

WHAT IS *Rothina silesica*? A TAXONOMIC REVISION OF THE GENUS *ROTHINA* (FORAMINIFERIDA)

Miroslav BUBÍK

Czech Geological Survey, Leitnerova 22, 658 69 Brno, Czech Republic

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Abstract: The genus *Rothina* Hanzlíková, 1966 has been revised taxonomically. This genus should be considered as the younger synonym of *Caudammina*. The generotype *Rothina silesica* Hanzlíková was found fully synonymous with *Hormosina ovulum crassa* Geroch. The former species has priority and is here assigned to the genus *Caudammina* Montanaro-Galitelli.

Abstrakt: W pracy przedstawiono rewizję taksonomiczną rodzaju *Rothina* Hanzlíková, 1966. Rodzaj ten należy uznać za młodszy synonim *Caudammina*. Gatunek *Rothina silesica* Hanzlíková jest starszym synonimem gatunku *Hormosina ovulum crassa* Geroch. *Rothina silesica* Hanzlíková została zaliczona do rodzaju *Caudammina* Montanaro-Galitelli.

Key words: Foraminifera, Hormosinacea, Cretaceous, taxonomy, biometry, revision.

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INTRODUCTION

In 1966, Eva Hanzlíková described a new genus of agglutinated foraminifera which she called *Rothina* based on her new species *Rothina silesica*. The generotype is from the Albian Lhoty Formation of the Silesian Unit in Moravia. In the same year, Stanisław Geroch described the new subspecies *Hormosina ovulum crassa* from the Barremian to Albian sediments of Subsilesian and Silesian units in Poland.

Hanzlíková (1966) characterized her new genus and species by its unusual test with reduced planispire in the early stage, later becoming uniserial, and assigned it to the family Rzehakinidae. Geroch (1966) described his new subspecies of *Hormosina ovulum* as having a uniserial test like other hormosinids. *Hormosina ovulum crassa* was later referred by many authors from various units of Carpathians and Alps, and also from the Mediterranean, North Atlantic, Indian Ocean and Pacific. The apparent external similarity of both taxa suggested that both of them could be single species.

I first discussed this interesting case with Stanisław Geroch in 1990 in Kraków. We agreed upon the necessity to restudy the type material of both taxa. Later in 1991, I studied the *Rothina silesica* type collection housed in the Czech Geological Survey in Prague. I did not observe any of the internal structures described by Hanzlíková (1966). On the contrary, the specimens from the type collection including the holotype correspond perfectly with the type description of *Hormosina ovulum crassa*. Therefore, both species appeared to be synonymous and genus the *Rothina* invalid. In

1992, Stanisław Geroch kindly enabled me access to his collection with the types of *H. ovulum crassa* housed in the Institute of Geological Sciences of the Jagiellonian University during my visit in Kraków. The comparison of both type collections has confirmed the synonymy of both taxa.

In 1993, the 4th IWAF in Kraków took up a considerable part of our time and energy as well as in the next year when we prepared contributions. Stanisław Geroch worked on the 4th IWAF Proceedings until his sudden death, which unfortunately made it impossible for us to write a paper together on this taxonomic case.

TAXONOMIC RE-EVALUATION OF GENUS *ROTHINA*

The type description of the new genus *Rothina* was published by Hanzlíková (1966) in German. Loeblich and Tappan (1987) translated the type description in their "Foraminiferal genera and their classification" into English. Their description is simplified compared with Hanzlíková's original diagnosis. Therefore the re-evaluation of *Rothina* should begin with the original text translated more accurately here:

"DIAGNOSIS: Test free, pear-shaped, consisting of an ovate proloculus connected with the next chamber by a long tubular neck fully surrounding the proloculus; the second chamber connected by a tubular neck with the third, which envelopes the former chambers; chambers arranged in a reduced planispire; wall transparent, secreted, consists of quartz (microcrystalline silica), agglutinated; sutures indis-

