorl where they are crossed by very indistinct, broad spiral threads producing a faint pattern of shallow pits in the interspaces and low nodes at the intersections. Umbilicus narrow and deep; U-shaped aperture with strong and protruding columellar lamella; very large and bent parietal tooth accompanied by a distinctly smaller and thinner angular tooth and an indistinct infraparietal denticle deep in the aperture; two widely spaced, large but narrow palatal plicae and a well-developed basal denticle. A knob-like low suprapalatalis may occur deep in the aperture. The more prominent lamellae are all characterised by strongly convex, tube-like inflated margins delimitating much thinner inner walls. A shallow sulcus on the outer surface of the apertural wall coincides with the position of the lower palatal plica.

Discussion. – Stworzewicz (1999b) was the first to recognise the unusual shell sculpture of this tiny vertiginid and suggested a placement in *Nesopupa* Pilsbry, 1900a within the subfamily Nesopupinae Steenberg, 1925. Indeed, *Nesopupa* sp. of Gargominy (2008, fig. 2A) is strikingly similar to *Vertigo minor* concerning sculpture and shape of the teleoconch but develops a sheet-like angularis. The protoconch of *Nesopupa* as described by Gargominy (2008) agrees with the Bohemian shell in its granulose surface but lacks any striae. These, however, are developed on the protoconch of the nesopupine genus *Nesoropupa* Gargominy, 2008 (type species *Nesoropupa duodecim* Gargominy, 2008). *Nesoropupa* differs from *Vertigo minor* in having a much higher and more convex protoconch, which lacks the malleated surface (see Gargominy 2008, figs 3C, D). Another similar (sub)genus is *Nesodagys* Cooke & Pilsbry *in* Pilsbry & Cooke, 1920. *Nesodagys thaanumi* (Ancey, 1904) develops a similar aperture like the Bohemian species with near-identical parietal and palatal plicae and a comparable columellaris and agrees in the tube-like margins of the lamellae. A close relation to any of these genera, however, seems unlikely as they represent extant Indo-West Pacific groups. Therefore, these similarities are most probably convergences and we follow Manganelli *et al.* (2008) and Nordsieck (written comm. 2014) and place this species in *Vertigo* based on its apertural features, although the protoconch sculpture is rather untypical for European *Vertigo* species.

The characteristic sculpture and aperture allow a clear separation from the Oligocene–Early Miocene *Pupa trigonostoma* Sandberger, 1863 and *Vertigo blumi* Boettger, 1884. These species develop at least one additional whorl – thus being distinctly larger – and bear prominent growth lines on the entire teleoconch. Since Boettger (1889) and Pilsbry & Cooke (1920, p. 379), both species were "traditionally" placed in *Nesopupa* (Stworzewicz 1999b, Manganelli *et al.* 2008). In our opinion, it is questionable if both are even congeneric: differences are the absence of palatal plicae in "*Pupa*" *trigonostoma* and the conspicuous continuation of the aperture margin into the angular lamella in "*Vertigo*" *blumi*.

Representatives of the Oligocene–Miocene genus *Ptychalaea* Boettger, 1889, which is also considered to be a Nesopupinae by Pilsbry & Cooke (1920), differ clearly in their smooth shells.

Stworzewicz (1999b) considered the shells from the Middle Miocene of Bełchatów to be conspecific with those from the Early Miocene of the Most Basin. As already noticed by Stworzewicz (1999b), the Polish specimens differ from those from Tuchořice in the shorter angular tooth and especially in the very indistinct basal denticle. In respect to

the large stratigraphic gap between both occurrences we consider the Polish specimens to represent a distinct chrono-subspecies.

Occurrence. – The species is known from the Burdigalian of Tuchořice. The Middle Miocene (MN 5) specimens from Bełchatów in Poland are probably a younger chrono-subspecies.

Vertigo angulifera Boettger, 1884

*1884 *Vertigo* (*Alaea*) *angulifera* sp. nov.; Boettger, p. 271, pl. 4, figs 10a–c.
1923 *Vertigo* (*Vertilla*) *angulifera angulifera* Boettger. – Wenz, p. 1006 (cum syn.).
1967 *Vertigo* (*Vertilla*) *angulifera angulifera* O. Boettger. – Schütt, p. 207, fig. 9.
1985 *Vertigo* (*Vertilla*) *angulifera angulifera* Boettger. – Čejchan, p. 176, pl. 1, figs 1–5, pl. 2, figs 1–3.
1998 *Vertigo angulifera*. – Finger, p. 44, pl. 9, fig. H.
2008 *Vertigo angulifera* Boettger, 1884. – Harzhauser *et al.*, p. 50, figs 5.7, 5.8.

Material. – No material was available; the specimen described by Čejchan (1985) is stored in the collection of the Charles University in Prague.

Dimensions. – Diameter: 0.85 mm, height: 1.45 mm.

Discussion. – *Vertigo angulifera* is a very rare species in the Most Basin; the only record was documented by Čejchan (1985).

Occurrence. – The distribution of this species was summarised by Stworzewicz (1999b) and Harzhauser *et al.* (2014): it appears during the Early Miocene (Bełchatów, Frankfurt, Tuchořice, Dolnice), is recorded from the Early/Middle Miocene of Undorf (Germany) and the Middle Miocene Badenian of the Rein Basin (Austria) and Hungary and persists up the late Middle Miocene Sarmatian (Gratkorn Basin and North-Alpine Foreland Basin in Austria, Steinheim Basin in Germany). During the Middle Miocene it spreads as far east as the Fore-Caucasus.

Vertigo callosa (Reuss *in* Reuss & Meyer, 1849)
Figure 8F–H

1849a *Vertigo callosa* Rss.; Reuss *in* Reuss & Meyer, p. 11 (nomen nudum).
*1849b *V.*[*ertigo*] *callosa* m.; Reuss *in* Reuss & Meyer, p. 30, pl. 3, fig. 7.
1861 *P.*[*upa*] *callosa* Reuss. – Reuss, p. 72.
1891 *Vertigo* (*Alaea*) *callosa* Reuss. – Klika, p. 96, text-figs 91a, b.
1892 *Vertigo* (*Alaea*) *callosa* Reuss. – Klika, p. 91, text-figs 91a, b.
1875 *Pupa* (*Vertigo*) *callosa* Reuss. – Sandberger, p. 400, pl. 24, figs 19–19b.
1889 *Vertigo* (*Alaea*) *callosa* (Rss.). – Boettger, p. 71, pl. 7, figs 3, 4.
1916 *Vertigo* (*Alaea*) *callosa* Reuss. – Thuma, p. 84.
1916 *Vertigo* (*Alaea*) *callosa* (Reuss). – Wenz, p. 174.
1917 *Vertigo* (*Alaea*) *callosa* (Reuss). – Wenz, p. 67.
1923 *Vertigo* (*Vertigo*) *callosa* (Reuss). – Wenz, p. 983 (cum syn.).
1964 *Vertigo callosa* (Reuss, 1849). – Čtyroký *et al.*, table for p. 149.
1977 *Vertigo* (*Vertigo*) *callosa* (Reuss). – Moayedpour, p. 63, pl. 4, figs 1, 2.
1999b *Vertigo callosa* (Reuss, 1849). – Stworzewicz, p. 137, figs 6, 7.
2008 *Vertigo callosa* (Reuss, 1849). – Prysjazhnjuk, p. 92, pl. 3, figs 20, 21, pl. 5, figs 37–43.
2013 *Vertigo callosa* (Reuss, 1849). – Salvador, p. 15, figs 17, 18.

Material. – 2 specimens (NHMW 2013/0572/0030); >8,600 specimens (NHMW 1909/0001/0077, 0079).

Dimensions. – Diameter: 1.15 mm, height: 1.75 mm (Fig. 8H); diameter: 1.22 mm, height: 1.85 mm (Fig. 8G).

Description. – Small ovoid shells with cyrtoconoid spire, large last whorl and domical, moderately convex protoconch lacking any sculpture. The three teleoconch whorls are moderately convex and bear prosocline growth lines. Two aperture types are represented in the rich material. The dominant type bears 6 teeth with two prominent parietal teeth, a large columellar fold, a knob-like basal denticle and two palatal teeth with a stronger lower one (Fig. 8F, H). Rarely a small infraparietal denticle may appear. The second, less abundant group comprises shells with an additional weak suprapalatal denticle and a very low, usually twofold basal knob (Fig. 8G). A comparable intra-specific variability was described by Stworzewicz (1999b) from Bełchatów in Poland, who rejects a taxonomic separation of both morphotypes.

Occurrence. – A widespread species during the Early and Middle Miocene in central and eastern Europe, ranging to the Caucasus region; latest occurrences are known from the Late Miocene of Austria and Hungary (see Stworzewicz 1999b and Harzhauser *et al.* 2014 for details). In the Most Basin it is known from Korozluky, Tuchořice, Lipno and the Kralupy drillings.

***Vertigo tuchoricensis* Pilsbry *in* Pilsbry & Cooke, 1919**
Figure 8I–J

1861 *P.*[*upa*] *microstoma* Reuss; Reuss, p. 73, pl. 2, fig. 8 (non *Pupa microstoma* Pfeiffer, 1854).
1869a *Vertigo microstoma* Reuss. – Slavík, p. 260 (non *Pupa microstoma* Pfeiffer, 1854).
1869b *Vertigo microstoma* Reuss. – Slavík, p. 272 (non *Pupa microstoma* Pfeiffer, 1854).
1875 *Pupa* (*Vertigo*) *microstoma* Reuss. – Sandberger, p. 438, pl. 24, figs 17–17b (non *Pupa microstoma* Pfeiffer, 1854).
1891 *Vertigo microstoma* Reuss. – Klika, p. 98, text-figs 93a, b (non *Pupa microstoma* Pfeiffer, 1854).
1892 *Vertigo microstoma* Reuss. – Klika, p. 93, text-figs 93a, b (non *Pupa microstoma* Pfeiffer, 1854).
1911 [*Vertigo* (*Alaea*)] *microstoma* Rss. – Kafka, p. 68 (non *Pupa microstoma* Pfeiffer, 1854).
*1919 *Vertigo tuchoricensis* new name; Pilsbry *in* Pilsbry & Cooke, p. 218.
1923 *Vertigo* (*Vertigo*) *tuchoricensis* Pilsbry. – Wenz, p. 1002 (cum syn.).

Material. – One specimen (NHMW 2013/0572/0031).

Dimensions. – Diameter: 1.0 mm, height: 1.6 mm.

Description. – Very small and thin-shelled species; the high-domical protoconch is weakly granulated; this microsculpture is best developed on the adapical part and becomes much weaker towards the lower suture. The teleoconch sculpture consists of weakly prosocline, somewhat irregular and broad growth lines. The spire whorls are strongly convex, separated by deep sutures; the umbilicus is narrow and partly covered by the inner lip. Peristome only moderately thickened and wide with two prominent but very narrow parietal folds and an also narrow columellar fold. No basal denticle is visible in our specimen; the lower palatal tooth is covered by sediment; above follow a comparatively prominent upper palatal tooth and a distinct but small suprapalatal denticle.

Discussion. – The identity of this species is completely unclear. It is based on a lost specimen illustrated and described by Reuss (1861), who did not provide any measurements. Aside from the problem that the name *Pupa microstoma* was preoccupied, the description and illustration of Reuss (1861) do not match at all. He describes two prominent palatal plicae of which the upper one is stronger and in the middle of the aperture, whilst the weaker, lower one is close to the columella. Further, Reuss (1861) mentioned two weaker but acute parietal lamellae. The illustration shows an additional, small columellar fold and an enormous angularis but no palatal ones. Reuss (1861) emphasised the narrow, half-moon shaped aperture with thin peristome and based the (preoccupied) name *microstoma* on this feature. Concerning the illustration, we are inclined to ascribe this unusual aperture to the fact that parts of the peristome may simply be broken off.

By introducing *tuchoricensis* as replacement name, Pilsbry in Pilsbry & Cooke (1919) settled the nomenclatorial problem, but no author was able to present new data on the morphology. Our specimen agrees with the original description largely in its internal apertural features and the strong convexity of the spire whorls. Thus, although uncertainties remain, we tentatively consider it as *Vertigo tuchoricensis*.

This species is clearly separated from other vertiginids of the Most Basin by its smaller size, the strongly convex whorls, the granulose protoconch, the narrow umbilicus and the wide aperture with rather fragile and thin elements.

Occurrence. – Only known from Lipno and Tuchořice,

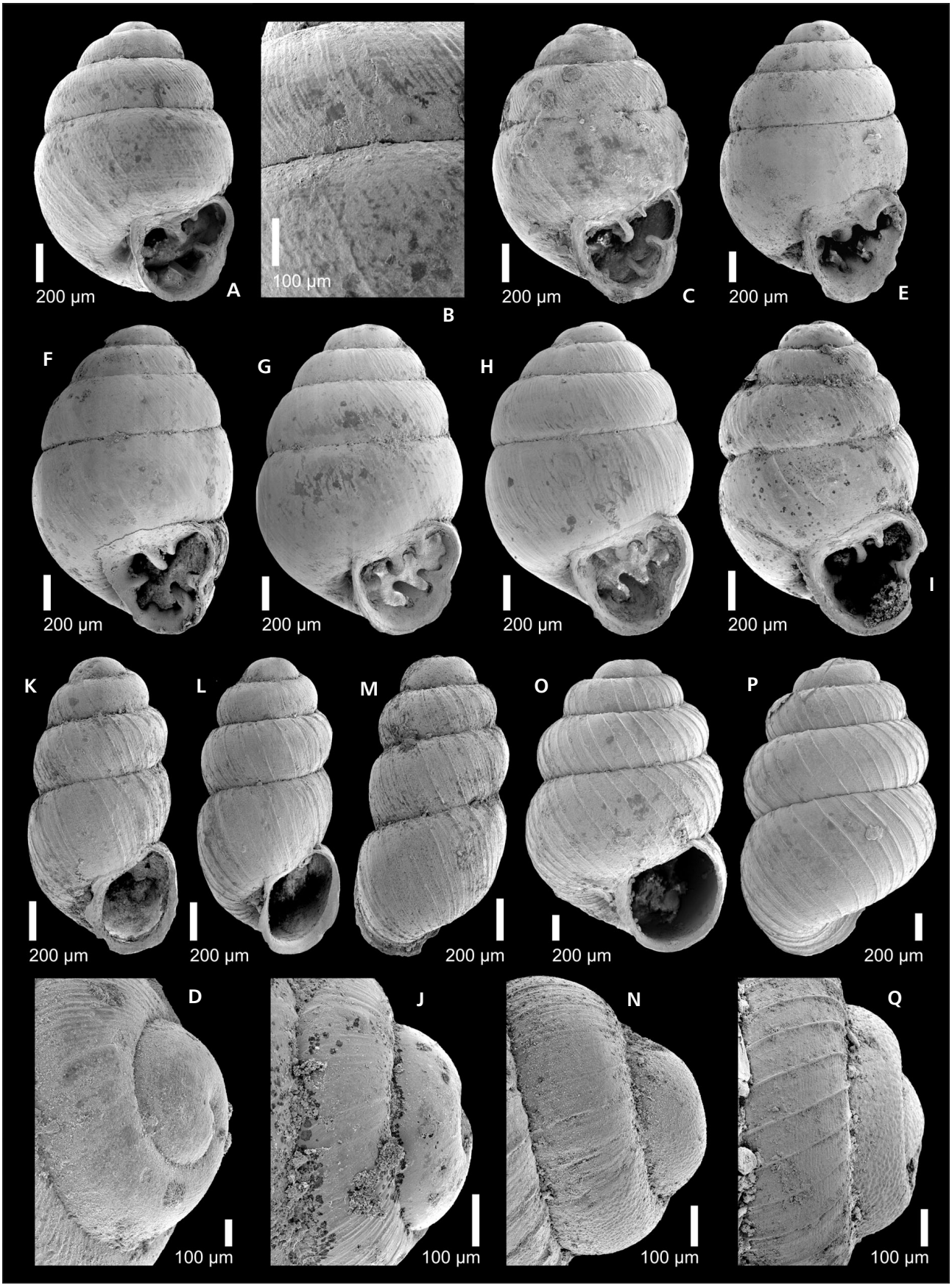
Genus *Negulus* Boettger, 1889

Type species. – *Pupa reinhardti* Jickeli, 1874; original designation. Recent, Ethiopia.

***Negulus suturalis* (Sandberger, 1858)**
Figure 8K–N

*1858 *Pupa suturalis* A. Braun; Sandberger, p. 54, pl. 6, figs 2–2a.
1861 *P.*[*upa*] *suturalis* A. Br. sp. – Reuss, p. 71.
1875 *Pupa lineolata* A. Braun. – Sandberger, p. 397 (pars).
1891 *Negulus lineolatus* Al. Braun. – Klika, p. 89, text-figs 85a, b (non *Pupa lineolata* A. Braun, 1875).
1892 *Negulus lineolatus* Al. Braun. – Klika, p. 85, text-figs 85a, b (non *Pupa lineolata* A. Braun, 1875).
1889 *Negulus lineolatus* (Al. Br.). – Boettger, p. 45 (pars).

Figure 8. A–C – *Vertigo minor* Boettger, 1870, NHMW 1909/0001/0078. • D – *Vertigo minor* Boettger, 1870, protoconch of A, B. • E – *Ptychalaea flexidens* (Reuss, 1861), NHMW 1909/0001/0076. • F – *Vertigo* cf. *callosa* (Reuss *in* Reuss & Meyer, 1849), NHMW 2013/0572/0030. • G, H – *Vertigo callosa* (Reuss *in* Reuss & Meyer, 1849) NHMW 2013/0572/0030. • I, J – *Vertigo tuchoricensis* Pilsbry *in* Pilsbry & Cooke, 1919, NHMW 2013/0572/0031. • K–M – *Negulus suturalis* (Sandberger, 1858), NHMW 2013/0572/0032. • N – *Negulus suturalis* (Sandberger, 1858) (protoconch of L). • O–Q – *Negulus raricosta* (Slavík, 1869), NHMW 2013/0572/0033.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1911 *Negulus lineolatus* A. B. – Kafka, p. 69 (non *Pupa lineolata* A. Braun, 1875).
1914 *Negulus suturalis* (Sandberger). – Wenz, p. 92, pl. 5, fig. 13.
1916 *Negulus suturalis* (Sandberger). – Wenz, p. 172.
1917 *Negulus suturalis* (Sandberger). – Wenz, p. 65.
1923 *Negulus suturalis suturalis* (Sandberger). – Wenz, p. 1024.
1993 *Negulus suturalis* (Sandberger, 1858). – Stworzewicz, p. 398.
1999b *Negulus suturalis* (Sandberger, 1858). – Stworzewicz, p. 146, figs 23–25.
2002 *Negulus suturalis* (Sandberger, 1858). – Binder, p. 168, pl. 1, fig. 10, text-figs 6a, b.
2006 *Negulus suturalis suturalis* (Sandberger), 1858. – Kókay, p. 61, pl. 21, figs 12, 13.

Material. – 2 specimens (NHMW 2013/0572/0032), 840 specimens (NHMW 1909/0001/0071).

Dimensions. – Diameter: 0.75 mm, height: 1.5 mm (Fig. 8L); diameter: 0.65 mm, height: 1.45 mm (Fig. 8K).

Discussion. – A very common species at Tuchořice. Stworzewicz (1999b) presented a detailed description of this species with emphasis on the microsculpture and its shell variability. The Bohemian shells agree largely with those from Bełchatów aside from the slightly weaker peristome.

Occurrence. – A wide-spread species known from the Oligocene of Hochheim-Flörsheim (Germany), the Early Miocene of Donaurieden, Erbach, Budenheim (Germany), Bełchatów (Poland), Teiritzberg (Austria), Somlóvásárhely (Hungary) and the Middle Miocene of Opole and Bełchatów (Poland). In the Most Basin it was detected at Tuchořice (Wenz 1923; Stworzewicz 1993, 1999b; Binder 2002; Kókay 2006).

Negulus raricosta (Slavík, 1869)
Figure 8O–Q

*1869a *Pupa* (*Pupilla*) *raricosta* sp. nov.; Slavík, p. 258, pl. 4, figs 9–11.
1869b *Pupa* (*Pupilla*) *raricosta* sp. nov.; Slavík, p. 266, pl. 4, figs 9–11.
1891 *Negulus raricosta* Slavík. – Klika, p. 91, text-figs 86a–c.
1892 *Negulus raricosta* Slavík. – Klika, p. 86, text-figs 86a–c.
? 1902b *Negulus raricostatus* [sic] Slav. – Andreae, p. 17.
1911 [*Negulus*] *raricosta* Sl. – Kafka, p. 69.
1917 *Negulus raricostatus* [sic] (Slavik). – Wenz, p. 66.
1923 *Negulus raricostatus* [sic] (Slavik). – Wenz, p. 1024 (cum syn.).
? 1993 *Negulus raricostatus* [sic] (Slavik, 1869). – Stworzewicz, p. 399.
1999 *Negulus raricostatus* [sic] (Slavik). – Esu, p. 332.

Material. – 2 specimens (NHMW 2013/0572/0033), 5 specimens (NHMW 1909/0001/0072).

Dimensions. – Diameter: 1.5 mm, height: 2.25 mm (Fig. 8O); diameter: 1.55 mm, height: 2.25 mm (Fig. 8P).

Description. – The shell bears wide and regularly spaced, strongly oblique prosocline and sharp axial ribs with faint growth lines in the interspaces. A dense pattern of spiral grooves appears in the interspaces, crossing the growth lines without intersecting the axial ribs. The convex protoconch has a slightly immersed initial part and develops a coarse, malleated granulose sculpture. The apertural margin is thin; only the inner lip is slightly expanded.

Discussion. – This species was originally described as *Pupa raricosta* by Slavík (1869) and erroneously listed as *raricostatus* by Wenz (1917, 1923); the correct name is *Negulus raricosta*. It is much rarer than the congeneric *Negulus suturalis* from which it differs very distinctly in its stout shape with strongly convex whorls.

Occurrence. – Known only from Tuchořice; the much younger occurrences from the Middle Miocene of Opole in Poland mentioned by Andreae (1902b) need confirmation.

Subfamily Truncatellininae Steenberg, 1925

Genus *Truncatellina* Lowe, 1852

Type species. – *Pupa linearis* Lowe, 1852; by monotypy. Recent, Madeira.

Truncatellina splendidula (Sandberger, 1875)
Figure 9E–H

1849a *Pupa minutissima* Hartm. – Reuss *in* Reuss & Meyer, p. 11 (non *Pupa minutissima* Hartmann, 1821).
1849b *P.*[*upa*] *minutissima* Hartm. – Reuss *in* Reuss & Meyer, p. 29, pl. 3, fig. 6 (non *Pupa minutissima* Hartmann, 1821).
1861 *P.*[*upa*] *cryptodus* A. Br.? – Reuss, p. 71 (non *Pupa cryptodus* Sandberger, 1858).
1869a *Pupa* (*Pupilla*) *cryptodus* A. Braun. – Slavík, p. 267 (non *Pupa cryptodus* Sandberger, 1858).
*1875 *P.*[*upa*] *splendidula* Sandb.; Sandberger, p. 397.
1891 *Isthmia splendidula* Sandberger. – Klika, p. 93, text-figs 88a, b.

1892 *Isthmia splendidula* Sandberger. – Klika, p. 89, text-figs 88a, b.
1889 *Isthmia splendidula* (Sbgr.). – Boettger, p. 48 in offprint, pl. 6, fig. 9.
1911 *Isthmia splendidula* Sndb. – Kafka, p. 69.
1914 *Isthmia splendidula* (Sdbg.). – Wenz *in* Fischer & Wenz, p. 93, pl. 5, fig. 15.
1917 *Isthmia splendidula* (Sandberger). – Wenz, p. 66.
1923 *Truncatellina splendidula* (Sandberger). – Wenz, p. 1021 (cum syn.).

Material. – 2 specimens (NHMW 2013/0572/0035), 266 specimens (NHMW 1909/0001/0074).

Dimensions. – Diameter: 0.75 mm, height: 1.55 mm (Fig. 9F); diameter: 0.7 mm, height: 1.45 mm (Fig. 9G–H).

Description. – High-cylindrical shell with smooth protoconch, moderately convex, nearly smooth whorls, incised sutures, and narrow umbilicus. Aperture U-shaped, with a prominent columellar fold, a slightly weaker parietal lamella and a knob-like palatal denticle deep in the aperture. In contrast to the ovoid aperture in the schematic illustration of Boettger (1889), the outer lip is nearly straight (see also Fischer & Wenz 1914).

Discussion. – Wenz (1923) mentioned also *Truncatellina cryptodus* (Sandberger, 1858) from Tuchořice with question mark. He referred to Slavík (1869a), who did not mention this species anymore in the descriptive part of Slavík (1869b).

Occurrence. – This species was described from the Late Oligocene of Hochheim-Flörsheim (Germany) and the Early Miocene of Budenheim and Frankfurt am Main (Germany). In the Most Basin it is only known from Tuchořice.

Family Gastrocoptidae Pilsbry, 1918

Genus *Gastrocopta* Wollaston, 1878
Subgenus *Albinula* Sterki, 1892

Type species. – *Pupa contracta* Say, 1822; subsequent designation by Pilsbry (1916). Recent, North America.

Gastrocopta* (*Albinula*) *turgida
(Reuss *in* Reuss & Meyer, 1849)
Figure 9A–D

1849a *Vertigo turgida* Rss.; Reuss *in* Reuss & Meyer, p. 11 (nomen nudum).
*1849b *V.*[*ertigo*] *turgida* m.; Reuss *in* Reuss & Meyer, p. 30, pl. 3, fig. 8.
1861 *P.*[*upa*] *turgida* Reuss. – Reuss, p. 71.
1889 *L.*[*eucochilus*] *quadriplicatum* (Al. Br.) var. *lamellidens* Sbgr. – Boettger, p. 56.
1891 [*Leucochilus quadriplicatum* A. Braun] var. *lamellidens* Sandberger. – Klika, p. 92, text-figs 87a, b.
1892 [*Leucochilus quadriplicatum* A. Braun] var. *lamellidens* Sandberger. – Klika, p. 88, text-figs 87a, b (non *Pupa lamellidens* Sandberger, 1858).
1911 *Leucochilus quadriplicatum* A. Br. var. *lamellidens* Sndb. – Kafka, p. 69.
1916 *Leucochilus quadriplicatum* A. Braun, var. *lamellidens* Sandberger. – Thuma, p. 84.
1916 *Leucochila turgida* (Reuss). – Wenz, p. 173.
1916/17 *Vertigo turgida* Reuss. – Pilsbry, p. 115.
1917 *Leucochila turgida* (Reuss). – Wenz, p. 66.
1918 *Leucochila turgida* (Reuss). – Wenz, p. 20.
1923 *Gastrocopta* (*Albinula*) *turgida turgida* (Reuss). – Wenz, p. 922 (cum syn.).
1999 *Gastrocopta* (*Albinula*) *turgida* (Reuss). – Esu, p. 331.
1999b *Gastrocopta turgida* (Reuss, 1849). – Stworzewicz, p. 159, figs 51–54.
2000a *Vertigo turgida* Reuss, 1849. – Manganelli & Giusti, p. 73.
2000a *Gastrocopta* (*Albinula*) *quadriplicata* (Braun, 1851). – Manganelli & Giusti, pl. 8, figs 1, 2.
? 2008 *Gastrocopta* (*Albinula*) *turgida* (Reuss, 1849). – Prysjazhnjuk, p. 89, pl. 3, figs 15–17, pl. 4, figs 26–28.

Material. – 2 specimens (NHMW 2013/0572/0034), 104 specimens (NHMW 1909/0001/0104, 1909/0001/0104).

Dimensions. – Diameter: 1.7 mm, height: 2.6 mm (Fig. 9A–C); diameter: 1.7 mm, height: 2.6 mm (Fig. 9D).

Description. – This species is characterised by its sheet-like anguloparietal lamella with undulating margin, joining the apertural margin. The aperture bears three palatal plicae with a well-developed lower one and a usually still recognisable upper palatal plica, whereas the suprapalatal denticle is strongly reduced. The columellar lamella is emerging, semicircular and obliquely ascending. The entire aperture and especially the anguloparietal lamella are covered by tiny granulae. Prosocline growth lines are distinct but never as strong as indicated by the illustration of Reuss *in* Reuss & Meyer (1849).

