

*COCHLODINA COSTATA* (C. PFEIFFER, 1828)  
(STYLOMMATOPHORA: CLAUSILIIDAE) FROM  
THE HOLOCENE SEDIMENTS OF THE KACZAWA MTS.  
(WESTERN POLAND)

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ABSTRACT: A subfossil series of the clausiliid *Cochlodina costata* (C. Pfeiffer, 1828) from the Mt. Miłek differs from the extant populations from the main distribution range in having higher shells, and from the related *C. laminata* (Montagu, 1803) in many shell characters.

KEY WORDS: *Cochlodina costata*, *C. laminata*, shell variability, rare species, extinction

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***Cochlodina costata* (C. PFEIFFER, 1828)  
(*Stylommatophora: Clausillidae*)  
from the Holocene Sediments  
of the Kaczawa Mts. (Western Poland)**

## 1. Introduction

*Cochlodina (Cochlodina) costata* (C. PFEIFFER, 1828) is a montane species of East Alpine-Dinaric distribution. Its insular localities are scattered as far as the Frankish Jura, Czech-Moravian Upland, the Sudetes and the Transcarpathian district of the Ukraine. It lives on shaded calcareous rocks, on old stone walls and under stones (RIEDEL 1988).

The older literature contains records of *C. costata* from the Miłek and Połom mountains in the Kaczawa Mts., Western Sudetes (SCHOLTZ 1845, SCHMIDT 1868, REINHARDT 1874, MERKEL 1884). It was recorded under the name of *C. commutata* (ROSSMÄSSLER, 1836) or *C. silesiaca* (A. SCHMIDT, 1868). The latter was regarded as a Lower Silesian endemic, its type locality being the Mt. Połom, Kaczawa Mts. Besides, the snail was recorded from the Ślęza mountain as *C. silesiaca var. minor* (A. SCHMIDT, 1868) (SCHOLTZ 1843, PAX 1921). Basing on anatomical studies, NORDSIECK (1969) synonymized *C. commutata* (ROSSMÄSSLER, 1836) with *C. costata* (C. PFEIFFER, 1828).

Though the old records from Lower Silesia suggests that the snail occurred in the area, no sample of *C. costata* from any of those localities could be found in SCHOLTZ and MERKEL's collections (both at the Museum of Natural History, Wrocław University). In spite of repeating searches *C. costata* was found at neither the Miłek and Połom mountains (WIKTOR 1964, POKRYSZKO 1984), nor the Ślęza mountain (WIKTOR 1956). In addition, there were many cases of mis-determining related species: the much variable *C. laminata* (MONTAGU, 1803) and *C. orthostoma* (MENKE, 1828) were confused with for *C. costata*. This raises doubts as to the actual occurrence of the latter in Lower Silesia (RIEDEL 1988).

The palaeontological studies recently undertaken by the Department of Paleozoology, Zoological Institute, Wrocław University, in the vicinity of Wojcieszów - the area, in which two of the three localities just named are situated - have provided new data on the subfossil *C. costata*.

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## 2. Locality description

The palaeozoological studies at Wojcieszów covered slope deposits and numerous karst localities at the Mt. Miłek (Fig. 1). They resulted in abundant material, which made it possible to follow the habitat changes at the Mt. Miłek during the Holocene.

