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FRANCISZEK ADAMCZAK

ON THE GENUS *POLONIELLA* GÜRICH (OSTRACODA)

Abstract. — This paper reports the results of investigations on the ontogeny, variation, dimorphism and structure of carapace in several species of *Poloniella* Gürich (Kloedenellidae) from Middle Devonian strata of the Holy Cross Mountains (Góry Świętokrzyskie) in Poland. *Dizygopleura* Ulrich & Bassler is regarded as a synonym of the genus *Poloniella* Gürich. Two new species: *P. brevis* and *P. diversa* have been distinguished; a description is given of the male specimens of two species, heretofore not recorded from Poland (*P. tertia* Krömmelbein, *P. cingulata* Warthin), also of two other species (*P. kielanae* Přibyl, *P. devonica* Gürich) previously reported from Poland.

INTRODUCTION

The here reported results of studies on the ostracod genus *Poloniella* Gürich (Kloedenellidae Ulrich & Bassler) from the Middle Devonian of the Holy Cross Mountains permit to clear up the questions of the ontogeny, variation and structure of carapace in this form.

An analysis of the morphology of carapaces of *Poloniella* Gürich, 1896 does not provide sufficiently reliable evidence for the recognition of the genus *Dizygopleura* Ulrich & Bassler, 1923 which is characterized by similar ornamentation pattern and type of dimorphism as *Poloniella* Gürich. The individual development, i.e. the moults of e.g. *P. devonica* Gürich, also of other species, are adequate ground for a broader concept of the genus *Poloniella*. The succession and mode of production of the chief elements of ornamentation in the young stages of the here considered species are analogous. These stages are all very much the same, although mature carapaces differ considerably (*P. kielanae* Přibyl and *P. diversa* n. sp.).

Recently Pokorný (1958) has advanced a concept postulating the separation of the Kloedenellidae from the Palaeocopa, and their inclusion into the Platycopa or Podocopa on the basis of the dimorphism. At first sight this supposition may seem justifiable. Further observations are necessary, since certain features (lack of muscle scars) do not fully confirm this view suggesting the connection of Kloedenellidae with Palaeocopa. To a certain extent, these characters weaken the significance of the type of dimorphism and of the manner of its realization as important

systematic characters with reference to large taxonomic units (e.g. of a suborder).

The here described representatives of *Poloniella* from Poland comprise not only species in common with the rest of Europe, but also with North America (*P. cingulata* Warthin). This would suggest a wide geographical distribution and, moreover, shed some light on the migration routes they followed.

The writer desires to convey his warmest thanks to Professor R. Kozłowski for the unrestricted help offered during the study of the here considered problems. He also thanks Mrs. K. Budzyńska for making the text-drawings and figures, Mrs. D. Platajs for the figures in plates I-VI, and Mrs. J. Humnicka for the English translation of this paper.

MATERIAL, WORK METHODS, TERMINOLOGY

The materials for the present work were collected by the writer in 1955-57 from Middle Devonian strata (Couvinian and Givetian) of the Łysogóra region within the Holy Cross Mountains. Out of the total number of some tens of thousands of the collected ostracods, about

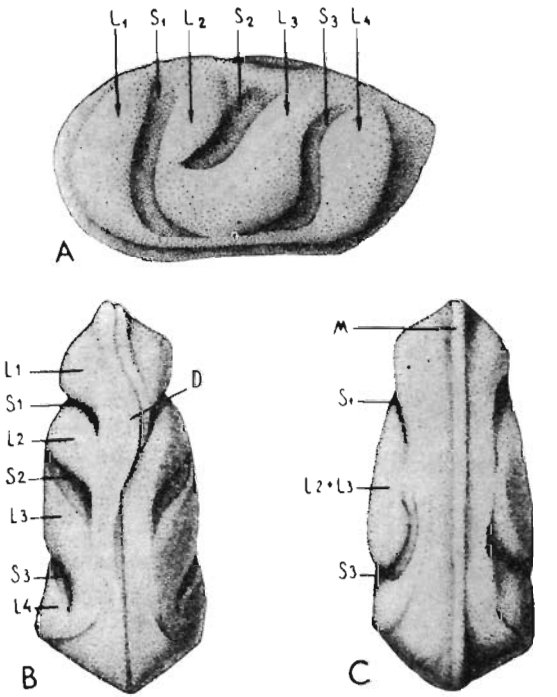


Fig. 1. — *Poloniella tertia* Krömmelbein: *A* left valve, *B* dorsal view, *C* ventral view; *L1* — *L4* lobes: anterior, median, posterior and last; *S1* — *S3* sulci: anterior, median, posterior; *D* dorsal tooth, M marginal ridge.

500 specimens have been identified as representing young instars and mature carapaces or detached valves of six *Poloniella* species.

Suggestions in papers by Kesling (1952, 1953) have been very helpful in the determination of the particular growth stages. Studies on the carapacial structure were carried out by means of fluoridization and thin sections.

The terminology here used for elements of shell ornamentation was that universally accepted, i.e. lobes, grooves; their position was indicated by corresponding symbols (fig. 1).

GENERAL REMARKS ON THE MORPHOLOGY, STRUCTURE AND ORIGIN OF THE GENUS *POLONIELLA*

The Kloedenellidae Ulrich & Bassler are a large Palaeozoic group of ostracods of some stratigraphic importance. Their peculiar sexual dimorphism (Veen, 1920; Swartz, 1933, 1936; Egorov, 1950; Henningsmoen, 1953; Jaanusson, 1957; Pokorny, 1958) is the diagnostic character of this family on which they are distinguished from other ostracods (Palaeocopa). Female specimens are as a rule distinguishable by the swollen posterior part of the carapace and this feature very characteristically stamps the whole group. In Pokorny's opinion (1958) the type of dimorphism characterizing the Kloedenellidae agrees with that observable in recent Podocopa (in the sense of Müller, 1894) and hence that author has some doubts as to their relationship with Palaeocopa.

The present paper is concerned foremost with the morphology, ontogeny and structure of carapace of several species of *Poloniella* (= *Dizygopleura* Ulrich & Bassler, 1923) Gürich, 1896. Numerous observations on their dimorphism and ontogeny suggest that taxonomic problems cannot be always cleared up by dimorphism to such an extent as it is postulated by Pokorny (1958). Frequently, particularly in groups subject to strong metamorphosis, the position of the so-called "pouch" or of the dimorphic swelling of certain parts of the shell oscillates from the posterior to the anterior part of carapace. This question is fairly well illustrated in *Kozłowskiella* (Přibyl). In *K. praetuberculata* Adamczak the pouch is placed nearly postero-ventrally, while in the assumed Givetian descendants of this species (*K. kozłowskii* (Přibyl) it was shifted more anteriorly (Adamczak, 1958, text-pl. I). An analogous phenomenon (unpublished materials) has been observed in other forms allied with this genus, where the change in the position of the pouch was sometimes strongly marked.

The origin of Kloedenellidae is still an open question. Swartz (1933, p. 568) supposed that they are derived from the type of *Milleratia* Swartz.

According to Henningsmoen (1953), *Poloniella* displays a certain morphological resemblance with Zygobolbinae Ulrich & Bassler, while Jaanusson (1957) traces the Kloedenellidae back to the Leperditellacea Ulrich & Bassler. All these concepts assert that it is not the Podocopa nor the Platycopa, but the primitive Palaeocopa that are the ancestors of Kloedenellidae.

Investigations of young instars of *Poloniella*, particularly of their early growth stages, show that the median sulcus (S2) is the most typical element of the carapace. It appears already during the first stage of growth. At its base most likely occurred a muscle scar which could not be more closely determined in spite of the use of various techniques.

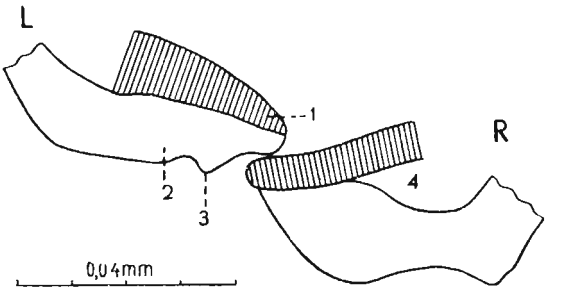


Fig. 2. *Knoxites accepta* Polenova, transverse section of carapace in the free margin area; *L* left valve, *R* right valve, *1* inner lamella, *2* outer lamella, *3* admarginal list, *4* vestibulum.

Light is more strongly refracted at the muscle attachment place, but no distinct impressions are detectable. This is a very true character since it is systematically and phylogenetically important. The young instars of *Poloniella* have two grooves, the third, posterior one (S3) does not make its appearance until in the later stages. The lobes in first stages resemble those of *Bolbina* Henningsmoen (*B. lehtmetsaensis* (Oraspald, in coll.), (*vide*: Sarv, 1959, pl. 8, fig. 5).

The microstructure of shells in species of *Poloniella* is cryptocrystalline; in thin sections the presence of duplicature around the outer edge has not been ascertained with the exception of dark lines. On the other hand, the presence of duplicature has been ascertained by the writer within the group Knoxidae Egorov (*Knoxites accepta* Polenova), probably related with the Kloedenellidae. This ostracod character has not yet been adequately studied and calls for further investigations (fig. 2).

Two-layered structure of shell has been ascertained on fluoridized specimens (fig. 3). It resembles the shell structure of *Hollinella* Coryell (*vide* Adamczak, 1961, pl. 2, fig. 1) in which the carapace is two layered, as in *Poloniella*. The dark lines of Adamczak (1958), called the bisecting

lines (Jaanusson, 1957), are likewise observable in thin sections within the free edge of the valve (fig. 6, 8-10, 12 14). The sections of fluoridized shells of one species (*Poloniella tertia* Krömmelbein) display the layered structure resembling that in the carapace of the trilobite *Tetraspis seticornis* (Hisinger), (Størmer, 1930).