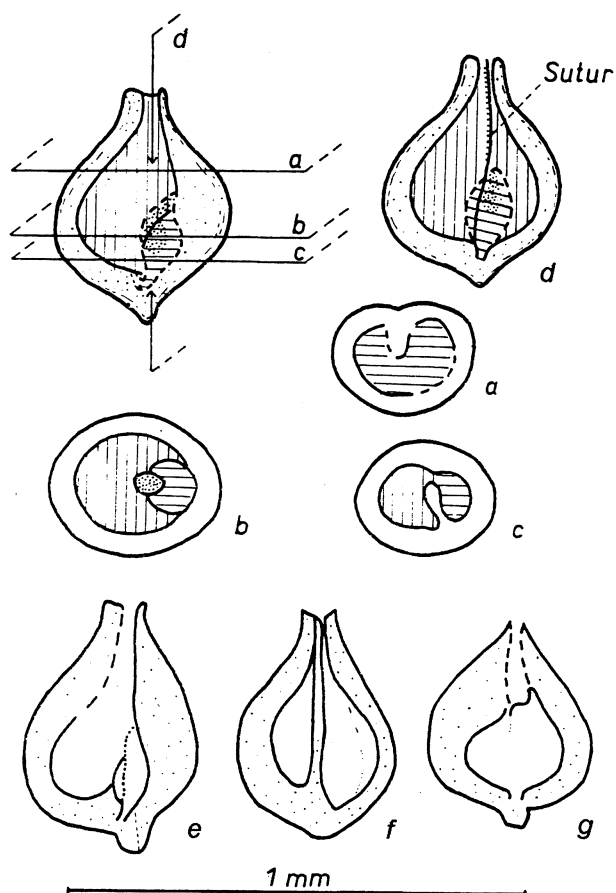


Fig. 1. Reconstruction of internal arrangement of *Rothina silesica* Hanzlíková; (a, b, c) the section planes through the test; (d) – section perpendicular to planes a, b, c; (e, f, g) – thin sections of real tests from Staříč NP 235 and NP 118 Boreholes (original figure after Hanzlíková, 1966)

tinct except the slightly depressed line along the test side; aperture circular at the end of produced tubular neck."

In her remarks Hanzlíková compared the test arrangement of *Rothina* with *Nubeculariidae* (*Miliolida*) and considering the planispiral early stage and siliceous wall; she assigned *Rothina* to the family *Rzehakinidae*.

In addition to *Rothina silesica*, Hanzlíková included within the new genus the species *Lagenammina pyriformis* Tappan, 1940. Loeblich and Tappan (1987) nevertheless, assigned this species to the genus *Nodopthalmidium*

(*Miliolida*) on the basis of its porcellaneous wall, with only external agglutinated coating.

I have re-examined the holotype, paratypes, and other specimens from the Hanzlíková type collection. I have focussed my attention on thin sections of specimens which were used by Hanzlíková for interpreting the internal arrangement (Fig. 1). The subdivision of the specimens into chambers has not been confirmed. In fact, all specimens represent fragments of a uniserial test. The only internal structure observed within chambers is the partition (see description of *Caudammina silesica* below).

Such features correspond well to the concept of *Hormosina ovulum crassa* Geroch, when comparing with the type figures (Fig. 2) and type description (translated from Polish):

"DESCRIPTION: *Hormosina ovulum crassa* is preserved as one-chambered fragments in fossil material. Chambers pear-shaped produced a neck, more thick than that of *H. ovulum* (Grzybowski) and *H. ovulum gigantea* (Geroch). About 20% of fragments represent the embryonic chambers with one aperture at end of the neck. Other chambers possess another aperture at the opposite end. Wall consists of siliceous cement and fine quartz grains, surface is smooth or a little coarse. Chambers with sponge spicules within the wall are fairly frequent in the Lhoty Beds (Albian). Some chambers possess numerous spicules oriented randomly (pl. 7, fig. 23), others possess only one large spicule. The external surface of chamber may be incised where the spicule penetrates the chamber lumen (pl. 7, figs. 21–22)."

Considering this comparison *Rothina silesica* is undoubtedly congeneric and even synonymous with *Hormosina ovulum crassa*. It was also confirmed by examination some specimens of *H. ovulum crassa* from the Geroch type collection housed in the Institute of Geological Sciences of the Jagiellonian University, Kraków. The date of publication of both taxa is referred hitherto in the literature as the year 1966, which brings into question of priority. The solution of this question follows from these facts:

1) A colophon of the *Časopis Moravského Musea*, *Vědy přírodní* in which the *R. silesica* type description was published includes the information: "issued on 15th December 1966".

2) A separately printed content of volume 36 of the *Rocznik Polskiego Towarzystwa Geologicznego* includes

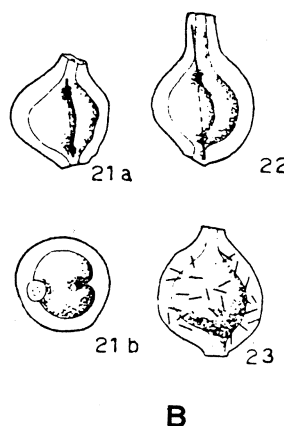
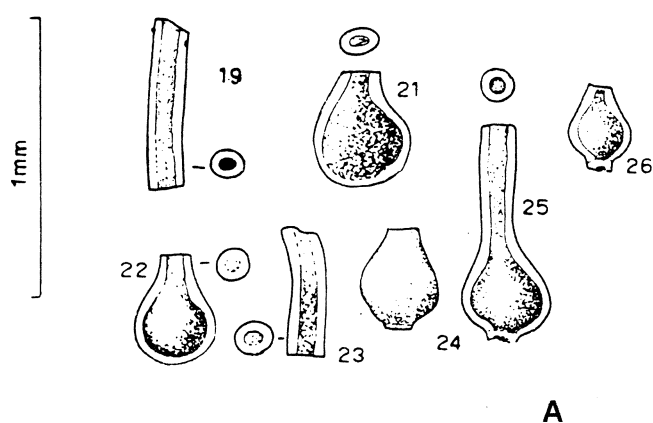


Fig. 2. Type figures of *Hormosina ovulum crassa* Geroch, after Geroch, 1966. A. Original fig. 6 (19, 21–26); Subsilesian Unit, ?Veřovice Shales, Sułkowice – Ubionka, (25 – holotype). B. Original fig. 7 (21–23); Silesian unit, Lhoty Formation, Straconka

the date of appearance of issue No. 4 with the type description of *H. ovulum crassa* as January 1967.