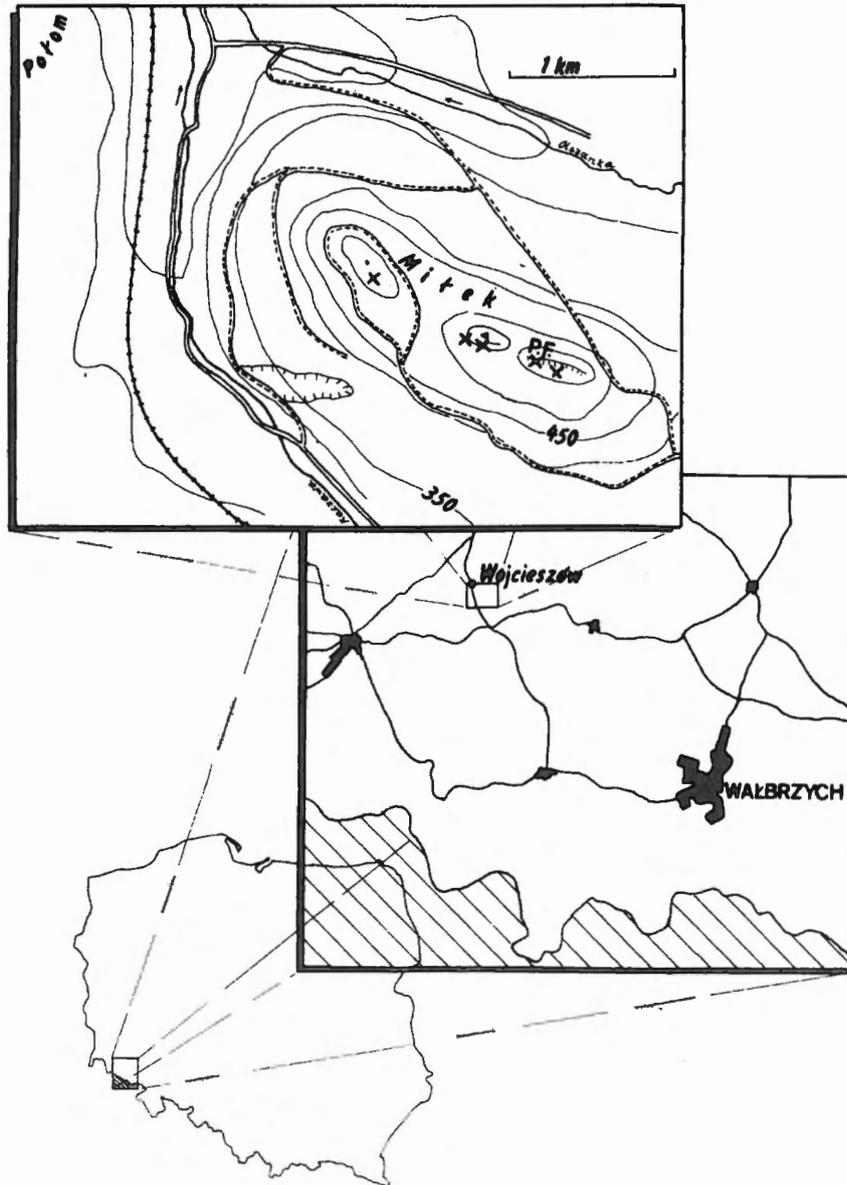


Fig. 1. Map of the study area, with more important paleontological sites (PF - Palaeontologist's Fright)

The area was selected for studies because of the abundance of possible localities (rock niches, fragments of caves), the richness of the flora and fauna associated with the calcareous substratum, and the negligible human impact.

The deposits at the localities at the Mt. Milek correspond to the time span from the Atlanticum till present. Their detailed stratigraphic analysis will be presented elsewhere. At most sites only single shells were found. Only at the PF locality (abbreviation for Palaeontologist's Fright - the name derived from the working conditions, which turn a palaeontologist into an alpinist) a series of shells was collected. The deposit at the PF was formed once, within a short time, so the shells found there can be assumed to represent a population in the biological sense. The site is a fragment of an old cave system, the entrance opening situated 10 m above ground level, in a rock wall close to the top of the Milek Cisowa mountain, facing southeast. On the bottom of the corridor there is a red deposit of maximum thickness of 25 cm, very rich in animal remnants. A preliminary analysis suggests that it dates back to the climatic optimum of the Holocene - Atlanticum (the Atlantic Phase).

### 3. Material and methods

The series of *C. costata*, which has served as a basis for biometrical analysis, is deposited in the collection of the Museum of Natural History, Wrocław University. It comprises 41 specimens, 37 of which are undamaged. To confirm the identification the following comparative material was used: *C. costata*, Valle di Musi, Italy (29 specimens); *C. laminata*, the Mt. Milek, Kaczawa Mts. (32 specimens); the Muszkowice Beech Forest Nature Reserve, Lower Silesia (37 specimens); the Białowieża Forest, NE Poland (37 specimens); all in the collection of the Museum of Natural History, Wrocław University.