Discussion. – This species is very common, easily recognisable and well represented in the NHMW collection. Therefore, we have little doubts that our shells represent the species described by Reuss *in* Reuss & Meyer (1849)

although the original illustration is very poor. The poor illustration and vague description of Reuss *in* Reuss & Meyer (1849) was base for much confusion on its relation to *Gastrocopta* (*Albinula*) *quadriplicata* (Braun *in* Walchner, 1851) and *Gastrocopta* (*Albinula*) *lamellidens* (Sandberger, 1858). Manganelli & Giusti (2000a) identified specimens from Tuchořice as *Gastrocopta* (*Albinula*) *quadriplicata* and considered *G. turgida* as potential senior synonym of *G. lamellidens* Sandberger, 1858. In our opinion, because only a single but frequent *Gastrocopta* species is represented in the material from the Most Basin, *Gastrocopta* (*Albinula*) *quadriplicata* sensu Manganelli & Giusti (2000a) might rather be a junior synonym of *P. turgida*.

Occurrence. – Known from Korozluky, Tuchořice and Lipno in the Most Basin. Further Early Miocene occurrences are listed by Wenz (1923) from France (Noaillan, Mérignac, Saucats) and Germany (Hochheim-Flörsheim, Donaurieden, Öpfingen, Ehingen, Lehr bei Ulm, Eggingen). Stworzewicz (1999b) documented *G. turgida* also from the Early and early Middle Miocene of Bełchatów (Poland). The species is probably also recorded from several Oligocene localities but the unclear status of *Gastrocopta lamellidens* (Sandberger, 1858) and *G. quadriplicata* (Braun *in* Walchner, 1851) does not allow a clear statement. The occurrence of this species in the Early Miocene of Sjenica in Trijebine (Serbia) is doubtful as it is based only on internal molds (Prysjazhnjuk 2008). A Middle Miocene record from Opole in Poland listed by Wenz (1923) was identified as *G. edlaueri* (Wenz, 1921) by Stworzewicz (1999b).

Genus *Ptychalaea* Boettger, 1889

Type species. – *Pupa flexidens* Reuss, 1861; original designation. Early Miocene, Czech Republic.

***Ptychalaea flexidens* (Reuss, 1861)**
Figure 8E

*1861 *P.*[*upa*] *flexidens* Reuss; Reuss, p. 74, pl. 2, fig. 9.
1875 *Pupa* (*Vertigo*) *flexidens* Reuss. – Sandberger, p. 439, pl. 24, figs 18–18b.
1889 *Vertigo* (*Ptychalaea*) *flexidens* (Rss.). – Boettger, p. 69, pl. 7, fig. 1.
1891 *Vertigo* (*Ptychalaea* Boettg.) *flexidens* Reuss. – Klika, p. 95, text-figs 90a, b.
1892 *Vertigo* (*Ptychalaea* Boettg.) *flexidens* Reuss. – Klika, p. 90, text-figs 90a, b.
1911 *Vertigo* (*Ptychalaea*) *flexidens* Rss. – Kafka, p. 69.
1916 *Vertigo* (*Ptychalaea*) *flexidens* (Reuss). – Wenz, p. 173.
1917 *Vertigo* (*Ptychalaea*) *flexidens* (Reuss). – Wenz, p. 67.
1919 *V.*[*ertigo*] *flexidens* Reuss. – Pilsbry, p. 157.
1923 *Vertigo* (*Ptychalaea*) *flexidens flexidens* (Reuss). – Wenz, p. 1003 (cum syn.).
non 1891 *Pupa* (*Vertigo*) *flexidens* Rss. – Penecke, p. 368 (= *Leucochilus quadriplicatum* mut. *suevica* Boettger, 1889).

Material. – One specimen (NHMW 1909/0001/0076).

Dimensions. – Diameter: 1.2 mm, height: 1.75 mm.

Discussion. – The identity of this species has been unlear due to the very poor descriptions and drawings of Reuss (1861) and Sandberger (1875), who both present a rather conical shell with rapidly contracting base and heart-shaped aperture. A part of the peristome might have been broken off, resulting in the strange aperture shape. In fact, the aperture of the stout ovoid shell is more or less U-shaped with wide peristome as already indicated by Klika (1891) and Boettger (1889). The characteristic feature is the prominent and slightly bent angularis, which extends to the apertural margin. The likewise strong and bent parietal tooth is adjoined by a weak infraparietal denticle. Similarly, the two prominent palatal teeth are adjoined by a pointed suprapalatal denticle, which causes a trefoil-like sulcus in the aperture together with the angular tooth. The basal denticle is weak and knob-like; the columellar fold is slightly weaker than the palatal and parietal teeth.

According to G. Manganelli (written comm. 2014) *Ptychalaea* should be placed in the Gastrocoptidae based on the morphology of the angularis, which is tentatively followed herein.

Occurrence. – This species is known from Tuchořice and Lipno. Wenz (1923) mentions several additional occurrences from the Early Miocene of Germany (*e.g.* Öpfingen, Budenheim, Wiesbaden, Donaurieden). Occurrences of this species in the Middle Miocene Rein Basin in Austria as mentioned by Penecke (1891) actually represent *Gastrocopta suevica* (Boettger 1889, Harzhauser *et al*. 2014).

Family Orculidae Pilsbry, 1918

Genus *Nordsieckula* Harl & Harzhauser gen. nov.

Type species. – *Pupa subconica* Sandberger, 1858; Late Oligocene, Germany.

Etymology. – In honour of Hartmut Nordsieck (Senckenberg Museum, Frankfurt), the leading specialist for European Tertiary terrestrial gastropods.

Diagnosis. – Medium-sized orculid of barrel-like shape

with narrow umbilicus; 7–9 weakly convex whorls; sculpture of protoconch smooth, teleoconch weakly or moderately ribbed; apex rather rounded, not attenuate. First whorls regularly increasing in diameter, last whorls of similar width. Aperture one-sided rounded, the outer margin curved stronger, margins not closing. Aperture armouring: parietalis strong; subangularis bulge-like and weakly expressed; two equally strong upper columellar lamellae extend to the aperture margins; a third, bulge-like columellar lamella (subcolumellaris) sometimes present at aperture margin, but not entering the shell; palatal plica missing.

Discussion. – *Pupa subconica* was traditionally placed in *Orcula* Held, 1837, with the extant type species *Pupa dolium* Draparnaud, 1801. The genus *Orcula* was revised by Harl *et al.* (2011) and Páll-Gergely *et al.* (2013), who emphasised the difficulties to distinguish the various extant orculid genera and subgenera based on conchological data alone. Nevertheless, the characteristic bulge-like subangularis (*sensu* Hausdorf 1996) separates *N. subconica* from extant species of *Orcula*, as already discussed by Sandberger (1858) and Boettger (1889). *N. subconica* is probably closest related to the Middle Miocene *N. falkneri* (Hausdorf, 1995), which is known from Middle Miocene sediments of Gündlkofen (Germany) and Nowa Wies Królewska (Poland) (Hausdorf 1995). *Nordsieckula falkneri* and *N. subconica* strongly resemble each other in shell form and aperture characteristics, including the shared presence of a subangularis. The similarities between these two species let us suggest that *N. subconica* (or related taxa) is ancestral to *O. falkneri*, wherefore the latter species is also placed in *Nordsieckula* herein. The third columellar lamella (subcolumellaris) is a distinctive trait shown by *N. subconica* only, but not by *N. falkneri* or any of the extant *Orcula* species. Generally, the shell characteristics of *N. subconica* and *N. falkneri* indicate a close relationship with the orculid genera *Orcula*, *Orculella*, *Sphyradium* and *Schileykula*. Some of the *Orculella* species from Northern Africa (Libya) also exhibit a subangularis (Brandt 1956).

Included species. – *Pupa subconica* Sandberger, 1858 and *Orcula falkneri* Hausdorf, 1995 are placed in *Nordsieckula* herein.

Occurrence. – *Nordsieckula* is known from the Late Oligocene to the Middle Miocene of Central Europe.

***Nordsieckula subconica* (Sandberger, 1858) comb. nov.**
Figure 9I

*1858 *Pupa subconica* Sandb.; Sandberger, p. 51, pl. 5, figs 7–7c.
1868 *Pupa subconica* Sandb. – Reuss, p. 82, pl. 1, fig. 3.
1875 *Pupa* (*Orcula*) *subconica* Sandberger. – Sandberger, p. 394, pl. 23, figs 8–8c.
1889 *Orcula subconica* (Sbgr.). – Boettger, p. 14.
1891 *Orcula subconica* Sandberger. – Klika, p. 88, text-figs 84a–c.
1892 *Orcula subconica* Sandberger. – Klika, p. 84, text-figs 84a–c.
1911 *Orcula subconica* Sandb. – Kafka, p. 68.
1917 *Orcula* cf. *subconica* (Sandberger). – Wenz, p. 64.
1922 *Orcula subconica* (Sandberger). – Pilsbry, p. 3, pl. 4, fig. 10.
1923 *Orcula subconica* (Sandberger). – Wenz, p. 1033 (cum syn.).

Material. – One fragmentary specimen (NHMW 1868/0014/0002) from Tuchořice and one complete shell from Hochheim in Germany (NHMW 1865/0011/0049) (Fig. 9I). A single fragment stored in the Prague collection (NM-PM-P 1094) consists only of few spire whorls and is unidentifiable.

Much more material is stored in the Senckenberg Museum in Frankfurt (Tuchořice: SMF 151718/1; Hochheim: SMF 151713/1, SMF 151714, SMF 151715/2, SMF 151716/2, SMF 151717/3, SMF 185029).

Dimensions. – Hochheim specimen: diameter: 3.6 mm, height: 6.2 mm.

Discussion. – This species seems to be very rare at Tuchořice. Reuss (1868) mentioned four poorly preserved specimens with largely filled apertures. Boettger (1889) confirmed the identification based on a single specimen in his collection. Later, Wenz (1917), based on the same specimen, doubted that the Bohemian shell is fully conspecific with the Oligocene species due to the stronger axial sculpture. The specimen illustrated by Reuss (1868) is still present in the NHMW collection. It consists of 7 spire whorls, which agree in every detail with the specimens from the type locality Hochheim. A difference in axial sculpture, as proposed by Wenz (1917), is definitely not present. Investigations of the rich collection of the Senckenberg Museum by J.H. confirmed that the specimens from both occurrences are conspecific.

Occurrence. – This species is known from the Late Oligocene of Hochheim-Flörsheim (Germany) and from the Burdigalian of Tuchořice.

Clade Elasmognatha Mörch, 1864

Superfamily Succineoidea Beck, 1837
Family Succineidae Beck, 1837
Subfamily Succineinae Beck, 1837

Genus *Oxyloma* Westerlund, 1885

Type species. – *Succinea hungarica* Hazay, 1880 [= *Oxyloma dunkeri* (Pfeiffer, 1865)], by monotypy. Recent, Hungary.

***Oxyloma affinis* (Reuss *in* Reuss & Meyer, 1849) comb. nov.**
Figure 9K–N

1849a *S.*[*uccinea*] *affinis* Rss.; Reuss *in* Reuss & Meyer, p. 11 (nomen nudum).
1849a *Succinea Pfeifferi* Rossm. – Reuss *in* Reuss & Meyer, p. 11 (non *Succinea Pfeifferi* Rossmässler, 1835).
1849b *S.*[*uccinea*] *Pfeifferi* Rossm. – Reuss *in* Reuss & Meyer, p. 18, pl. 1, fig. 2 (non *Succinea Pfeifferi* Rossmässler, 1835).
*1849b *S.*[*uccinea*] *affinis* m.; Reuss *in* Reuss & Meyer, p. 18, pl. 1, fig. 3.
1855 *S.*[*uccinea*] *Pfeifferi* Rossm. – Pictet, p. 31, pl. 57, fig. 26 (non *Succinea Pfeifferi* Rossmässler, 1835).
1861 *S.*[*uccinea*] *affinis* Reuss. – Reuss, p. 63.
1861 *S.*[*uccinea*] *Pfeifferi* Rossm.? – Reuss, p. 63 (non *Succinea Pfeifferi* Rossmässler, 1835).
1875 *Succinea* (*Amphibina*) *affinis* Reuss. – Sandberger, p. 440, pl. 24, figs 21–21b.
1875 *Succinea peregrina* Sandberger; Sandberger, p. 440, pl. 24, figs 22–22b.
1891 *Succinea peregrina* Sandberger. – Klika, p. 99, text-figs 94a, b.
1891 *Succinea affinis* Reuss. – Klika, p. 99, text-figs 95a, b.
1892 *Succinea peregrina* Sandberger. – Klika, p. 94, text-figs 94a, b.
1892 *Succinea affinis* Reuss. – Klika, p. 95, text-figs 95a, b.
1911 *Succinea peregrina* Sndbg. – Kafka, p. 68.
1911 *Succinea affinis* Rss. – Kafka, p. 68.
1916 *Succinea peregrina* Sandberger. – Thuma, p. 84.
1917 *Succinea* (*Amphibina*) *affinis* Reuss. – Wenz, p. 72.
1917 *Succinea* (*Amphibina*) *peregrina* Sandberger. – Wenz, p. 72.
1923 *Succinea* (*Amphibina*) *affinis* Reuss. – Wenz, p. 890 (cum syn.).
1923 *Succinea* (*Amphibina*) *peregrina peregrina* Sandberger. – Wenz, p. 895 (cum syn.).

Material. – 5 specimens (NHMW 2013/0572/0036), 123 specimens (NHMW 1847/0032/0087, 1909/0001/0081, 1909/0001/0080); 4 specimens in the Prague collection (NM-PM-P 586-587 = *Succinea peregrina sensu* Klika, 1891, NM-PM-P 578 = *Succinea affinis sensu* Klika, 1891).

Dimensions. – Diameter: 5.0 mm, height: 9.0 mm (Fig. 9K, L); diameter: 4.8 mm, height: 8.5 mm (Fig. 9M, N).

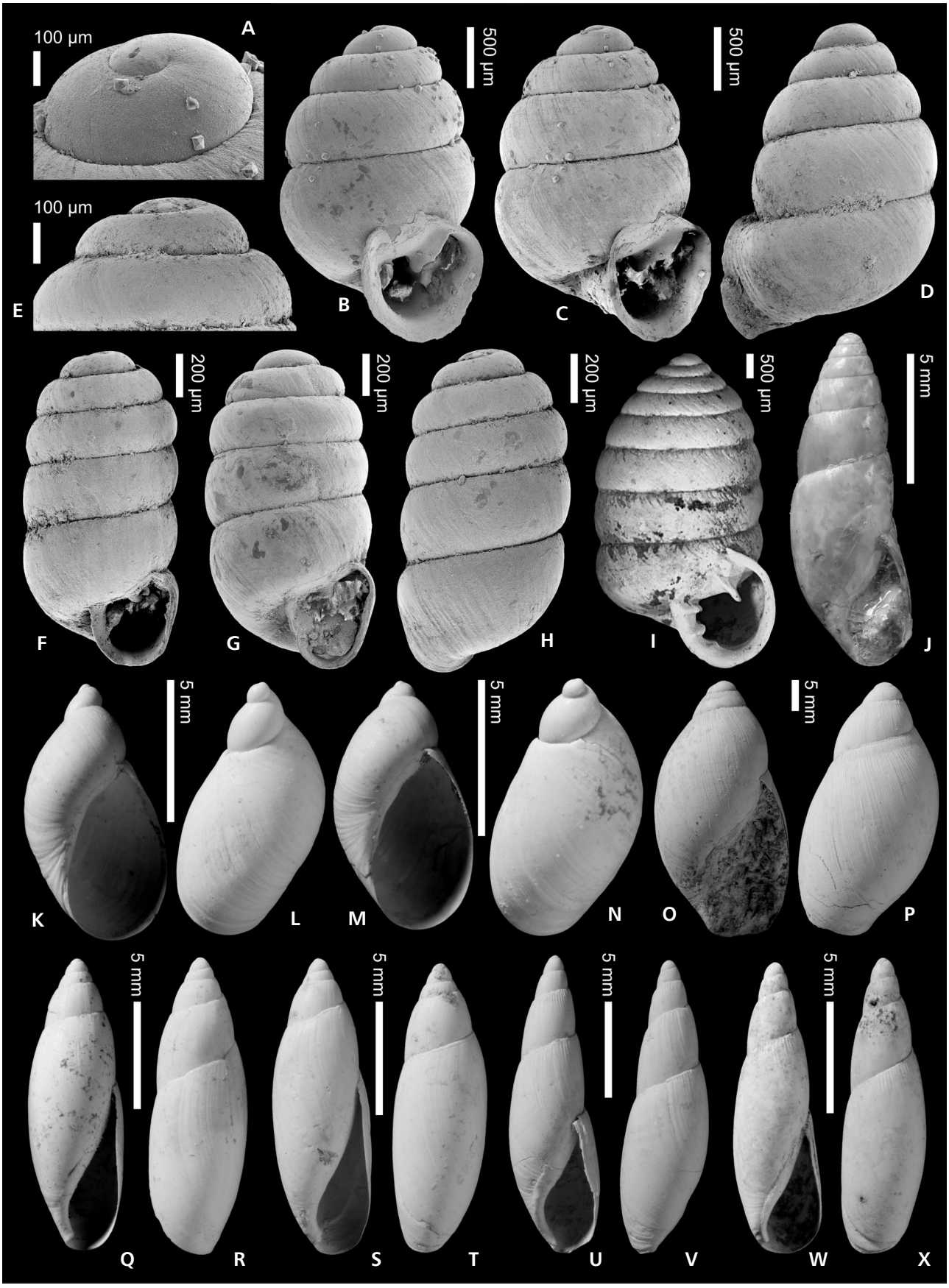
Discussion. – Since Reuss *in* Reuss & Meyer (1849a), the Succineidae from Tuchořice have traditionally been split into two species. A stouter morphotype with low spire, moderately convex whorls, more or less straight columella, wide basal aperture, prominent growth lines and faint spiral grooves was originally identified with the extant *Succinea pfeifferi* Rossmässler, 1835 [= *Oxyloma elegans* (Risso, 1826)]. For this morphotype, Sandberger (1875) introduced *Succinea peregrina* as new name. Shells with higher spire, more convex whorls, slightly concave columella, narrower aperture and overall more delicate sculpture were described as *Succinea affinis* Reuss *in* Reuss & Meyer, 1849. Most authors, such as Sandberger (1875) and Klika (1891), seem to have reproduced the original description of Reuss uncritically. Only Wenz (1917) discussed the possibility that both taxa are morphotypes of a single species. Moreover, both taxa have been recorded so far exclusively from the Most Basin. Within the herein studied material, which comprises more than 120 shells of all ontogenetic stages, none of the above mentioned features qualified as useful criterion. All combinations of the supposed discriminating features appear in the population. Interestingly, many of the fully grown shells show injuries that occurred during early growth stages. Subsequent shell growth was clearly influenced by these injuries, often resulting in more pronounced spiral sculpture and/or a wider last whorl. Therefore, we treat both taxa as a single species for which *Succinea affinis* is the first available name.

Occurrence. – Only known from Korozluky, Tuchořice and Lipno.

Informal group Sigmurethra Pilsbry, 1900b
Superfamily Clausilioidea Gray, 1855

Note. – The generic assignments of species within this superfamily follow Nordsieck (1981a, b, 2000, 2013a).

Figure 9. A–D – *Gastrocopta turgida* (Reuss *in* Reuss & Meyer, 1849), NHMW 2013/0572/0034. • E – *Truncatellina splendidula* (Sandberger, 1875), NHMW 2013/0572/0035 (protoconch of H). • F–H – *Truncatellina splendidula* (Sandberger, 1875), NHMW 2013/0572/0035. • I – *Nordsieckula subconica* (Sandberger, 1858), NHMW 1865/0011/0049 (note that this specimen is from Hochheim, Germany). • J – *Pseudocalaxis*? *insignis* (Babor, 1897), NM-PM-P 450. • K–N – *Oxyloma affinis* (Reuss *in* Reuss & Meyer, 1849), NHMW 2013/0572/0036. • O, P – *Palaeoglandina gracilis* (von Zieten, 1832), NHMW 2013/0572/0040. • Q–T – *Pseudoleacina oligostropha* (Reuss *in* Reuss & Meyer, 1849), NHMW 2013/0572/0041. • U–X – *Pseudoleacina producta* (Reuss *in* Reuss & Meyer, 1849), NHMW 2013/0572/0042.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Family Filholiidae Wenz, 1923

Genus *Triptychia* Sandberger, 1875

Type species. – *Clausilia antiqua* von Zieten, 1832; subsequent designation by Wenz (1923). Early Miocene, Germany.

***Triptychia vulgata* (Reuss *in* Reuss & Meyer, 1849)**
Figure 10A–D

1849a *Clausilia vulgata* Rss.; Reuss *in* Reuss & Meyer, p. 11 (nomen nudum).
*1849b *C.*[*lausilia*] *vulgata* m.; Reuss *in* Reuss & Meyer, p. 34, pl. 4, fig. 1.
1861 *Cl.*[*ausilia*] *vulgata* Reuss. – Reuss, p. 74, pl. 2, fig. 10.
1875 *Clausilia vulgata* Reuss. – Sandberger, p. 434, pl. 24, figs 13–13b.
1877 *Clausilia* (*Triptychia*) *vulgata* Reuss. – Boettger, p. 23.
1891 *Triptychia* (*Plioptychia*) *vulgata* Reuss. – Klika, p. 76, text-figs 73a, b.
1892 *Triptychia* (*Plioptychia*) *vulgata* Reuss. – Klika, p. 73, text-figs 73a, b.
1911 *Triptychia* (*Plioptychia*) *vulgata* Rss. – Kafka, p. 68.
1914 *Clausilia* (*Triptychia*) *vulgata* Reuss. – Frankenberger, p. 156.
1914 [*Clausilia* (*Triptychia*) *vulgata* Reuss] f. *grandis* m. – Frankenberger, p. 157.
1916 *Triptychia* (*Plioptychia*) *vulgata* Reuss. – Thuma, p. 84.
1917 *Triptychia* [sic] (*Plioptychia*) *vulgata*. – Wenz, p. 61.
1923 *Triptychia* (*Plioptychia*) *vulgata* (Reuss). – Wenz, p. 801 (cum syn.).
2006 *Triptychia* (*Plioptychia*) *vulgata* (Reuss 1849). – Schnabel, p. 175, pl. 10, figs 116–119 (cum syn.).
non 1967 *Triptychia* (*Plioptychia*) *vulgata* (Reuss). – Schütt, p. 215 [= *Triptychia* (*Plioptychia*) *schuetti* Schnabel, 2006].

Material. – 2 specimens (NHMW 2013/0572/0037), 11 specimens (NHMW 1890/0013/0411, 1909/0001/0063).

Dimensions. – Diameter: 4.3 mm, height: 18.0 mm (Fig. 10A, B); diameter: 4.5 mm, height: 17.5 mm (Fig. 10C, D).

Description. – This species was discussed in great detail by Schnabel (2006). It is characterised by its moderately stout fusiform shape, a very regular sculpture of densely spaced and sharp axial ribs, a narrow sinulus, a very prominent and protruding parietal lamella (almost perpendicular to the shell axis) and two less prominent, oblique columellar lamellae.

Discussion. – This species is the type species of *Plioptychia* Boettger, 1877, which is based on the palatal plicae of the penultimate whorl, which are developed as transverse folds (Schnabel 2006). As pointed out by Nordsieck (2013a) transitions from normal to transverse folds may occur and therefore the subgeneric status of *Plioptychia* is not accepted.

The Middle Miocene (Sarmatian) shells from Hollabrunn in Austria, identified as *Triptychia* (*Plioptychia*) *vulgata* by Schütt (1967), represent a different species (Schnabel 2006).

Occurrence. – Only known from the Most Basin, where it is documented from Korozluky, Tuchořice, Lipno and Pyšná.

Family Clausiliidae Gray, 1855

Genus *Serrulella* Nordsieck *in* Zilch, 1978

Type species. – *Serrulina truci* Nordsieck, 1972; original designation. Pliocene, Germany.

***Serrulella schwageri* (Boettger, 1877)**
Figure 10E–H

1861 *Cl.*[*ausilia*] *denticulata* Reuss; Reuss, p. 76, pl. 2, fig. 12, pl. 3, fig. 12 (non *Bulimus denticulatus* Olivier, 1801).
*1877 *Clausilia* (*Serrulina*) *Schwageri*; Boettger, p. 73.
1891 *Serrulina schwageri* Boettger. – Klika, p. 79, text-figs 75a, b.
1892 *Serrulina schwageri* Boettger. – Klika, p. 75, text-figs 75a, b.
1911 [*Serrulina*] *Schwageri* Bttg. – Kafka, p. 68.
1914 *Clausilia* (*Serrulina*) *Schwageri* Bttg. – Frankenberger, p. 160.
1917 *Serrulina schwageri* Boettger. – Wenz, p. 62.
1923 *Serrulina schwageri* (Boettger). – Wenz, p. 780 (cum syn.).
1972 [*Serrulina*] *schwageri* (O. Boettger, 1877). – Nordsieck, p. 172.
1981a [*Serrulella*] *schwageri* O. Boettger. – Nordsieck, p. 67.
1981b *Serrulella schwageri* (O. Boettger). – Nordsieck, p. 107.
1999 *Serrulella schwageri* (Boettger). – Esu, p. 332.
2000 [*Serrulella*] *schwageri* (O. Boettger, 1877). – Nordsieck, p. 2.
2007 [*Serrulella*] *schwageri* (O. Boettger, 1877). – Nordsieck, p. 126.

Material. – One specimen (NHMW 1909/0001/0065), one specimen (NHMW 1979/2083/0025).

Dimensions. – Diameter: 2.0 mm, height: 9.8 mm (Fig. 10E, F); diameter: 2.5 mm, height: 10.5 mm (Fig. 10G, H).

Description. – Fusiform shells with weakly convex whorls and moderately detached aperture. Early whorls are smooth; axial ribs appear between the 4th to 6th whorls, becoming successively stronger. The position of the sharp parietal lamella coincides with a deep incision of the adapical part of the aperture. Five about equally spaced parietal and columellar lamellae follow, whilst basal and palatal areas are smooth.

Discussion. – Reuss (1861) introduced this species as *Clausilia denticulata*, overlooking that this name was already preoccupied by the extant *Clausilia denticulata* (Olivier, 1801). Therefore, Boettger (1877) proposed *Clausilia* (*Serrulina*) *Schwageri* as replacement name.

The lack of basal and palatal denticles separates this species from superficially similar clausiliids of the Most Basin such as *Serrulastra* (*Serrulastra*) *amphiodon* (Reuss, 1861) and *Serrulastra* (*Serrustigma*) *polyodon* (Reuss, 1861). Nordsieck (1981a) considers *Serrulella andreaei* Nordsieck, 1981a from Opole as closely related Middle Miocene species.

Occurrence. – Only known from Tuchořice.

Genus *Serrulastra* Nordsieck, 1981
Subgenus *Serrulastra* Nordsieck, 1981

Type species. – *Clausilia amphiodon* Reuss, 1861, original designation. Early Miocene, Czech Republic.

***Serrulastra* (*Serrulastra*) *amphiodon* (Reuss, 1861)**
Figure 10I–L

*1861 *Cl.*[*ausilia*] *amphiodon* Reuss; Reuss, p. 77, pl. 3, fig. 14.
1875 *Clausilia* (*Laminifera*) *amphiodon* Reuss. – Sandberger, p. 436, pl. 24, figs 15–15b.
1877 *Clausilia* (*Serrulina*) *amphiodon* Reuss. – Boettger, p. 72.
1891 *Serrulina amphiodon* Reuss. – Klika, p. 80, text-figs 76a–c.
1892 *Serrulina amphiodon* Reuss. – Klika, p. 76, text-figs 76a–c.
1911 [*Serrulina*] *amphiodon* Rss. – Kafka, p. 68.
1914 *Clausilia* (*Serrulina*) *amphiodon* Reuss. – Frankenberger, p. 160.
1917 *Serrulina amphiodon* (Reuss). – Wenz, p. 62.
1923 *Serrulina amphiodon* (Reuss). – Wenz, p. 777 (cum syn.).
1981a [*Serrulastra* (*Serrulastra*)] *amphiodon* Reuss. – Nordsieck, p. 69.
1981b *Serrulastra amphiodon* (Reuss). – Nordsieck, p. 107.
1999 *Serrulastra amphiodon* (Reuss). – Esu, p. 332.
2000 [*Serrulastra* (*Serrulastra*)] *amphiodon* (Reuss, 1860). – Nordsieck, p. 2.
2007 [*Serrulastra* (*Serrulastra*)] *amphiodon* (Reuss, 1860). – Nordsieck, p. 127, pl. 19, fig. 2.

Material. – One specimen (NHMW 2013/0572/0038), 20 specimens (NHMW 1909/0001/0066, 1979/2083/0024).

Dimensions. – Diameter: 1.75 mm, height: 8.2 mm (Fig. 10I, J); diameter: 1.8 mm, height: 9.0 (Fig. 10K, L).