In this event it is clear that *Rothina silesica* has priority over *H. ovulum crassa*. In this case another question appears: shall a better defined and often referred younger synonym be replaced by an originally mis-interpreted and later sporadically referred older name? In some cases a younger synonym can be conserved for reasons of nomenclature stability (Article 79 of the International Code of Zoological Nomenclature – ICZN). Nevertheless, an older name can be suppressed as far as it was not referred to during the last 50 years (Article 79c of ICZN). Since *Rothina silesica* was described only 29 years ago, it cannot be suppressed.

It can be concluded that the genotype of the genus *Rothina* is a synonym of *Hormosina ovulum crassa* and possess taxonomic priority. Shall *Rothina* be a younger synonym of *Hormosina*? The answer is not simple.

The genus *Hormosina* Brady, 1879 is defined as having chambers overlapping the previous ones to enclose the neck (Loeblich & Tappan, 1987). The Carpathian Cretaceous to Paleocene "*Hormosina*" representatives of *H. ovulum* group possess chambers with the long apertural necks not enclosed by the next chambers, resulting in stolons between chambers. Kuhnt and Kaminski (1990) discussed three hormosinid generic names as applicable for this group: *Caudammina* Montanaro-Gallitelli, 1955, *Carpathiella* Myat-lyuk, 1966, and *Reophanus* Saidova, 1970. The first two genera are synonyms based on having the same genotype "*Hormosina*" *ovulum* (the genotype of *Caudammina*: *Saccammina*? *caudata* Montanaro-Gallitelli is considered fully synonymous with "*Hormosina*" *ovulum* by Kuhnt & Kaminski, 1990). If the genus *Reophanus* will be considered synonymous, it would have not priority. It can therefore be concluded that *Rothina silesica* shall be assigned to *Caudammina*, and the genus *Rothina* is a younger synonym of *Caudammina*.

SYSTEMATIC PALEONTOLOGY

Caudammina silesica (Hanzlíková, 1966)

Figs. 1–6

1959. *Hormosina* cf. *ovulum* (Grzybowski): Geroch, p. 116, pl. 13, figs. 1–2, 4.
 1960. *Hormosina ovulum* (Grzybowski): Geroch, p. 43, pl. 2, fig. 20.
 1966. *Rothina silesica* Hanzlíková: Hanzlíková, p. 106, pl. 8, figs. 1–9; text fig. 3.
 1967. *Hormosina ovulum crassa* Geroch: Geroch, p. 439, pl. 6, figs. 19, 21–26; pl. 7, figs. 21–23.
 1969. *Hormosina ovulum crassa* Geroch: Dabagian, p. 216, pl. 46, fig. 1.
 1973. *Kalamopsis silesicus* Hanzlíková (part): Hanzlíková, p. 143, pl. 2, figs. 3–6, not 1, 2, 7, 8.
 1981. *Hormosina crassa* Geroch: Morgiel and Olszewska, p. 8, pl. 2, fig. 3.
 1984. *Hormosina crassa* Geroch: Olszewska, pl. 2, fig. 5.
 1984. *Hormosina crassa* Geroch: Malik and Olszewska, p. 317, pl.

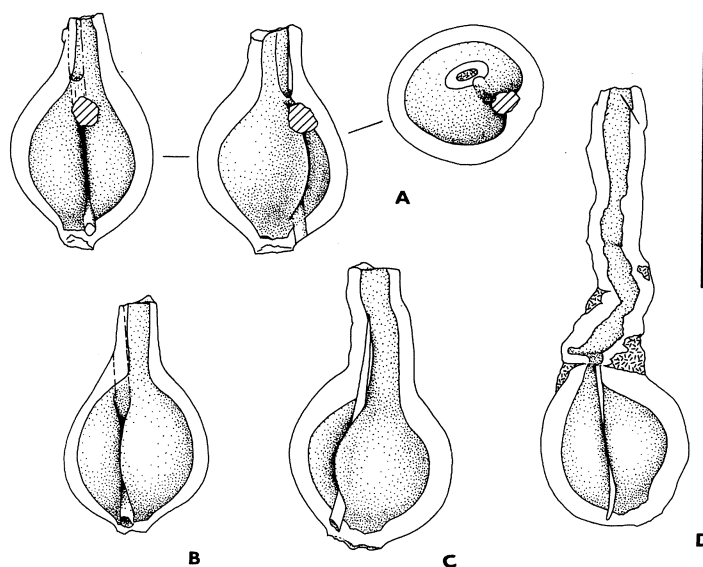


Fig. 3. *Caudammina silesica* (Hanzlíková). Specimens from the type collection of Hanzlíková: A. holotype, Staříč NP-177 (130.0–134.5 m); B. paratype, section G-15, south of Mořkov Village. C, D. Specimens from Staříč NP-118 Borehole (400 m). Total length of scale bar – 0.5 mm