The following shell parameters were originally taken into account: (1) total height: H; (2) body whorl height: h; (3) aperture height: Ah; (4) maximum shell breadth: Sb; (5) aperture breadth: Ab; (6) number of whorls: Nw; (7) degree of displacement of the aperture, relative to the shell long axis: "0" - aperture axis on the long axis of the shell, "+" - aperture shifted to the left, "-" - aperture shifted to the right.

<i>C. laminata</i>	<i>C. costata</i>
(1) height 12 - 20 mm, breadth 3 - 4 mm	height 14 - 15 mm, breadth 3.2 mm
(2) shell more or less tumid	shell slender
(3) colour reddish brown, less often yellowish brown or greenish	colour horny brown
(4) shell smooth, delicately, slightly irregularly striated	shell striation regular, fairly distinct, but less so than in <i>C. orthostoma</i>
(5) lip always continuous	lip not always continuous
(6) aperture broadly pear-shaped, its long axis most often on shell long	aperture narrowly pear-shaped usually shifted to the left axis
(7) upper part of palatal aperture margin viewed in profile allows to see a part of columellar wall	columellar wall in profile visible in its lower part, the upper one hidden behind the palatal wall

The results of the first five measurements were then tested for normality of distribution, using Student's t-test. Only the most characteristic three parameters: H, h, Sb and the height : breadth ratio were used in the analysis.

#### 4. Results and discussion

While single shells from the remaining localities do not seem to depart from typical condition, those from the PF are markedly higher (14.5 - 17.0 mm), the proportions being maintained. These shells can be described in detail because of their excellent condition (conchiolin layer present). Except for their somewhat larger dimensions, they correspond to the diagnoses given in most determination keys (e.g. URBAŃSKI 1957, LOZEK 1964). It seems justified to list only the characters that distinguish this species from *C. laminata* (Figs 2 - 4).

Also the measurements allow one to separate *C. costata* and *C. laminata*. Two samples of *C. costata* and three of *C. laminata* (Fig. 5) show a high affinity within species and independence between species with respect to their height : breadth ratio. Also the comparison of the subfossil *C. costata* with *C. laminata* living at present at the Mt. Miłek, with respect to three characters (H, h, Sb) reveals distinct differences (Fig. 6).

The results of the biometrical analysis evidence that the synonymization of *C. costata* (C. PFEIFFER, 1828) and *C. commutata* (ROSSMÄSSLER, 1836) (NORDSIECK 1969) is justified. *C. costata* differs from *C. laminata* in both descriptive and biometric shell characters. In spite of this it was often mis-determined for *C. laminata*, or *C. orthostoma*. The presence of *C. costata* in subfossil deposits of the Mt. Miłek indicates, however, that its older records pertained to its actual occurrence and were not cases of mis-identification. Thus the species in all probability lived in the Kaczawa Mts. still in historic times. The reason why it has become extinct on the Mt. Miłek should mainly be sought in the climate. This is supported by the parallel extinction of *Helicodonta obvoluta* (O. F. MÜLLER, 1774), a species which is very common in the deposits of the latest Holocene of the Mt. Miłek. On the neighbouring mountain, Połom, the intense exploitation of limestone could also contribute to the extermination of *C. costata*. Though nothing can be said for certain about the record of *C. costata* from the Ślęża mountain, it can be concluded, from the data from the Mt. Miłek, that it is probable that the species really occurred at the Ślęża.

#### 5. Acknowledgements

I am thankful to Ms Katarzyna Bulman and to Prof. Andrzej Wiktor, for their permission to examine the materials from the collection of the Museum of Natural History, Wrocław University, and for their profound comments on the ecology and distribution of the genus *Cochlodina*.