Observations of the structure of the carapace in the studied species, as well as a study of their individual development emphasize that: 1) structure of the carapace, 2) ontogeny, 3) type of dimorphism, and 4) ornamentation pattern — are the fundamental criteria in determining the systematic position of the Kloedenellidae. They also suggest that

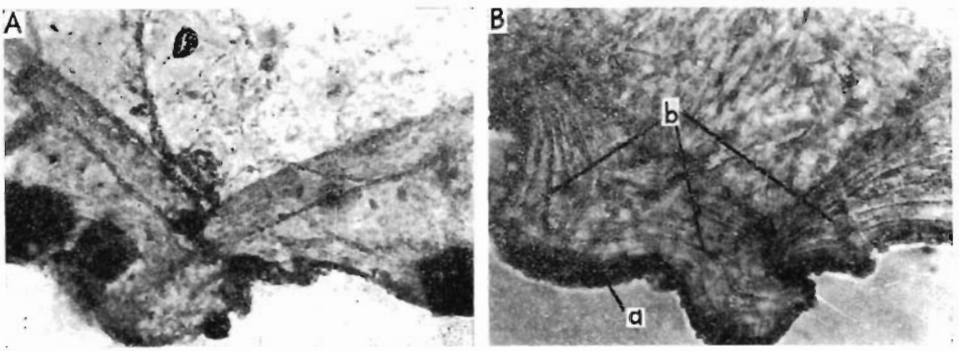


Fig. 3. — *Poloniella tertia* Krömmelbein, transverse section of carapace in the free margin area below groove S2; *A* unfluoridized carapace, *B* fluoridized carapace, *a* outer layer, *b* inner layer with laminar structure; × 215.

this is probably one of the groups of the suborder Palaeocopa. In the light of the here discussed investigations there seems to be as yet no sufficiently reliable evidence for placing them close to the Podocopa or the Platycopa solely on the type of dimorphism. This character, as already mentioned here above, is indeed expressed most diversely and is subject to strong fluctuations.

ONTOGENY IN SOME REPRESENTATIVES OF THE GENUS *POLONIELLA*

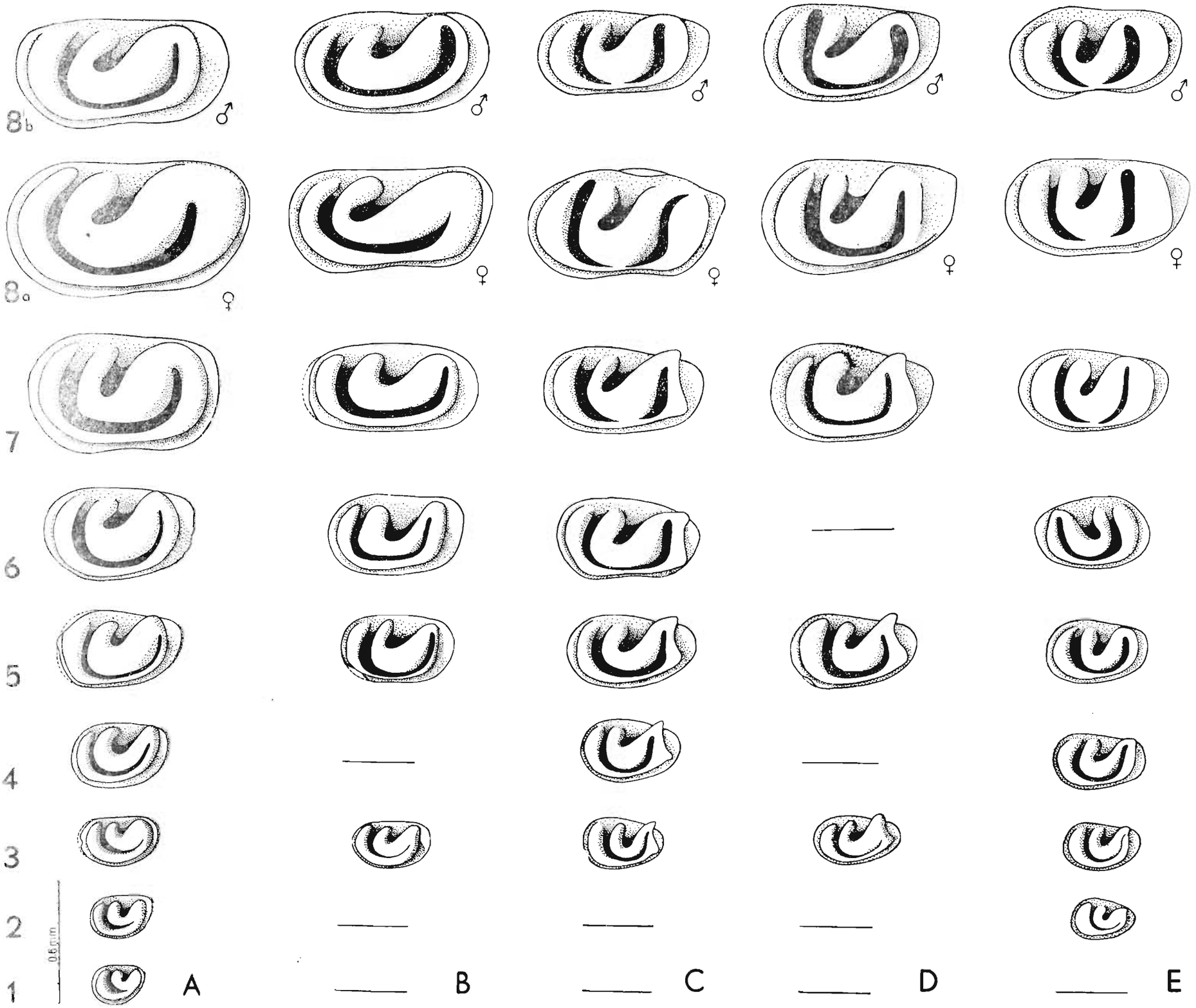
The moults or young instars of carapaces of Kloedenellidae have been known since long. Detached immature forms have been i.al. described by Ulrich and Bassler (1923). Fairly complete growth series have not, however, been described heretofore. Probably the first complete ontogenetic development has been given by Adamczak (1959) for *Poloniella devonica* Gürich. Seven growth stages have been ascertained there by the writer. Upon their completion sexual maturity is attained and dimorphism realized (stage VIII). Moreover, incomplete ontogenies have been investigated in the case of *P. kielanae* Přibyl, *P. tertia* Krömmelbein, *P. cingulata* Warthin and *P. diversa* n. sp. (text-pl. I). In spite of

considerable specific differences in mature specimens, their early stages are on the whole much the same.

During individual development the ornamentation pattern of the shell varies considerably, permitting not only to trace the history of the species, but also to study the mode of realization of changes with phyletic significance (Adamczak, 1959). It has been ascertained that small changes in the ornamentation pattern may occur in various growth stages. They are realized either by means of prolongation (Franz, 1927, 1931) in the last growth stages, or they may occur during the early moult stages and gradually involve the later stages, too (the proterogeny of Schindewolf, 1927, 1950). In the latter case they determine the future habitus and ornamentation pattern of the mature forms.

Young specimens of the here studied species of *Poloniella* are distinguished by scanty ornamentation, these are bisulcate forms. The posterior sulcus (S3) makes its appearance during later stages, beginning with stage III which, in mature forms, to a certain extent, delimits the posterior swelling (pouch) from the remaining part of the domicilium. A secondary simplification of ornamentation, expressed by the disappearance of the posterior sulcus (S3) has been observed in very closely allied species, e.g. *P. devonica* Gürich and *P. kielanae* Přibyl occurring in successive stages (Couvinian-Givetian). This has been noted in female specimens of *P. kielanae* Přibyl. It seems that the disappearance of this sulcus may be connected with the development of ovaries and hence with increased fertility. In male specimens of *P. kielanae* Přibyl the posterior sulcus is still relatively well developed, similarly as in the last young stages. The latter strongly resemble the instars of *P. devonica* Gürich, suggesting that the two species are very closely related. The changes in *P. devonica* were gradual. Their first symptoms were noted in mature individuals collected from the uppermost Couvinian horizons of Grzegorzowice. They affect the outline of the carapace and the posterior part of the carapace including lobes L3 and L4.

P. tertia Krömmelbein, *P. cingulata* Warthin and *P. diversa* n. sp. represent another type of ornamentation pattern differing in details from that in *P. devonica* and *P. kielanae*. Two small nodes (minute spines) directed posteriorly (text-pl. I, C-D) occur on lobe L4 during the early growth stages in *P. tertia* and *P. cingulata*. This feature appears in the moult stages only; in stage VII of *P. cingulata* the nodes are nearly obliterated, in the related species (*P. tertia*) their traces are still fairly distinct. In *P. diversa* n. sp. one small node occurs dorsally on lobe L4. Although these nodes are a minor structure, subject to obliteration, still they are not without significance when determining relationships between species. Moreover they permit to observe the realization of changes



Diagrammatic drawing, showing the individual development of shells: A *P. devonica* Gürich, B *P. kielanae* Přibyl, C *P. tertia* Krömmelbein, D *P. cingulata* Warthin, E *P. diversa* n. sp.; *1*—*8* successive moult stages.

affecting the ornamentation pattern, and are useful in systematic studies. It is thanks to this character that an "Ostracoda A" specimen, familia et genus inc. sedis, described by Jordan (1959, p. 32, pl. 1, fig. 10) could be assigned to the genus *Poloniella* since it resembles stage VI of *P. tertia* not in general morphology only, but in size, too.

The close similarities of the moult stages with the mature stage in species *P. tertia* and *P. cingulata* suggest a relationship closer than that with any other *Poloniella* species. *P. tertia* appears in the lower Middle Devonian of Europe and *P. cingulata* in the Givetian of the same continent, while in North America it has been recorded from the Upper Couvinian (Upper Casenovian). Owing to certain similarities of the moult stages and its occurrence in time, *P. diversa* n. sp. is probably allied with *P. tertia*. This claim is supported by the occurrence throughout all the young stages, stage VII included, of a connecting sulcus that unites S1 and S3.

Not only ornamentation details but the shell outline, too, are subject to changes during individual ontogeny. The truncated posterior part of the carapace, so characteristic of *Poloniella*, occurs in various stages of individual ontogeny. Most commonly, however, the youngest growth stages (I-III) are ovate, with the maximum height occurring anteriorly.

Observations of the growth stages in the studied species of *Poloniella* indicate that: 1) the first stages of ontogeny (I-II) are bisulcate, 2) the changes affect both shell outline and ornamentation pattern, and 3) new characters make their appearance in various stages of individual ontogeny.

DIMORPHISM

Sexual dimorphism in representatives of *Poloniella* was for the first time described by Veen (1920) in *P. hieroglyphica* (Krause). With respect to various species of *"Dizygopleura"* this problem was worked out in detail by Swartz (1933).