- 6, fig. 12.
 1984. *Hormosina ovulum crassa* Geroch: Geroch and Nowak, pl. 1, fig. 14; pl. 5, figs. 20–22.
 1988. *Hormosina crassa* Geroch: Moullade, Kuhnt and Thurow, p. 364, pl. 2, figs. 4–6.
 1989. *Pelosina crassa* (Geroch): Riegraf and Luterbacher, p. 1085, pl. 1, figs. 2–3.
 1990. *Kalamopsis silesicus* Hanzlíková: Weidich, p. 84, pl. 2, fig. 4.
 1990. *Hormosina praecaudata* (Hanzlíková): Weidich, p. 84, pl. 1, fig. 13; pl. 33, figs. 21–24.
 not 1990. *Hormosina ovulum crassa* Geroch: Weidich, p. 84, pl. 33, fig. 25.
 cf. 1990. *Hormosina crassa* Geroch: Kuhnt, p. 314, pl. 2, fig. 5.
 1990. *Hormosina crassa* Geroch: Kuhnt and Kaminski, p. 472, pl. 1, fig. o.
 1990. *Hormosina crassa* Geroch: Malata and Oszczyk, p. 516, pl. 1, fig. 7.
 1992. *Hormosina crassa* Geroch: Kaminski, Gradstein and Geroch, p. 254, pl. 3, figs. 7–8.
 1995. *Hormosina crassa* Geroch: Bubík, p. 82, pl. 2, figs. 12–13.
 1990. *Hormosina* sp.: Geroch and Olszewska, p. 530, pl. 1, figs. 30, 35.

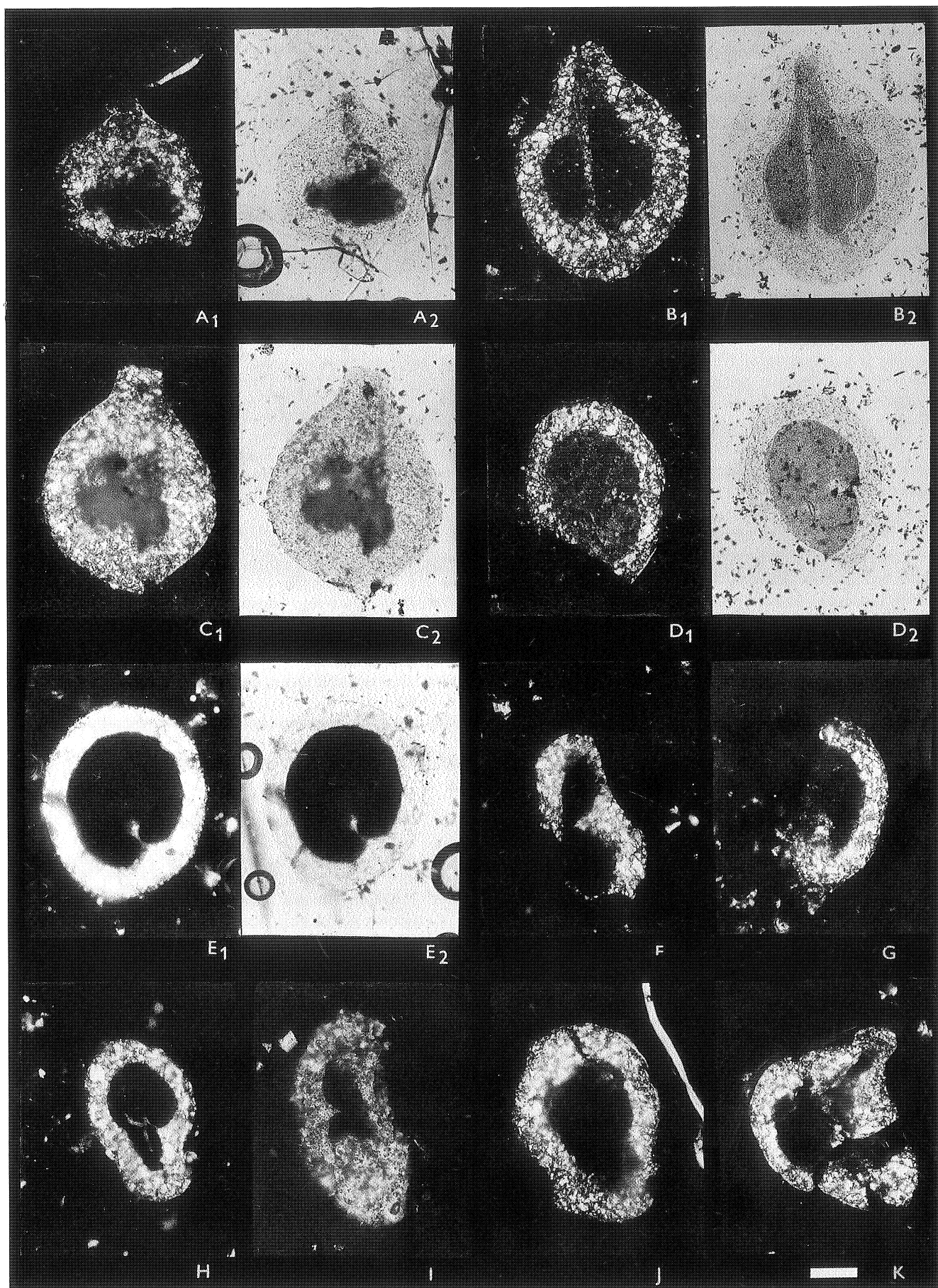
Material: 71 free specimens and 13 thin sections. Collections of the Czech Geological Survey, Prague.