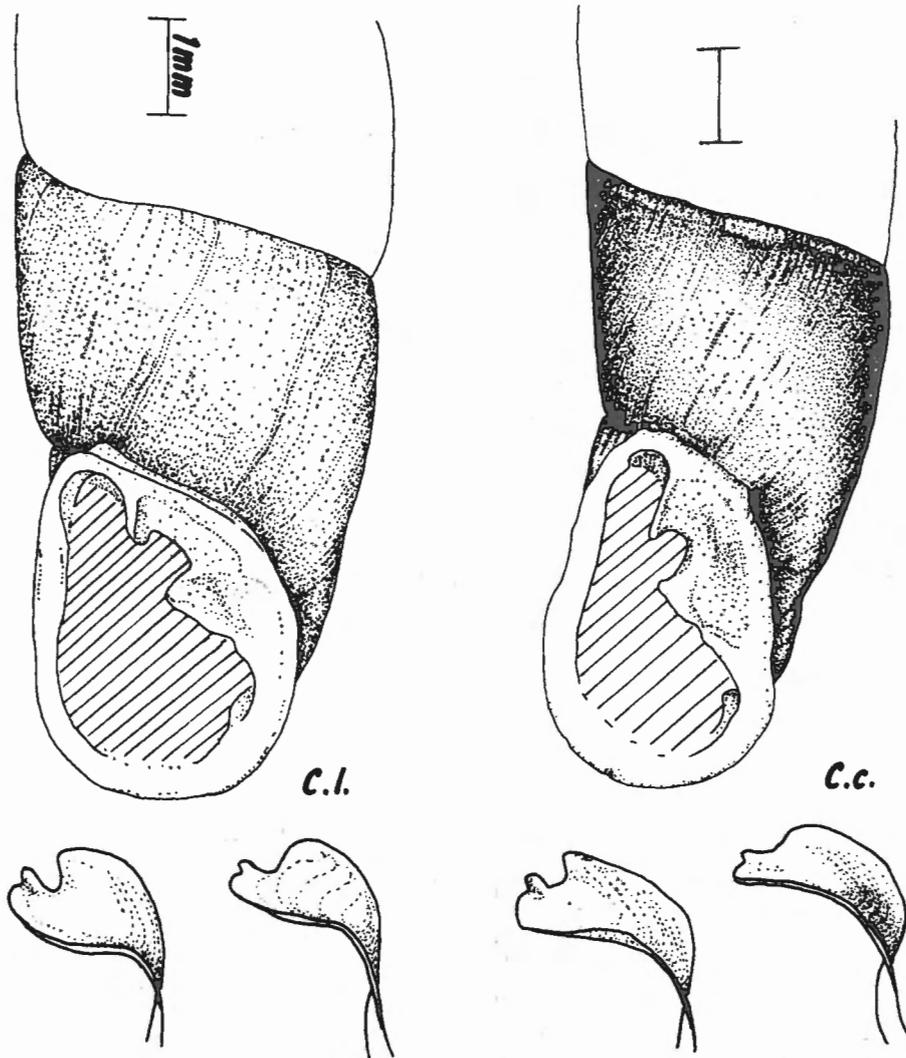


Fig. 2. Apertures and clausilia of *Cochlodina laminata* (C.l.) and *C. costata* (C.c.)

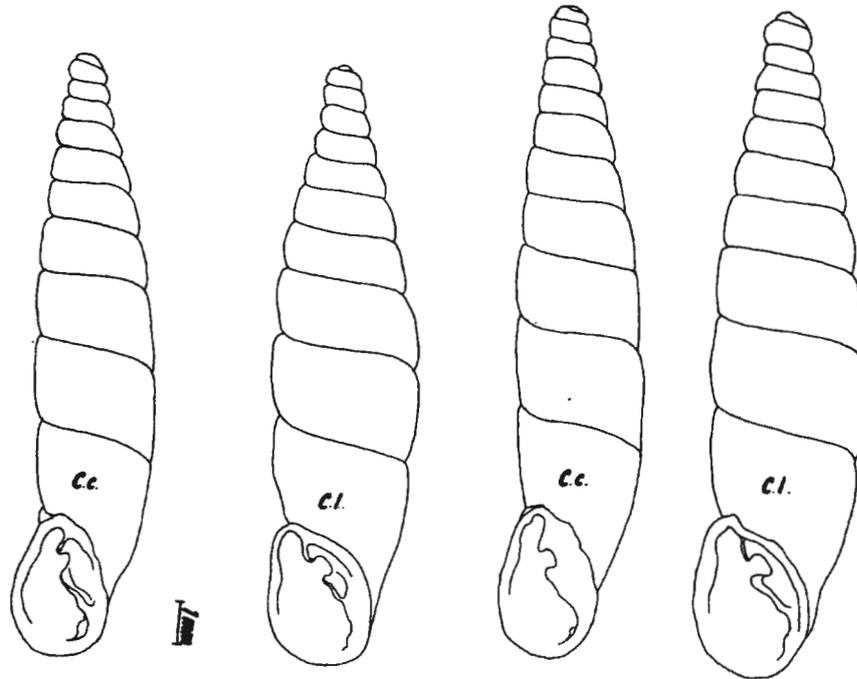


Fig. 3. Comparison of extreme specimens of *Cochlodina laminata* (C.l.) and *C. costata* (C.c.)