Description. – Somewhat irregular shells with narrow and smooth spire whorls. Only the two adult whorls develop a narrow axial ribbing, which grades into wider-spaced, sharp and rarely bifurcate ribs on the cervix. Narrow, elongate aperture with numerous lamellae and denticles of which the parietalis and columellaris are slightly more prominent; only the palatal wall below the sinulus lacks denticles (see Klika 1891 for a detailed description).

Discussion. – The small size, the ribbing of the last three teleoconch whorls, the narrow aperture, and the high number of denticles distinguish this species clearly from other clausiliids of the Most Basin.

Occurrence. – Only known from Tuchořice and Lipno.

Subgenus *Serrustigma* Nordsieck, 1981

Type species. – *Clausilia polyodon* Reuss, 1861; original designation. Early Miocene, Czech Republic.

***Serrulastra* (*Serrustigma*) *polyodon* (Reuss, 1861)**
Figure 10M–P

*1861 *Cl.*[*ausilia*] *polyodon* Reuss; Reuss, p. 76, pl. 3, fig. 13.
1875 *Clausilia polyodon* Reuss. – Sandberger, p. 437, pl. 24, figs 16–16c.
1877 *Clausilia* (*Serrulina*) *polyodon* Reuss. – Boettger, p. 293, pl. 13, fig. 5.
1891 *Serrulina polyodon* Reuss. – Klika, p. 77, text-figs 74a, b.
1892 *Serrulina polyodon* Reuss. – Klika, p. 74, text-figs 74a, b.
1911 *Serrulina polyodon* Rss. – Kafka, p. 68.
1914 *Clausilia* (*Serruline* [sic]) *polyodon* Bttg. – Frankenberger, p. 159.
1917 *Serrulina polyodon* (Reuss). – Wenz, p. 61.

1923 *Serrulina polyodon* (Reuss). – Wenz, p. 779 (cum syn.).
1981b *Serrulastra* (*Serrustigma*) *polyodon* (Reuss, 1860). – Nordsieck, p. 98.
1999 *S.*[*errulastra*] *polyodon* (Reuss). – Esu, p. 332.
2000 [*Serrulastra* (*Serrustigma*)] *polyodon* (Reuss, 1860). – Nordsieck, p. 2.
2007 [*Serrulastra* (*Serrustigma*)] *polyodon* (Reuss, 1860). – Nordsieck, p. 127.

Material. – One specimen (NHMW 2013/0572/0039), 4 specimens (NHMW 1890/0013/0412, 1909/0001/0064).

Dimensions. – Diameter: 2.5 mm, height: 11.7 mm (Fig. 10M, N); diameter: 2.7 mm, height: 11.0 mm (Fig. 10O, P).

Description. – Stout fusiform shell characterised by nearly completely smooth surface aside from sharp axial ribs on the cervix. Wide aperture with angulated sinulus and deep incision at the position of the parietal lamella. Parietal and columellar walls bear numerous prominent denticles and lamellae, of which two columellar lamellae are the strongest.

Discussion. – This is the type species of *Serrustigma* Nordsieck, 1981b, which was defined mainly based on its clausilium plate morphology (Nordsieck 1981b).

Occurrence. – Only known from Tuchořice and Lipno.

Subgenus *Serruplica* Nordsieck, 1981

Type species. – *Clausilia ptycholarynx* Boettger, 1877; original designation. Middle Miocene, Czech Republic.

Serrulastra (*Serruplica*) *tuchoricensis* nom. nov.

1914 *Clausilia* (*Serrulina*) *ptycholarynx* Bttg. var. *laevigata* m. – Frankenberger, p. 159 (non *Clausilia laevigata* Potiez & Michaud, 1838).
2007 [*Serrulastra* (*Serruplica*)] *laevigata* Frankenberger. – Nordsieck, p. 127 (non *Clausilia laevigata* Potiez & Michaud, 1838).

Material. – No material was available.

Dimensions. – No measurements were provided by Frankenberger (1914); the specimens seem to be comparable to *Serrulastra* (*Serruplica*) *ptycholarynx* (Boettger, 1877), which has an aperture of about 3 mm in height.

Discussion. – According to Frankenberger (1914), the species from Tuchořice differs from the Middle Miocene *Serrulastra* (*Serruplica*) *ptycholarynx* (Boettger, 1877) only in the absence of sculpture.

As pointed out by Nordsieck (2000, 2007), the name given by Frankenberger (1914) has to be replaced by a new name as it is preoccupied by *Clausilia laevigata* Potiez & Michaud, 1838. Therefore, we propose *Serrulastra* (*Serruplica*) *tuchoricensis* as new name, referring to the locality Tuchořice.

Occurrence. – Only known from Tuchořice.

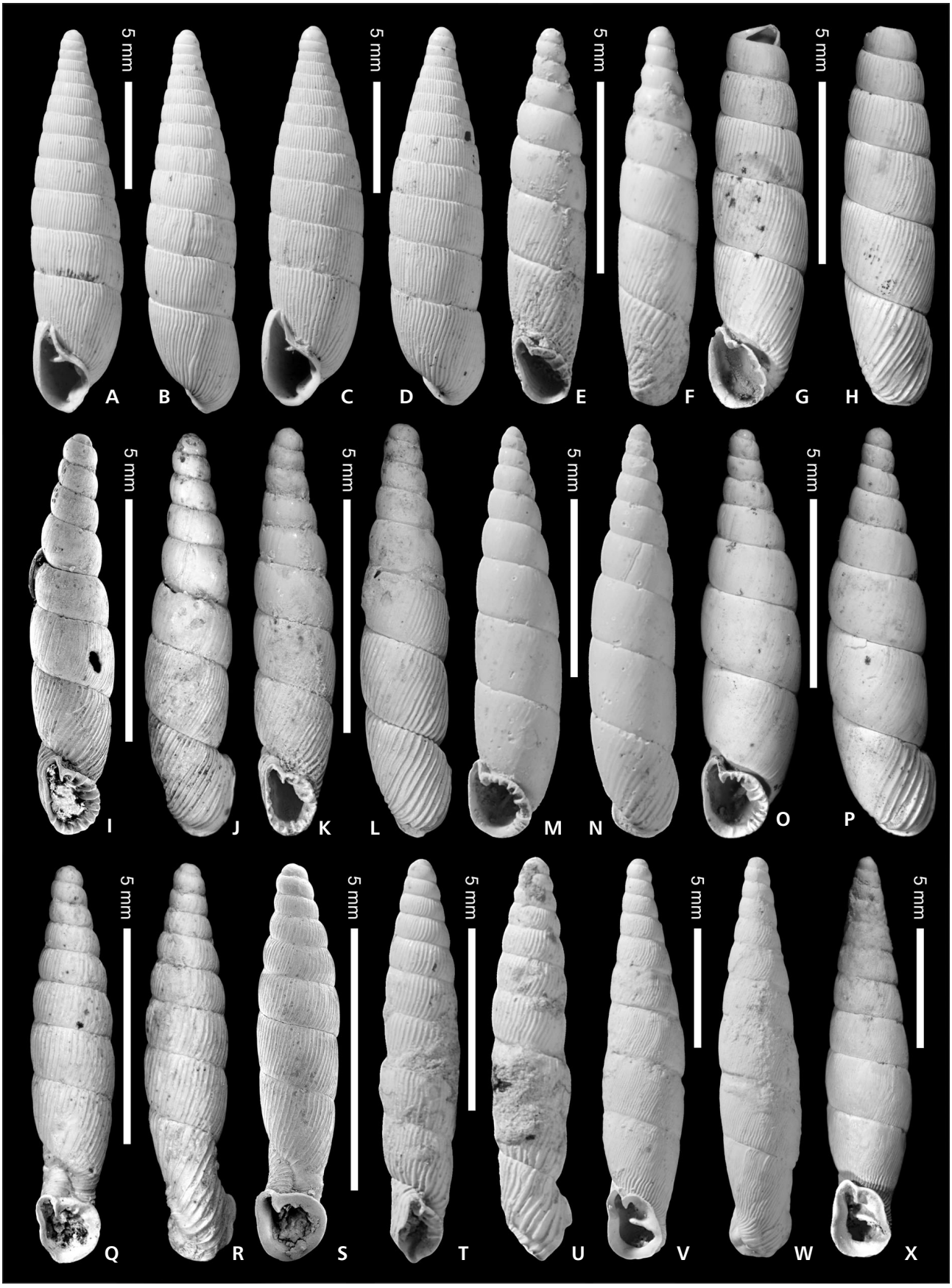
Genus *Laminifera* Boettger, 1863

Type species. – *Clausilia rhombostoma* Boettger, 1863; subsequent designation by Wenz (1923) [note that Boettger (1877) did not designate a type species although this is frequently cited in the literature (*e.g.* Wenz & Zilch 1960)]. Oligocene, Germany.

Laminifera mira (Slavík, 1869)
Figure 10Q–S

*1869a *Clausilia* (*Laminifera*) *mira* sp. nov.; Slavík, p. 255, text-fig. 57.
1869b *Clausilia* (*Laminifera*) *mira* sp. nov.; Slavík, p. 264, text-fig. 57.
1877 *Clausilia* (*Laminifera*) *mira* Slavík. – Boettger, p. 103, pl. 4, figs 41a–c.
1891 *Clausilia* (*Laminifera* Boettg.) *mira* Slavík. – Klika, p. 86, text-figs 82a–c.
1892 *Clausilia* (*Laminifera* Boettg.) *mira* Slavík. – Klika, p. 82, text-figs 82a–c.
1911 [*Clausilia*] (*Laminifera*) *mira* Sl. – Kafka, p. 68.
1914 *Clausilia* (*Laminifera*) *mira* Slavík. – Frankenberger, p. 161.

Figure 10. A–D – *Triptychia vulgata* (Reuss *in* Reuss & Meyer, 1849), NHMW 2013/0572/0037. • E, F – *Serrulella schwageri* (Boettger, 1877), NHMW 1909/0001/0065. • G, H – *Serrulella schwageri* (Boettger, 1877), NHMW 1979/2083/0025. • I, J – *Serrulastra* (*Serrulastra*) *amphiodon* (Reuss, 1861), NHMW 2013/0572/0038. • K, L – *Serrulastra* (*Serrulastra*) *amphiodon* (Reuss, 1861), NHMW 1979/2083/0024. • M, N – *Serrulastra* (*Serrustigma*) *polyodon* (Reuss, 1861), NHMW 2013/0572/0039. • O, P – *Serrulastra* (*Serrustigma*) *polyodon* (Reuss, 1861), NHMW 1909/0001/0064. • Q, R – *Laminifera mira* (Slavík, 1869), NHMW 1909/0001/0069. • S – *Laminifera mira* (Slavík, 1869), NHMW 1979/2083/0027. • T, U – *Canalicia attracta* (Boettger, 1870), NHMW 1909/0001/0068). • V, W – *Constricta tenuisculpta* (Reuss, 1861), NHMW 1909/0001/0067. • X – *Constricta tenuisculpta* (Reuss, 1861), NHMW 1979/2083/0028.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1917 *Laminifera* (*Laminifera*) *mira* (Slavik). – Wenz, p. 63.
1923 *Laminifera* (*Laminifera*) *mira* (Slavik). – Wenz, p. 798.
1981b *Laminifera mira* (Slavik). – Nordsieck, p. 107.
1999 *Laminifera mira* (Slavik). – Esu, p. 332.
2000 [*Laminifera*] *mira* (Slavik, 1869). – Nordsieck, p. 3.
2007 [*Laminifera* (*Laminifera*)] *mira* (Slavik, 1869). – Nordsieck, p. 128.
non 1915 *Clausilia* (*Laminifera*) *mira* Slavik. – Fischer & Wenz, p. 54, pl. 2, figs 9a, b.
non 1977 *Laminifera* (*L.*) *mira.* – Moayedpour, pp. 54, 67.

Material. – One specimen (NHMW 1909/0001/0069), 4 specimens (NHMW 1979/2083/0027).

Dimensions. – Diameter: 2.0 mm, height: 9.2 mm (Fig. 10Q, R); diameter: 1.8 mm, height: 8.8 mm (Fig. 10S).

Discussion. – This species is easily recognised by its slender fusiform shape and the widely detached, subcircular to roughly triangular aperture with wide and regularly concave sinulus, broadened margins and narrow, keeled cervix. Two or three weak lamellae appear between the narrow and prominent parietal lamella and the weak columellaris.

Occurrence. – Known only from Tuchořice. Fischer & Wenz (1915) and Moayedpour (1977) describe this species also from the Early Miocene of Theobaldshof/Rhön (Germany). The illustration in Fischer & Wenz (1915) shows a species with more slender apical whorls, narrower aperture margins and a stronger parietal lamella. Therefore, these specimens are not conspecific with the Bohemian species (see also Nordsieck 2000).

Genus *Baboria* Cossmann, 1898

Type species. – *Clausilia Slavíki* Babor, 1897; original designation. Early Miocene, Czech Republic.

Baboria slaviki (Babor, 1897)

*1897 *Clausilia* (*Cossmannia* subsct. n.) *Slavíki* sp. nov.; Babor, p. 10, text-fig. 4.
1898 *Clausilia slaviki*. – Cossmann, p. 56.
1914 *Clausilia* (*Laminifera, Baboria*) *Slaviki* Babor. – Frankenberger, p. 162.
1917 *Laminifera* (*Baboria*) *slaviki* (Babor). – Wenz, p. 64.
1923 *Laminifera* (*Baboria*) *slaviki* (Babor). – Wenz, p. 795 (cum syn.).
1981b ? *slaviki* (Babor, 1897). – Nordsieck, p. 107.
2000 "*Laminifera*" *slaviki* (Babor, 1897). – Nordsieck, p. 3.
2007 [*Baboria*] *slaviki* (Babor, 1897). – Nordsieck, p. 128.

Material. – No specimens were available. The type is listed in the digital inventory of the National Museum in Prague but could not be found.

Dimensions (after Babor 1897). – Diameter: 2.5 mm, height: 10 mm.

Discussion. – Babor (1897) introduced the subgenus *Cossmannia* for this species, which was preoccupied by Newton (1891). Therefore, Cossmann (1898) proposed *Baboria* as replacement name. The status of this poorly known genus was accepted recently by Nordsieck (2007).

Occurrence. – Only known from Tuchořice.

Genus *Constricta* Boettger, 1877

Type species. – *Clausilia* (*Constricta*) *kochi* Boettger, 1877; subsequent designation by Wenz (1923). Oligocene, Germany.

Constricta tenuisculpta (Reuss, 1861)
Figure 10V–X

*1861 *Cl.*[*ausilia*] *tenuisculpta* Reuss; Reuss, p. 75, pl. 2, fig. 11.
1875 *Clausilia tenuisculpta* Reuss. – Sandberger, p. 435, pl. 24, figs 14–14b.
1877 *Clausilia* (*Constricta*) *tenuisculpta* Reuss. – Boettger, p. 43.
1891 *Clausilia* (*Constricta* Bttg.) *tenuisculpta* Reuss. – Klika, p. 81, text-figs 78a–c.
1892 *Clausilia* (*Constricta* Bttg.) *tenuisculpta* Reuss. – Klika, p. 78, text-figs 78a–c.
1911 [*Clausilia* (*Constricta*)] *tenuisculpta* Rss. – Kafka, p. 68.
1914 *Clausilia* (*Constricta*) *tenuisculpta* Reuss. – Frankenberger, p. 158, text-fig. 2.
1914 *Clausilia* (*Constricta*) *collarifera* Bttg. – Frankenberger, p. 157, text-fig. 1 (non *Clausilia collarifera* Boettger, 1877).
1917 *Constricta tenuisculpta* (Reuss). – Wenz, p. 62.
1923 *Constricta tenuisculpta* (Reuss). – Wenz, p. 770 (cum syn.).
1981b [*Constricta*] *tenuisculpta* (Reuss, 1860). – Nordsieck, p. 99.
1993 *Constricta tenuisculpta* (Reuss, 1861). – Stworzewicz, p. 398.

1999 *Constricta tenuisculpta* (Reuss). – Esu, p. 332.
2000 [*Constricta*] *tenuisculpta* (Reuss, 1860). – Nordsieck, p. 4.
2007 [*Constricta*] *tenuisculpta* (Reuss, 1860). – Nordsieck, p. 129, pl. 18, fig. 2.

Material. – One specimen (NHMW 1909/0001/0067), 10 specimens (NHMW 1979/2083/0028).

Dimensions. – Diameter: 3.5 mm, height: 16.5 mm (Fig. 10V, W); diameter: 3.6 mm, height: 16.9 mm (Fig. 10X).

Discussion. – A very characteristic species which is readily distinguished from all other clausiliids of the Most Basin by it large parietal lamella, the strongly protruding columellaris, the wide and smooth apertural margins and the dense and delicate axial ribbing.

Occurrence. – Known from Tuchořice; an additional occurrence was mentioned by Stworzewicz (1993) from the Burdigalian of Bełchatów (Poland).

Genus *Cochlodina* Férussac, 1821
Subgenus *Miophaedusa* Nordsieck, 1972

Type species. – *Clausilia* (*Dilataria*) *perforata* Boettger, 1877; original designation. Early Miocene, Tuchořice, Czech Republic.

***Cochlodina* (*Miophaedusa*) *perforata* (Boettger, 1877)**
Figure 11A, B

*1877 *Clausilia* (*Dilataria*) *perforata*; Boettger, p. 53, pl. 2, figs 25a–f.
1891 *Clausilia* (*Dilataria* v. Möllend.) *perforata* Boettger. – Klika, p. 83, text-figs 79a–f.
1892 *Clausilia* (*Dilataria* v. Möllend.) *perforata* Boettger. – Klika, p. 79, text-figs 79a–f.
1911 [*Clausilia*] (*Dilataria*) *perforata* Bttg. – Kafka, p. 68.
1914 *Clausilia* (*Dilataria*) *perforata* Bttg. – Frankenberger, p. 159.
1917 *Dilataria perforata* (Boettger). – Wenz, p. 63.
1923 *Charpentieria perforata* (Boettger). – Wenz, p. 759 (cum syn.).
1972 *Miophaedusa perforata*. – Nordsieck, p. 166.
1981a *Miophaedusa perforata* O. Boettger. – Nordsieck, p. 71.
1981b *Cochlodina perforata* (O. Boettger). – Nordsieck, p. 107.
1999 *Cochlodina perforata* (Boettger). – Esu, p. 332.

Figure 11. *Cochlodina* (*Miophaedusa*) *perforata* (Boettger, 1877), holotype, SMF 341913.

2000 *Cochlodina* (*Miophaedusa*) *perforata* (O. Boettger, 1877). – Nordsieck, p. 5.
2007 [*Cochlodina* (*Miophaedusa*)] *perforata* (O. Boettger, 1877). – Nordsieck, p. 130.

Material. – One specimen (holotype: SMF 341913).

Dimensions. – Height: 3.46 mm, width: 2.5 mm.

Discussion. – No material seems to have been found of this small species since the description of Boettger (1877). The holotype – the only available apertural fragment – in the collection of the Senckenberg Museum was restudied by Nordsieck (1981a), who confirmed the relation to *Cochlodina*.

Occurrence. – Only known from Tuchořice.

Genus *Canalicia* Boettger, 1863

Type species. – *Clausilia articulata* (Sandberger, 1863); subsequent designation by Wenz (1923). Oligocene, Germany.

***Canalicia attracta* (Boettger, 1870)**
Figure 10T, U

*1870a *Clausilia* (*Canalicia* Boettg.) *attracta* Boettg.; Boettger, p. 294, pl. 13, figs 5a–d.
1877 *Clausilia* (*Canalicia*) *attracta* Boettger. – Boettger, p. 83.
1891 *Clausilia* (*Canalicia* Boettg.) *attracta* Boettger. – Klika, p. 84, text-figs 81a–d.
1892 *Clausilia* (*Canalicia* Boettg.) *attracta* Boettger. – Klika, p. 81, text-figs 81a–d.

1911 [*Clausilia*] (*Canalicia*?) *attracta* Bttg. – Kafka, p. 68.
1914 *Clausilia* (*Canalicia*) *attracta* Bttg. – Frankenberger, p. 160.
1916 *Clausilia* (*Canalicia*) *attracta* Boettger. – Thuma, p. 84.
1917 *Canalicia attracta* (Boettger). – Wenz, p. 63.
1923 *Canalicia attracta* (Boettger). – Wenz, p. 784.
1981b *Canalicia attracta* (O. Boettger). – Nordsieck, p. 107.
1999 *Canalicia attracta* (Boettger). – Esu, p. 332.
2000 [*Canalicia*] *attracta* (O. Boettger, 1877). – Nordsieck, p. 5.
? 2006 *Canalicia* cf. *attracta* (Boettger), 1870. – Kókay, p. 83, text-fig. 8.
2007 [*Canalicia*] *attracta* (O. Boettger, 1877). – Nordsieck, p. 130.

Material. – One specimen (NHMW 1909/0001/0068).

Dimensions. – Diameter: 2.1 mm, height: 10.9 mm.

Discussion. – Differs from all other clausiliids of the Most Basin in its coarse and partly bifurcate axial ribs, the cord-like basal keel and the canaliculate basal margin.

Occurrence. – Known from Korozluky, Tuchořice and Lipno. An aperture fragment from the Lower Miocene Somlóvásárhely drilling in Hungary described by Kókay (2006) might represent an additional occurrence.

Canalicia klikai (Babor, 1897)

*1897 *Clausilia* (*Serrulina* Mousson) *Klikai* sp. nov.; Babor, p. 14, text-fig. 5.
1914 *Clausilia* (*Canalicia*) *Klikai* Babor. – Frankenberger, p. 161.
1917 *Canalicia klikai* (Babor). – Wenz, p. 63.
1923 *Canalicia klikai* (Babor). – Wenz, p. 786.
2000 [*Canalicia*] *klikai* (Babor, 1897). – Nordsieck, p. 5.
2007 [*Canalicia*] *klikai* (Babor, 1897). – Nordsieck, p. 130.

Material. – No material was available.

Dimensions (after Babor 1897). – Diameter: 1.5 mm, height: 13 mm.

Discussion. – Differs from *Canalicia attracta* (Boettger, 1870) in its wider aperture with convex left margin.

Occurrence. – Only known from Tuchořice.

Superfamily Achatinoidea Swainson, 1840
Family Ferussaciidae Bourguignat, 1883

Genus *Pseudocalaxis* Pallary, 1912

Type species. – *Pseudocalaxis terebellum* Pallary, 1912; subsequent designation by Zilch *in* Wenz & Zilch (1959). Recent, Egypt.

Pseudocalaxis? *insignis* (Babor, 1897)
Figure 9J

*1897 *Férussacia insignis* sp. nov.; Babor, p. 8, text-fig. 3.
1908a *Ferussacia insignis* Babor. – Pilsbry, p. 218.
1917 *Ferussacia* (*Pseudazeca*) *insignis* Babor. – Wenz, p. 71.
1923 *Ferussacia* (*Ferussacia*) *insignis* Babor. – Wenz, p. 1084 (cum syn.).

Material. – One specimen (NM-PM-P 450).

Dimensions. – Diameter: 4.5 mm, height: 13 mm.

Description. – A single specimen is known so far. It is slender with weakly convex whorls, narrow sutures and glossy surface despite distinct growth lines. The last whorl attains slightly more than half of the total height. Moderately wide, drop-shaped aperture with deeply concave columella, truncated at the base, and a delicate inner lip. The inner parts of the aperture are completely sealed by sediment and glue.

Discussion. – Pilsbry (1908a) considered *Ferussacia insignis* to be related with the extant *F. folliculum* (Schröter, 1784). This generic affiliation, which was first proposed by Babor (1897), critically discussed by Wenz (1917) and accepted again by Wenz (1923), is very unlikely.

The species has little in common with extant species of *Ferussacia* Risso, 1826, such as *F. folliculum* and *F. carnea* (Risso, 1826), which are clearly more bullet-shaped and have a much higher last whorl. Even the very slender *Ferussacia lanzarotensis* (Mousson, 1872) lacks the deep concavity of the columella. Aside from the morphologic differences, the huge stratigraphic gap between the Early Miocene and the Pliocene, when the first true *Ferussacia* species appear, raises doubts on the identification. The overall shape of the Bohemian shell is strongly reminiscent of *Cecilioides*, but differs from species of this genus in its much larger size and the distinctly less bulbous protoconch.

Among the extant Ferussaciidae only the African genus *Pseudocalaxis* agrees insize, shape and apertural features with the Bohemian shell. This generic placement is provisionally and remains problematic, because we cannot exclude that the similarities are convergent. The disjunct geo-

graphic occurrence – Miocene in Europe versus Recent in Africa – is no a-priori argument against the identification, as documented by the occurrence of *Negulus* (van Bruggen, 1994). In any case, it would be unwise to establish a new genus for this species, due to the lack of information on apertural features.

Occurrence. – Only known from Tuchořice.

Superfamily Testacelloidea Gray, 1840
Family Oleacinidae H. & A. Adams, 1855

Genus *Palaeoglandina* Wenz *in* Fischer & Wenz, 1914

Type species. – *Limnaea gracilis* von Zieten, 1832; original designation. Early Miocene, Germany.

***Palaeoglandina gracilis* (von Zieten, 1832)**
Figure 9O–P

*1832	*Limnaea gracilis* nobis; von Zieten, p. 39, pl. 30, figs 3a, b.
1849a	*A.*[*chatina*] *inflata* Rss.; Reuss *in* Reuss & Meyer, p. 11 (nomen nudum).
1849b	*A.*[*chatina*] *inflata* m.; Reuss *in* Reuss & Meyer, p. 33, pl. 3, fig. 14.
1855	*Achatina inflata* Reuss. – Pictet, p. 27, pl. 57, fig. 17.
1861	*Gl.*[*andina*] *inflata* Reuss. – Reuss, p. 69.
1875	*Glandina inflata* Reuss. – Sandberger, p. 408, pl. 21, figs 18, 18a.
1891	*Glandina inflata* Reuss. – Klika, p. 20, text-fig. 12.
1891	*Glandina inflata* Reuss. – Maillard, p. 4, pl. 1, fig. 3.
1892	*Glandina inflata* Reuss. – Klika, p. 20, text-fig. 12.
1911	*Glandina inflata* Reuss. – Jooss, p. 52.
1911	*Glandina inflata* Rss. – Kafka, p. 67.
1914	*Poiretia* (*Palaeoglandina*) *gracilis* (Zieten). – Wenz *in* Fischer & Wenz, p. 38.
1917	*Poiretia* (*Palaeoglandina*) *gracilis* (Zieten). – Wenz, p. 52.
1923	*Poiretia* (*Palaeoglandina*) *gracilis gracilis* (Zieten). – Wenz, p. 839.
1930	*Palaeoglandina gracilis* (Zieten). – Pfeffer, p. 210, pl. 3, figs 6, 7.
2004	*Palaeoglandina inflata* (Reuss). – Binder, p. 201.

Material. – 2 specimens (NHMW 2013/0572/0040), 9 specimens (NHMW 1896/0034, 1909/0001/0008, 1909/0001/0007).

Dimensions. – Diameter: 22 mm, height: 42 mm.

Discussion. – The first illustration of *Palaeoglandina gracilis* from the Early Miocene of Ulm in von Zieten (1832) shows a very high-spired, elongate shell with acute spire. Similarly, the better drawn specimen from Ulm in Klein (1846) shows a high-spired species. Therefore, it seemed unlikely that the stout Early Miocene *Achatina inflata* Reuss, 1849 should represent a synonym. Comparisons of specimens from the Mainz Basin and those from the Most Basin by Pfeffer (1930), however, confirmed that both taxa are conspecific as already proposed by Wenz *in* Fischer & Wenz (1914) and Wenz (1923).

Occurrence. – A widespread species in the Late Oligocene and Early Miocene of Germany, Switzerland and France (Wenz 1923); in the Most Basin it is documented from Tuchořice and Lipno.

Genus *Pseudoleacina* Wenz *in* Fischer & Wenz, 1914

Type species. – *Achatina sandbergeri* Thomä, 1845; original designation. Late Oligocene, Germany.