Holotype: Fig. 3A (this paper); pl. 8, fig. 1 of Hanzlíková (1966).
Paratypes: pl. 8, figs. 2–9 of Hanzlíková (1966), see also Fig. 3B, and 29 originally unfigured specimens in the type collection (Fig. 5B).

Type-locality: Staříč NP-177 Borehole; West Carpathians, Moravia.

Type-level: Core 130.0–134.5 m, interval 1.0–3.0 m, sample 625/57; Middle Albian, local zone with *Haplophragmoides nonioninoides* (sensu Hanzlíková, 1966), Lhoty Formation.

Diagnosis: The *Caudammina* species with pear-shaped chambers with relatively thick necks at the both ends; chamber/neck diameter ratio ranges from 2.3 to 4.0; surface nearly smooth. Chambers usually contain one partition underlain by a large sponge spicule penetrating the chamber lumen.



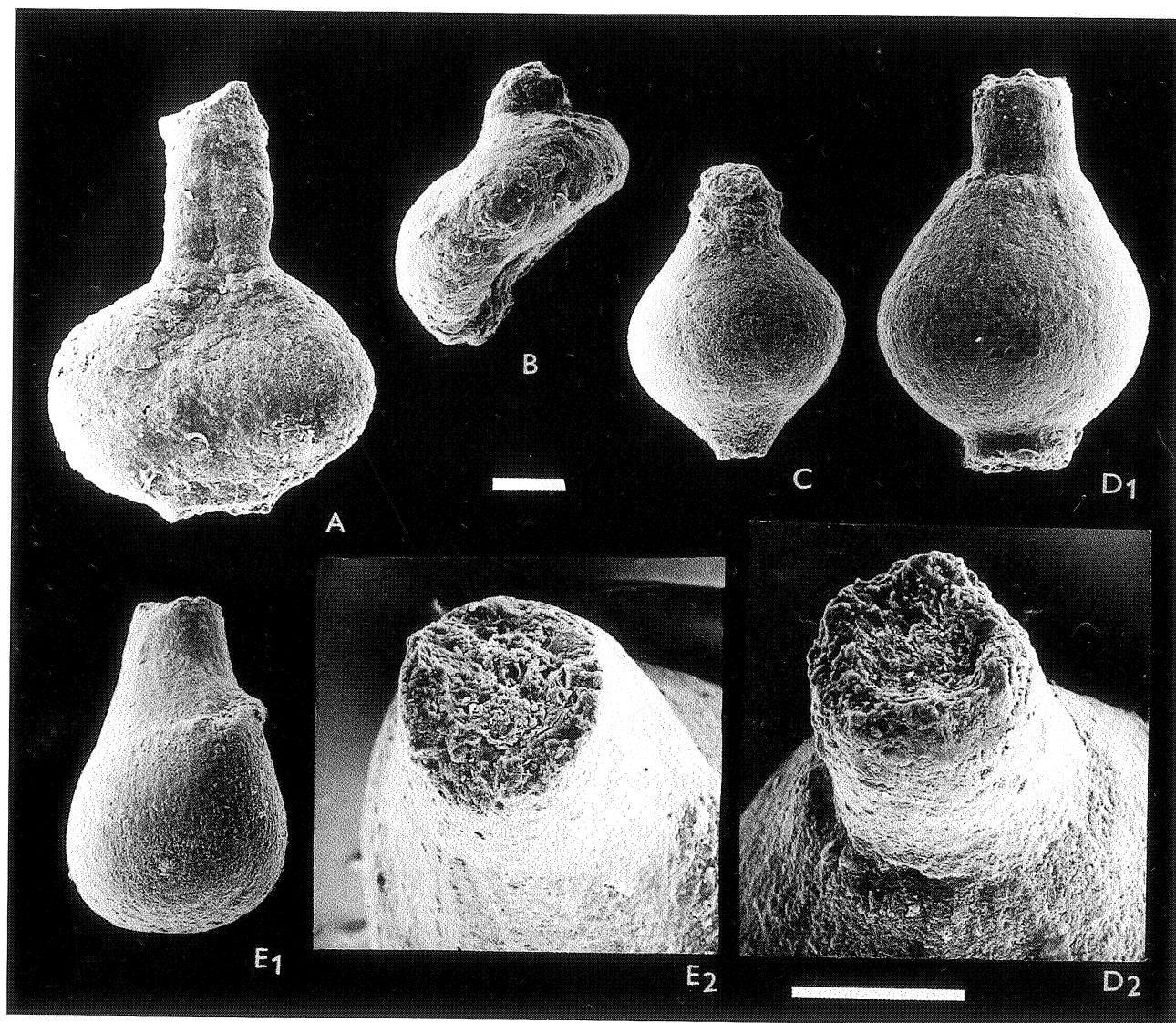


Fig. 5. *Caudammina silesica* (Hanzlíková). Specimens from the type collection of Hanzlíková: A. Staříč NP-177 Borehole (110.7–114.2 m); B. paratype, Staříč NP-177 Borehole (130.0–134.5 m); C. Veřovice village, test pit; D, E. Staříč NP-118 Borehole (108 m), (E) proloculum, (E2, D2) detail of broken necks. Length of scale bars – 0.1 mm

Biometry: *Caudammina silesica* differs from other members of the *Caudammina ovulum* group by its thicker necks. This feature can be well expressed by chamber/neck diameter ratio (b/a) first measured by Geroch (1959). It could be approximately accepted range of b/a from 2.5 to 4.0 for *Caudammina silesica* given by Geroch (1959) for their *Hormosina* cf. *ovulum* (= *C. silesica*). For closely related *C. ovulum* Geroch gave the range from 5.5 to 8.0. New biometric measurements of