Thus, secondary sexual features in Kloedenellidae appear after the last moulting, i.e. in stage VIII. Female specimens are as a rule larger and distinctly swollen in the region of lobe L4.

Male specimens of all *Poloniella* species reported from the Holy Cross Mountains have also been identified. They are less numerous than the females with the ratio at 1 : 3-4. In female carapaces lobe L4 is always well developed, with the maximum thickness of the carapace always occurring posteriorly; *P. devonica* and *P. brevis* n. sp. are here an exception.

A number of fundamental infraspecific sexual differences concerning ornamental details are observable in mature individuals. Female specimens of *Poloniella diversa* n. sp. have the marginal ridge developed

along the anterior and ventral edge, while in male specimens this element is interrupted below the median sulcus. Hence this part of the carapace is concave and the shell outline kidney-shaped. Moreover, male specimens are gently rounded on both sides and without the truncation so characteristic of the female shells. In *P. brevis* n. sp. lobe L4 in male specimens forms a crest-like structure being narrow and joining to the first lobe (L1). The male shells of *P. devonica* Gürich are more rectangular than the female. The carapaces of mature female forms of *P. kielanae* Přibyl are bisulcate (Přibyl, 1953), while the male carapaces are still trisulcate.

STRATIGRAPHIC DISTRIBUTION

Genus *Poloniella* (= *Dizygopleura*) Gürich is most common in Silurian, Devonian and Lower Mississippian beds of North America, and in the Devonian of Europe — from the Eifel Mountains to the Russian Platform. Their strongest differentiation took place during the Silurian. The majority of species are of that age. In Europe the first representatives of genus *Poloniella* were described from the Lower Devonian (*P. concentrica*[1]), while the only Silurian species — *P. hieroglyphica* (Krause) has been yielded by erratic boulders (Krause, 1891).

Table 1 shows the number of species thus far described from the various formations and geographical regions.

Table 1

Number of species of the genus *Poloniella* described from the various formations and geographical regions

Age \ Regions	North America	Western Europe	Eastern Europe
Carboniferous	1	—	—
Upper Devonian	—	1	—
Middle Devonian	7	2	9
Lower Devonian	5	2	1
Silurian	39	1	—
Total:	52	6	10

Within Europe the majority of species of *Poloniella* Gürich have been recorded from the Middle Devonian. The stratigraphic and geographical distribution of that genus indicates that its first appearance was probably in the Silurian strata of North America. Its differentiation and rapid spread began in the same period.

[1] The species *P. concentrica* (*Dizygopleura concentrica*) was described by Kummerow (1953) and it is a homonym of the species established by Ulrich and Bassler (1923).

In Poland, *Poloniella* occurs in the Łysogóra region of the Holy Cross Mountains beginning with the lowermost Couvinian horizons, also in the passage beds (Silurian-Devonian) of the Lower Devonian of south-eastern Poland where the species of *P.* cf. *symmetrica* (Hall) has been discovered (unpublished materials). Moreover, species of that genus are known from the Givetian Skały series. Hitherto they have been reported from two localities only: Dąbrowa near Kielce (Lower Couvinian) and Skały (Upper Givetian). Recently, however, other occurrences of *Poloniella* have been discovered within the Holy Cross Mountains (Wydryszów, Grzegorzowice, Świętomarz-Śniadka).

P. devonica Gürich is the only species found within the marly lowermost Couvinian deposits of Wydryszów, in beds bearing a trilobite fauna of *Phacops* (*Phacops*) *latifrons grzegorzowicensis* Kielan and *Otarion*

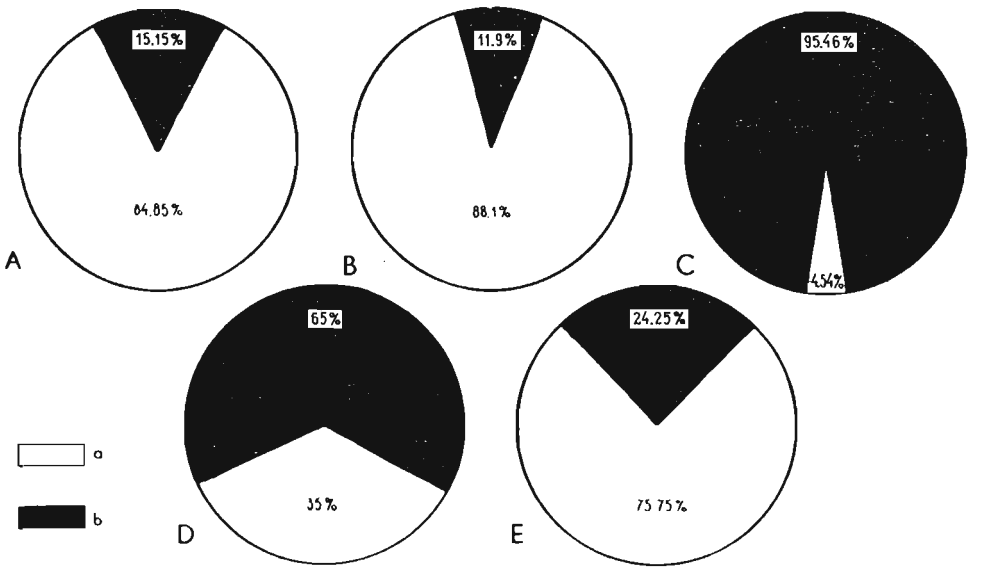


Fig. 4. — Percentage distribution of the two *Poloniella* Gürich species within five Couvinian horizons at Grzegorzowice; *A*—*E* successive horizons, *a* *P. devonica* Gürich, *b* *P. diversa* n. sp.

(*Otarion*) *convexum* (Hawle & Corda), (Osmólska, 1957). *P. brevis* n. sp., a short lived species, is encountered in the higher horizons of that section (siltstones). *P. tertia* Krömmelbein occurs in marls overlying the limestones, with *P. devonica* present there, too, but *P. tertia* is the predominant form throughout all these beds.

P. devonica and *P. diversa* occur in the Couvinian deposits of Grzegorzowice, beginning with the lowermost horizons from which samples were collected (argillaceous and greywacke shales of the Grzegorzowice beds, Pajchel, 1957). These species display strong variation in their successive beds, that is when one of the two species is predominant, the

other is less abundant (fig. 4). Analogous conditions have been noted within this section in respect to species of *Kozłowskiella* (Přibyl), (com. Adamczak, 1958, p. 82-83, fig. 10).

The Upper Givetian brachiopod shales with *Schelwienella umbraculum*, *Laeptena rhomboidalis* have yielded the following species: *P. curta* (Polenova), (one specimen not described in the present paper), *P. kielanae* Přibyl and *P. cingulata* Warthin, the last two having their nearest ancestors in the Couvinian.

Species of *Poloniella* here described constitute decidedly small parts of ostracod assemblages. Some forms, such as *P. brevis* n. sp. and *P. cingulata*, are extremely rare. Others, though more numerous, make up but 5 per cent of the whole ostracod fauna.

DESCRIPTION

Superfamily **Kloedenellacea** Ulrich & Bassler, 1908 (Swartz, 1945)
Family **Kloedenellidae** Ulrich & Bassler, 1908
Genus *Poloniella* Gürich, 1896
(fig. 5)

Genotype: *Poloniella devonica* Gürich, 1896.

Diagnosis. — Carapace quadrilobate, subrectangular, anteriorly more or less sharply truncated. Lobe L4 conspicuous in female specimens. Hinge line straight. A dorsal tooth occurs on the left valve in the prolongation of S1.

Occurrence. — From the Silurian to the Mississippian (Lower Carboniferous).

Geographical distribution. — North America, Europe.

Remarks. — A number of papers dealing with Middle Devonian ostracods of the Holy Cross Mountains have been published since Gürich's time (1896). Recent investigations (Přibyl, 1953; Adamczak, 1956, 1958, 1959, 1961) have led to a revision of previous identifications (Gürich, 1896) and to the description of new species, previously unknown, i.al. of representatives of *Poloniella*, whose description by Gürich was based on species *P. devonica*. Neither the figures, nor the description given by that author are correct, and hence palaeontological literature contains many contradictory opinions on the genus *Poloniella* (Veen, 1920; Ulrich & Bassler, 1923b; Swartz, 1933; Kummerow, 1930, 1953; Warthin, 1934; Bassler & Kellett, 1934; Přibyl, 1953; Pokorný, 1958; Polenova, 1960).

Results of investigations on that genus, including its ornamentation pattern and fairly strong variation, clear up a number of taxonomic "misunterstandings". Such are the claims for the assignment of *Poloniella* species to different genera which were, in turn, referred to the different

families (Ulrich & Bassler, 1923*b*; Steward & Hendrix, 1945; Swartz, 1933; Polenova, 1960).

Veen (1920) carried out detailed comparative studies on some species of *Kloedenella* Ulrich & Bassler (1908) (*P. hieroglyphica*) arriving at the conclusion that this is a genus identical with *Poloniella*. In 1923, on the base of the quadrilobate ornamentation of the carapace in some *Kloedenella* species, also of others collected from the Silurian (Upper-Clinton, McKenzie-fm in the United States of America) Ulrich and Bassler erected for them the genus *Dizygopleura*. In general morphology and ornamentation that genus is actually identical with *Poloniella* and agrees in every respect with Veen's assertments. Nevertheless Ulrich and Bassler (1923*b*, p. 664) write that: "Under the circumstances we must content ourselves with the simple statement that in our opinion *Poloniella*, instead of being the same as any of the genera of the Kloedenellidae is really very near and perhaps generically the same as species now referred to Jones and Holl's genus *Octonaria*".

It is a known fact that Ulrich and Bassler's opinion had some bearing on later investigations (Swartz, 1933; Bassler & Kellett, 1934; Polenova, 1960).

The view held by Swartz (1933) is that most noteworthy among the numerous, often contradictory opinions advanced in respect to the genus *Poloniella* and *Dizygopleura*. On evidence of rich materials of "*Dizygopleura*" from the Silurian of Pennsylvania (USA) that author discusses the relation of the American forms to *P. devonica*, with special stress on the species *P. hieroglyphica*. His remarks concerning morphological differences (ornamentation) of these two genera are correct, but his claim that they are not congeneric cannot be accepted. Rather strong intraspecific and even infraspecific shell outline variation has been ascertained in the genus *Poloniella*. The infraspecific variations are noted between specimens of different sex. As a rule, however, the shell outline is subrectangular, with the posterior part more or less sharply truncated, hence the posterior dorsal angle of the shell is acute. The dorsal border is straight, long, and developed similarly as in the remaining species which Swartz contrasts with *P. devonica*. Moreover, the quadrilobate ornamentation of the shell is additional evidence to support the supposition that we are dealing here with congeneric forms. The habitus and topography of sulci in the here described species show much resemblance with the American forms, as well as with European species described under the generic name of "*Dizygopleura*".