***Pseudoleacina oligostropha* (Reuss *in* Reuss & Meyer, 1849)**
Figure 9Q–T

1849a	*A.*[*chatina*] *Sandbergeri* Thom. – Reuss *in* Reuss & Meyer, p. 11 (non *Achatina Sandbergeri* Thomä, 1845).
1849a	*Achatina oligostropha* Rss.; Reuss *in* Reuss & Meyer, p. 11 (nomen nudum).
1849b	*A.*[*chatina*] *Sandbergeri* Thom. – Reuss *in* Reuss & Meyer, p. 32, pl. 3, fig. 11 (non *Achatina Sandbergeri* Thomä, 1845).
*1849b	*A.*[*chatina*] *oligostropha* m.; Reuss *in* Reuss & Meyer, p. 33, pl. 3, fig. 13.
1861	*Gl.*[*andina*] *Sandbergeri* Thom. – Reuss, p. 70 (non *Achatina Sandbergeri* Thomä, 1845).
1861	*Gl.*[*andina*] *oligostropha* Reuss. – Reuss, p. 70.
1891	*Oleacina neglecta* n.; Klika, p. 21, text-fig. 13.
1891	[*Oleacina neglecta*] var. *subcylindrata* Bttgr.; Boettger, p. 229.
1892	*Oleacina neglecta* Klika. – Klika, p. 21, text-fig. 13.
1911	*Oleacina neglecta* Kl. – Kafka, p. 67.
1914	*Poiretia* (*Pseudoleacina*) *sandbergeri* (Tho.). – Wenz, p. 52 (pars).
1916	*Oleacina neglecta* Klika. – Thuma, p. 83.
1917	*Poiretia* (*Pseudoleacina*) *neglecta* Klika. – Wenz, p. 52.
1923	*Poiretia* (*Pseudoleacina*) *oligostropha oligostropha* (Reuss). – Wenz, p. 860 (cum syn.).
1923	*Poiretia* (*Pseudoleacina*) *oligostropha subcylindrata* (Boettger). – Wenz, p. 861.
1930	*Pseudoleacina oligostropha* (Reuss). – Pfeffer, p. 212.

non 1977 *Pseudoleacina oligostropha* (Reuss). – Moayedpour, p. 68, pl. 7, figs 2, 3.
non 1999 *Pseudoleacina* (*Paraglandina*) *oligostropha* (Reuss). – Esu, p. 332.

Material. – 2 specimens (NHMW 2013/0572/0041), 149 specimens (NHMW 1890/0013/0407, 1909/0001/0009).

Dimensions. – Diameter: 4.5 mm, height: 13.6 mm (Fig. 9Q, R); diameter: 4.3 mm, height: 13.3 mm (Fig. 9S, T).

Discussion. – Reuss *in* Reuss & Meyer (1849) considered the specimens from the Most Basin to be conspecific with *Achatina sandbergeri* Thomä, 1845 from the Chattian of Hochheim (Germany). This decision was also supported by the illustration of a Bohemian shell in which the growth lines and the spiral grooves are strongly overemphasised, suggesting an almost cancellate sculpture. Wenz (1917), however, pointed out that a separation of both species can be based on the nearly smooth shells of *P. oligostropha*. Boettger (1891) separated some rare narrower and more cylindrical shells as variation *P. subcylindrata*. Such morphologies are also found in our material but represent only slender morphotypes.

Klika (1891) recognised the specimen described as *Achatina oligostropha* by Reuss (*in* Reuss & Meyer 1849) as a juvenile shell. Neglecting the rules of priority, he introduced *Oleacina neglecta* as new name for the adult shells of the very same species. Therefore, *Oleacina neglecta* Klika, 1891 is a subjective junior synonym of *Achatina oligostropha* Reuss.

Esu (1999) assigned this species to the subgenus *Paraglandina* Pfeffer, 1930. The type species of this (sub)genus is the Late Oligocene *Paraglandina confusa* Pfeffer, 1930 by monotypy. It is characterised by its high spire, incised sutures and a blunt axial ribbing, bearing little in common with *Pseudoleacina oligostropha*. The specimens from the Early Miocene of Theobaldshof/Rhön (Germany) mentioned by Moayedpour (1977) differ in their stouter shape, the lower last whorl, the thin and narrow columellar lip and the deeper concavity of the columella.

Occurrence. – Only known from Korozluky, Tuchořice, Lipno and Pyšná.

Pseudoleacina producta (Reuss *in* Reuss & Meyer, 1849)

Figure 9U–X

1849a *A.*[*chatina*] *producta* Rss.; Reuss *in* Reuss & Meyer, p. 11 (nomen nudum).
*1849b *A.*[*chatina*] *producta* m.; Reuss *in* Reuss & Meyer, p. 32, pl. 3, fig. 12.
1861 *Gl.*[*andina*] *producta* Reuss. – Reuss, p. 70.
1875 *Oleacina producta* Reuss. – Sandberger, p. 444, pl. 24, figs 29, 29a.
1891 *Oleacina producta* Reuss. – Klika, p. 23, text-fig. 14.
1892 *Oleacina producta* Reuss. – Klika, p. 22, text-fig. 14.
1897 *Oleacina producta* Reuss var. *emphysematica* n. – Babor, p. 2.
1897 *Oleacina subsulcosa* (Thomae). – Babor, p. 17 (non *Achatina subsulcosa* Thomä, 1845).
1911 [*Oleacina*] *producta* Rss. – Kafka, p. 67.
1917 *Poiretia* (*Pseudoleacina*) *producta* (Reuss). – Wenz, p. 53.
1923 *Poiretia* (*Pseudoleacina*) *producta producta* (Reuss). – Wenz, p. 861 (cum syn.).
1923 *Poiretia* (*Pseudoleacina*) *producta emphysematica* (Babor). – Wenz, p. 862 (cum syn.).
1930 *Pseudoleacina producta* (Reuss). – Pfeffer, p. 213.
non 2006 *Pseudoleacina* (*Pseudoleacina*) *producta* (Reuss), 1849 var. – Kókay, p. 85, pl. 32, figs 6, 7.

Material. – 2 specimens (NHMW 2013/0572/0042), 160 specimens (NHMW 1890/0013/0407, 1909/0001/0010, 1909/0001/0098).

Dimensions. – Diameter: 4.9 mm, height: 15.8 mm (Fig. 9U, V); diameter: 4.0 mm, height: 12.5 mm (Fig. 9W, X).

Discussion. – A very characteristic and common species, with very high spire, strongly oblique sutures and strong axial ribs closely below the sutures. These ribs fade out quickly and grade into faint growth lines in the lower two thirds of the whorls. These features and the slender-bullet shaped outline allow a clear separation from *Pseudoleacina oligostropha* even for juvenile shells. Similarly, the record of *Oleacina subsulcosa* (Thomä, 1845) from Pyšná in a list of Babor (1897) might be based on strongly sculptured species of *Pseudoleacina producta* or *P. oligostropha*. The type specimen of *Oleacina producta* var. *emphysematica* Babor, 1897 does not justify any separation from *Pseudoleacina producta*.

The Early Miocene Hungarian specimens, identified by Kókay (2006) as variety of *Pseudoleacina producta*, are clearly not conspecific with the Bohemian species. They differ in their much broader shells and the completely different type of axial sculpture. A further occurrence in the late Early Miocene of Vermes near Delsberg (= Delémont, Switzerland), described by Maillard (1891), is most probably not conspecific based on its stepped spire and higher aperture.

Poiretia (*Pseudoleacina*) *producta* (Rss.) var. *subcylindrica* Wenz *in* Fischer & Wenz, 1915, from the Late Oligocene of Hochheim, was later transferred to *P.* (*P.*) *sandbergeri* by Wenz (1923).

This species has a striking counterpart in the Recent *Sardopoiretia emanueli* Bodon, Nardi, Braccia &

Cianfanelli, 2010 from Sardinia, which differs in its more prominent and continuous axial sculpture and the lower protoconch and more convex first teleoconch whorl.

Occurrence. – Only known from Tuchořice, Lipno and Pyšná.

Superfamily Punctoidea Morse, 1864
Family Punctidae Morse, 1864

Genus *Punctum* Morse, 1864

Type species. – *Helix minutissima* Lea, 1841, by monotypy. Recent, North America.

***Punctum propygmaeum* Andreae, 1904**
Figure 12A–E

*1904 *Punctum propygmaeum* sp. nov.; Andreae, p. 6, fig. 4.
1923 *Punctum propygmaeum propygmaeum* Andreae. – Wenz, p. 349.

Material. – 102 specimens (NHMW 2013/0572/0043).

Dimensions. – Diameter: 1.2 mm, height: 0.72 mm (Fig. 12A); diameter: 0.8 mm, height: 1.3 mm.

Description. – Tiny shell with low conical spire and regularly convex whorls. The moderately convex protoconch has a diameter of 400 µm and displays a faintly malleated initial part; the following whorl is smooth on its adapical half and bears more or less developed spiral striae on its lower half, being most prominent close to the lower suture. The teleoconch is entirely covered by faint spiral threads which are crossed by weak, slightly sigmoidal growth lines. The spiral sculpture is weakest close to the upper suture and in the umbilical region. The umbilicus is deep and open; peristome thin with slightly widened inner lip.

Discussion. – The Miocene representatives are usually identified as *Punctum propygmaeum* Andreae, 1904 and *P. parvulum* Gottschick, 1920 (Gottschick 1920a). Both taxa are known mainly from late Middle Miocene (Serravallian; late Badenian and Sarmatian) sections of Poland, Germany and Austria. SEM studies of *Punctum parvulum* from Steinheim in Finger (1998) document that this species is different from Late Miocene shells of the Vienna Basin, treated as *P. propygmaeum* by Lueger (1981). As comparable studies on topotypic material from Opole in Poland are missing so far, the relation between all these taxa remains unclear. The Middle Miocene (Sarmatian) *Punctum parvulum* Gottschick, 1920 from Steinheim in Germany *sensu* Finger (1998) differs clearly in its much coarser growth lines and the broader and more prominent striae on the protoconch. In addition, specimens from the Sarmatian of Austria, identified as *P. parvulum* by Harzhauser *et al.* (2008), have a much more prominent spiral sculpture on the teleoconch. *Punctum oligocaenicum* was described by Zinndorf (1901) from the Oligocene of Offenbach in Germany. This species differs from the Bohemian and Middle Miocene *Punctum* species in its down-bent aperture; in fact this species might not even belong to *Punctum*.

Judging from the description and illustration given by Andreae (1904), the Bohemian shells agree in size and outline with those from Opole and therefore we tentatively assign the specimens to *P. propygmaeum*.

Occurrence. – *P. propygmaeum* was originally described from the late Middle Miocene (MN7/8) from Opole in Poland. This tiny species has not been mentioned from the Most Basin so far and is recorded there only from Tuchořice.

Family Discidae Thiele, 1931 (1866)

Genus *Discus* Fitzinger, 1833

Type species. – *Helix ruderata* Hartmann, 1821; subsequent designation by Gray (1847). Recent, Europe.

***Discus bohemicus* (Wenz *in* Fischer & Wenz, 1914)**
Figure 12I–K

1868 *Helix multicostata* Thom. – Reuss, p. 81, pl. 1, fig. 2 (non *Helix multicostata* Thomä, 1845).
1891 *Patula multicostata* Thomae. – Klika, p. 39, text-figs 31a–d (non *Helix multicostata* Thomä, 1845).
1892 *Patula multicostata* Thomae. – Klika, p. 38, text-figs 31a–d (non *Helix multicostata* Thomä, 1845).
*1914 *Pyramidula* (*Goniodiscus*) *bohemica* sp. nov.; Wenz *in* Fischer & Wenz, p. 57.
1917 *Pyramidula* (*Goniodiscus*) *bohemica* Wenz. – Wenz, p. 55.
1923 *Gonyodiscus* (*Gonyodiscus*) *bohemicus* Wenz. – Wenz, p. 325 (cum syn.).
1964 *Pyramidula* (*Gonyodiscus*) *euglypha* (Reuss, 1849). – Čtyroký *et al.*, p. 137, fig. 2 (non *Helix euglypha* Reuss *in* Reuss & Meyer, 1849).

Material. – 2 specimens (NHMW 2013/0572/0044), 25 specimens (NHMW 1909/0001/0026).

Dimensions. – Diameter: 4.2 mm, height: 2.1 mm (Fig. 12J); diameter: 4.1 mm, height: 1.58 mm (Fig. 12I, K).

Discussion. – This species was originally intermingled with the Oligocene *Discus multicostatus* (Thomä, 1845). As pointed out by Wenz *in* Fischer & Wenz (1914), the Bohemian species differs from the older one in its narrower coiling, deeper sutures and regularly convex whorls, lacking a keel or angulation. The text in Reuss (1868) is misguiding as he mentioned shells of up to 11 mm diameter and 5 mm height. *Discus bohemicus,* however, is always much smaller ranging around 4–4.5 mm in diameter. Maybe Reuss (1868) had a small specimen of the then undescribed *Pleurodiscus falciferus* (Boettger, 1870) at hand.

The shell described as *Pyramidula* (*Gonyodiscus*) *euglypha* by Čtyroký *et al.* (1964) from the Kralupy drilling in the Most Basin is rather *Discus bohemicus* based on its large bulbous protoconch, the dense axial ribbing and the deeply incised sutures.

Occurrence. – Only known from Tuchořice and the drilling at Kralupy.

Discus euglyphus (Reuss *in* Reuss & Meyer, 1849)

Figure 12L–N

1849a *H.*[*elix*] *euglypha* Rss.; Reuss *in* Reuss & Meyer, p. 11 (nomen nudum).
*1849b *H.*[*elix*] *euglypha* m.; Reuss *in* Reuss & Meyer, p. 22, pl. 1, fig. 12.
1861 *H.*[*elix*] *euglypha* Reuss. – Reuss, p. 63.
1875 *Patula euglypha* Reuss. – Sandberger, p. 427 (pars).
1891 *Patula euglypha* Reuss. – Klika, p. 37, text-figs 29a–c.
1892 *Patula euglypha* Reuss. – Klika, p. 36, text-figs 29a–c.
1894 *Patula Diezi* sp. nov.; Clessin, p. 30.
1911 [*Patula*] *euglypha* Rss. – Kafka, p. 67.
1916 [*Patula*] *euglypha* Reuss. – Thuma, p. 83.
1917 *Pyramidula* (*Gonyodiscus*) *euglypha* (Reuss). – Wenz, p. 56.
1918 *Pyramidula* (*Gonyodiscus*) *euglypha* (Reuss). – Wenz, p. 8.
1923 *Gonyodiscus* (*Gonyodiscus*) *diezi* (Clessin). – Wenz, p. 327.
1923 *Gonyodiscus* (*Gonyodiscus*) *euglyphus* Reuss. – Wenz, p. 328.
1930 *Goniodiscus euglyphus* Reuss. – Pfeffer, p. 42.
1999 *Discus* (*Discus*) *euglyphus* (Reuss). – Esu, p. 332.
non 1863 *Helix* (*Patula*) *euglypha* Reuss. – Sandberger, p. 389, pl. 35, figs 18, 18a (= *Patula sandbergeri* Clessin, 1894).
non 1863 *Patula* (*Charopa*) *euglypha* Reuss. – Sandberger, p. 373, pl. 24, figs 3, 3a (= *Patula sandbergeri* Clessin, 1894).
non 1864 *Helix euglypha* Reuss. – Deshayes, p. 820, pl. 9, figs 33–36 (= *Patula sandbergeri* Clessin, 1894).
non 1964 *Pyramidula* (*Gonyodiscus*) *euglypha* (Reuss, 1849). – Čtyroký *et al.*, p. 137, fig. 2 [= *Discus bohemicus* (Wenz *in* Fischer & Wenz, 1914)]
non 1977 *Discus* (*Discus*) *euglyphus* (Reuss). – Moayedpour, p. 65, pl. 5, figs 5–9 (is probably *D. rasseri* sp. nov.).

Material. – 2 specimens (NHMW 2013/0572/0045), 430 specimens (NHMW 1909/0001/0024).

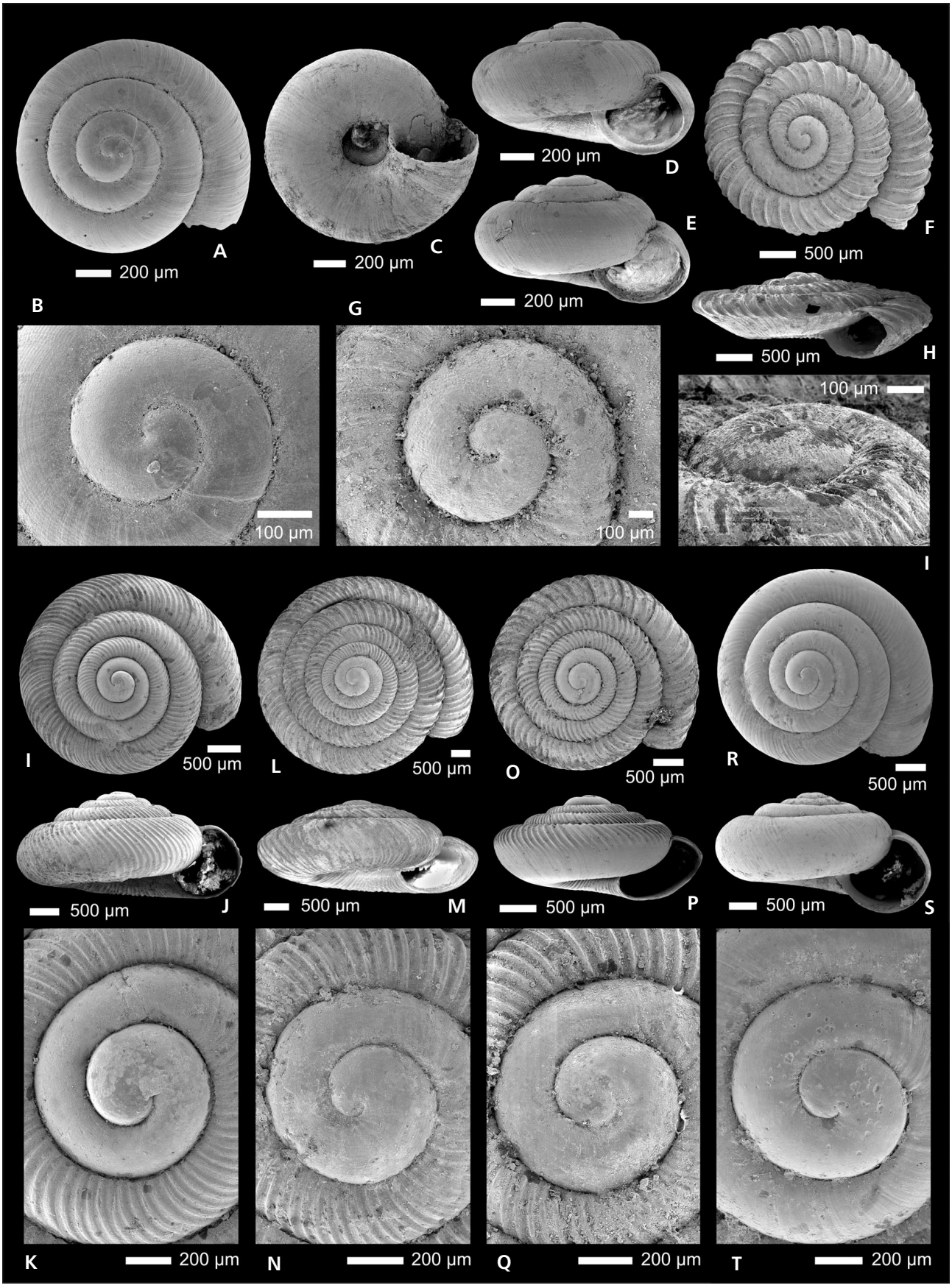
Dimensions. – Diameter: 4.55 mm, height: 1.9 mm (Fig. 12M); diameter: 4.3 mm, height: 1.8 mm (Fig. 12L, N).

Discussion. – Differs from *Discus bohemicus* clearly in its lower shell, the less numerous but stronger axial ribs and the more or less developed angulation along the periphery. In addition, its protoconch is less convex and bears several somewhat irregular spiral grooves, which are deepest close to the lower suture. The strong and sigmoidal ribs on the base are a characteristic feature.

When describing the Early/Middle Miocene MN5 faunas from Undorf, Clessin (1894) discussed also several Oligocene and Early Miocene taxa, including the Discidae from Tuchořice. He concluded that the Diez-collection contains a then undescribed species, which he named *Patula Diezi*. His description was mainly focussed on differences from *Discus euglyphus* and lacks an illustration and even data on the size of this new species. Clessin (1894) emphasised the low spire, wide umbilicus, a delicate and dense axial ribbing and the absence of an angulation. The rich material of the NHM collection documents that the angulation and spire height of *D. euglyphus* is quite variable and morphotypes as described by Clessin (1894) range well within *D. euglyphus*.

Occurrence. – Known from Korozluky, Tuchořice and Lipno. Further occurrences from the Early Miocene of Donaurieden and Theobaldshof/Rhön in Germany need

Figure 12. A–E – *Punctum propygmaeum* Andreae, 1904, NHMW 2013/0572/0043. • F–H – *Manganellia alata* (Klika, 1891), NHMW 2013/0572/0051. • I, J – *Discus bohemicus* (Wenz *in* Fischer & Wenz, 1914), NHMW 2013/0572/0044. • K – protoconch of *Discus bohemicus,* same specimen as I. • L, M – *Discus euglyphus* (Reuss *in* Reuss & Meyer, 1849), NHMW 2013/0572/0045. • N – protoconch of *Discus euglyphus*, same specimen as L. • O – *Discus rasseri* sp. nov., NHMW 2013/0572/0047 (paratype 1). • P – *Discus rasseri* sp. nov., NHMW 2013/0572/0046 (holotype). • Q – *Discus rasseri* sp. nov., NHMW 2013/0572/0048 (paratype 2). • R, S – *Discus stenospira* (Reuss *in* Reuss & Meyer, 1849), NHMW 2013/0572/0050. • T – protoconch of *Discus stenospira*, same specimen as R.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confirmation and are partly misidentifications (*e.g.* Moayedpour 1977).

Discus rasseri Harzhauser, Neubauer & Georgopoulou sp. nov.

Figure 12O–Q

? 1977 *Discus* (*Discus*) *euglyphus* (Reuss). – Moayedpour, p. 65, pl. 5, figs 5–9 (non *Helix euglypha* Reuss *in* Reuss & Meyer, 1849).

Types. – Holotype (NHMW 2013/0572/0046): diameter: 2.95 mm, height: 1.55 mm (Fig. 12P); paratype 1 (NHMW 2013/0572/0047): diameter: 3.05 mm, height: 1.55 mm (Fig. 12O); paratype 2 (NHMW 2013/0572/0048): diameter: 2.95 mm, height: 1.55 mm (Fig. 12Q).

Material. – 280 specimens (NHMW 1909/0001/0027).

Etymology. – In honour of Michael W. Rasser, palaeontologist at the Stuttgart State Museum of Natural History.

Diagnosis. – Small shell with striate protoconch, low conical spire, a distinct angulation in the upper third of the last whorl and a weakly convex lower part, causing a bowl-like outline. Prominent axial ribbing, which fades out quickly along the angulation and re-appears as narrow rim close to the umbilicus.

Description. – Raised protoconch consisting of 1.5 convex whorls (850 µm diameter) with densely-spaced but very faint spiral threads, which are best developed in the lower half of the whorl. Teleoconch comprising 3.5 whorls; the spire displays some variability in height, ranging from low conical to nearly flat; sutures deeply incised. The first two teleoconch whorls bear regularly spaced, very prominent, prosocline-prosocyrt axial ribs, slightly narrower than the smooth interspaces. On the last whorl the interspaces become gradually wider and growth lines become stronger. A distinct angulation along the periphery separates the upper third of the last whorl from the weakly convex, rapidly contracting lower part. The axial ribs persist down to the angulation and are strongly prosocline; below the periphery they fade out quickly, passing into faint, slightly opisthocyrt growth lines and re-appear as distinct fold-like ribs again very close to the deep, sub-cylindrical umbilicus. Aperture semi-circular, moderately narrow with smooth peristome.

Discussion. – This species was erroneously identified in the NHM collection as *Janulus densestriatus* (Klika, 1891) and most probably it was also intermingled with this species in the literature. Despite some similarities in sculpture and shell outline, a placement within *Janulus* Lowe, 1852 is excluded based on the absence of any palatal teeth. Partly, this species was probably also mistaken for *Discus euglyphus* (*e.g.* specimens from the Early Miocene of Theobaldshof/Rhön in Moayedpour 1977). The Bohemian *Discus rasseri* species differs from *D. euglyphus* clearly in the strength and the higher position of the angulation, the narrower umbilicus and the weak axial ribs on the base. In addition, the semi-circular, strongly oblique aperture differs considerably from the wide and circular aperture of *D. euglyphus.* These features allow also a clear separation of the specimens of Moayedpour (1977) from *D. euglyphus*. The poor preservation, however, does not allow a decision whether these shells are conspecific with the Bohemian ones.

Morphologically, the Bohemian species is very close to *Patula gyrorbis* Klein *sensu* Sandberger, 1875 (p. 454, pl. 21, figs 7–7b). A separation of *D. rasseri* from this Oligocene and Early Miocene German species is based on the much smaller size (about half of the diameter), the less numerous and wider spaced ribs on the upper shell surface and on the lower number of teleoconch whorls (3.5 versus 5.5). As pointed out by Manganelli *et al.* (2011), *Helix gyrorbis* Klein, 1846 (p. 72, pl. 1, figs 14a–c) is obviously not conspecific with *Patula gyrorbis* Klein *sensu* Sandberger, 1875. Moser *et al.* (2009) consider the latter species to represent the genus *Janulus,* but no information on internal denticles is available so far. Therefore, we tentatively treat it as a member of the Discidae.

The Middle Miocene *Discus costatus* Gottschick *sensu* Finger, 1998 is also very similar to the Bohemian species. It differs in its smaller protoconch diameter (700 µm versus 800 µm), the higher spire, the less abrupt termination of the axial ribs, and the deeper position of the angulation. The original illustration of *Discus costatus* in Gottschick (1911, p. 501, pl. 7, figs 15a–c) shows a high-spired shell with prominent ribs on the base and a wide umbilicus, differing strongly from *Discus rasseri.*

Occurrence. – Known from Tuchořice and probably also from the Early Miocene of Theobaldshof/Rhön (Germany).

Discus stenospira (Reuss *in* Reuss & Meyer, 1849)

Figure 12R–T

1849a *Helix stenospira* Rss.; Reuss *in* Reuss & Meyer, p. 12 (nomen nudum).

*1849b *H.*[*elix*] *stenospira* m.; Reuss *in* Reuss & Meyer, p. 22, pl. 1, fig. 11.

1861 *H.*[*elix*] *stenospira* Reuss. – Reuss, p. 63.

1861 *H.*[*elix*] *lunula* Thom. – Reuss, p. 63 (non *Helix lunula* Thomä, 1845).

1870a *Helix* (*Patula*) *stenospira* Rss. – Boettger, p. 287, pl. 13, figs 2a–c.
1891 *Patula stenospira* Reuss. – Klika, p. 38, text-fig. 30.
1892 *Patula stenospira* Reuss. – Klika, p. 37, text-fig. 30.
1911 [*Patula*] *stenospira* Rss. – Kafka, p. 67.
1914 *Pyramidula* (*Goniodiscus*) *stenospira* (Reuss). – Wenz *in* Fischer & Wenz, p. 58.
1915 *Pyramidula* (*Goniodiscus*) *stenospira* Reuss. – Fischer & Wenz, p. 45.
1916 [*Patula*] *stenospira* Reuss. – Thuma, p. 83.
1916 *Pyramidula* (*Gonyodiscus*) *stenospira* (Reuss). – Wenz, p. 167.
1917 *Pyramidula* (*Gonyodiscus*) *stenospira* (Reuss). – Wenz, p. 56.
1923 *Gonyodiscus* (*Gonyodiscus*) *lunula stenospira* (Reuss). – Wenz, p. 334 (cum syn.).
1977 *Discus* (*D.*) *lunula stenospira* (Reuss). – Moayedpour, p. 54.
non 1891 *Patula* (*Discus*) *stenospira* Rss. sp. – Penecke, p. 359 [= *Discus pleuradrus* (Bourguignat, 1881)].

Material. – 2 specimens (NHMW 2013/0572/0050), 4 specimens (NHMW 1909/0001/0025).

Dimensions. – Diameter: 3.9 mm, height: 2.2 mm (Fig. 12S); diameter: 3.9 mm (Fig. 12R, T).

Description. – A very characteristic shell with strongly reduced sculpture consisting only of widely spaced, low and fold-like axial ribs, which are most prominent close to the upper suture. The microsculpture consists of dense and very delicate spiral furrows covering the entire teleoconch. These spiral furrows are even weaker on the otherwise smooth protoconch. Umbilicus deep and sub-cylindrical.