non-deformed specimens from the type series show very similar b/a values of *Rothina silesica* and *Hormosina ovulum crassa*. The former ranges from 2.3 to 3.9 with average 3.06; the later ranges from 2.4 to 3.8 with average 2.92. For a comparison, a specimen sets of *Caudammina ovulum* (Grzybowski) from Lower Cretaceous Veřovice Shales of the Skole Unit

(specimens figured by Geroch, 1966), the Kaumberg Formation of the Bílé Karpaty Unit (*Uvigerinammina jankoi* Zone), and Upper Senonian–Paleocene Soláň Formation of the Rača Unit were measured. The Lower Cretaceous specimens represents usually intermediate *C. ovulum-silesica* forms when comparing with the *C. silesica* and *C. ovulum* ranges in b/a diagram (Fig. 6). Both Upper Cretaceous specimen sets show close similarity each other. Some specimens exceed the upper b/a limit given for *C. ovulum* by Geroch (1959). On the other hand, one specimen from the Kaumberg Formation appeared to be *C. silesica*. Both *C. ovulum* and *C. silesica* type series contain specimens (without holotype or paratype status) from *C. silesica-ovulum* transition (Fig. 6).

Remarks: The holotype and 29 unfigured paratypes from the

Fig. 4. *Caudammina silesica* (Hanzlíková). Thin sections from the type collection of Hanzlíková: A–C, K. – longitudinal sections; D–J. – cross sections. (A, J, K) Staříč NP-118 Borehole (404 m), (B–D) Staříč NP-235 Borehole (356.0–362.8 m), (E) Sviadnov NP-95 Borehole (245–248 m), (F, G) Sviadnov NP-95 Borehole (255–257 m), (H) Staříč NP-185 Borehole (150.6–155.6 m), (I) Staříč NP-177 Borehole (130.3–134.5 m). Length of scale bar – 0.1 mm