Přibyl (1953) supposes *Poloniella* to be a genus quite distinct from "*Dizygopleura*". He also questions the assignment to *Poloniella* of the species *P. cingulata* and others.

Pokorný (1958) examines the genus *Poloniella* together with other forms of the Kloedenellidae and writes that: "Die Mitteldevonische *Poloniella* steht der Gattung *Dizygopleura* so nahe, dass als deren Abkömmling betrachtet werden kann" (p. 192).

No detailed study has thus far been carried out of the structure of the hinge line in species of *Poloniella* and in representatives of the so-called genus "*Dizygopleura*". Stewart and Hendrix (1945), and Polenova (1952) were probably the first to give some attention to this element, while in 1956 Swartz and Whitmore (pl. 109, fig. 24) described the hinge surface in *P. angustisulcata* (Swartz & Whitmore). The description and figures given by the last named authors enabled their comparison with analogous structures in typical forms of *Poloniella*, described by Gürich (1896) from Devonian deposits of the Holy Cross Mountains. The type of construction of the hinge surface in all species of that genus, known from the Devonian of Poland, on the whole agrees with that in forms described from America or from the USSR. The hinges in *Poloniella* carapaces are all built according to one scheme. In the anterior part of the left valve a rather deep groove occurs below the dorsal tooth (fig. 5).

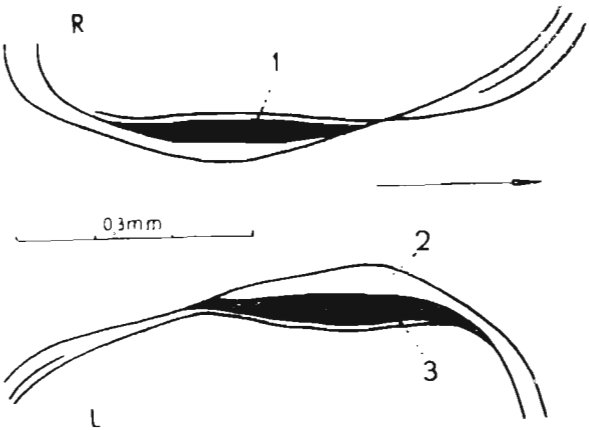


Fig. 5. — *Poloniella diversa* n. sp., diagrammatic drawing, simplified, showing hingement structures; *L* left valve, *R* right valve, *1* posterior hinge groove, *2* dorsal tooth, *3* anterior hinge groove.

In the right valve a list is present in the anterior part of the hinge (to this list corresponds a hinge groove in the left valve), and in the posterior part of the hinge a groove is present to accommodate the hinge list of the left valve. The dorsal surface above the groove (right valve) is sometimes greatly dilated and protrudes beyond the hinge line. The illustrations of the different specimens given by Polenova (1952, pl. 7, fig. 1b), and by Swartz and Whitmore (1956, pl. 108, fig. 24) suggest that their structures morphologically complement one another and may be correlated.

Along with ornamentation and dimorphism the just considered cha-

racters provide diagnostic evidence that *Dizygopleura* Ulrich & Bassler may be considered as a synonym of the genus *Poloniella* Gürich (1896).

Poloniella represents a fairly diversified assemblage of species among which several groups may be distinguished (Ulrich & Bassler, 1923*b*). The Silurian forms are characterized by the generally well developed dorsal tooth and by sulci (S1, S2, S3) running vertically to the dorsal edge and not fused together. According to Pokorný (1958, p. 194) the latter feature distinguishes species of *Poloniella* from *Dizygopleura*. The most important difference here is the ventral fusion of sulci S1 and S3. Naturally, this is not the rule, since e. g. in species *P. tertia* Krömmelbein and *P. diversa* n. sp. these grooves do not unite in mature stages, but do so in the young stages. Moreover, Devonian species, particularly the European ones, have a less conspicuous dorsal tooth and this is most likely the only difference separating them from the American forms.

Into the genus *Poloniella* the present writer has included all species heretofore described under the name of *Dizygopleura*, with the exception of *D. obliqua* Roth and *D. recta* Roth, which have been referred to Thlipsuriidae (Warthin, 1945).

Species *P. devonica* Gürich, on which the genus *Poloniella* has been erected, was derived from the Couvinian of Dąbrowa near Kielce. At present, the beds in question are inaccessible. Forms most closely agreeing with the descriptions and figures of Gürich (1896) have been collected from the Couvinian strata of Wydryszów and Grzegorzowice. Specimens of *P. devonica* from these beds are excellently preserved and their young stages also occur there. On comparing the writer's material with Gürich's illustrations (1896, pl. 14, fig. 1 a-e) it has been ascertained that Gürich's figures are not quite correct. In the first place the orientation of carapaces is inverse to what is now generally accepted. The illustrations also display a number of differences concerning the ornamentation of the left and right valves. Gürich himself admits that lobe L2 has not been correctly drawn. Moreover, sulcus S2 in that drawing is too oblique and longer than in reality. Although the draughtsman may probably be blamed for these errors, nevertheless the differences they imply have occasionally been quoted (Kummerow, 1953) to indicate the differences between the genus *Poloniella* and *Dizygopleura*.

In addition to *P. devonica*, already previously known, several other species have been found in the Middle Devonian beds of the Holy Cross Mountains which likewise confirmed that the genus *Dizygopleura*, established by Ulrich and Bassler (1923), may reasonably be considered as synonymous with the genus *Poloniella*. There are no sufficiently important morphological or ontogenetic differences to justify their systematic separation.

Poloniella devonica Gürich, 1896

(fig. 6, 7; pl. I, fig. 1—2)

1896. *Poloniella devonica* Gürich; G. Gürich, Das Palaeozoicum . . ., p. 388, pl. 14, fig. 1.

Neotypus: female carapace shown in pl. I, fig. 2 *a—c*.

Stratum typicum: Middle Devonian (Couvinian) of the Holy Cross Mountains.

Locus typicus: Grzegorzowice.

Diagnosis. — Shell rectangular, quadrilobate. Anterior sulcus (S1) connected with S3. Median sulcus anteriorly outcurved. A marginal ridge stretching along the free edge of valve. Left valve overlapping the right along free edge. Dimorphism distinct.

Material. — Several tens of shells of mature and youthful individuals. The holotype of this species housed in the Wrocław University was destroyed during war operations. A neotype has been selected from the Grzegorzowice specimens.

Dimensions (in mm):

	Neotype	
	♀	♂
Length	1.08	1.00
Height	0.62	0.58
Thickness	0.56	0.44

Description. — The *female carapace* has a rectangular outline, posteriorly slightly truncated. The gently anterior sulcus (S1) is connected in the ventral part of the valve with the posterior sulcus (S3). This takes up 1/2 of the carapace height and is nearly at right angle to the dorsal margin. Sulcus S2 curves out at the base towards the front. The anterior lobe (L1) is narrow, gently rounded and connected with the last lobe (L4). The median lobe (L2), showing a club-like expansion in the dorsal part of the carapace, tapers towards the base of the valve and joins the broad posterior lobe (L3). This stretches somewhat obliquely (diagonally) across the carapace to the dorsal margin where it joins lobe L4. A marginal ridge stretches along the free edge of the valve. The dorsal tooth occurs on the dorsal side in the prolongation of the anterior sulcus. Sulci S1 and S2 are distinctly marked. The central part of the shell is strongly swollen. The ventral surface is in the shape of an asymmetric bi-convex lens. On the dorsal side, in the prolongation of S1, is present the dorsal tooth pushed onto the right valve. In the distal part of the carapace lobe L4 slightly protrudes outside the hinge line.

The *male carapace* is smaller, more slender, with a poorly developed last lobe (L4). Sulci S1 and S2 are connected and U-shaped with a broad base. Sulcus S3 occupies 2/3 of the valve height. The maximum carapace thickness occurs centrally. Both the anterior and the posterior edges are nearly equally rounded.

Structure of carapace (fig 6). In thin sections, vertical to the longitudinal axis of shell, dark lines are visible within the free border area,

which cut across the distal parts of the carapace. The microstructure of the shell is cryptocrystalline. Slides of fluoridized shells exhibit two layers; the outer is dark coloured, the inner transparent.

Ontogeny. — The individual development of shells of this species has been investigated, beginning with the earliest stages, and it seems to show the complete carapacial metamorphosis. Young carapaces and their moults have been collected of rock samples from Grzegorzowice. On the evidence of modifications noted in the different stages and on the base of the growth ratio ranging up to 1.24, it may be supposed that there were seven moults in the ontogeny of *Poloniella* Gürich.

Instar I — Dimensions (in mm):

Length	0.26
Height	0.20
Thickness	0.16

The valve is trilobate with well marked anterior (S1) and median (S2) sulci. Shell outline subovate. Anterior sulcus gently curved, passing onto the ventral side and terminating somewhere below the median sulcus. This is short and shallow, occurring in the postero-central part of valve. The marginal ridge stretches along the antero-ventral part of the free edge.

Instar II — Dimensions (in mm):

Length	0.30
Height	0.21
Thickness	0.17

Valve outline hardly modified. Anterior sulcus deepens and elongates distally on the ventral side. The median sulcus occupies a nearly central position. The posterior lobe (L3 + L4) is conspicuous and undivided.

Instar III — Dimensions (in mm):

Length	0.37
Height	0.24
Thickness	0.20

Shell outline unchanged. Anterior sulcus ventrally greatly elongated. Lobe (L3 + L4) still constitutes an undivided structure.

Instar IV — Dimensions (in mm):

Length	0.49
Height	0.32
Thickness	0.26

Sulcus S3 begins to be outlined in this stage. The shell is nearly ovate, gently posteriorly truncated, quadrilobate. The median sulcus very broad, occupying the dorso-central area of valve.

Instar V — Dimensions (in mm):

Length	0.60
Height	0.38
Thickness	0.32

The trisulcate valve is subrectangular, posteriorly gently truncated. Sulcus S3 longer than in the preceding instar, but still narrow. The posterior lobe (L3) broad.