Discussion. – The Bohemian species was often intermingled with the Early Miocene *Discus lunula* (Thomä, 1845) from the Mainz Basin. Later, Wenz (1923) and Moayedpour (1977) treated it as subspecies of *D. lunula*. Based on the description and illustration of this species by Sandberger (1858), both species can be distinguished by the very low and wide last whorl and the regular growth lines of *D. lunula*. *Discus stenospira* is superficially reminiscent of the Middle Miocene *Lucilla subteres* (Clessin, 1877). It differs from this and other *Lucilla* species in its much larger size, the less convex adapical part of the last whorl above the periphery and the less incised sutures. In addition, its last whorl is distinctly increasing in width but only weakly expanding in *Lucilla*.

Occurrence. – Known from Korozluky, Tuchořice and Pyšná. Further occurrences are mentioned from the Early Miocene of Germany (Öpfingen, Hochheim, Ehingen, Theobaldshof/Rhön) by Wenz (1923) and Moayedpour (1977). Shells from the early Middle Miocene of the Rein Basin in Austria, identified as *Discus stenospira* by Penecke (1891), might rather represent *Discus pleuradrus* (Bourguignat, 1881; see Harzhauser *et al.* 2014 for discussion and further references).

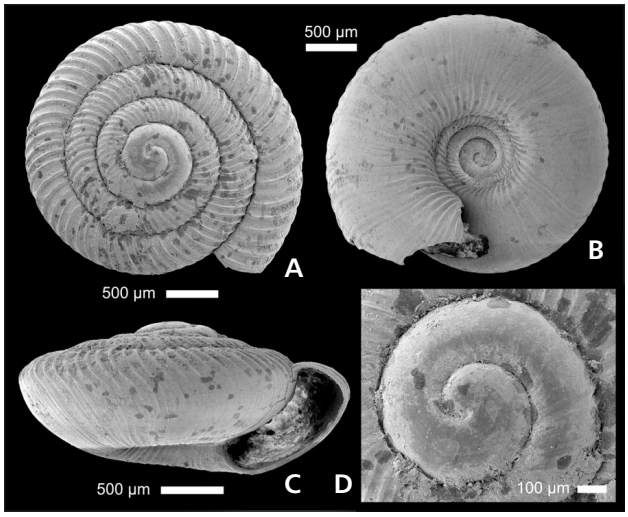


Figure 13. *Discus zagorseki* sp. nov. • A – NHMW 2013/0572/0075 (paratype 1). • B –NHMW 2013/0572/0076 (paratype 2). • C – NHMW 2013/0572/0077 (holotype). • D – protoconch of A.

***Discus zagorseki* Harzhauser, Neubauer & Georgopoulou sp. nov.**
Figure 13A–D

Types. – Holotype (NHMW 2013/0572/0077): diameter: 2.7 mm, height: 1.25 mm (Fig. 13C); paratype 1 (NHMW 2013/0572/0075): diameter: 2.75 mm, height: 1.25 mm (Fig. 13A, D); paratype 2 (NHMW 2013/0572/0076): diameter: 2.85 mm, height: 1.3 mm (Fig. 13B).

Material. – 3 specimens.

Etymology. – In honour of Kamil Zágoršek, palaeontologist at the National Museum in Prague.

Diagnosis. – Small shell with striate protoconch, very low spire, prominent angulation below the spire and rapidly contracting, weakly convex base. Strong axial ribs on spire passing into weak ribs and growth lines along the periphery and base. Delicate spiral threads on base and prominent axial ribs in the circum-umbilical area. Wide and deep umbilicus; aperture narrow and oblique.

Description. – A low discoidal shell consisting of 1.7 protoconch whorls and about 3 teleoconch whorls. Its moderately convex protoconch has a diameter of 700 µm and bears numerous spiral threads. The spire is very low conical with

moderately convex whorls bearing prominent axial ribs separated by slightly wider interspaces (55 ribs appear on the last whorl). The last whorl is characterised by a prominent angulation directly below the spire. The whorl is only weakly convex below the angulation and contracts rapidly towards the umbilicus. The ribs are prominent and strongly prosocline along the angulation and become much weaker and weakly opisthocyrt below. On the base, the weak ribs are sigmoidal and become prominent again in the circum-umbilical area. A delicate microsculpture of broad spiral threads, which are somewhat staggered along the growth lines, covers the base. Umbilicus wide and deep. Aperture narrow, oblique with subparallel margins and thin peristome.

Discussion. – This species is superficially similar with *Discus rasseri* sp. nov. due to its near identical axial sculpture on the spire. Differences are the slightly smaller diameter, the lower spire, the more prominent circum-umbilical axial sculpture, and the pronounced angulation of *Discus zagorseki*. The transition from angulation into base is less convex and the angulation is in a more adapical position. Moreover, the protoconch of *D. zagorseki* is less convex but its spiral sculpture is better developed. The characteristic angulation of the periphery allows a clear separation from all other Miocene *Discus* species of the Most Basin.

The early Miocene *Discus neumaieri* Schlickum, 1964 differs in its continuous axial ribs on the base (Binder 2004) and the convex periphery. The late Early to Middle Miocene *Discus pleuradrus* (Bourguignat, 1881), as illustrated by Böttcher *et al.* (2009), has a higher spire and its axial ribs continue along the flanks.

Occurrence. – Only known from Tuchořice.

Genus *Manganellia* Harzhauser, Neubauer & Georgopoulou gen. nov.

Type species. – *Patula alata* Klika, 1891. Early Miocene, Czech Republic.

Etymology. – In honour of Giuseppe Manganelli, specialist for Neogene and Holocene terrestrial molluscs at the University of Siena (Italy).

Diagnosis. – Minute, saucer-shaped shells with very low spire from which the large protoconch protrudes; the *ca* 800 µm wide protoconch consists of about 1.5 convex whorls with conspicuous crazing effect sculpture. Periphery formed by a keel or bulge in the upper part of the last whorl, which contracts quickly into the base via a more or less pronounced concavity. Sculpture consisting of prominent axial ribs, which are prosocyrt on the upper side of the shell and strongly prosocline along the keel/bulge. They become weak below the bulge and very prominent again in the umbilical area. Umbilicus moderately wide and deep; apertural margin thin.

Discussion. – We place this genus in the family Discidae Thiele, 1931. Some species of *Discus* are slightly reminiscent of the new genus but all Miocene representatives of *Discus* of which SEM-data are available develop a completely different protoconch sculpture, being smooth or faintly striate (*e.g.* Harzhauser & Binder 2004, Böttcher *et al.* 2009, and species herein). The extant *Discus perspectivus* (Megerle von Mühlfeld, 1816) is superficially similar concerning the discoid and keeled shape but is distantly larger, develops a higher number of teleoconch whorls and has a very flat but still conical spire.

The shells have a superficial similarity with *Xerocrassa* Monterosato, 1892. Although the type species of *Xerocrassa* (*Helix seetzeni* Pfeiffer, 1847) has little in common with the discoid fossil shells, several extant *Xerocrassa* species, such as *Xerocrassa barceloi* (Hidalgo, 1878), *X. betulonensis* (Bofill, 1897), and *X. prietoi* (Hidalgo, 1878) develop somewhat similar shells with comparable sculpture. However, these species are always distinctly larger compared to the tiny *Manganellia* species and lack the characteristic protoconch sculpture.

Included species. – Two species are assigned to *Manganellia*. The type species *M. alata* (Klika, 1891) is an Early Miocene representative known only from the Most Basin in Bohemia. The second species is *M. schneideri* (Harzhauser & Neubauer *in* Harzhauser *et al.,* 2014) from the early Middle Miocene of the Austrian Rein Basin.

Occurrence. – Early and Middle Miocene of Central Europe.

Manganellia alata (Klika, 1891)

Figure 12F–I

1869a *Helix* (*Patula*) *disculus* A. Braun. – Slavík, p. 245, pl. 4, figs 3, 4 (non *Helix disculus* Sandberger, 1858).

1869b *Helix* (*Patula*) *disculus* A. Braun. – Slavík, p. 261, pl. 4, figs 3, 4 (non *Helix disculus* Sandberger, 1858).

1870a *Helix* (*Patula*) *disculus* A. Br. – Boettger, p. 288 (non *Helix disculus* Sandberger, 1858).

*1891 *Patula alata* n.; Klika, p. 40, text-figs 33a–c.

1892 *Patula alata* Klika; Klika, p. 39, text-figs 33a–c.

1911 [*Patula*] *alata* Kl. – Kafka, p. 67.

1917 *Pyramidula* (*Gonyodiscus*) *alata* (Klika). – Wenz, p. 56.

1923 *Gonyodiscus* (*Gonyodiscus*) *alatus* (Klika). – Wenz, p. 324.

Material. – 2 specimens (NHMW 2013/0572/0051), 15 specimens (NHMW 1909/0001/0028).

Dimensions. – Diameter: 3.3 mm, height: 1.2 mm (Fig. 12F, G); diameter: 3.3 mm, height: 1.25 mm (Fig. 12H, I).

Discussion. – This rare, tiny disc-shaped shell is characterised by strongly raised axial ribs and a prominent bulge at the periphery, adjoined by a weak abapical concavity; its protoconch has a conspicuous crazing effect sculpture. The closest relative was recently described from the early Middle Miocene of Styria in Austria as "*Discus*" *schneideri* Harzhauser & Neubauer *in* Harzhauser *et al.* (2014). This species has an identical protoconch but differs in its larger number of axial ribs and the less discoidal outline. Moreover, it develops a keel at the periphery.

The Oligocene "*Discus*" *disculus* (Braun *in* Walchner, 1851) is slightly reminiscent of the Bohemian shell concerning its discoidal outline, and strong axial sculpture but is clearly distinguished by its much wider umbilicus (see Sandberger 1858, p. 16, pl. 2, figs 10–10b and Sandberger 1875, p. 373, pl. 22, figs 12a–c).

Occurrence. – Only known from Tuchořice.

Superfamily Gastrodontoidea Tryon, 1866
Family Gastrodontidae Tryon, 1866

Genus *Janulus* Lowe, 1852

Type species. – *Helix* (*Janulus*) *calathus* Lowe, 1852; by monotypy. Recent. Madeira.

***Janulus* sp.**

1891 *Patula densestriata* n.; Klika, p. 40 (pars).
1892 *Patula densestriata* Klika. – Klika, p. 39 (pars).
1897 *Patula densestriata* Klika. – Babor, p. 16 (non *Patula densestriata* Klika, 1891).
1923 *Janulus densestriatus* (Klika). – Wenz, p. 301 (pars).

Material. – No material was available.

Dimensions. – Unknown, but probably comparable to *J. densestriata*: diameter: 5.7 mm, height: 1.8 mm.

Discussion. – Babor (1897) discussed a *Janulus* species, which he identified as *Patula densestriata* Klika, 1891. *Janulus densestriatus* was originally described from the Rupelian of Dvérce, but from the context it seems very likely that Babor (1897) referred to material from Tuchořice as his entire paper considered only specimens from that locality. An additional occurrence at Tuchořice was mentioned by Klika (1891), who emphasised that he had seen only a single specimen in a local private collection without having the opportunity to compare the specimen with the Oligocene type material. In our opinion, it is unlikely that the Burdigalian specimens are conspecific with the much older Rupelian ones. Unfortunately, the specimens of Babor (1897) could not be detected in the collection of the National Museum in Prague. The generic status of this Early Miocene *Janulus* is confirmed by the presence of radial rows of palatal teeth described by Babor (1897) – but it remains unclear if this is only true for the Tuchořice specimens or also for the Rupelian ones as already discussed by Manganelli *et al.* (2011).

Occurrence. – *Janulus densestriatus* is known from the Rupelian of Dvérce (Wärzen) and Dětaň (Czech Republic) (Mikuláš *et al.* 2003). *Janulus* sp. in only documented from Tuchořice.

Family Pristilomatidae Cockerell, 1891

Genus *Vitrea* Fitzinger, 1833

Type species. – *Glischrus* (*Helix*) *diaphana* Studer, 1820; by monotypy. Recent, Europe.

***Vitrea* cf. *procrystallina* (Andreae, 1902)**
Figure 14S–U

cf. 1902b *Hyalina* (*Vitrea*) *procrystallina* sp. nov.; Andreae, p. 10, fig. 4.
cf. 1923 *Vitrea procrystallina procrystallina* (Andreae). – Wenz, p. 293.
cf. 1976 *Vitrea procrystallina* (Andreae). – Schlickum, p. 12, pl. 2, fig. 38.

Material. – 2 specimens (NHMW 2013/0572/0052).

Dimensions. – Diameter: 2.4 mm (Fig. 14S); diameter: 2.3 mm (Fig. 14T).

Description. – Flat protoconch consisting of *ca* 0.75 nearly flat whorls with faint spiral sculpture. About two thin-shelled teleoconch whorls form a tiny shell with low spire and nearly smooth surface except for faint spiral threads (more prominent than on the protoconch) and very delicate, orthocyrt growth lines. Smooth, regularly convex base with narrow umbilicus; even in SEM pictures the spiral sculpture is nearly invisible on the base.

Discussion. – The Bohemian species has a somewhat wider last whorl compared with the drawings in Andreae (1902b) and the internal cast in Schlickum (1976) but agrees well with the Late Miocene *Vitrea p. steinheimensis* Gottschick, 1920 *sensu* Lueger (1981, p. 42, pl. 5, fig. 7). The delicate spiral sculpture was also described by Lueger (1981). The status of the Middle Miocene *V. p. procrystallina* and *V. p. steinheimensis* and of the Late Miocene species described by Lueger (1981) is unclear as no adequate SEM illustrations are available so far. Therefore, we treat the Bohemian shells as "cf."

Occurrence. – This species was not recorded from the Most Basin so far. *Vitrea p. procrystallina* and *V. p. steinheimensis* are described from various Middle Miocene localities in Poland, Hungary and Germany (Wenz 1923, Kókay 2006) and from the Late Miocene of the Vienna Basin (Lueger 1981).

Family Oxychilidae Hesse *in* Geyer, 1927 (1879)
Subfamily Oxychilinae Hesse *in* Geyer, 1927 (1879)

Genus *Oxychilus* Fitzinger, 1833

Type species. – *Helix cellaria* Müller, 1774; original designation. Recent, Europe.

***Oxychilus mendicus* (Slavík, 1869)**
Figure 14O–R

*1869a	*Helix* (*Hyalina*) *mendica* sp. nov.; Slavík, p. 247, pl. 4, figs 7, 8.
1869b	*Helix* (*Hyalina*) *mendica* sp. nov.; Slavík, p. 262, pl. 4, figs 7, 8.
1891	*Hyalinia mendica* Slavík. – Klika, p. 31, text-fig. 23.
1892	*Hyalinia mendica* Slavík. – Klika, p. 31, text-fig. 23.
1911	[*Hyalinia*] *mendica* Sl. – Kafka, p. 67.
1917	*Hyalinia* (*Hyalinia*) *mendica* Slavik. – Wenz, p. 54.
1923	*Zonitoides* (*Zonitoides*) *mendicus* (Slavik). – Wenz, p. 296 (pars; Bohemian occurrences only).
1975	*Helix* (*Hyalinia*) *mendica* Slavik. – Schlickum & Strauch, p. 41.
non 1902b	*Hyalina* (*Polita*) *mendica* Slavic [sic]. – Andreae, p. 8 (= *Perpolita wenzi* Schlickum & Strauch, 1975).
non 1918	*Hyalina* (*Polita*) *mendica* Slavik. – Wenz, p. 7 (= *Perpolita wenzi* Schlickum & Strauch, 1975).
non 2006	*Nesovitrea* (*Perpolita*) *mendica* Slavik, 1869. – Kókay, p. 76, pl. 29, figs 1–5.

Material. – 2 specimens (NHMW 2013/0572/0053), 20 specimens (NHMW 1909/0001/0018).

Dimensions. – Diameter: 3.6 mm, height: 1.9 mm (Fig. 14P); largest specimen: diameter: 3.8 mm, height: 1.7 mm.

Discussion. – The spiral sculpture on the protoconch and the early teleoconch is only visible in SEM-images and consists of faint spiral grooves with interspaces of 7–10 µm width. The spiral furrows become most prominent on the last whorl. A delicate spiral thread coincides with the upper suture, forming a faint collar. These features, the low spire and the regularly convex base allow a clear separation from all other *Oxychilus* and *Aegopinella* species of the Most Basin. Schlickum & Strauch (1975) studied this species in their revision of *Perpolita* Baker, 1928 and documented that the Early Miocene shells from Germany, listed by Wenz (1923) as *Zonitoides mendicus*, represent a different species and that the Bohemian species belongs to *Oxychilus*.

Occurrence. – This species is known only from the Burdigalian of Tuchořice; the poorly preserved, juvenile shells from the much younger Late Badenian and Sarmatian of Hungary described by Kókay (2006) are not conspecific with *O. mendicus*; they are higher and the sutures are distinctly more incised.

Subfamily Godwiniinae Cooke, 1921

Genus *Aegopinella* Lindholm, 1927

Type species. – *Helix pura* Alder, 1830; original designation. Recent, Great Britain.

***Aegopinella denudata* (Reuss *in* Reuss & Meyer, 1849)**
Figure 14D–G

1849a	*H.* [*elix*] *denudata* Rss.; Reuss *in* Reuss & Meyer, p. 11 (nomen nudum).
*1849b	*H.* [*elix*] *denudata* m.; Reuss *in* Reuss & Meyer, p. 21, pl. 1, fig. 9.
1861	*H.*[*elix*] *denudata* Reuss. – Reuss, p. 64.
1875	*Hyalinia denudata* Reuss. – Sandberger, p. 441, pl. 24, figs 23–23b.
1891	*Hyalinia denudata* Reuss. – Klika, p. 28, text-fig. 19.
1892	*Hyalinia denudata* Reuss. – Klika, p. 28, text-fig. 19.
1897	*Hyalina denudata* Reuss var. *sculpta* n. – Babor, p. 2.
1911	*Hyalinia denudata* Rss. – Kafka, p. 67.
1915	*Hyalina* (*Hyalina*) *denudata* Reuss. – Fischer & Wenz, p. 45, pl. 2, fig. 3.
1916	*Hyalinia denudata* Reuss. – Thuma, p. 83.
1917	*Hyalinia* (*Hyalinia*) *denudata* (Reuss). – Wenz, p. 54.
1923	*Oxychilus* (?*Oxychilus*) *denudatum denudatum* (Reuss). – Wenz, p. 274 (cum syn.).

1923 *Oxychilus* (?*Oxychilus*) *denudatum sculptum* (Babor). – Wenz, p. 274.
1930 *Hyalinia* (*Polita*) *denudata* Reuss. – Pfeffer, p. 36.
1977 *Retinella* (*Retinella*) *denudata* (Reuss). – Moayedpour, p. 66.
2004 *Aegopinella denudata* (Reuss, 1849). – Binder, p. 197, pl. 3, fig. 4.
? 2006 *Aegopinella denudata* (Reuss), 1849 var. – Kókay, p. 77, pl. 30, figs 1, 2.

Material. – 2 specimens (NHMW 2013/0572/0055), 246 specimens (NHMW 1847/0032/0092, 1890/0013/0395, 1909/0001/0015, 1909/0001/0099).

Dimensions. – Diameter: 10 mm, height: 4.2 mm (Fig. 14D–F); largest specimen: diameter: 14 mm, height: 4.5 mm.

Discussion. – The generic status of this species changed considerably in the literature. Wenz (1923) listed it as *Oxychilus* and Moayedpour (1977) considered it to be a *Retinella* [the identifications were done by Schlickum as mentioned by Moayedpour in the introduction], whilst Binder (2004) described it as *Aegopinella.* This view is followed herein as the depressed shell outline, the delicate microscopical spiral striation, the wide and elongate-ovoid aperture and the rapidly expanding last whorl correspond much better to *Aegopinella*.

Babor (1897) separated a shell with prominent axial ribs and spiral threads on the base as "var. *sculpta*". The very fragmentary specimen is still present in the Prague collection (NM-PM-P 458) and does not support a taxonomic separation.

Occurrence. – Known from Korozluky, Tuchořice and Lipno; additional occurrences are mentioned from the Early Miocene of Theobaldshof/Rhön (Germany; middle-late Burdigalian) and Oberdorf (Austria; mid-Burdigalian). It is also reported from the Hungarian Early Miocene (Kókay 2006), although the larger size and the additional teleoconch whorl of the specimens from the Somlóvásárhely drilling differ from typical *A. denudata* (Kókay 2006).

Aegopinella vetusta (Klika, 1891)
Figure 15A–C

*1891 *Hyalinia vetusta* n.; Klika, p. 31, text-figs 22a–c.
1892 *Hyalinia vetusta* Klika. – Klika, p. 30, text-figs 22a–c.
1911 [*Hyalinia*] *vetusta* Kl. – Kafka, p. 67.
1923 *Oxychilus* (? *Oxychilus*) *vetustum* (Klika). – Wenz, p. 287 (cum syn.).
? 1977 *Retinella* (*Retinella*) cf. *vetusta* (Klika). – Moayedpour, p. 66, pl. 6, figs 4–6.

Material. – One specimen in the Prague collection (NM-PM-P 741).

Dimensions. – Diameter: 10 mm, height: 4.2 mm.

Description. – Depressed solid shell with nearly completely flat spire and moderately incised suture and wide last whorl with regularly convex periphery. Prominent growth lines cover the spire and the periphery, where they are distinctly prosocline. Base smooth and glossy; umbilicus wide and open.

Discussion. – According to Hartmut Nordsieck (written comm. 2014), this species does not represent the genus *Retinella* Fischer *in* Shuttleworth, 1877, as suggested by Moayedpour (1977), but might rather represent an *Aegopinella*. A specimen from the Burdigalian of Theobaldshof/Rhön described by Moayedpour (1977) is very similar to the species described by Klika (1891) concerning shape, umbilical features and incised sutures. The poor preservation of the shell surface, however, does not allow a clear identification. Moreover, the less convex upper part of the periphery of the shell from Germany differs from the regularly convex periphery of *A. vetusta*.

Occurrence. – Only known from Pyšná.

Superfamily Zonitoidea Mörch, 1864
Family Zonitidae Mörch, 1864

Discussion. – Several rather poorly defined genera have been described for Oligocene and Miocene Zonitidae by Pfeffer (1930) and Lueger (1981). Consequently, species are variously treated as *Archaeozonites, Miozonites* and *Pontaegopis* (see Binder 2004, Moser *et al.* 2009, Harzhauser *et al.* 2014). Herein, we provisionally accept *Miozonites* Pfeffer, 1930 mainly because the Most Basin species *Helix algiroides* is its type species.

Genus *Miozonites* Pfeffer, 1930

Type species. – *Helix algiroides* Reuss *in* Reuss & Meyer, 1849; subsequent designation by Wenz & Zilch (1959). Early Miocene, Czech Republic.

Miozonites algiroides (Reuss *in* Reuss & Meyer, 1849)
Figure 14H–M

1849a *Helix algiroides* Rss.; Reuss *in* Reuss & Meyer, p. 11 (nomen nudum).
1849a *H.*[*elix*] *Haidingeri* Rss.; Reuss *in* Reuss & Meyer, p. 11 (nomen nudum).

1849a *H*. [*elix*] *semiplana* Rss.; Reuss *in* Reuss & Meyer, p. 11 (nomen nudum).
*1849b *H*.[*elix*] *algiroides* m.; Reuss *in* Reuss & Meyer, p. 19, pl. 1, fig. 5.
1849b *H*.[*elix*] *Haidingeri* m.; Reuss *in* Reuss & Meyer, p. 19, pl. 1, fig. 6.
1849b *H*. [*elix*] *semiplana* m.; Reuss *in* Reuss & Meyer, p. 20, pl. 1, figs 7, 8.
1861 *H*.[*elix*] *algiroides* Reuss. – Reuss, p. 63.
1861 *H*.[*elix*] *Haidingeri* Reuss. – Reuss, p. 63.
1861 *H*.[*elix*] *semiplana* Reuss. – Reuss, p. 63.
1869a *Zonites algiroides* Reuss. – Slavík, p. 238.
1869a *Zonites semiplanus* Reuss. – Slavík, p. 239.
1870a *Helix* (*Campylaea* Beck) *semiplana* Rss. – Boettger, p. 290.
1875 *Archaeozonites semiplanus* Reuss. – Sandberger, p. 442, pl. 24, figs 25–25b.
1875 *Archaeozonites Haidingeri* Reuss. – Sandberger, p. 404, 443, pl. 24, figs 26–26b.
1890 *Archaeozonites Haidingeri* Reuss. – Klika, p. 43, fig. 14 1a–c.
1890 *Archaeozonites Haidingeri* var. *Reussi.* – Klika, p. 43, fig. 14 2a, b.
1891 *Archaeozonites Haidingeri* Reuss. – Klika, p. 25, text-figs 17a–c.
1891 [*Archaeozonites Haidingeri*] var. *Reussi* Klika. – Klika, p. 27, text-figs 18a, b.
1892 *Archaeozonites Haidingeri* Reuss. – Klika, p. 25, text-figs 17a–c.
1892 [*Archaeozonites Haidingeri*] var. *Reussi* Klika. – Klika, p. 27, text-figs 18a, b.
1911 [*Archaeozonites*] *Haidingeri* Rss. – Kafka, p. 67.
1911 [*Archaeozonites Haidingeri*] var. *Reussi* Kl. – Kafka, p. 67.
1914 *Zonites* (*Aegopis*) *algiroides* (Reuss). – Wenz *in* Fischer & Wenz, p. 48.
1916 *Archaeozonites Haidingeri* Reuss. – Thuma, p. 83.
1916 [*Archaeozonites*] *Haidingeri* var. *Reussi* Klika. – Thuma, p. 83.
1917 *Zonites* (*Aegopis*) *algiroides* (Reuss). – Wenz, p. 54.
1923 *Zonites* (*Aegopis*) *algiroides* (Reuss). – Wenz, p. 248 (cum syn.).
1930 *Miozonites algiroides* (Reuss) var. *Reussi* (Klika). – Pfeffer, p. 177.
1932 *Zonites* (*Aegopis*) *algiroides* (Reuss). – Wenz, p. 19.
1933 *Archaeozonites* (*Miozonites*) *algiroides* (Reuss). – Wenz, p. 8.
2006 *Aegopis algiroides* (Reuss), 1849. – Kókay, p. 76, pl. 29, fig. 10.
2010 *Helix*. – Dvořák *et al.*, p. 58, unnumbered plate, fig. 4.

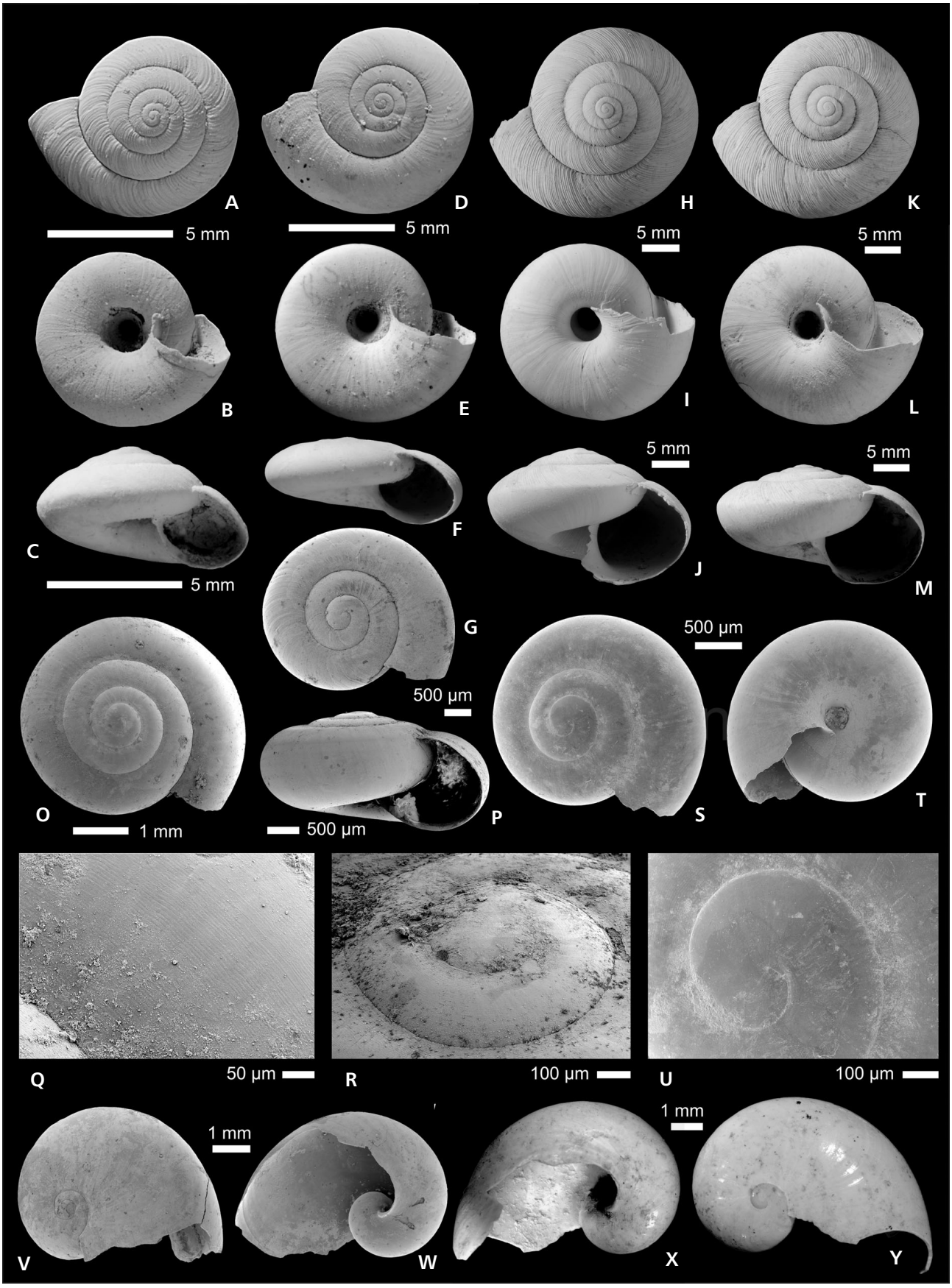
Material. – 2 specimens (NHMW 2013/0572/0056), 58 specimens (NHMW 1855/0034/0032, 1890/0008/0394, 1909/0001/0013, 1909/0001/0014, 1909/0001/0017, 1909/0001/0022).