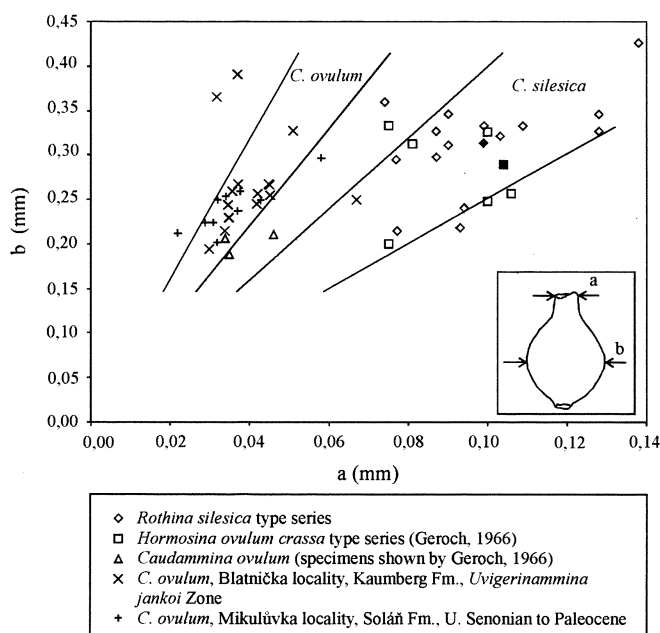


Fig. 6. Chamber/neck (b/a) diameter diagram. The holotypes of *R. silesica* and *H. ovulum crassa* marked by full black. A limit lines for *Caudamina silesica* and *C. ovulum* constructed after values given by Geroch (1959)

same sample are preserved in the type collection of Hanzlíková. The holotype was found in a slide designed "*Rothina silesica* n. sp., n. gen., type of genus, 8/9-I". Figured paratypes were not found, except one specimen figured on pl. 8, fig. 6a, 6b of Hanzlíková (1966) – Fig. 3B. Among 13 thin sections, three slides were identified with the original drawings of Hanzlíková (compare Fig. 1 & Fig 4A–C).

Kalamopsis silesica described by Hanzlíková (1973) from the Upper Albian–Lower Cenomanian of the Silesian Unit seems to be related to *Caudamina silesica*. The holotype of this species shows inflated chamber-like base of segment and large sponge spicule penetrating the chamber lumen like in *C. silesica*. From the later, *Kalamopsis silesica* differs by its low b/a value (1.7 at the holotype). A part of the paratypes with relatively high b/a can be assigned to *Caudamina silesica*.

Stratigraphic distribution: Tithonian–Senonian. In the flysch Carpathians its range is given as Barremian to Cenomanian by Geroch and Nowak (1984), respectively up to the Lower Senonian according to Morgiel and Olszewska (1981). Later Geroch and Olszewska (1990) referred corresponding forms from the Upper Tithonian to the Berriasian. Kaminski *et al.* (1992) referred the occurrence of this species from the Upper Tithonian to the Valanginian in the eastern Indian Ocean. Kuhnt (1990) figured very similar forms from the Maastrichtian of the Apennines.

Geographical distribution: *Caudamina silesica* is cosmopolitan in distribution. It was reported by many authors as *Hormosina (ovulum) crassa* from the flysch Carpathians: Książkiewicz and Liszkowa (1979), Malik and Olszewska (1984), Malata and Oszczytko (1990), Ponomareva (1989), Ion (1978) and as *Rothina silesica* by Książkiewicz and Liszkowa (1979). Outside of the flysch Carpathians it is known from: the Eastern Alps (Pflaumann, 1968, Weidich, 1990), the Apennines (Kuhnt, 1990), the North Atlantic (Moullade *et al.*, 1988, Kuhnt & Kaminski, 1990), the Indian Ocean (Kaminski *et al.*, 1992; Riegraf & Luterbacher, 1989), and the eastern Pacific (Riegraf & Luterbacher, 1989).

CONCLUSIONS

From the revision of the genus *Rothina* Hanzlíková, 1966 (genotype *Rothina silesica* Hanzlíková) based on a study of the type collection it can be concluded:

1. *Rothina silesica* is the older synonym of *Hormosina ovulum crassa*, which is therefore invalid.
2. *Rothina silesica* as well as representatives of *Hormosina ovulum* group shall be assigned to the genus *Caudamina* Montanaro-Gallitelli, 1955.
3. The genus *Rothina* is younger synonym of *Caudamina*.

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Streszczenie

CO TO JEST *Rothina silesica*?
REWIZJA TAKSONOMICZNA RODZAJU
ROTHINA (FORAMINIFERIDA)

Miroslav Bubík

W 1966 r. Hanzlíková opisała wśród otwornic aglutynujących nowy rodzaj – *Rothina* oraz nowy gatunek – *Rothina silesica*. Okazy otwornic pochodziły z osadów albu formacji lgockiej w jednostce śląskiej na Morawach. Nowy rodzaj i gatunek został wyróżniony na podstawie planu zwinienia komór: planispiralny w młodszej części skorupki, przechodzący w jednoseryjny w starszej części. Porównując skorupkę *Rothina* z rodzajem *Nubeculariidae* (Miliolida) oraz biorąc pod uwagę planispiralny sposób zwinienia we wczesnym etapie rozwoju, a także krzemionkowy materiał, z którego zbudowana jest skorupka, Hanzlíková włączyła rodzaj *Rothina* do rodziny Rzehakinidae.

W tym samym roku (1966) Geroch opisał nowy podgatunek, *Hormosina ovulum crassa*, pochodzący z osadów baremu–albu w jednostce podśląskiej i śląskiej w polskich Karpatach zewnętrznych. Cechą diagnostyczną wyróżnionego taksonu jest jednoseryjny sposób zwinienia skorupki.