Instar VI — Dimensions (in mm):

Length	0.72
Height	0.48
Thickness	0.38

The shell outline nearly rectangular, posteriorly slightly truncated. The median sulcus (S2) outcurved to the front. Otherwise unchanged.

Instar VII — Dimensions (in mm):

Length	0.92
Height	0.56
Thickness	0.44

The details of ornamentation are now almost completely developed. The anterior, median and posterior lobes narrow. The sulci markedly

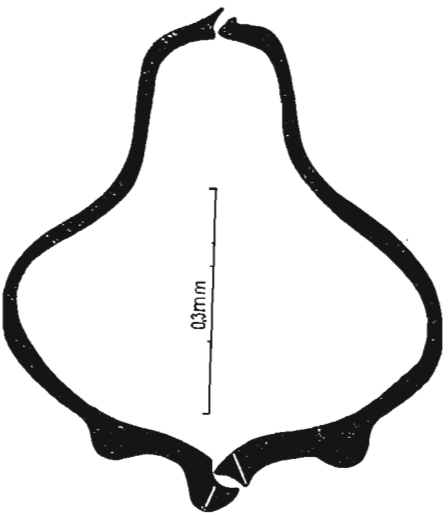


Fig. 6. — *Poloniella devonica* Gürich, transverse section of carapace ♀ in area of S2.

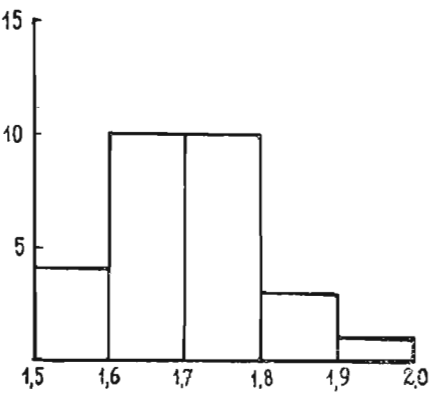


Fig. 7. — *Poloniella devonica* Gürich, variation diagram; number of specimens on ordinate, length/height ratio quotient on abscissa.

broader than during the preceding instar. This stage is followed by maturity.

Variation (fig. 7). — In specimens of *Poloniella devonica* from Wydryszów the marginal ridge is not so well developed as in the Grzegorzowice representatives of this species, which have been collected from marly deposits of that profile. Moreover, sulcus S3 is less well developed in the latter forms. Among the Grzegorzowice material some detached specimens exhibit a rather elongated valve outline approaching that of *P. kielanae* Přibyl. The observed modifications affected the outline of lobe L4 which tapers and its development resembles that of a Givetian

species described by Přibyl (1953). Since the higher Couvinian horizons are not exposed either in Wydryszów or in Grzegorzowice, it is not possible to trace the further evolutionary stages of *P. devonica*. Nevertheless, changes observed on valves of that species collected from the uppermost horizons of that section, reasonably suggest its trend in the direction of *P. kielanae*.

Occurrence. — In the uppermost horizons of the Lower Devonian and, in greater abundance, in the Couvinian.

Remarks. — *P. devonica* is a characteristic assemblage of forms, in ornamentation details differing somewhat from the remaining species. The general arrangement of lobes and the course of grooves are typical for representatives of that genus. In female shells lobe L4 is distinctly swollen. The carapace outline approaches that in *P. conjugata* (Swartz) and of certain specimens *P. symmetrica* (Hall, emend. Swartz) and *P. micula* (Ulrich & Bassler). The ventral surface of *P. devonica* comes nearest to that of *P. conjugata*. The fundamental difference between the Devonian species from Poland and the Silurian forms from North America consists in the smaller size of the dorsal tooth of the European specimens.

Poloniella kielanae Přibyl, 1953
(fig. 8; pl. II, fig. 1, 2)

1953. *Poloniella kielanae* Přibyl; A. Přibyl, Skořepatci..., p. 248, pl. 6, fig. 6-13.

Holotypus: carapace of *P. kielanae* figured by Přibyl (1953, pl. 6, fig. 10—12).

Stratum typicum: Middle Devonian (Givetian, Skały formation), Holy Cross Mountains.

Locus typicus: Skały.

Diagnosis. — Shell rectangular, posteriorly truncated. Narrow sulci, S3 disappears. Posterior lobe (L3) broad, running diagonally on surface of shell. Surface of carapace locally grooved. Hinge edge straight. Dimorphism distinct.

Material. — Well over ten satisfactorily preserved valves, both young and mature.

Dimensions (in mm):

	♀	♂
Length	0.96	0.88
Height	0.52	0.48
Thickness	0.44	0.36

Description. — *Female carapace* subrectangular in outline, posteriorly rather sharply truncated. Dorsal margin distally gently raised. The marginal ridge occurs along the free edge. The anterior sulcus (S1) fairly deep, subvertical to the dorsal margin. Along the ventral part of the shell it is connected with the disappearing posterior sulcus (S3) which is short and shallow and occupies 1/4 of the shell height. Lobe L2 extends parallel to S2 and is fused with the broad posterior lobe (L3), dorsally connected

with lobe L4. The latter lobe is strongly swollen. The distal part of the carapace and the ventral part of L3 are finely grooved, dorsally reticulated. A gentle elevation corresponding to the dorsal tooth occurs on the side of the dorsal surface in the prolongation of S1. The ventral surface of the carapace is in the shape of an asymmetric biconvex lens and its development resembles that in *Poloniella devonica* Gürich.

Male carapace. Valve rectangular in outline, posteriorly very gently truncated. Posterior sulcus (S3) is narrow and takes up nearly $^3/_4$ of the shell height. Lobe L4 narrow. Lobes L3 and L4 finely ornamented.

The *structure of carapace* is cryptocrystalline. The dark line is indistinctly marked within the ventral part of the valve (fig. 8).

Ontogeny. — The young specimens of this species have been collected from the Givetian Skały formation, the so-called brachiopod shales. Instars I, II and IV are missing from that material.

Instar III — Dimensions (in mm):

Length	0.36
Height	0.24
Thickness	0.20

Valve outline subovate. Anterior sulcus (S1) narrow, passing to the ventral side and producing the posterior sulcus at the base of lobes L3+L4. Median groove broad and shallow.

Instar V — Dimensions (in mm):

Length	0.54
Height	0.34
Thickness	0.28

Carapace outline subrectangular. Anterior sulcus (S1) broad and connected with S3. Anterior lobe (L1) narrow, at right angle to the dorsal margin. Median sulcus (S2) strongly expanded dorsally.

Instar VI — Dimensions (in mm):

Length	0.66
Height	0.40
Thickness	0.30

Shell outline rectangular, posteriorly slightly truncated. Sulci distinct and well marked. Lobe L4 broader than in the preceding stage. Median sulcus continues to be wide.

Instar VII — Dimensions (in mm):

Length	0.80
Height	0.44
Thickness	0.36

In this stage the valve is strongly elongated. The particular sulci and lobes are very distinct. The median sulcus somewhat shorter than during the preceding stage, but still wide.

Occurrence. — *P. kielanae* Přibyl occurs in Middle Devonian (Givetian) deposits at Skały.

Remarks. — This species has descended directly from *P. devonica* Gürich, as is suggested by its individual development, since close morphological similarities with young specimens of *P. kielanae* are exhibited by practically all the evolutionary stages. Although certain sculptural details of this species are differently developed, the fundamental ornamentation pattern is analogous. In the Givetian species the carapaces are more elongated than those of the Couvinian *P. devonica*. The main change which has affected *P. kielanae* concerns the posterior sulcus (S3) which is obliterated in female specimens. Certain modifications concerning the ornamentation of lobes have also occurred in the Couvinian form, in that they are grooved and even finely reticulated, with a smaller lobe L4. These modifications were realized gradually. First, the new characters (reticulation, smaller sized lobe L4 and elongation of shells) were of sporadical occurrence only, in detached individuals of *P. devonica* in the Couvinian strata of Grzegorzowice.

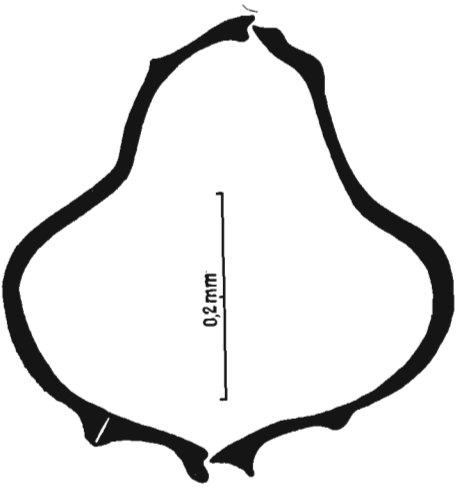


Fig. 8. — *Poloniella kielanae* Přibyl, transverse section of carapace ♀ in area of S2.

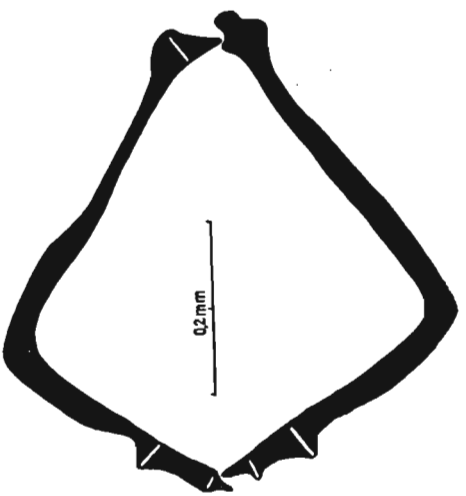


Fig. 9. — *Poloniella brevis* n. sp., transverse section of carapace ♀ in area of S2.

Přibyl (1953), who established this species, did not find any dimorphic specimens. Actually, however, they do occur, and male specimens differ strongly from the females which have a bisulcate carapace.

Poloniella brevis n. sp.
(fig. 9; pl. III, fig. 1, 2)

Holotypus: female carapace figured in pl. III, fig. 2 *a*—*c*.

Stratum typicum: Middle Devonian (Couvinian) in the Holy Cross Mountains.

Locus typicus: Wydryszów.

Derivatio nominis: Lat. *brevis* — short; a short-lived species, recorded from one horizon only (Lower Couvinian) at Wydryszów.