Dimensions. – Diameter: 26 mm, height: 17.5 mm (Fig. 14H–J); diameter: 28 mm, height: 16.2 mm (Fig. 14K–M).

Discussion. – This species is one of the largest and most characteristic gastropods in the Tuchořice collections, attaining a diameter of more than 40 mm. It is thin shelled and displays considerable variability concerning spire height and the more or less distinct angulation of the last whorl. Characteristic features are the deep, perspectivic, moderately wide umbilicus, the thin peristome and the sculpture consisting of densely spaced, thin but prominent prosocline to prosocyrt ribs on the upper part of the whorls. These ribs are of varying strength and may rarely be bifurcate and become very weak or fade out on the base. Few subsutural spiral grooves cross the axial ribs in most specimens. The allometric growth with a rapidly expanding last whorl allows a clear distinction between juvenile and adult shells. All these factors resulted in the introduction of different species and varietal names for the same species (*e.g. Helix semiplana*, *Helix haidingeri*, *Archaeozonites haidingeri* var. *reussi*; *M. semiplanus* is a juvenile stage of *M. algiroides*; see also Fischer & Wenz 1914).

Occurrence. – Known from Korozluky, Tuchořice and Lipno; a tiny fragment from the Lower Miocene of the Somlóvásárhely drilling in Hungary described by Kókay (2006) might represent a "*subplanus*"-morph, but the preservation does not allow a clear identification; the irregular axial ribs, however, are fully comparable with *M. algiroides* and differ from the late Early/Middle Miocene *M. costatus* (Sandberger, 1875). Additional occurrences are listed by Wenz (1923, 1932, 1933) from the Late Oligocene to Early Miocene of Germany (Hochheim-Flörsheim, Eggingen, Hauchenberg/Missen) and France (Son-Saucats).

Figure 14. A–C – *Lyrodiscus ihli* (Klika, 1891), NHMW 2013/0572/0054. • D–F – *Aegopinella denudata* (Reuss *in* Reuss & Meyer, 1849), NHMW 2013/0572/0055. • G – *Aegopinella denudata* (Reuss *in* Reuss & Meyer, 1849), NHMW 2013/0572/0055. • H–M – *Miozonites algiroides* (Reuss *in* Reuss & Meyer, 1849), NHMW 2013/0572/0056. • O, P – *Oxychilus mendicus* (Slavík, 1869), NHMW 2013/0572/0053. • Q, R – microsculpture of *Oxychilus mendicus* (Slavík, 1869), NHMW 2013/0572/0053. • S–U – *Vitrea* cf. *procrystallina* (Andreae, 1902), NHMW 2013/0572/0052. • V, W – *Phenacolimax intermedius* (Reuss *in* Reuss & Meyer, 1849), NHMW 2013/0572/0058. • X, Y – *Phenacolimax intermedius* (Reuss *in* Reuss & Meyer, 1849), NHMW 2013/0572/0058.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Genus *Lyrodiscus* Pilsbry, 1893

Type species. – *Helix circumsessa* Shuttleworth, 1852; original designation. Recent. Canary Islands.

***Lyrodiscus ihli* (Klika, 1891) comb. nov.**
Figure 14A–C

*1891	*Hyalinia ihli*	n.; Klika, p. 29, text-fig. 20.
1892	*Hyalinia ihli*	Klika. – Klika, p. 29, text-fig. 20.
1911	[*Hyalinia*] *Ihli*	Kl. – Kafka, p. 67.
1917	*Hyalinia* (*Hyalinia*) *ihli*	Klika. – Wenz, p. 54.
1923	*Oxychilus ihli*	(Klika). – Wenz, p. 277 (cum syn.).

Material. – 2 specimens (NHMW 2013/0572/0054), 15 specimens (NHMW 1901/0001/0016).

Dimensions. – Diameter: 8 mm, height: 4.3 mm (Fig. 14A–C); largest specimen: diameter: 9.2 mm, height: 4.7 mm.

Discussion. – Hartmut Nordsieck (written comm. 2014), suggested a placement in *Lyrodiscus* (*Riedeliella*) Schlickum & Strauch, 1975, based on the sculpture of the base of this species. Own investigations supported this view. The base of well preserved specimens bears very delicate spiral threads and few widely spaced spirals consisting of short discontinuous and somewhat irregularly staggered parts. This pattern is characteristic for several species of the genus *Lyrodiscus* as illustrated by Rousseau & Puisséger (1990). As shown by Alonso *et al.* (2013), *Riedeliella* is a junior synonym of *Lyrodiscus*.

Only three specimens of this species were known to Klika (1891) when describing this shell, which was probably frequently intermingled with *Aegopinella denudata*. The richer material of the NHMW collection supports the description of Klika (1891) and suggests only minor variability in shape. Thus, the conical spire, the coarse growth lines (which are most prominent at the upper suture), the smaller size, the narrower last whorl and the less incised sutures of *L. ihli* allow a clear separation from *A. denudata*. The placement in the family Zonitidae follows Alonso *et al.* (2013).

Occurrence. – Only known from Tuchořice.

Superfamily Limacoidea Lamarck, 1801
Family Limacidae Lamarck, 1801

Genus *Limacus* Lehmann, 1864

Type species. – *Limacus breckworthianus* Lehmann, 1864 [= *Limacus flavus* (Linnaeus, 1758)]; by monotypy. Recent, Europe (anthropogenic in Australia).

***Limacus crassitesta* (Reuss, 1868)**
Figure 15D

*1868	*Limax crassitesta*	Rss.; Reuss, p. 81, pl. 1, fig. 1.
1869a	*Limax crassitesta*	Reuss. – Slavík, p. 239.
1891	*Sansania crassitesta*	Reuss. – Klika, p. 20 (pars).
1892	*Sansania crassitesta*	Reuss. – Klika, p. 20 (pars).
? 1902b	*Sansania crassitesta*	(Reuss). – Andreae, p. 7.
? 1904	*Sansania crassitesta*	(Rss). – Andreae, p. 3.
? 1915	*Sansania crassitesta*	(Reuss). – Fischer & Wenz, p. 44.
1911	*Saussania* [sic] *crassitesta*	Rss. – Kafka, p. 67.
1917	*Sansania crassitesta*	(Reuss). – Wenz, p. 53.
1923	*Limax crassitesta*	(Reuss). – Wenz, p. 309 (pars).
1964	*Milax crassitesta*	(Reuss, 1868). – Čtyroký *et al.*, p. 137, fig. 1.
2009	"*Limax*" *crassitesta*	Reuss 1868. – Moser *et al.*, p. 49.
non 1923	*Limax* cf. *crassitesta*	Reuss. – Wenz, p. 310 (cum syn.).

Material. – One specimen (NHMW 2013/0572/0057), 4 specimens in the Prague collection (NM-PM-P 496).

Dimensions. – Diameter: 2.3 mm, length: 3.3 mm (NM-PM-P 496).

Discussion. – The generic placement of this species in *Limacus* follows Moser *et al.* (2009). The broad and robust specimens in the NHMW and Prague collections agree well with the type illustrated by Reuss (1868). Only the specimen illustrated by Klika (1891) displays a more slender outline and might represent a second species. It is doubtful that the many records from the Late Oligocene and Early Miocene of Germany and the Middle Miocene of Poland listed by Wenz (1923) all represent the same species. Late Miocene specimens, listed by Wenz (1923) as "cf. *crassitesta*", are most probably not conspecific with the Early Miocene species.

Occurrence. – Known from Tuchořice and the Kralupy drillings.

Family Vitrinidae Fitzinger, 1833

Genus *Phenacolimax* Stabile, 1859

Type species. – *Helicolimax major* Férussac, 1807; subsequent designation by Fischer *in* Paulucci (1878). Recent, Europe.

***Phenacolimax intermedius* (Reuss *in* Reuss & Meyer, 1849)**
Figure 14V–Y

1849a	*Vitrina intermedia* Rss.; Reuss *in* Reuss & Meyer, p. 11 (nomen nudum).
*1849b	*V.*[*itrina*] *intermedia* m.; Reuss *in* Reuss & Meyer, p. 18, pl. 1, fig. 4.
? 1858	*Vitrina intermedia* Reuss. – Sandberger, p. 12, pl. 5, figs 19–19c.
1875	*Vitrina intermedia* Reuss. – Sandberger, p. 426, pl. 24, figs 27–27c.
1861	*V.*[*itrina*] *intermedia* m. – Reuss, p. 62.
1891	*Vitrina intermedia* Reuss. – Klika, p. 23, text-figs 15/1.
1892	*Vitrina intermedia* Reuss. – Klika, p. 23, text-figs 15/1.
1911	*Vitrina intermedia* Rss. – Kafka, p. 67.
1916	*Vitrina intermedia* Reuss. – Thuma, p. 83.
1917	*Vitrina* (*Phenacolimax*) *intermedia* Reuss. – Wenz, p. 53.
1923	*Vitrina intermedia intermedia* Reuss. – Wenz, p. 216.
? 1977	?*Vitrina* cf. *intermedia* Reuss. – Moayedpour, p. 65, pl. 5, figs 10, 11.
non 1981	*Semilimax intermedius* (Reuss). – Lueger, p. 41, pl. 5, figs 1–3.
non 2006	*Semilimax intermedia* (Reuss), 1849. – Kókay, p. 75, pl. 28, fig. 5.
non 2004	*Semilimax* cf. *intermedia* (Reuss, 1852). – Harzhauser & Binder, p. 25, pl. 9, fig. 7.

Material. – 2 specimens (NHMW 2013/0572/0058), 7 specimens (NHMW 1909/0001/0011).

Dimensions. – Diameter: 7.0 mm, height: 3.9 mm (Fig. 14X, Y); diameter: 4.8 mm, height: 3.2 mm (Fig. 14V, W).

Discussion. – The generic status of most fossil vitrinids is doubtful (Nordsieck 2013b). Moser *et al.* (2009) placed the closely related *Vitrina suevica* Sandberger, 1872 in *Phenacolimax* Stabile, 1859, which is followed herein.

Fragments of this fragile species are not rare in the studied collections. Only more or less complete and adult specimens reveal the characteristic ear-shaped outline due to the rapidly widening last whorl. The protoconch bears coarse and irregularly arranged pits, which become spirally arranged on its lower side (if viewed from the umbilical side) and continue as weaker, spirally arranged pits on the entire base. The apical part of the glossy shell is smooth aside from faint growth lines. Weak and discontinuous grooves appear on the base close to and parallel to the columellar lip.

This seemingly long-lived species was also mentioned from Middle and Late Miocene strata. Whilst the Middle Miocene Sarmatian specimens from Hungary described by Kókay (2006) differ in their higher and (partly) much thicker shells, the Late Miocene Pannonian shells as described by Lueger (1981) and Harzhauser & Binder (2004) lack the microsculpture and their last whorls are expanding less quickly. Similarly, occurrences from Opole (Poland) mentioned by Andreae (1902b) need verification. These records should probably better be compared with *Phenacolimax suevicus* (Sandberger) *sensu* Schütt (1967).

Occurrence. – Known from Korozluky, Tuchořice and Pyšná; a further occurrence from the Burdigalian of Theobaldshof/Rhön was mentioned by Moayedpour (1977).

***Phenacolimax crassitesta* (Andreae, 1902)**

1891	*Vitrina intermedia* Reuss. – Klika, p. 23, text-fig. 15/2 (non *Vitrina intermedia* Reuss *in* Reuss & Meyer, 1849).
1892	*Vitrina intermedia* Reuss. – Klika, p. 23, text-fig. 15/2 (non *Vitrina intermedia* Reuss *in* Reuss & Meyer, 1849).
*1902b	*Vitrina* (*Semilimax*) *intermedia* var. *crassitesta* n. nom.; Andreae, p. 7.
1923	*Vitrina intermedia crassitesta* Andreae. – Wenz, p. 217 (cum syn.).
non 2006	*Semilimax intermedia crassitesta* (Andreae), 1902. – Kókay, p. 75, pl. 28, figs 6, 7.

Material. – No material was available.

Dimensions (after Klika 1891). – Diameter: 6.6 mm, height: 5.2 mm.

Discussion. – Andreae (1902b) refers to the thick shelled specimens from Tuchořice described by Klika (1891) as *Vitrina intermedia*. Whether the Middle Miocene specimens from Opole (Poland) represent the same species, however, remains dubious. Similarly, the identity of the shells from the Sarmatian of Hungary described by Kókay (2006) is dubious. The neritid-like shape and the rather straight columella suggest that these shells are not conspecific with *P. crassitesta*.

Occurrence. – Only known from Tuchořice.

Superfamily Helicoidea Rafinesque, 1815
Family Hygromiidae Tryon, 1866

Genus *Leucochroopsis* O. Boettger, 1908

Type species. – *Leucochroa* (*Leucochroopsis*) *emmerichi* O. Boettger, 1908; by monotypy. Miocene, Germany.

***Leucochroopsis apicalis* (Reuss, 1861)**
Figure 15E–K

*1861 *H.*[*elix*] *apicalis* Reus [sic]; Reuss, p. 64, pl. 1, fig. 1.
1875 *Helix* (*Fruticicola*) *leptoloma* var. *apicalis* Reuss. – Sandberger, p. 380, pl. 24, figs 7–7c.
1870a *Helix* (*Fruticicola*) *leptoloma* A. Br. – Boettger, p. 289 (non *Helix leptoloma* Sandberger, 1858).
1891 *Helix* (*Trichia*) *apicalis* Reuss. – Klika, p. 55, text-figs 51a–c.
1892 *Helix* (*Trichia*) *apicalis* Reuss. – Klika, p. 35, text-figs 51a–c.
1897 *Helix* (*Carthusiana* Kobelt) *oxyspira* sp. nov.; Babor, p. 4, fig. 1.
1911 [*Helix*] (*Trichia*) *apicalis* Rss. – Kafka, p. 68.
1915 *Trichopsis apicalis* Reuss. – Fischer & Wenz, p. 47.
1916 [*Helix*] (*Trichia*) *apicalis* Reuss. – Thuma, p. 83.
1917 *Hygromia* (*Trichopsis*) *apicalis* (Reuss). – Wenz, p. 56.
1917 *Hygromia* (*Monacha*) *oxyspira* (Baber) [sic]. – Wenz, p. 57.
1923 *Trichia* (*Leucochroopsis*) *apicalis apicalis* (Reuss). – Wenz, p. 422 (cum syn.).
1923 *Hygromia* (*Monacha) oxyspira* (Babor). – Wenz, p. 415.
1930 *Leucochroopsis apicalis apicalis* (Reuss). – Pfeffer, p. 116.
1930 *Zenobiella* (*Monachoides*) [*oxyspira* (Babor)]. – Wenz, p. 3028.
1933 *Trichia* (*Leucochroopsis*) *apicalis* (Reuss). – Wenz, p. 8.
? 1977 *Leucochroopsis apicalis* (Reuss). – Moayedpour, p. 69, pl. 7, figs 6–8.
1980 [*Monacha*] *oxyspira* (Babor, 1897). – Richardson, p. 215.
1980 [*Leucochroopsis*] *apicalis* (Reuss, 1860). – Richardson, p. 455.

Material. – 2 specimens (NHMW 2013/0572/0059), 138 specimens (NHMW 1890/0013/0398, 1909/0001/0043), 1 specimen (NM-PM-P 454, = *Helix oxyspira* Babor, 1897).

Dimensions. – Diameter: 11 mm, height: 7 mm (Fig. 15E–H); diameter: 13 mm, height: 9.1 mm (Fig. 15I–K = holotype of *Helix oxyspira* Babor, 1897).

Description. – A characteristic species with pointed conical spire and somewhat allometric, broad last whorl, which usually develops a very weak angulation in its upper third. The peristome is thin, the outer lip is only slightly expanded and the columellar lip is gently reflected, covering parts of the narrow and deep umbilicus.

A single specimen from Tuchořice was described by Babor (1897) as *Helix oxyspira.* It shows a bulbous last whorl and rather high conical spire; the spire appears small compared to the large last whorl due to the rapidly increasing width of the whorls. The raised protoconch consists of 1.3 strongly convex whorls. Shell smooth except for irregular, blunt growth lines, which are most prominent close to the incised sutures. Deep and open umbilicus with smooth circum-umbilical area bearing a weak ridge, which increases in strengths towards the aperture; thin peristome; the semi-circular aperture is expanding along its umbilical part, forming a slight concavity coinciding with the termination of the umbilical ridge and covering the umbilicus partly.

Discussion. – *Helix oxyspira* Babor, 1897 seems to be a pathologic specimen of *Leucochroopsis apicalis* (Reuss, 1861). It has an identical protoconch and the characteristic ratio between pointed spire and wide last whorl. The strange umbilical ridge represents the only difference. As this feature is also reflected in the indention of the peristome, we consider this a healed injury. Therefore, we consider this species as subjective junior synonym of *Leucochroopsis apicalis*.

Occurrence. – Known from Korozluky, Tuchořice, Lipno and Pyšná; the specimen from the Early Miocene of Theobaldshof/Rhön illustrated by Moayedpour (1977) is smaller and the last whorl is only weakly expanding but might represent a subadult shell of *L. apicalis*. An additional Early Miocene occurrence is mentioned by Wenz (1933) from Hauchenberg at Missen in Germany.

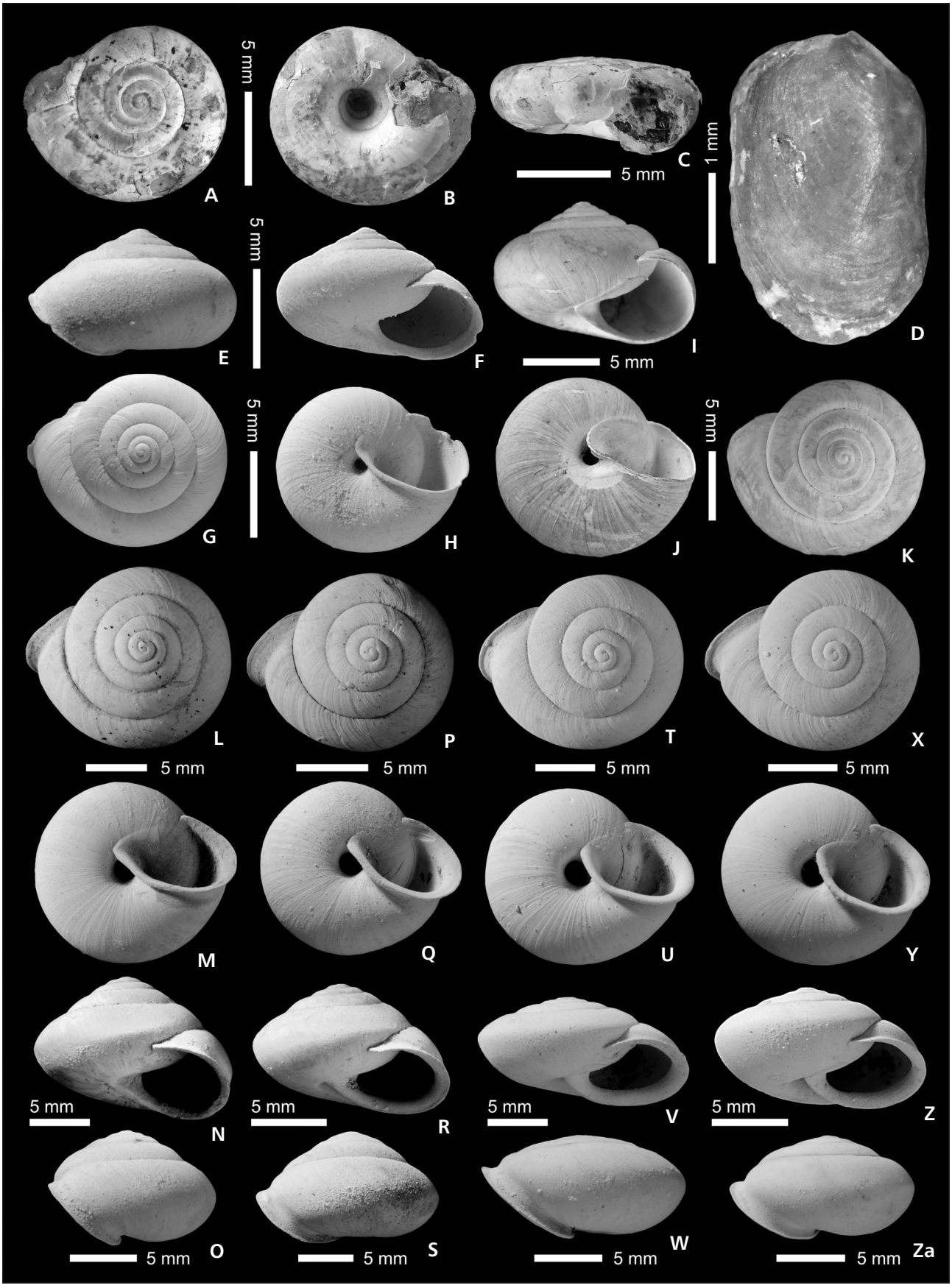
Genus *Pseudomonacha* Pfeffer, 1930

Type species. – *Helix punctigera* Thomä, 1845; subsequent designation by Nordsieck (1986). Early Miocene, Germany.

***Pseudomonacha zippei* (Reuss *in* Reuss & Meyer, 1849)**
Figure 15L–S

1849a *H.* [*elix*] *Zippei* Rss.; Reuss *in* Reuss & Meyer, p. 11 (nomen nudum).

Figure 15. A–C – *Aegopinella vetusta* (Klika, 1891), NM-PM-P 741. • D – *Limacus crassitesta* (Reuss, 1868), NM-PM-P 496. • E–H – *Leucochroopsis apicalis* (Reuss, 1861), NHMW 2013/0572/0059. • I–K – *Leucochroopsis apicalis* (Reuss, 1861), NM-PM-P 454 (= holotype of *Helix oxyspira* Babor, 1897). • L–S – *Pseudomonacha zippei* (Reuss *in* Reuss & Meyer, 1849), NHMW 2013/0572/0060. • T–Za – *Pseudomonacha homalospira* (Reuss, 1861), NHMW 2013/0572/0061.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5 mm
Z
5 mm
O
5 mm
S
5 mm
W
5 mm
Za
5 mm

*1849b *H.*[*elix*] *Zippei* m.; Reuss *in* Reuss & Meyer, p. 24, pl. 2, figs 5, 6.
1861 *H.*[*elix*] *Zippei* Reuss. – Reuss, p. 64.
1875 *Helix* (*Fruticicola*) *Zippei* Reuss. – Sandberger, p. 428, pl. 24, figs 4–4c.
1891 *Helix zippei* Reuss. – Klika, p. 51, text-figs 46a, b.
1892 *Helix zippei* Reuss. – Klika, p. 49, text-figs 46a, b.
1909 [*Monacha*] *zippei* Reuss. – Boettger, p. 15.
1911 [*Helix* (*Fruticicola*)] *Zippei* Rss. – Kafka, p. 68.
1916 [*Helix* (*Trigonostoma*)] *Zippei* Reuss. – Thuma, p. 83.
1917 *Hygromia* (*Monacha*) *zippei* (Reuss). – Wenz, p. 57.
1923 *Monacha* (*Monacha*) *zippei* (Reuss). – Wenz, p. 418 (cum syn.).
1930 *Pseudomonacha Zippei* (Reuss). – Pfeffer, p. 112.
1930 *Zenobiella* (*Monachoides*) [*zippei* (Reuss)]. – Wenz, p. 3028.
1980 [*Monachoides*] *zippei* (Reuss, 1849). – Richardson, p. 464.
1999 *Pseudomonacha zippei* (Reuss). – Esu, p. 332.

Material. – 2 specimens (NHMW 2013/0572/0060), 148 specimens (NHMW 1864/0012/725, 1890/0013/0398, 1909/0001/0040, 1909/0001/0041, 1909/0001/0042).

Dimensions. – Diameter: 17 mm, height: 13 mm (Fig. 15L–O); diameter: 14.5 mm, height: 8.6 mm (Fig. 15P–S).

Discussion. – This medium-sized species is characterised by its conical spire, the slightly angulated last whorl and the deeply incised furrow behind the flaring peristome. There is complete confusion between this species and the morphologically similar *Pseudomonacha homalospira* (Reuss, 1861) in many collections. Usually, the conical spire of *P. zippei* differs considerably from the much lower spire of *P. homalospira*. Nevertheless, there is some overlap between low-spired *P. zippei* and high-spired *P. homalospira*. Both species can be distinguished immediately based on the microsculpture: *P. zippei* develops a very delicate and densely spaced microsculpture of tiny papillae. This sculpture is not always fully preserved but usually visible on the last whorl; in addition, many specimens bear weak spiral grooves on the base. *Pseudomonacha homalospira* lacks any spiral grooves and bears coarser knob-like papillae accompanied by axially elongated pits. These structures override a faint velvet-like microsculpture formed by tiny papillae comparable to those of *P. zippei*. Moreover, some shells of *P. zippei* bear a single, narrow spiral band coinciding with the angulation of the last whorl; no comparable band is seen in *P. homalospira*. Both species, however, develop a dense pattern of papillae on their protoconchs.

Occurrence. – Only known from Korozluky, Tuchořice, Lipno and Pyšná.

Pseudomonacha homalospira (Reuss, 1861)

Figure 15T–Za

*1861 *H.*[*elix*] *homalospira* Reuss; Reuss, p. 65, pl. 1, fig. 3.
1875 *Helix homalospira* Reuss. – Sandberger, p. 429, pl. 24, figs 6–6c.
1891 *Helix homalospira* Reuss. – Klika, p. 53, text-figs 48a–c.
1892 *Helix homalospira* Reuss. – Klika, p. 51, text-figs 48a–c.
1915 *Fruticicola homalospira* Reuss. – Fischer & Wenz, p. 47.
1909 [*Monacha*] *homalospira* Reuss. – Boettger, p. 15.
1911 [*Helix*] *homalospira* Rss. – Kafka, p. 68.
1916 [*Helix* (*Trigonostoma*)] *homalospira* Reuss. – Thuma, p. 83.
1917 *Hygromia* (*Monacha*) *homalospira* (Reuss). – Wenz, p. 57.
1923 *Monacha* (*Monacha*) *homalospira* (Reuss). – Wenz, p. 413 (cum syn.).
1930 *Pseudomonacha homalospira* (Reuss). – Pfeffer, p. 113.
1930 *Zenobiella* (*Monachoides*) [*homalospira* (Reuss)]. – Wenz, p. 3028.
1977 *Monacha homalospira* (Reuss). – Moayedpour, p. 54.
1980 [*Monachoides*] *homalospira* (Reuss, 1860). – Richardson, p. 461.
non? 2006 *Perforatella* (*Monachoides*) *homalospira* (Reuss), 1860. – Kókay, p. 86, pl. 33, fig. 1.

Material. – 2 specimens (NHMW 2013/0572/0061), 74 specimens (NHMW 1909/0001/0045, 1909/0001/0101), 7 specimens from Lipno (NHMW 1864/0012/0731).

Dimensions. – Diameter: 18 mm, height: 8.5 mm (Fig. 15T–W); diameter: 15.5 mm, height: 8.2 mm (Fig. 15X–Za).

Discussion. – See above (*Pseudomonacha zippei*).