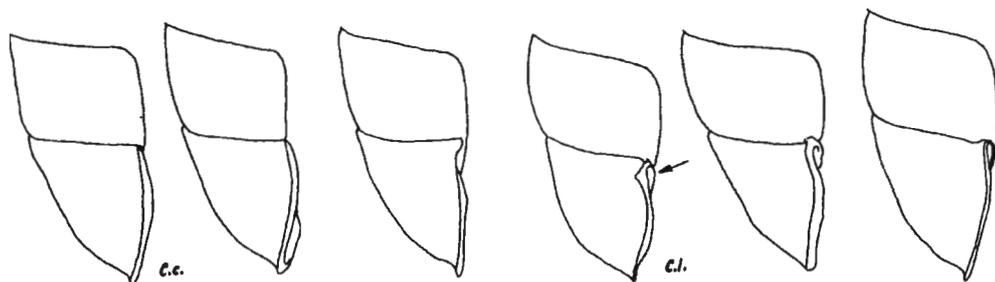


Fig. 4. Shells of *Cochlodina costata* (a) and *C. laminata* (b) in side view

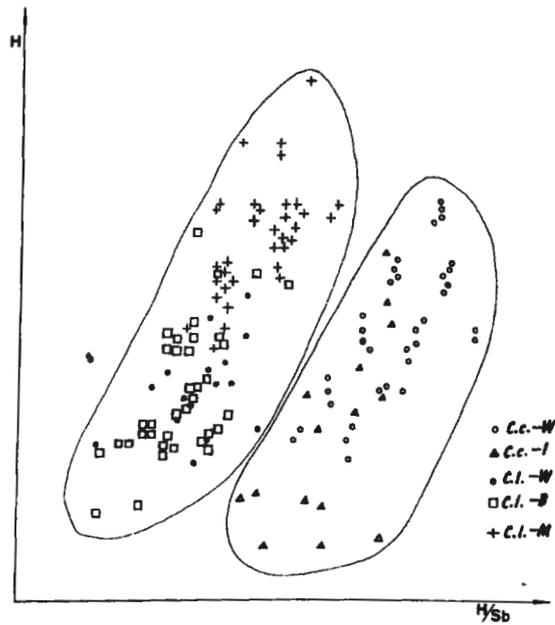


Fig. 5. Dependence between height : breadth ratio and shell height in *Cochlodina laminata* and *C. costata*: C.c.-W - *C. costata*, Wojcieszów; C.c.-I - *C. costata*, Valle di Musi; C.l.-W - *C. laminata*, Wojcieszów; C.l.-B - *C. laminata*, Białowieża; C.l.-M - *C. laminata*, Muszkowice

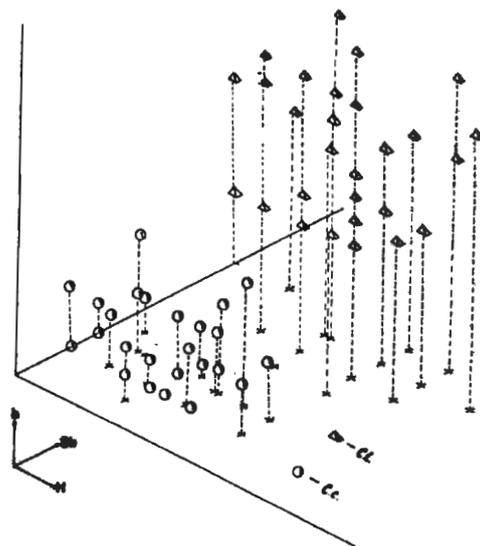


Fig. 6. Comparison of subfossil *Cochlodina costata* from Wojcieszów (Milek) and recent *C. laminata* from the same locality with respect to three biometrical characters: H - total shell height, h - body whorl height, Sb - shell breadth

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Reviewer: Beata Pokryszko D. Sc.