Diagnosis. — Carapace elongated, quadrilobate, narrowing towards the distal part. Dorsal margin straight. Lobes with edges. Grooves broad. Lobe L4 separated from L3. Left valve larger than the right. Well marked dimorphism.

Material. — Very few specimens of this species have been washed out of the residuum.

Dimensions (in mm):

	Holotype ♀	Paratype ♂
Length	1.24	1.08
Height	0.64	0.64
Thickness	0.56	0.50

Description. — The *female carapace* is quadrilobate, posteriorly sharply truncated. The anterior sulcus (S1) is broad, connected with S3 along the ventral part of the carapace. The anterior lobe (L1) gently rounded, passes to the ventral side. The narrow median lobe (L2) runs nearly at right angle to the dorsal margin; in the ventral part it is connected with the posterior lobe (L3). The median sulcus (S2) takes up $^2/_3$ of the shell height and is subparallel to sulcus S1. In the dorsal valve it is considerably expanded. The last lobe L4 is conspicuous, delimited from the other lobes by a long posterior sulcus. The dorsal edge straight, posteriorly slightly bent. The marginal ridge occurs along the antero-ventral edge of the left valve. The dorsal tooth occurs on the dorsal side in the prolongation of the anterior sulcus, while fine crests are indicated in the posterior part. On the ventral side, similarly as in most of the *Poloniella* species from the Holy Cross Mountains, lobes L1 and L4 are connected.

The *male carapace* is quadrilobate, uniformly narrowing towards the distal end. The narrow lobe L1 coalesces along the ventral part of shell with L4 which is narrow, too, and bears a fairly sharp crest on its surface. Lobes L2 and L3 form a U-shaped ridge. The ventral margin is somewhat concave, the ventral area is nearly symmetric.

Structure of carapace (fig. 9). In transverse section the carapace is in the shape of an irregular rectangle. Two dark lines are indicated in the ventral area. The posterior one bisects the marginal ridge (left valve). The other one occurs higher up and bisects the valve below the connecting sulcus.

Occurrence. — This species makes its appearance in the Couvinian. It is short-lived and has been recorded from one horizon only of the Wydryszów profile.

Remarks. — The arrangement of lobes in this species resembles the ornamentation pattern in *Poloniella mehli* (Morey), (Morey, 1935), particularly in respect to lobe L4. In female specimens this lobe is not dorsally connected with L3. In the valve outline *P. brevis* n. sp. resembles *P.*

oblonga (Warthin), (Warthin, 1934), but the habitus of the dorsal margin in the Couvinian form from the Holy Cross Mountains differs from that in the American form.

Poloniella tertia Krömmelbein, 1953
(fig. 10, 11; pl. IV, fig. 1, 2)

1953. *Poloniella tertia* Krömmelbein; K. Krömmelbein, Nachweis..., p. 58, pl. 3, fig. 3 a—d.

Holotypus: carapace figured by Krömmelbein (1953, pl. 3, fig. 3 *a*—*c*).
Stratum typicum: Untere Nohner Schichten, Eifelium.
Locus typicus: Hillesheimer Mulde.

Diagnosis. — The quadrilobate carapace is subrectangular, distally sharply truncated. A marginal ridge occurs along the antero-ventral edge of the carapace. The posterior sulcus (S3) is dorsally curved backwards. Distinct dimorphism present.

Material. — 220 young and mature carapaces.

Dimensions (in mm):

	♀	♂
Length	0.96	0.80
Height	0.52	0.42
Thickness	0.40	0.32

Description. — *Female carapace* subrectangular in outline, posteriorly sharply truncated. A marginal ridge developed along the antero-ventral margin of (left) valve. The dorsal margin is gently convex. The sulci well marked. The anterior sulcus (S1) meets the dorsal edge at a nearly right angle, while the median (S2) one is virgulately curved to the front. The sigmoidal posterior sulcus (S3) which, in female specimens, shows no tendency to be joint with the anterior sulcus S1, is the most typical character in this species. The lobes are gently convex. The median lobe (L2), expanded dorsally, narrows lower down and, parallel to the ventral margin, it passes into the posterior lobe (L3). In the dorsal part of valve lobes L3 and L4 are joint together.

In the dorsal area a dorsal tooth occurs in the prolongation of S1. The ventral side of the posterior part of shell is considerably expanded. Below lobes L2 and L3 it narrows to widen out again above S1. The left valve is larger than the right and overlaps it along the free edge.

Male carapace. No male specimens of this species were identified by Krömmelbein (1953). The outline of the male carapace is more distinctly rectangular than the female. The last lobe (L4) is small and subrectangular in outline. The anterior (S1) and posterior (S3) sulci are often united along the ventral part of the valve. The male specimens are smaller-sized. They are also less numerous, there being 3—4 female specimens for each male.

Structure of carapace (fig. 10). Bisecting lines are observable in thin sections on the ventral side of the carapace. The microstructure is cryptocrystalline. Sections of fluoridized carapaces show distinct lamination similar to the structure of carapace of certain Ordovician trilobites (*Tetraspis seticornis* (Hisinger), (Størmer, 1930), (our fig. 3*b*).

Ontogeny. — The earliest instars have not been distinguished among representatives of this species.

Instar III — Dimensions (in mm):

Length	0.38
Height	0.26
Thickness	0.20

Shell outline nearly ovate, distally narrowing. Lobes and sulci well developed. Posterior sulcus (S3) directed slightly backwards. Two small tubercles directed posteriorly occur on the last lobe (L4). On the dorsal side a dorsal tooth is already present in the prolongation of the anterior sulcus. S1 and S3 are united.

Instar IV — Dimensions (in mm):

Length	0.48
Height	0.32
Thickness	0.24

The grooves are deeper. Similarly as in the last instar the upper node on lobe L4 slightly protrudes above the hinge line. The posterior groove is broader and deeper than during the preceding stage. The remaining characters are unchanged.

Instar V — Dimensions (in mm):

Length	0.58
Height	0.36
Thickness	0.28

The shell outline and the other characters unchanged.

Instar VI — Dimensions (in mm):

Length	0.68
Height	0.40
Thickness	0.30

A gentle truncation of the posterior part of the carapace is observable in this stage. The nodes are reduced. The upper one rather conspicuous. The last lobe (L4) is nearly rectangular in outline.

Instar VII — Dimensions (in mm):

Length	0.78
Height	0.46
Thickness	0.34

Details of ornamentation are now almost definitely fully developed. Nodes are still present on lobe L4. The juncture of the anterior and posterior sulci is broken up. The upper part of the posterior lobe still protrudes above the hinge line.

Variation. — The size and outline of carapace are subject to certain variations. The latter displays different degree of elongation. The hinge line is variably convex. In detached carapaces the dorsal margin is nearly straight. The posterior sulcus (S3) on the whole meets the dorsal border at a right angle and then curves backwards; occasionally, however, it is slightly oblique. The variation diagram plotted for this species (fig. 11), has a regular course, the maximum frequency occurs in classes: 1.85, 1.90 and 1.95, indicating that the height/length ratio is hardly one half the valve length. Specimens of this species described by Krömmelbein (1953) are of greater size and their length/height ratio is 2.11.

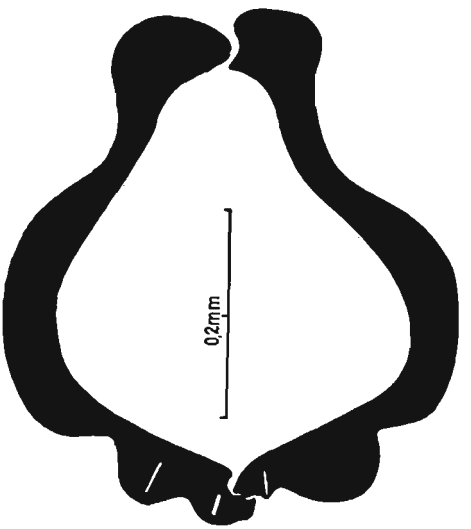


Fig. 10. — *Poloniella tertia* Krömmelbein, transverse section of carapace ♀ in area of S2.

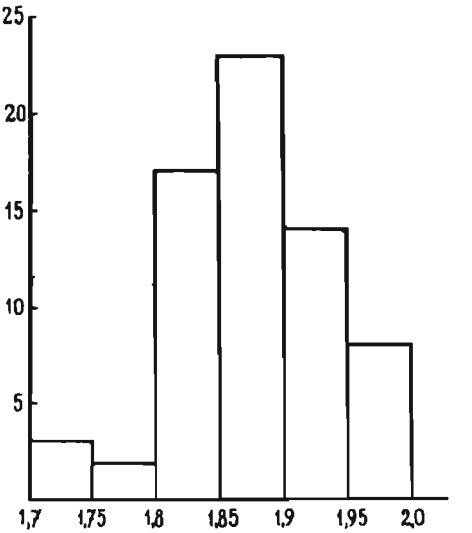


Fig. 11. — *Poloniella tertia* Krömmelbein, variation diagram; number of specimens on ordinate, length/height ratio quotients on abscissa.

Occurrence. — *Poloniella tertia* Krömmelbein has been described from the Lower Couvinian (Untere Nohner Schichten) of the Eifel Mountains. In Poland this species occurs likewise in the Couvinian, but it is encountered in the upper horizons of the Wydryszów section. It has a considerable vertical range in the Couvinian strata of the Holy Cross Mountains. Its stratigraphic distribution helps to understand the migration routes in Europe of the Upper Devonian ostracod fauna.

Remarks. — *P. tertia* exhibits some affinities in the first place to *P. cingulata* Warthin from the Middle Devonian of Michigan, USA (Krömmelbein, 1953). This American species has also been identified in the Givetian deposits of Poland. The resemblance of the two species is most striking in the young stages in which small tubercles occur on lobe L4.

In this respect the young stages of *P. tertia* also closely resemble an ostracod described by Jordan (1959), but not more definitely identified by him (comp. p. 81). The male specimens of *P. tertia* and *P. cingulata* Warthin are similar in their elongated shape and the development of the anterior part of the carapace. They differ, however, in the development of the posterior sulcus (S3) and of the posterior end of the carapace. There is also some resemblance between *P. tertia* and *P. diversa* n. sp. (comp. p. 306—308).