Occurrence. – Known from Korozluky, Tuchořice and Lipno; a further occurrence is mentioned without description by Moayedpour (1977) from the Early Miocene of Theobaldshof/Rhön (Germany). The Early Miocene specimen from the Somlóvásárhely drilling in Hungary, illustrated by Kókay (2006) seems to represent a different species based on the much coarser papillae and the prominent growth lines.

Family Helicodontidae Kobelt, 1904

Genus *Praeoestophorella* Pfeffer, 1930

Type species. – *Helix phacodes* Thomä, 1845, designation herein. Late Oligocene, Germany.

***Praeoestophorella petersi* (Reuss *in* Reuss & Meyer, 1849) comb. nov.**
Figure 16A–F

1849a *H.*[*elix*] *Petersi* Rss.; Reuss *in* Reuss & Meyer, p. 11 (nomen nudum).
*1849b *H.*[*elix*] *Petersi* m.; Reuss *in* Reuss & Meyer, p. 23, pl. 2, fig. 3.
1861 *H.*[*elix*] *phacodes* Thom. – Reuss, p. 68 (non *Helix phacodes* Thomä, 1845).
1891 *Helix* (*Gonostoma*) *phacodes* Thomae. – Klika, p. 45, text-figs 38a–c (non *Helix phacodes* Thomä, 1845).
1892 *Helix* (*Gonostoma*) *phacodes* Thomae. – Klika, p. 44, text-figs 38a–c (non *Helix phacodes* Thomä, 1845).
1897 *Helix* (*Caracollina* Ehrenberg) *phacodes* Thomae var. *grossa* n. – Babor, p. 3.
1911 *Helix* (*Gonostoma*) *phacodes* Th. – Kafka, p. 67 (non *Helix phacodes* Thomä, 1845).
1917 *Helicodonta* (*Caracollina*) *phacodes* (Thomae). – Wenz, p. 60 (non *Helix phacodes* Thomä, 1845).
1930 *Praeoestophorella tuchoricensis* nov.; Pfeffer, p. 127.
1980 [*Caracollina*] *tuchoricensis* Pfeffer, 1929. – Richardson, p. 426.

Material. – 2 specimens (NHMW 2013/0572/0062), 29 specimens (NHMW 1890/0013/0397, 1909/0001/0100, 1909/0001/00033).

Dimensions. – Diameter: 9.8 mm, height: 3.9 mm (Fig. 16A–C); diameter: 9.9 mm, height: 4.5 (Fig. 16D–F).

Discussion. – This species was originally described as *Helix Petersi* Reuss *in* Reuss & Meyer, 1849. Later, Reuss (1861) doubted the validity of his species and suggested that is a junior synonym of *Helix phacodes* Thomä, 1845. This view was accepted by following authors up to Wenz (1923), until Pfeffer (1930) recognised the differences between both taxa and described the species from Tuchořice as *Praeoestophorella tuchoricensis*, erroneously overlooking the older available name *petersi* [and also the available name *grossa* of Babor (1897)].

Wenz (1917, 1923) treated this species as *Caracollina* and Richardson (1980) considered *Praeoestophorella* as synonym of *Caracollina*. Aside from a superficial similarity concerning outline and sculpture, the completely covered umbilicus allows a clear separation from *Caracollina*. The distinguishing features from the Oligocene *P. phacodes*, such as the much more pronounced keel in *P. petersi* and its lower discoidal shape and differences in the ribbing, were discussed in detail by Pfeffer (1930) and confirmed by us by comparison with material from Hochheim.

Pfeffer (1930, p. 278) introduced *Praeoestophorella* as new genus without designating a type species. He listed *Praeoestophorella phacodes* (Thomä) and *P. tuchoricensis* Pfeffer as sole species of this genus. In the same monograph, Pfeffer (1930, p. 276) erected *Pachycarocollina* as new genus and listed only *Pachycarocollina lapicidella* (Thomä) as species within this genus, which thus is automatically the type species by monotypy (ICZN 1999, Article 68.3). Unfortunately, Nordsieck (1986) overlooked this decision and defined *Helix phacodes* Thomä as type species of *Pachycarocollina*. Herein, we designate *Helix phacodes* Thomä, 1845 as type species of *Praeoestophorella* Pfeffer, 1930, which corresponds to the original intention of Pfeffer (1930).

The specimen described as *Helix* (*Caracollina*) *phacodes* var. *grossa* by Babor (1897) is a high spired morph with rather convex spire. After examination of the type in the Prague collection, we consider it an aberrant or unusual specimen of *Praeoestophorella petersi*.

Occurrence. – Only known from Tuchořice and Pyšná; it might represent the direct descendant of the Oligocene to Aquitanian *P. phacodes*.

Genus *Protodrepanostoma* Germain, 1929

Type species. – *Helix* (*Polygyra*) *plioauriculata* Sacco, 1889; original designation. Pliocene, Italy.

***Protodrepanostoma involuta nordsiecki* Falkner, 1986**
Figure 16 O–P

1849a *H.*[*elix*] *involuta* Thom. – Reuss *in* Reuss & Meyer, p. 11 (non *Helix involuta* Thomä, 1845).
1849b *H.*[*elix*] *involuta* Thom. – Reuss *in* Reuss & Meyer, p. 28, pl. 3, fig. 3 (non *Helix involuta* Thomä, 1845).
1861 *H.*[*elix*] *involuta* Thom. – Reuss, p. 68 (non *Helix involuta* Thomä, 1845).
1891 [*Helix* (*Trigonostoma* Fitz.) *involuta* Thomae] var. *minor.* – Klika, p. 47, text-figs 39a, b.
1892 [*Helix* (*Trigonostoma* Fitz.) *involuta* Thomae] var. *minor.* – Klika, p. 45, text-figs 39a, b.
1911 [*Helix*] (*Trigonostoma*) *involuta* Th. var. *minor.* – Kafka, p. 67.
1916 [*Helix*] (*Trigonostoma*) *involuta* Thomae var. *minor* Klika. – Thuma, p. 83.

1917 *Helicodonta* (*Helicodonta*) *involuta* (Thomae). – Wenz, p. 59 (non *Helix involuta* Thomä, 1845).
1930 *Helicodonta involuta involuta* (Thomae). – Pfeffer, p. 131 (pars) (non *Helix involuta* Thomä, 1845).
*1986 *Protodrepanostoma nordsiecki* sp. nov.; Falkner, p. 121, pl. 17, figs 9, 10.
1999 *Protodrepanostoma nordsiecki* Falkner. – Esu, p. 332.
2000b "*P.*" *involutum – nordsiecki*. – Manganelli & Giusti, p. 352.

Material. – 2 specimens (NHMW 2013/0572/0063), 85 specimens (NHMW 1890/0013/0403, 1909/0001/0034).

Dimensions. – Diameter: 6.8 mm, height: 3.1 mm; diameter: 5.5 mm, height: 2.9 mm (Fig. 16P).

Discussion. – Falkner (1986) placed this species in the genus *Protodrepanostoma* Germain, 1929 with the Pliocene type species *Helix* (*Polygyra*) *plioauriculata* Sacco, 1889. Manganelli & Giusti (2000b) suggested that this genus is a synonym of *Drepanostoma* Porro, 1836 and excluded *P. nordsiecki* from that genus as understood by them. Indeed, the wide aperture of the Miocene species differs significantly from *D. helenae* Manganelli & Giusti, 2000b and *D. plioauriculatum* Sacco, 1889, which develop a prominent parietal lamella. The presence of this lamella, however, is not a distinguishing feature and is missing in related species such as *Helicodonta obvoluta sensu* Ciangherotti *et al.* 2007 and may be absent or present within *P. bernardii* (Michaud, 1862) (H. Nordsieck, written comm. 2014). We cannot follow the statement of Manganelli & Giusti (2000b) that the Most Basin species is "practically indistinguishable" from the Oligocene and Early Miocene *P. i. involuta* (Thomä, 1845). In his precise description, Falkner (1986) listed a number of features, which allow a separation of both taxa at least on the subspecies level (*e.g.* the larger diameter of the papillae in *P. i. nordsiecki*).

Occurrence. – Only known from Korozluky, Tuchořice and Lipno.

***Protodrepanostoma hecklei* (Klika, 1891)**
Figure 16G–N

*1891 [*Helix* (*Trigonostoma* Fitz.) *involuta* Thomae] var. *hecklei*; Klika, p. 47, text-figs 40a, b.
1892 [*Helix* (*Trigonostoma* Fitz.) *involuta* Thomae] var. *hecklei*. – Klika, p. 45, text-figs 40a, b.
1911 *Helix* (*Trigonostoma*) *involuta* Th. var. *Hecklei*; Kafka, p. 67.
1986 [*Helicodonta*] *hecklei*. – Falkner, p. 123, pl. 17, fig. 11.
1999 *Helicodonta hecklei* (Klika). – Esu, p. 332.

Material. – 2 specimens (NHMW 2013/0572/0064), 4 specimens (NHMW 1909/0001/0102, 1909/0001/0035/).

Dimensions. – Diameter: 8.8 mm, height: 3.4 mm (Fig. 16G–J); diameter: 7.8 mm, height: 3.4 mm (Fig. 16K–N).

Discussion. – This species is readily distinguished from the somewhat similar *Protodrepanostoma involuta nordsiecki* by its larger size and the much weaker sculpture of early teleoconch whorls. According to Nordsieck (2013b, written comm. 2014), this group, including taxa such *as P. bernardii* (Michaud, 1862) and *P. obvoluta sensu* Ciangherotti *et al.* 2007, belongs to *Protodrepanostoma* and not to *Helicodonta* as proposed by Manganelli & Giusti (2000b) based on the apertural features (see Nordsieck 2013b, figs 6–9).

Occurrence. – Only known from Tuchořice.

Family Elonidae Gittenberger, 1979

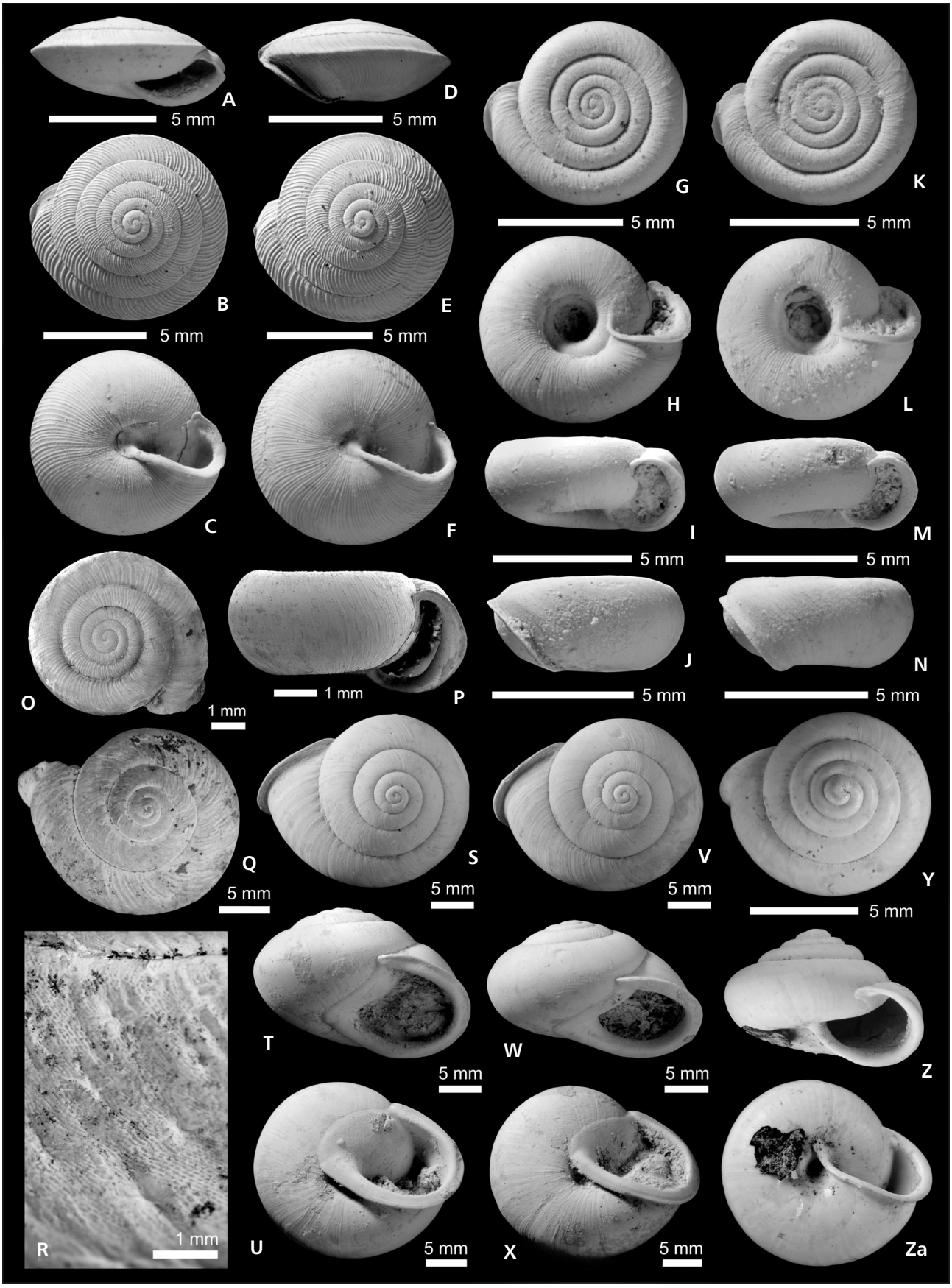
Genus *Metacampylaea* Pilsbry, 1894

Type species. – *Helix Rahtii* Thomä, 1845; original designation. Oligocene, Germany.

***Metacampylaea papillifera* (Klika, 1891)**
Figure 16Q–R

*1891 *Helix* (*Geotrochus*?) *papillifera* n.; Klika, p. 64, text-figs 60a–c.
1892 *Helix* (*Geotrochus*?) *papillifera* Klika. – Klika, p. 62, text-figs 60a–c.
1911 *Helix* (*Geotrochus*) *papillifera*. – Kafka, p. 68.
1917 *Metacampylaea papillifera* (Klika). – Wenz, p. 57.
1921 [*Metacampylaea* (*Metacampylaea*)] *papillifera* (Klika). – Boettger & Wenz, p. 17.
1923 *Metacampylaea* (*Metacampylaea*) *papillifera* (Klika). – Wenz, p. 482 (cum syn.).

Figure 16. A–F – *Praeoestophorella petersi* (Reuss *in* Reuss & Meyer, 1849), NHMW 2013/0572/0062. • G–J, K–N – *Protodrepanostoma hecklei* (Klika, 1891), NHMW 2013/0572/0064. • O, P – *Protodrepanostoma involuta nordsiecki* Falkner, 1986, NHMW 2013/0572/0063. • Q, R – *Metacampylaea papillifera* (Klika, 1891), NM-PM-P 432 (holotype); R – details of the microsculpture. • S–X – *Pseudochloritis robusta* (Reuss *in* Reuss & Meyer, 1849), NHMW 2013/0572/0065. • Y–Za – *Apula prominens* (Babor, 1897), NM-PM-P 707 (holotype).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1933 *Metacampylaea* (*Metacampylaea*) *papillifera* (Klika). – Wenz, p. 8.
1980 [*Metacampylaea* (*Galactochiloides*)] *papillifera* (Klika, 1891). – Richardson, p. 58.

Material. – One specimen in the Prague collection (NM-PM-P 432).

Dimensions. – Diameter: 23.5 mm, height: 10.7 mm.

Description. – Depressed, obtuse-carinate shell characterised by its sculpture consisting of large and wide-spaced papillae, arranged in strongly opisthocline rows. The entire shell is covered by a crazing effect microsculpture, consisting of densely spaced, slightly elongate to wrinkled papillae. All these elements are predominated by blunt, rather irregular, prosocline growth lines. A distinct angulation appears on the last whorl, which terminates in a strongly reflected peristome.

Umbilicus covered. Unfortunately, the holotype is glued to a collection label and we did not dare to remove it. Therefore, we have to refer to Klika (1891) for accurate illustrations of the umbilical and apertural views.

Discussion. – An extremely rare species, which is known so far only from a single specimen described by Klika (1891; 20 additional specimens were mentioned by Klika from the private collection of O. Boettger). As discussed by Klika (1891) and Wenz (1917), this species seems to be closely related with the Oligocene *Metacampylaea rahtii* (Thomä, 1845), which is the type species of *Metacampylaea* Pilsbry, 1894. Therefore, the decision of Richardson (1980) to place this species in *Galactochiloides* cannot be followed, because this (sub)genus was introduced by Wenz (1919) for *Metacampylaea*-like species without keel. The weaker keel, lower spire and fully covered umbilicus allow a separation from *M. rahtii*.

Occurrence. – Known from Tuchořice; Wenz (1933) mentions the species also from the Early Miocene of Kustersberg (Germany) and Wirtatobel (Austria).

Genus *Pseudochloritis* C. Boettger, 1909

Type species. – *Helix incrassata* Klein, 1853; original designation. Miocene, Germany.

Pseudochloritis robusta (Reuss *in* Reuss & Meyer, 1849)

Figure 16S–X

1849a *H.*[*elix*] *robusta* Rss.; Reuss *in* Reuss & Meyer, p. 11 (nomen nudum).
1849a *H.*[*elix*] *trichophora* Rss.; Reuss *in* Reuss & Meyer and Meyer, p. 11 (nomen nudum).
*1849b *H.*[*elix*] *robusta* m.; Reuss *in* Reuss & Meyer, p. 25, pl. 2, fig. 7.
1849b *H.*[*elix*] *trichophora* m.; Reuss *in* Reuss & Meyer, p. 26, pl. 2, fig. 8.
1861 *H.*[*elix*] *robusta* Reuss. – Reuss, p. 67.
1861 *H.*[*elix*] *trichophora* Reuss. – Reuss, p. 68.
1875 *Helix* (*Hemicycla*) *robusta* Reuss. – Sandberger, p. 431, pl. 24, figs 10–10b.
1891 *Helix* (*Chlorites*) *robusta* Reuss. – Klika, p. 60, text-figs 56a, b.
1892 *Helix* (*Chlorites*) *robusta* Reuss. – Klika, p. 58, text-figs 56a, b.
1897 *Helix* (*Trachia* Albers) *Ihliana* sp. nov.; Babor, p. 6, text-fig. 2.
1911 [*Helix*] (*Chloritis*) *robusta* Rss. – Kafka, p. 68.
1917 *Tropidomphalus* (*Pseudochloritis*) *robustum* (Reuss). – Wenz, p. 58.
1917 *Tropidomphalus* (*Tropidomphalus*) *ihlianus* (Babor). – Wenz, p. 58.
1923 *Tropidomphalus* (*Pseudochloritis*) *ihlianus* (Babor). – Wenz, p. 510 (cum syn.).
1923 *Tropidomphalus* (*Pseudochloritis*) *robustus* (Reuss). – Wenz, p. 517.
1930 *Pseudochloritis robusta* Reuss. – Pfeffer, p. 74.
1980 [*Tropidomphalus* (*Pseudochloritis*)] *robustus* (Reuss, 1849). – Richardson, p. 60.
? 2006 *Tropidomphalus* (*Pseudochloritis*) *robustus* (Reuss), 1852. – Kókay, p. 89, pl. 34, figs 5, 6, text-fig. 14.
2008 *Pseudochloritis robusta* (Reuss, 1849). – Binder, p. 171, pl. 1, figs 3a–c, 4a–c, 5a–c.

Material. – 2 specimens (NHMW 2013/0572/0065), 50 specimens (NHMW 2005z0059/0004, 2005z0059/0006, 2005z0059/0007, 2005z0059/0008), one specimen (NM-PM-P 453 = *Helix ihliana* Babor, 1897).

Dimensions. – Diameter: 28 mm, height: 17.5 mm (Fig. 16S–U); diameter: 28 mm, height: 16 mm (Fig. 16V–X).

Discussion. – The species was discussed in detail by Binder (2008); the generally depressed spherical shell shows some variability concerning spire height and the covering of the deep umbilicus by the broad and reflected inner lip.

Occurrence. – Common species in the Most Basin, known from Tuchořice and Lipno. Poorly preserved fragments described by Kókay (2006) from the Lower Miocene of the Somlóvásárhely drilling in Hungary might also represent this species.

Genus *Klikia* Pilsbry, 1895

Type species. – *Helix osculum* Thomä, 1845; original designation. Miocene, Germany.

***Klikia labiata* (Klika, 1891)**
Figure 17G–L

1849a *H.*[*elix*] *osculum* Thom. – Reuss *in* Reuss & Meyer, p. 11 (non *Helix osculum* Thomä, 1845).
1849b *H.*[*elix*] *osculum* Thom. – Reuss *in* Reuss & Meyer, p. 27, pl. 3, fig. 2 (non *Helix osculum* Thomä, 1845).
1861 *H.*[*elix*] *osculum* Thom. – Reuss, p. 64 (non *Helix osculum* Thomä, 1845).
1891 *Helix* (*Trigonostoma*) *osculum* Thomae. – Klika, p. 47, text-figs 41a–c (non *Helix osculum* Thomä, 1845).
*1891 [*Helix* (*Trigonostoma*) *osculum* Thomae] mut. *labiata* n.; Klika, p. 48, text-figs 42a–c.
1891 [*Helix* (*Trigonostoma*) *osculum* Thomae] mut. *tenuis* n.; Klika, p. 49, text-figs 43a, b.
1892 *Helix* (*Trigonostoma*) *osculum* Thomae. – Klika, p. 46, text-figs 41a–c (non *Helix osculum* Thomä, 1845).
1892 [*Helix* (*Trigonostoma*) *osculum* Thomae] mut. *labiata* Klika. – Klika, p. 47, text-figs 42a–c.
1892 [*Helix* (*Trigonostoma*) *osculum* Thomae] mut. *tenuis* Klika. – Klika, p. 47, text-figs 43a, b.
1911 [*Helix*] *osculum* mut. *labiata*. – Kafka, p. 67.
1911 *Helix osculum* mut. *tenuis*. – Kafka, p. 67.
1911 *Klikia labiata* Klika. – Wenz, p. 96, pl. 4, figs 31–35.
1916 [*Helix* (*Trigonostoma*)] *osculum* Thomae var. *tenuis* Klika. – Thuma, p. 83.
1916 *Klikia* (*Klikia*) *osculum tenuis* Klikia [sic]. – Wenz, p. 58.
1917 *Klikia* (*Klikia*) *osculum* (Thomae). – Wenz, p. 47 (non *Helix osculum* Thomä, 1845).
1917 *Klikia* (*Klikia*) *labiata* (Klika). – Wenz, p. 58.
1923 *Klikia* (*Klikia*) *labiata* (Klika). – Wenz, p. 545 (cum syn.).
1923 *Klikia* (*Klikia*) *osculum tenuis* (Klika). – Wenz, p. 552 (cum syn.).
1930 [*Klikia*] *labiata*. – Pfeffer, p. 86.
1980 [*Klikia*] *labiata* (Klika, 1891). – Richardson, p. 56.

Material. – 4 specimens (NHMW 2013/0572/0066), 443 specimens (NHMW 1847/0032/0091, 1864/0012/0729, 1909/0001/0036, 1909/0001/00037, 1909/0001/00038, 1909/0001/00052, 1909/0001/0103).

Dimensions. – Diameter: 9 mm, height: 6 mm (Fig. 17J–L); diameter: 9.5 mm, height: 6.5 mm (Fig. 17G–I).

Discussion. – This very frequent species has a solid, depressed, globose shell with low spire, strongly convex last whorl and base, and a typical, strongly thickened, reflected, collar-like peristome with a glossy well-defined parietal callus. There is some minor variability in sphericity and especially in the thickness of the peristome. Such shells with reflected but rather thin outer lip have been treated as "var. *tenuis*" by Klika (1891) and Wenz (1923). In our opinion, they just represent late subadult stages. This species is most likely a direct descendant of the slightly older Oligocene and Aquitanian *Klikia osculum* (Thomä, 1845), which lacks the thickened peristome.

Occurrence. – Only known from Korozluky, Tuchořice and Lipno.

Genus *Apula* C. Boettger, 1909

Type species. – *Helix devexa* Reuss, 1861; original designation. Early Miocene, Czech Republic.

***Apula devexa* (Reuss, 1861)**
Figure 17A–F

*1861 *H.*[*elix*] *devexa* Reuss; Reuss, p. 65, pl. 1, fig. 4.
1869a *Helix* (*Fruticicola*) *devexa* Reuss. – Slavík, p. 242.
1891 *Helix devexa* Reuss. – Klika, p. 50, text-figs 45a–c.
1891 *Helix devexa* Reuss. – Klika, p. 49, text-figs 45a–c.
1897 *Helix devexa Reuss* f. *applanata* n.; Babor, p. 3.
1875 *Helix* (*Fruticicola*) *devexa* Reuss. – Sandberger, p. 429, pl. 24, figs 5–5c.
1911 *Helix* (*Fruticicola*) *devexa* Rss. – Kafka, p. 68.
1911 *Klikia devexa* Rss. – Wenz, p. 94, pl. 4, figs 26–28.
1912 *Klikia devexa* Reuss. – Boettger, p. 129.
1916 *Klikia* (*Apula*) *devexa* (Reuss). – Wenz, p. 59.
1923 *Klikia* (*Apula*) *devexa* (Reuss). – Wenz, p. 537 (pars).
1933 *Klikia* (*Apula*) *devexa* (Reuss). – Wenz, p. 9.
1930 *Klikia* (*Apula*) *devexa* (Reuss). – Pfeffer, p. 87.
1960 *Klikia* (*Apula*) *devexa* (Reuss). – Zilch *in* Wenz & Zilch, p. 707, fig. 2459.
1980 [*Klikia* (*Ampula* [sic])] *devexa* (Reuss, 1860). – Richardson, p. 58.
non 1915 *Klikia* (*Apula*) *devexa* (Rss). – Fischer & Wenz, p. 49.
non 2006 *Klikia* (*Apula*) cf. *devexa* (Reuss) var., 1860. – Kókay, p. 92, pl. 35, figs 11–15.

Material. – 2 specimens (NHMW 2013/0572/0067), 58 specimens (NHMW 1890/0013/0399, 1909/0001/0039), 3 specimens in the Prague collection (NHM-PM-P 879-881, = *Helix devexa applanata* Babor, 1897).

Dimensions. – Diameter: 10 mm, height: 5.2 mm (Fig. 17D–F); diameter: 11 mm, height: 6.3 mm (Fig. 17A–C).

Discussion. – All available specimens are quite homogenous concerning size, shape and umbilicus. The umbilicus is nearly completely covered or reduced to a narrow puncture. The microsculpture consists of a dense pattern of delicate papillae. The specimens separated by Babor (1897) as "*applanata*" do not justify any taxonomic separation.

Occurrence. – Known from Tuchořice and Lipno. Wenz & Fischer (1915) mentioned this species also from the Early Miocene of Theobaldshof/Rhön (Germany). Based on the wider umbilicus of these specimens, Moayedpour (1977) doubted this identification. Similarly, the Early Miocene specimens from the Hungarian Somlóvásárhely drilling, tentatively assigned to *Apula devexa* by Kókay (2006), differ distinctly in their much wider umbilicus. An Early Miocene occurrence from Wirtatobel (Austria) is mentioned by Wenz (1933).

Apula prominens (Babor, 1897) species inquirenda

Figure 16Y–Za

1897 *Helix devexa* Reuss f. *prominens* n. – Babor, p. 4.

Material. – One specimen in the Prague collection (NM-PM-P 707).

Dimensions. – Diameter: 8.5 mm, height: 5.8 mm.

Discussion. – A single specimen was described by Babor (1897) as variation of *Apula devexa*. Later, Wenz (1923) listed this taxon as synonym of *Apula devexa* (Reuss, 1861). At first sight, it differs clearly from that common species in its high spire, the convex whorls, the comparatively narrower last whorl (in apical view) and the wider umbilicus. In addition it has a large and bulbous protoconch consisting of *ca* 0.75 whorls. A closer look at the protoconch, however, documents a pathologic development with an injury early in ontogeny. Its microsculpture is identical with that of *A. devexa* and the peristome is also very similar. Therefore, the status of this species remains unclear unless further specimens are found.

Occurrence. – Known from Tuchořice.