Podobieństwo zewnętrzne obu powyższych taksonów może sugerować, że są one tym samym gatunkiem. Odpowiedź na tą sugestię może dać porównanie gatunków typowych.

Autor zbadał holotyp, paratypy oraz inne okazy z gatunku *Rothina silesica* w kolekcji typowej (71 okazów i 13 płytek cienkich), która znajduje się w budynku Czeskiej Służby Geologicznej w Pradze. Cechy diagnostyczne opisane przez Hanzlíkovą, a odnoszące się do stylu zwinienia komór nie zostały przez autora potwierdzone. Wszystkie okazy charakteryzuje obecność jednoseryjnie ułożonych komór. W wewnętrznej strukturze komór przejawia się podział związany z obecnością dużych igieł gąbek wnikaających do wnętrza komory. Te cechy są identyczne jak u okazów *Hormosina ovulum crassa* opisanych przez Gerocha (1966). Autor porównał okazy typowe *Rothina silesica* z okazami należącymi do *Hormosina ovulum crassa*, które znajdują się w Instytucie Nauk Geologicznych UJ w Krakowie. Poprzez to porównanie autor wnioskuję, że oba taksony są z pewnością pokrewne, a nawet, należy je sklasyfikować w obrębie jednego gatunku.

Powstaje pytanie, który z nich został wcześniej wykreowany i jednocześnie ma pierwszeństwo w cytacji? Daty publikacji obu taksonów są cytowane w literaturze jako 1966, jednak rzeczywista data wykreowania *H. ovulum crassa* to rok 1967. Z tego powodu, *Rothina silesica* powinna mieć pierwszeństwo w cytacji (Artykuł 79c Międzynarodowego Kodeksu Nomenklatury Zoologicznej) mimo, że podgatunek *H. ovulum crassa* jest bardziej znany i bardzo licznie cytowany, a *Rothina silesica* została źle zdiagnozowana i była bardzo rzadko odnotowywana w literaturze.

Rothina silesica jest synonimem *Hormosina ovulum crassa*, ale rodzaj *Rothina* nie może być uważany jako synonim rodzaju *Hormosina*. Cechy okazów oznaczonych jako podgatunki *Hormosina ovulum* z osadów kredy i paleogenu w Karpatach nie są zgodne w rzeczywistości z definicją rodzaju *Hormosina* Brady, 1879, która definiuje go na podstawie obecności komór, znajdujących się jedne na drugich, zakończonych szyją (Loeblich & Tappan, 1987). U reprezentantów podgatunków *H. ovulum* występują natomiast długie stolony łączące komory. Według Kuhnta i

Kaminskiego (1990), ta cecha sprawia, że okazy te powinny zostać zaliczone do jednego z trzech rodzajów: *Caudammina* Montanaro-Gallitelli, 1955, *Carpathiella* Myatlyuk, 1966 lub *Reophanus* Saidova, 1970. Spośród nich, *Caudammina* ma pierwszeństwo taksonomiczne. Zatem gatunek opisany przez Hanzlikową jako *Rothina silesica* powinien zostać włączony do rodzaju *Caudammina* (*Rothina* jest młodszym synonimem *Caudammina*).

Dla wyraźnego oddzielenia *Caudammina silesica* od podgatunków w obrębie *Caudammina ovulum* autor przedstawił graficznie relacje pomiędzy średnicą szyji i komory (b/a), wprowadzone w opisie diagnostycznym do subgatunków przez Gerocha (1959). Porównano te cechy u okazów należących do *Rothina silesica*, *Hormosina ovulum crassa* i *Caudammina ovulum*, pochodzących z kredy i paleogenu Karpat fliszowych (Fig. 6). Z porównania wynika, że proporcje b/a wahają się od 2,5 do 4,0 dla *Caudammina*

silesica i pomiędzy 5,5 i 8,0 dla okazów *C. ovulum* opisanych przez Gerocha (1959). Okazy z wczesnej kredy reprezentują najczęściej formy przejściowe pomiędzy *C. ovulum* i *C. silesica*. Te pomiary potwierdzają identyczność *Rothina silesica* i *Hormosina ovulum crassa*.

Autor wykonał ponadto pomiary skorupki okazów *Kalamopsis silesica* Hanzliková, 1973 (dolny alb–dolny cenoman w jednostce śląskiej). Holotyp tego gatunku ma podobne cechy jak *C. silesica*, związane z obecnością dużych igieł gąbek wnikaćcych do wnętrza komory od strony płaskiej części podstawy. Część paratypów tego taksonu charakteryzujących się wysoką wartością proporcji b/a może wskazywać, że należą one do *Caudammina silesica*. Jednakże cechy holotypu, m.in. niska wartość b/a (1,7) dowodzą, że stanowi on odrębny gatunek.