Poloniella diversa n. sp.
(fig. 12, 13; pl. V, fig. 1, 2)

Holotypus: female shell figured in pl. V, fig. 2 *a*—*c*.
Stratum typicum: Middle Devonian (Couvinian) of the Holy Cross Mountains.
Locus typicus: Grzegorzowice.
Derivatio nominis: Lat. *diversa* — different, owing to differences between the male and female specimens.

Diagnosis. — The female carapace is subrectangular, posteriorly sharply truncated, quadrilobate. The sulci run vertical to the dorsal margin which is convex. The lobes are semicircular, distinct. The anterior and posterior sulci do not unite. The dimorphism is well defined.

Material. — About 90 young and mature carapaces.

Dimensions (in mm):

	Holotype ♀	Paratype ♂
Length	0.88	0.84
Height	0.52	0.44
Thickness	0.42	0.32

Description. — *Female carapace* subrectangular, posteriorly truncated. Anterior border gently rounded. Sulci vertical to the dorsal margin. Anterior sulcus (S1) in the ventral valve curves out at a right angle, but does not unite with S3. Median sulcus (S2) anteriorly virgulate. Lobes L2 and L3 are united and form a U-shaped ridge; a crest is indicated on the last lobe. A marginal ridge occurs along the antero-ventral edge. On the dorsal valve the tooth is present in the prolongation of S1. The ventral surface does not consist of a closed area. Lobes L1 and L4, also the ventral surface of the fused lobes L2 and L3 are observable in this part of the carapace. The development of the hinge line resembles that in *Poloniella tertia* Krömmelbein. The distal part of the hinge line in the right valve is strongly expanded and protrudes above the left valve.

The *male carapace* is smaller, somewhat different in shape from the female one, being posteriorly gently rounded. Lobe L4 arched. Sulci S1 and S3 occasionally united. Along the free edge of the shell stretches a marginal ridge. This is discontinued below the median groove, hence, the ventral valve is concave.

Structure of carapace. In *P. diversa* n. sp. the microstructure of shell is cryptocrystalline. The shells are thick, massive. The bisecting line (fig. 12) is very distinct on the ventral part of the valve.

Ontogeny. — Only very few young forms of this species are available, sometimes represented by detached valves only. Instar I is missing.

Instar II — Dimensions (in mm):

Length	0.30
Height	0.20
Thickness	0.16

Carapace subovate, the anterior part higher than the posterior. Anterior sulcus gently curved backwards and on the ventral side reaching to the base of the posterior lobe (L3+L4), which is provided with a tubercle.

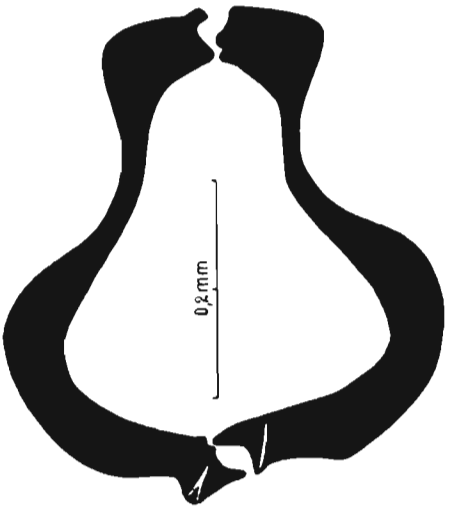


Fig. 12. — *Poloniella diversa* n. sp., transverse section of carapace ♀ in area of S2.

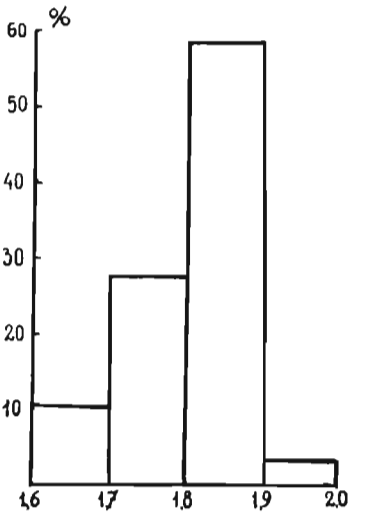


Fig. 13. — *Poloniella diversa* n. sp., variation diagram; number of specimens on ordinate, length/height ratio quotients on abscissa.

Instar III — Dimensions (in mm):

Length	0.36
Height	0.24
Thickness	0.20

In this stage the posterior sulcus (S3) begins to be slightly sigmoidally outlined. Lobes L3 and L4 protrude above the hinge line.

Instar IV — Dimensions (in mm):

Length	0.44
Height	0.28
Thickness	0.24

The carapace is quadrilobate, nearly rectangular in outline. The

length/height ratio is 1.6 (1.5 in the preceding stage). The grooves are distinct though narrow, the median is the broadest.

Instar V — Dimensions (in mm):

Length	0.49
Height	0.32

Single left valve. Valve outline unchanged. The posterior sulcus (S3) meets the dorsal margin at a nearly right angle.

Instar VI — Dimensions (in mm):

Length	0.56
Height	0.36

Single right valve. Details of ornamentation well marked. Carapace posteriorly gently truncated.

Instar VII — Dimensions (in mm):

Length	0.78
Height	0.42
Thickness	0.36

In this stage the development of the sculptural details is nearly fully complete. The connection of sulcus S1 with S3 is interrupted on the ventral side. The development of lobe L4 resembles that in male specimens.

Variation. — Shell dimensions are in the first place subject to certain variations. The length/height ratio ranges from 1.6 to 2.0 (fig. 13). The extent of development of the dorsal tooth varies too, resulting in certain modifications of the shape of the dorsal edge. Its concavity increases along with the size and bulkiness of the tooth.

Remarks. — *Poloniella diversa* n. sp. displays some resemblance with *P. tertia* Krömmelbein, *P. euglyphaea* (Warthin) and *P. clara* (Polenova). A representative of the last named species was found by the present writer in the Givetian deposits of the Holy Cross Mountains. The resemblance of the just named species concerns the carapace outline. In shape of grooves *P. diversa* approaches *P. compsa* (Kesling) and *P. clara*.

The origin of *P. diversa* is not very certain. Its individual development and the resemblance of some of its young stages to *P. tertia* reasonably suggest that *P. diversa* may probably be a descendant of *P. tertia*. Its representatives have not, however, been discovered in the Wydryszów profile.

Poloniella cingulata Warthin, 1934

(fig. 14; pl. VI, fig. 1, 2)

1934. *Poloniella cingulata* Warthin; A. S. Warthin, Common Ostracoda..., p. 212, pl. 1, fig. 9.

Holotypus: right valve shown by Warthin (1934) in pl. 1, fig. 9.

Stratum typicum: Middle Devonian (Lower Erian, Upper Casenovian), Grafel Point formation.

Locus typicus: Charlevoix, Michigan.

Diagnosis. — Trisulcate carapace, gradually narrowing towards the back, distally sharply truncated. Lobe L4 with a crest. Sulci S1 and S3 stretch to the dorsal margin at a right angle and are united in the ventral valve. A marginal ridge occurs along the antero-ventral edge. Distinct dimorphism present.

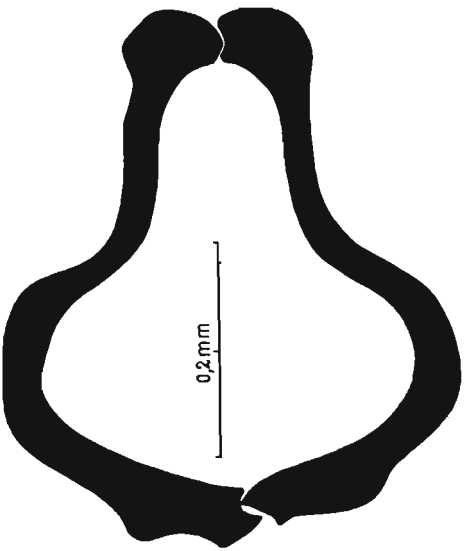


Fig. 14. — *Poloniella cingulata* Warthin, transverse section of carapace ♀ in area of S2.

Material. — Several young and mature specimens.

Dimensions (in mm):

	♀	♂
Length	0.94	0.90
Height	0.58	0.48
Thickness	0.48	0.38

Description. — *Female carapace.* Lobes on carapace well developed, with a crest indicated on the last lobe (L4). The anterior sulcus (S1) meets the dorsal edge at a right angle and on the ventral side it is united with S3 which occupies $^3/_4$ of the carapace height. The median sulcus (S2) deep and anteriorly virgulate. The median lobe (L2) narrow, fused with L3 which is united with L4 on the dorsal side. A marginal ridge occurs along the antero-ventral edge of shell. The dorsal tooth is present on the dorsal side in the prolongation of S1. The ventral side is nearly symmetric, more expanded at the back than at the front.

Male carapace. No male carapaces of this species have thus far been known. They are smaller-sized and more rectangular in outline than

the female specimens. The sulci are more shallow and the last lobe (L4) is rectangular. The broad posterior lobe (L3) runs diagonally across the valve.

Structure of carapace (fig. 14). In thin sections no bisecting line has been observed on shells of this species. Most likely it was obliterated owing to strong recrystallization. Microstructure of carapace is cryptocrystalline.

Ontogeny. — Very few young forms have been collected; they are assigned to instars III, V and VII. This material is very valuable owing to its significance in clearing up the phylogeny of *P. cingulata* Warthin and the evolution of *P. tertia* Krömmelbein.

Instar III — Dimensions (in mm):

Length	0.40
Height	0.24
Thickness	0.20

The carapace is ovate, narrowing towards the back. The well developed anterior sulcus (S1) passes onto the ventral valve and reaches the united lobes L3 and L4. Two small tubercles occur in the distal part of lobe L4; the upper tubercle protrudes above the dorsal edge. The marginal ridge, present in the anterior part of the left valve, extends onto the ventral side.

Instar V — Dimensions (in mm):

Length	0.60
Height	0.36
Thickness	0.26

Valve outline unchanged. Lobes (L1, L2, L3 and L4) well developed. Upper tubercle on lobe L4 conspicuous. Posterior sulcus (S3) arched towards the back of carapace. Dorsal tooth poorly developed.

Instar VII — Dimensions (in mm):

Length	0.76
Height	0.46
Thickness	0.32

Tubercles on lobe L4 become obliterated. Grooves stretch to the dorsal edge at a right angle. Carapace posteriorly gently truncated.

Occurrence. — In the Givetian deposits of the Skały formation in the Holy Cross Mountains *P. cingulata* Warthin occurs together with *P. kielanae* Přibyl. This species has been described from North America where it occurs in the Upper Couvinian (Upper Casenovian, Erian). In Poland the representatives of this species are very rare.