Family Helicidae Rafinesque, 1815

Genus *Creneatachea* Zilch *in* Wenz & Zilch, 1960

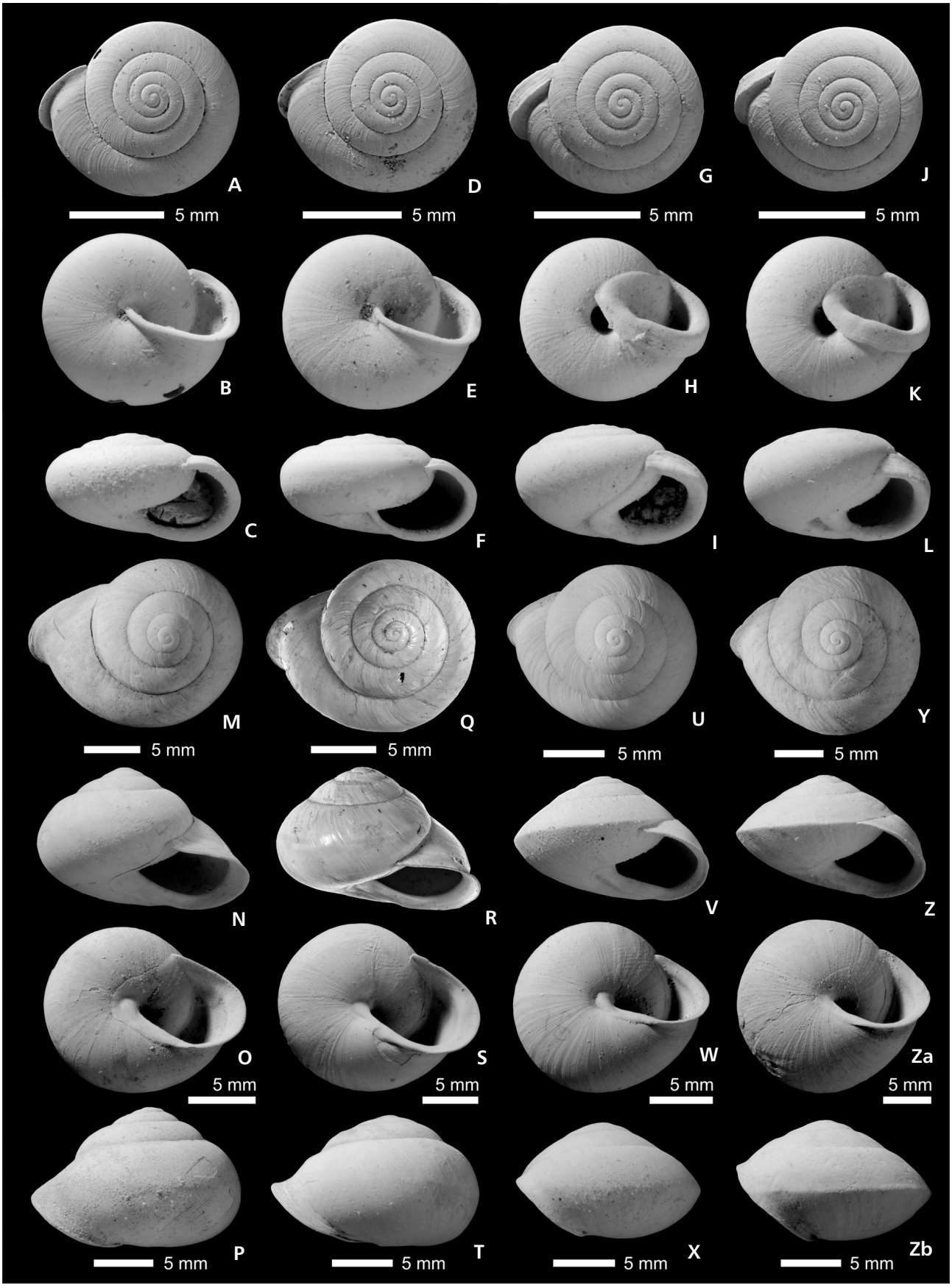
Type species. – *Helix obtusecarinata* Sandberger, 1858; original designation. Early Miocene, Czech Republic.

Creneatachea obtusecarinata (Sandberger, 1858)

Figure 17U–Zb

1849a *Helix Rahtii* Thom. – Reuss *in* Reuss & Meyer, p. 11 (non *Helix Rahtii* Thomä, 1845).
1849b *H.*[*elix*] *Rahtii* Thomae. – Reuss *in* Reuss & Meyer, p. 24, pl. 2, figs 1–2 (non *Helix Rahtii* Thomä, 1845).
*1858 *Helix obtusecarinata*; Sandberger, p. 25.
1861 *H.*[*elix*] *obtusecarinata* Sandb. – Reuss, p. 66.
1875 *Helix obtusecarinata* Sandberger. – Sandberger, p. 430, pl. 24, figs 9–9c.
1870a *Helix* (*Iberus* Montf.) *obtuse carinata* [sic] Sandb. – Boettger, p. 291.
1891 *Helix* (*Trichia*) *perfecta* n.; Klika, p. 56, text-figs 52a, b.
1891 *Helix* (*Geotrochus*?) *obtusecarinata* Sandberger. – Klika, p. 62, text-figs 57a, b.
1891 [*Helix* (*Geotrochus*?) *obtusecarinata* Sandberger] forma *minima* n. – Klika, p. 63, text-fig. 58.
1891 [*Helix* (*Geotrochus*?) *obtusecarinata* Sandberger] var. *obesula* n. – Klika, p. 63, text-figs 59a–c.
1892 *Helix* (*Geotrochus*?) *obtusecarinata* Sandberger. – Klika, p. 60, text-figs 57a, b.
1892 [*Helix* (*Geotrochus*?) *obtusecarinata* Sandberger] forma *minima* Klika. – Klika, p. 61, text-fig. 58.
1892 [*Helix* (*Geotrochus*?) *obtusecarinata* Sandberger] var. *obesula* Klika. – Klika, p. 61, text-figs 59a–c.
1909 [*Tachea*] *obtusecarinata* Sdbg. – Boettger, p. 18.
1911 [*Helix*] (*Trichia*) *perfecta* Kl. – Kafka, p. 68.
1911 [*Helix*] (*Geotrochus? Hemicyclus*) *obtusecarinata* Sndb. – Kafka, p. 68.
1911 [*Helix* (*Geotrochus? Hemicyclus*) *obtusecarinata* Sndb.] var. *minima* Kl. – Kafka, p. 68.
1912 *Helix* (*Tachea?*) *obtusecarinata* Sdb. – Frankenberger, p. 73.
1916 [*Helix*] (*Geotrochus*?) *obtusecarinata* Sandberger. – Thuma, p. 83.
1917 *Cepaea obtusecarinata* (Sandberger). – Wenz, p. 61.
1917 *Cepaea subsoluta* (Sandberger). – Wenz, p. 60 [non *Helix* (*Crena*) *subsoluta* Sandberger, 1858].
1918 *Cepaea obtusecarinata* (Sandberger). – Wenz, p. 17.

Figure 17. A–F – *Apula devexa* (Reuss, 1861), NHMW 2013/0572/0067. • G–L – *Klikia labiata* (Klika, 1891), NHMW 2013/0572/0066. • M–P, S–T – *Megalotachea macrocheila* (Reuss *in* Reuss & Meyer, 1849), NHMW 2013/0572/0069. • Q, R – *Megalotachea macrocheila* (Reuss *in* Reuss & Meyer, 1849), MB.Ga.12215. • U–Zb – *Creneatachea obtusecarinata* (Sandberger, 1858), NHMW 2013/0572/0068.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5 mm

1923 *Cepaea obtusecarinata* (Sandberger). – Wenz, p. 648 (cum syn.).
1933 *Cepaea obtusecarinata* (Sandberger). – Wenz, p. 9.
1930 *Crena obtusecarinata* Sandb. – Pfeffer, p. 189.
1960 *Cepaea* (*Creneatachea*) *obtusecarinata* (Sandberger). – Zilch *in* Wenz & Zilch, p. 717, text-fig. 2491.
1980 [*Cepaea* (*Creneatachea*)] *obtusecarinata* (Sandberger, 1858). – Richardson, p. 286.

Material. – 2 specimens (NHMW 2013/0572/0068), 149 specimens (NHMW 1843/0040/0002, 1847/0032/0089, 1890/0013/0396, 1909/0001/0053, 1909/0001/0049).

Dimensions. – Diameter: 16 mm, height: 9.9 mm (Fig. 17U–X); diameter: 21 mm, height: 12 mm (Fig. 17Y–Zb).

Discussion. – A very conspicuous lenticular and non-umbilicate shell – usually with very prominent carina – which cannot be confused with any other species. The broad, raised and flattened basal lip is another characteristic feature of this species. Along with the typical morphotypes appear rare specimens with tiny umbilical chink (mainly subadult shells) and ones, which lack the carina resulting in a rather depressed spherical outline. Some variation can also be stated concerning the spire height and the strength of the growth lines. Colour patterns are rarely preserved and seem to consist only of two narrow brown bands on the base.

Occurrence. – Known from Korozluky, Tuchořice and Lipno; an additional occurrence from the Lower Miocene of Ulm (Germany) and Wirtatobel (Austria) is mentioned by Wenz (1923, 1933).

Genus *Megalotachea* Pfeffer, 1930

Type species. – *Helix turonensis* Deshayes, 1831; subsequent designation by Truc (1971). Early Miocene, France.

Megalotachea macrocheila (Reuss *in* Reuss & Meyer, 1849) nov. comb.

Figure 17M–T

1849a *Helix oxystoma* Thom. – Reuss *in* Reuss & Meyer, p. 11 (non *Helix oxystoma* Thomä, 1845).
1849a *H.*[*elix*] *macrocheila* Rss.; Reuss *in* Reuss & Meyer, p. 12 (nomen nudum).
*1849b *H.*[*elix*] *macrocheila* m.; Reuss *in* Reuss & Meyer, p. 26, pl. 3, fig. 1.
1849b *H.*[*elix*] *rostrata* A. Braun. – Reuss *in* Reuss & Meyer, p. 27, pl. 2, fig. 9 (non "*Helix rostrata* Braun").
1861 *H.*[*elix*] *deflexa* A. Braun. – Reuss, p. 67 (non *Helix deflexa* Braun *in* Walchner, 1851).
1861 *H.*[*elix*] *macrochila* [sic] Reuss. – Reuss, p. 67.
1869a *Helix* (*Crenea*) *expansilabris* Sandberger. – Slavík, p. 245 (non *Helix expansilabris* Sandberger, 1858).
1869b *Helix* (*Crenea*) *expansilabris* Sandb. – Slavík, p. 271 (non *Helix expansilabris* Sandberger, 1858).
1870a *Helix* (*Macularia* Alb.) *expansilabris* Sandberger. – Boettger, p. 290 (non *Helix expansilabris* Sandberger, 1858).
1870a *Helix* (*Macularia*) *bohemica*; Boettger, p. 290, pl. 13, figs 4a–c.
1875 *Helix bohemica* Böttger. – Sandberger, p. 432, pl. 24, figs 8, 8a.
1891 *Helix* (*Coryda*) *bohemica* Boettger. – Klika, p. 57, text-figs 54a–c.
1891 *Helix* (*Coryda*) *hortulana* Thomae. – Klika, p. 59, text-figs 55a, b (non *Helix hortulana* Thomä, 1845).
1892 *Helix* (*Coryda*) *bohemica* Boettger. – Klika, p. 55, text-figs 54a–c.
1892 *Helix* (*Coryda*) *hortulana* Thomae. – Klika, p. 57, text-figs 55a, b (non *Helix hortulana* Thomä, 1845).
1897 *Helix* (*Coryda*) *rugulosa* var. *subsulcosa* Thom. – Babor, p. 17 (non *Helix subsulcosa* Thomä, 1845).
1909 [*Tachea*] *bohemica* O. Bttg. – Boettger, p. 18.
1911 [*Helix*] (*Coryda, Macularia*) *bohemica* Bttg. – Kafka, p. 68.
1911 *Helix* (*Coryda*) *hortulana* Th. – Kafka, p. 68 (non *Helix hortulana* Thomä, 1845).
1914 *Cepaea hortulana* (Tho.). – Wenz *in* Fischer & Wenz, p. 77 (pars).
1916 [*Helix*] (*Coryda*) *bohemica* Boettger. – Thuma, p. 83.
1916 [*Helix*] (*Coryda*) *hortulana* Thomae. – Thuma, p. 83 (non *Helix hortulana* Thomä, 1845).
? 1916 [*Helix*] (*Obba*) cfr *hyperbolica* Sandberger. – Thuma, p. 83 [non *Helix* (*Obba*) *hyperbolica* Sandberger, 1872].
1917 *Cepaea bohemica* (Boettger). – Wenz, p. 60.
1923 *Cepaea bohemica* (Boettger). – Wenz, p. 609 (cum syn.).
1930 *Holcotachea bohemica* (Bttg.). – Pfeffer, p. 158.
1930 *Holcotachea bohemica* var. *hortulanaeformis* nov.; Pfeffer, p. 159.
1980 [*Cepaea bohemica*] *hortulaniformis* [sic] G. Pfeffer, 1929. – Richardson, p. 268.
1980 [*Cepaea*] *bohemica* (Böttger, 1870). – Richardson, p. 268.
? 2006 *Cepaea bohemica* (Boettger), 1870. – Kókay, p. 93, pl. 36, fig. 1.
non 1911 *Helix* (*Coryda?*) *bohemica* Bttg. – Gaál, p. 59, pl. 3, fig. 5.

Material. – One specimen (NHMW 2013/0572/0069), 169 specimens (NHMW 1890/0013/0402, 1909/0001/0046, 1909/0001/0047, 1923/409, 1926/0002/1347), 5 specimens

from Lipno (NHMW 1864/0012/0720), one specimen (MB.Ga.12215, Museum für Naturkunde, Berlin; Fig. 17Q, R).

Dimensions. – Diameter: 19 mm, height: 13.5 mm (Fig. 17M–P); diameter: 17.5 mm, height: 13 mm (Fig. 17S, T).

Description. – A very frequent, medium-sized, globular to ovoid shell with very dense and fine growth lines. Colour pattern usually well-preserved, consisting of three moderately broad, dark bands on the lower part of the last whorl and the base; a narrower fourth one is occasionally preserved or developed some millimetres below the upper suture. Some specimens develop a rather high and moderately gradate spire; very large shells tend to form somewhat flaring outer lips and a strongly oblique apertural plane.

Discussion. – Boettger (1870a) introduced *Helix* (*Macularia*) *bohemica* for the globular morphotypes, which have been erroneously identified so far with *Helix rostrata* and *H. deflexa* by Reuss *in* Reuss & Meyer (1849b) and Reuss (1861). The high-spired morphotypes were treated as distinct species by Boettger (1870a) ("*expansilabris* Sandberger"). Later, these were mistaken for the Oligocene *Palaeotachea hortulana* (Thomä, 1845) by Klika (1891). Pfeffer (1930) recognised the mistake and proposed the variety name *hortulanaeformi*s for these shells, overlooking that Reuss *in* Reuss & Meyer (1849) had already introduced *Helix macrocheila* for these shells. Pfeffer (1930) had only 16 "typical" shells and a single "*hortulanaeformis*" shell at hand. Therefore, he was not able to evaluate the variability of this species. Based on the large number of specimens available to us, we agree with Wenz (1923) and Richardson (1980) that these high-spired shells are only morphotypes of a single species, which is usually referred to as *Cepaea bohemica* (Boettger, 1870). By treating all these taxa from Tuchořice as a single species, *Helix macrocheila* Reuss *in* Reuss & Meyer, 1849 gains priority over *Helix bohemica* Boettger, 1870.

This species is the type species of *Holcotachea* Pfeffer, 1930 (subsequent designation by Nordsieck 1986), which is considered a synonym of *Megalotachea* by Nordsieck (1986) referring to the descriptions of Pfeffer (1930).

It is unclear, which taxon from Korozluky was confused with the Eocene "*Helix*" *hyperbolica* by Thuma (1916). Obviously it is extremely unlikely that this species occurs in the Miocene Most Basin (Oppenheim 1916) and most probably he had a globular, high-spired *Megalotachea macrocheila* at hand.

Occurrence. – Known from Korozluky, Pyšná, Tuchořice and Lipno; the shell from the Lower Miocene of the Somlóvásárhely drilling in Hungary described by Kókay (2006) is too poorly preserved to allow a clear identification. A poorly preserved late Middle Miocene (Sarmatian) shell from Hungary described by Gaál (1911) represents clearly another species.

Class Bivalvia Linnaeus, 1758
Superorder Heterodonta Neumayr, 1883
Order Venerida Gray, 1854

Superfamily Sphaerioidea Deshayes, 1855
Family Sphaeriidae Deshayes, 1855

Genus *Sphaerium* Scopoli, 1777

Type species. – *Tellina cornea* Linnaeus, 1758; by monotypy (Welter-Schultes 2012). Recent, Europe.

***Sphaerium prominulum* (Reuss *in* Reuss & Meyer, 1849)**
Figure 18A–L

	1849a	*Cyclas prominula* Rss.; Reuss, p. 12 (nomen nudum).
	1849a	*Cyclas seminulum* Rss.; Reuss, p. 12 (nomen nudum).
	1849b	*Cyclas cornea* L. (Lam.). – Reuss *in* Reuss & Meyer, p. 41, pl. 4, fig. 13 (non *Tellina corneum* Linnaeus, 1758).
*	1849a	*C.*[*yclas*] *prominula* m.; Reuss, p. 42, pl. 4, fig. 14.
	1849a	*C.*[*yclas*] *seminulum* m.; Reuss, p. 42, pl. 4, fig. 15.
	1861	*Cyclas pseudocornea* Reuss; Reuss, p. 82.
	1861	*C.*[*yclas*] *prominula* Reuss. – Reuss, p. 82.
	1861	*C.*[*yclas*] *seminulum* Reuss. – Reuss, p. 82.
	1869a	*Sphaerium pseudocorneum* Reuss. – Slavík, p. 268.
	1869a	*Sphaerium prominulum* Reuss. – Slavík, p. 268.
	1869a	*Sphaerium seminulum* Reuss. – Slavík, p. 268.
	1869b	*Sphaerium pseudocorneum* Rss. – Slavík, p. 272.
	1869b	*Sphaerium prominulum* Rss. – Slavík, p. 272.
	1869b	*Sphaerium seminulum* Rss. – Slavík, p. 272.
	1870	*Cyclas pseudocornea* Rss. – Boettger, p. 299.
	1870	*Cyclas prominulum* Rss. – Boettger, p. 299.
	1870	*Cyclas seminulum* Rss. – Boettger, p. 299.
	1875	*Sphaerium pseudocorneum* Reuss. – Sandberger, pp. 366, 423.
	1891	*Sphaerium pseudocorneum* Reuss. – Klika, p. 115, text-figs 115a, b.
	1892	*Sphaerium pseudocorneum* Reuss. – Klika, p. 110, text-figs 115a, b.
	1916	*Sphaerium pseudocorneum* Reuss. – Thuma, p. 83.

Material. – 15 specimens (NHMW 1909/0001/0096, 1909/0001/0097), 3 specimens in the Prague collection (NM-PM-P 512–514).

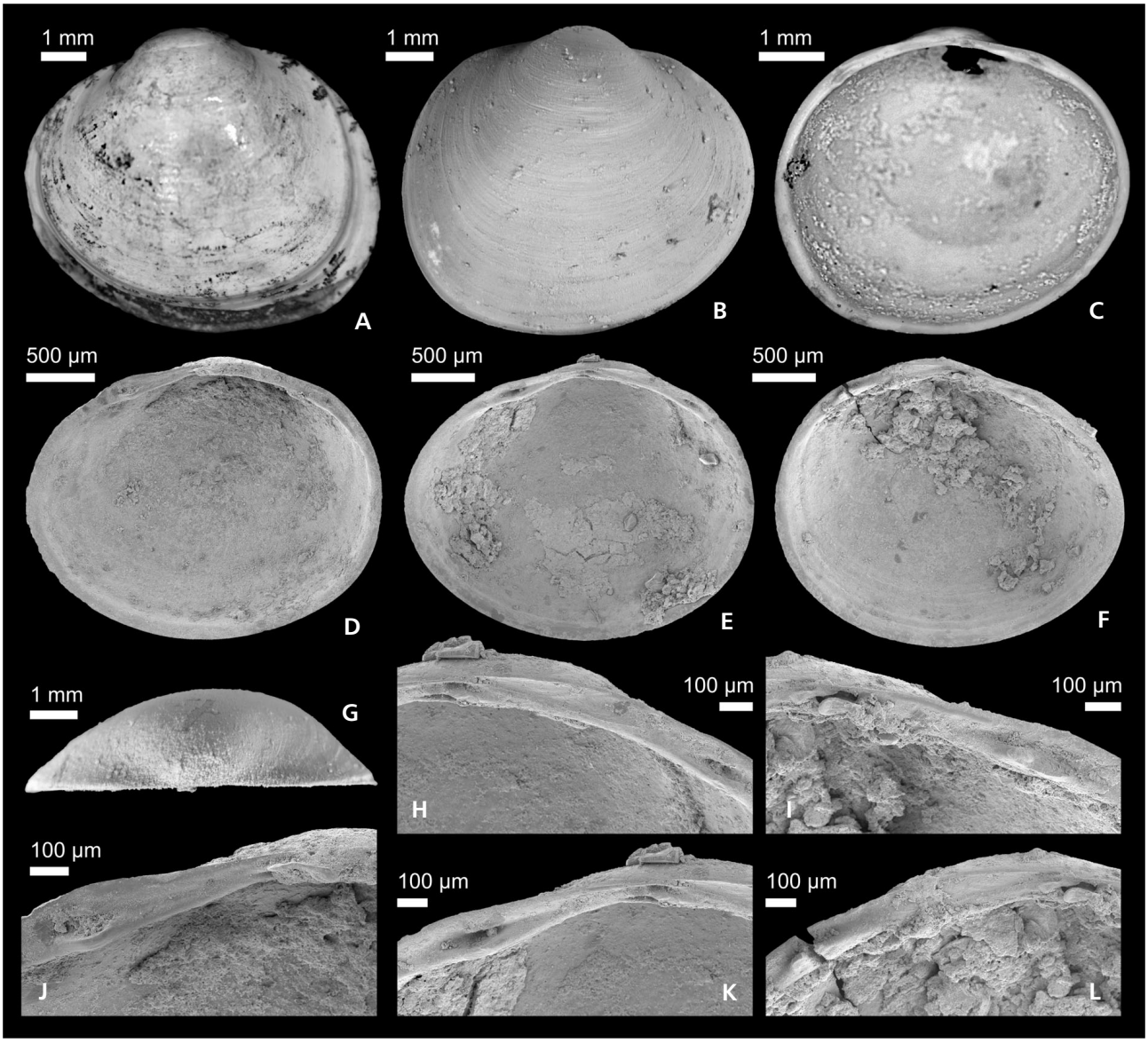

Figure 18. *Sphaerium prominulum* (Reuss *in* Reuss & Meyer, 1849). • A – NM-PM-P 513 (bivalved adult specimen, left valve up). • B, G – NHMW 1909/0001/0097 (adult specimen, right valve). • C – NM-PM-P 512 (adult specimen, left valve). • D, J – NHMW 1909/0001/0096 (juvenile specimen, right valve). • E, H, K – NHMW 1909/0001/0096 (juvenile specimen, right valve). • F, I, L – NHMW 1909/0001/0096 (juvenile specimen, left valve).

Dimensions. – The only adult specimen in the NHMW collection measures 7.5 mm in lenght, 6.5 mm in height and 2.1 mm in width (right valve, Fig. 18B, G).

Description. – Oval, symmetrical shell with anterior part slightly larger and elongate than posterior portion. Hinge very thin and delicate in both valves. Right valve: C3 thin, arcuate, with thin anterior portion and thickened posterior portion, measuring near 200 µm, flanked by dorsal and ventral furrows (for C2 and C4); A1 short, thin, arcuate; P1 likewise thin but more elongated; A3 and P3 very small and thin, almost indiscernable even in SEM images. Left valve: C2 prominent, leaf-like, arcuate, *ca* 100 µm in length; C4 elongate, with narrow anterior and thickened posterior portion, near 100 µm in length; both A2 and P2 prominent, short, triangular. Ligamental pit narrow, lanceolate, about 500 µm in length. Inner shell surface densely covered with small circular pores (*ca* 5 µm in diameter). Outer shell surface covered with dense, faint growth lines; occasionally growth irruglarities may result in local thickenings; no distinct transition between juvenile and adult shell.

Discussion. – Reuss (1861) introduced *Cyclas pseudocornea* as new name for the specimen, which he erroneously had described as *Cyclas cornea* in 1849. At that time he still considered the two other species *C. prominulum* and

C. seminulum as distinct species. Later, Boettger (1970) and Sandberger (1875) considered the three taxa described by Reuss *in* Reuss & Meyer (1849b) from Tuchořice to be conspecific, representing different ontogenetic stages. We follow this view, which makes *pseudocorneum* a younger subjective synonym of *prominulum* and *seminulum*. As First Reviser we choose *Sphaerium prominulum* as name.

Occurrence. – Known from Tuchořice, Jirkov, Korozluky and Lipno in the Most Basin. Additional occurrences from Hochheim, Gamerschwang, Öpfingen, Kaltennordheim, Theobaldshof/Rhön and Ulm, listed by Sandberger (1875), Klika (1891), and Fischer & Wenz (1915) need confirmation.

Dubious taxa and *species inquirendae*

The following taxa are either

1. based on insufficient material but might be valid species,
2. have been only mentioned in papers on the Most Basin fauna and might represent misidentifications, or
3. are based on unidentifiable fragments of (probably) other species.

Oxychilus thomaeanum (Braun *in* Walchner, 1851)

1845 *Helix deplanata* Nob. – Thomä, p. 146 (non *Helix deplanata* Müller).
*1851 *Helix Thomaeana* A. Braun; Braun *in* Walchner, p. 1140, p. 56 in offprint, No. 345.
1891 *Hyalinia* (*Polita*) *deplanata* Tho. – Boettger, p. 230 (non *Helix deplanata* Müller).
1917 *Hyalinia* (*Hyalinia*) *thomaeana* Wenz n. nom.; Wenz, p. 55.
1923 *Oxychilus thomaeanum* (A. Braun). – Wenz, p. 285 (cum syn.).

Discussion. – This Early Miocene species was mentioned by Boettger (1891) only "en passant" from Tuchořice in his book-review of Klika (1891). Since then, no additional shell could be detected. This record might either represent a misidentification or an extremely rare species. Braun *in* Walchner (1851) recognised that *Helix deplanata* Thomä, 1845 was preoccupied and introduced the replacement name *Helix Thomaeana*. There is no reason to consider this name a *nomen nudum* as done by Wenz (1917) and the authorship has to be passed to Braun *in* Walchner (1851).

"*Opeas corruptum* Klika, 1891"

*1891 *Opeas*? *corrupta* n.; Klika, p. 71, text-fig. 67.
1911 *Opeas*? *corrupta* Kl. – Kafka, p. 68.
1823 ?*Opeas corrupta* Klika. – Wenz, p. 872 (cum syn.).

Material. – One fragment in the Prague collection (NM-PM-P 679).

Dimensions. – Diameter: 2 mm.

Discussion. – Only a fragment of the last two whorls was available to Klika (1891). The internal mould is attached to the matrix along the aperture. Therefore, any identification is impossible but the fragment may simply represent one of the *Pseudoleacina* species. The genus *Opeas* Albers, 1850, with its type species *Helix goodalli* Miller, 1822 (subsequent designation by Martens *in* Albers & Martens, 1860; Recent, Cuba), is known from the Early and Middle Miocene of Europe (Schlickum 1964). The only known European representative is *Opeas minutum* (Klein, 1853), which differs considerably in its much shorter last whorl and characteristic serrated suture (Harzhauser *et al.* 2014). We strongly doubt that the Bohemian specimen belongs to *Opeas*.

Occurrence. – Only known from Pyšná.

"*Clausilia peregrina* Reuss *in* Reus & Meyer, 1849"

1849a *Clausilia peregrina* Rss.; Reuss *in* Reuss & Meyer, p. 11 (nomen nudum).
*1849b *C.*[*lausilia*] *peregrina* m.; Reuss *in* Reuss & Meyer, p., 34, pl. 4, fig. 2.
1861 *Cl.*[*ausilia*] *peregrina* Reuss. – Reuss, p., 77.
1877 *Cl.*[*ausilia*] *peregrina* Reuss. – Boettger, p. 111.

Discussion. – Is a *nomen dubium* (Boettger 1877).

"*Acrochasma tricarinatum* Reuss, 1861"

1861 *A.*[*crochasma*] *tricarinatum* Reuss; Reuss, p. 80, pl. 3, fig. 16.
1891 *Acrochasma tricarinatum* Reuss. – Klika, p. 111, text-figs 110a–c.
1892 *Acrochasma tricarinatum* Reuss. – Klika, p. 106, text-figs 110a–c.

Discussion. – This strange structure is clearly not a gastropod and is probably not even a Miocene fossil.

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