Remarks. — The collected young stages of *P. cingulata* seem to provide reliable evidence of its close relationship with *P. tertia* Krömmelbein encountered in the Lower Couvinian. In general morphology and in shell ornamentation the Holy Cross Mountains specimens come closest to *P. cingulata*. The resemblance concerns lobes and grooves, but they have different dimensions. On the basis of ornamentation the present

writer without hesitation assigns the forms from the Holy Cross Mountains to the species established by Warthin (1934).

The young form of *P. cingulata*, described by Stewart and Hendrix (1945), does not, probably, belong to this species, owing to structural differences in the distal part of the carapace and, foremost, of lobe L4.

Palaeozoological Laboratory
of the Warsaw University and
of the Polish Academy of Sciences
Warszawa, March 1961

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FRANCISZEK ADAMCZAK

RODZAJ *POLONIELLA* GÜRICH (OSTRACODA)

Streszczenie

Praca ta zawiera wyniki badań ontogenezy, zmienności i struktury pancerza 6 gatunków *Poloniella* Gürich, ze środkowego dewonu Polski (region Łysogórski, Góry Świętokrzyskie). Materiały do badań zebrane zostały w latach 1955—57. Ogółem z kilkudziesięciu tysięcy skorupek różnych Ostracoda wybrano około 500 pancerzy i skorupek pojedynczych osobników dorosłych i młodocianych przedstawicieli *Poloniella*.

Poloniella należy do rodziny Kloedenellidae — dużej grupy paleozoicznych ostrakodów, ważnych stratygraficznie. W wyniku przeprowadzonych badań autor doszedł do wniosku, że wyróżniony przez amerykańskich paleontologów (Ulrich & Bassler, 1923b) rodzaj *Dizygopleura*, występujący w sylurze, dewonie i karbonie Stanów Zjednoczonych, należy uważać za synonim rodzaju *Poloniella* Gürich, 1896, ustanowionego na materiale z dewonu środkowego (Dąbrowa k. Kielc). Szczegółowe porównania morfologii skorupek rodzajów *Dizygopleura* i *Poloniella* wykazało, że pod względem ogólnej rzeźby pancerza i budowy strefy zawiasowej nie ma między nimi istotnych różnic.

Jeżeli chodzi o stanowisko systematyczne Kloedenellidae, to są one zaliczane do grupy Palaeocopa. W ostatnim czasie jednak Pokorný (1958), biorąc pod uwagę przede wszystkim dymorfizm płciowy, wysunął myśl, aby włączyć Kloedenellidae do jednej z dziś żyjących grup Ostracoda, a mianowicie Platycopa, względnie Podocopa. Sposób przejawiania się dymorfizmu u Kloedenellidae stanowi, zdaniem Pokorný'ego, dostateczną podstawę do przyjęcia takiego postulatu. Autor niniejszej pracy polemizuje z tym stanowiskiem i odrzuca myśl, by dymorfizm mógł być, co przyjmuje Pokorný (1958), cechą diagnostyczną dla tak dużych jednostek takso-

nomicznych jak podrząd. Przedstawiono pewne dowody, że sposób przejawiania się drugorzędnych cech płciowych podlega znacznym fluktuacjom i w związku z tym cecha ta nie nadaje się do ustalania stosunków systematycznych dla większych grup, na przykład podrzędu.

Innym zagadnieniem poruszonym w tej pracy jest ontogeneza skorupek przedstawicieli *Poloniella*, dla których nie znano pełnych serii stadiów wzrostowych. Stwierdzono, że liczba stadiów dla *Poloniella* wynosi 8, tzn. 7 stadiów młodocianych, po których osiągnięta zostaje dojrzałość płciowa (VIII stadium) i na skorupkach przejawia się dymorfizm. Poza tym badania te pozwoliły prześledzić sposób przemian ewolucyjnych. Nowe cechy pojawiają się w różnych stadiach ontogenezy: w ostatnich — i wtedy ewolucja ich urzeczywistnia się sposobem prolongacji (Franz, 1927, 1931), na przykład w szeregu *P. devonica* — *P. kielanae*, lub gdy nowe cechy pojawiają się we wczesnych stadiach młodocianych i stopniowo przesuwają się na stadia dorosłe (bruzda łącząca S1 z S3), na przykład u *P. tertia* — *P. cingulata* (proterogeneza; Schindewolf, 1927, 1950).

Następnym ważnym zagadnieniem jest rozprzestrzenienie geograficzne i stratygraficzne gatunków *Poloniella*. Pierwsze gatunki tego rodzaju pojawiają się w sylurze (McKenzie fm.) Stanów Zjednoczonych. Z terenu Europy znany jest z tego okresu tylko jeden gatunek z głazów narzutowych Niemiec (Krause, 1891). W Polsce przedstawiciele *Poloniella* pojawiają się w warstwach przejściowych między sylurem a dewonem — *P.* cf. *symmetrica* (Hall) (materiały niepublikowane). W kuwinie występują: *P. devonica*, *P. brevis* n. sp., *P. tertia* (Wydryszów) i *P. diversa* n. sp. razem z *P. devonica* (Grzegorzowice), a w żywecie *P. kielanae* i *P. curta* (jeden egzemplarz nie opisany w tej pracy), (Skały).

DIAGNOZY NOWYCH GATUNKÓW

Poloniella brevis n. sp.
(fig. 9; pl. III, fig. 1, 2)

Skorupka wydłużona, czteropłatowa, zwężająca się ku tyłowi. Brzeg dorsalny prosty. Na płatach krawędzie. Bruzdy szerokie. Płat L4 oddzielony od L3. Skorupka lewa większa od prawej. Dymorfizm wyraźnie zaznaczony.

Poloniella diversa n. sp.
(fig. 12, 13; pl. V, fig. 1, 2)

Skorupka samiczek prawie prostokątna, z tyłu ścięta, czteropłatowa. Bruzdy biegną prostopadle do brzegu zawiasowego. Brzeg dorsalny wypukły. Płaty zaokrąglone. Bruzdy S1 i S3 nie połączone. Dymorfizm wyraźny.

OBJAŚNIENIA DO ILUSTRACJI

Fig. 1 (p. 284)

Poloniella tertia Krömmelbein: *A* skorupka lewa, *B* od strony dorsalnej, *C* od strony wentralnej; *L1—L4* płaty: przedni, środkowy, tylny, ostatni; *S1—S3* bruzdy: przednia, środkowa, tylna; *D* ząb dorsalny, *M* waleczek marginalny.

Fig. 2 (p. 286)

Knoxites accepta Polenova, przekrój poprzeczny przez pancerz w strefie wolnego brzegu; *L* skorupka lewa, *R* skorupka prawa, *1* blaszka wewnętrzna, *2* blaszka zewnętrzna, **3** listewka admarginalna, **4** vestibulum.

Fig. 3 (p. 287)

Poloniella tertia Krömmelbein, przekrój poprzeczny przez pancerz w strefie wolnego brzegu poniżej bruzdy S2; *A* pancerz niesfluorydyzowany, *B* pancerz sfluorydyzowany, *a* warstwa zewnętrzna, *b* laminarna budowa warstwy wewnętrznej skorupki; x 215.

Fig. 4 (p. 291)

Procentowy udział dwóch gatunków *Poloniella* Gürich w pięciu poziomach kuwinu z Grzegorzowic; *A—E* kolejne poziomy, *a P. devonica* Gürich, *b P. diversa* n. sp.

Fig. 5 (p. 294)

Poloniella diversa n. sp., rysunek schematyczny, uproszczony, struktur zawiasowych; *L* skorupka lewa, *R* skorupka prawa, *1* bruzda zawiasowa tylna, *2* ząb dorsalny, *3* bruzda zawiasowa przednia.

Fig. 6 (p. 298)

Poloniella devonica Gürich, przekrój poprzeczny przez pancerz ♀ w strefie S2.

Fig. 7 (p. 298)

Poloniella devonica Gürich, diagram zmienności; na osi rzędnych — ilość osobników, na osi odciętych — ilorazy stosunku długości do wysokości skorupki.

Fig. 8 (p. 301)

Poloniella kielanae Přibyl, przekrój poprzeczny przez pancerz ♀ w strefie S2.

Fig. 9 (p. 301)

Poloniella brevis n. sp., przekrój poprzeczny przez pancerz ♀ w strefie S2.

Fig. 10 (p. 305)

Poloniella tertia Krömmelbein, przekrój poprzeczny przez pancerz ♀ w strefie S2.

Fig. 11 (p. 305)

Poloniella tertia Krömmelbein, diagram zmienności; na osi rzędnych — ilość osobników, na osi odciętych — ilorazy stosunku długości do wysokości skorupki.

Fig. 12 (p. 307)

Poloniella diversa n. sp., przekrój poprzeczny przez pancerz ♀ w strefie S2.

Fig. 13 (p. 307)

Poloniella diversa n. sp., diagram zmienności; na osi rzędnych — ilość osobników, na osi odciętych — ilorazy stosunku długości do wysokości skorupki.

Fig. 14 (p. 309)

Poloniella cingulata Warthin, przekrój poprzeczny przez pancerz ♀ w strefie S2.

Text-pl. I (p. 288/9)

Rysunek schematyzowany rozwoju osobniczego skorupek: A *P. devonica* Gürich, B *P. kielanae* Přibyl, C *P. tertia* Krömmelbein, D *P. cingulata* Warthin, E *P. diversa* n. sp., *1—8* kolejne stadia.

Pl. I

Poloniella devonica Gürich

Fig. 1. Skorupka ♂, *a* skorupka lewa, *b* od strony dorsalnej, *c* od strony wentralnej; x 67,5.

Fig. 2. Neotyp, skorupka ♀, *a* skorupka lewa, *b* od strony dorsalnej, *c* od strony wentralnej; x 67,5.

Pl. II

Poloniella kielanae Přibyl

Fig. 1. Skorupka ♂, *a* skorupka lewa, *b* od strony dorsalnej, *c* od strony wentralnej; x 82,5.

Fig. 2. Skorupka ♀, *a* skorupka lewa, *b* od strony dorsalnej, *c* od strony wentralnej; x 82,5.

Pl. III

Poloniella brevis n. sp.

Fig. 1. Paratyp, skorupka ♂, *a* skorupka lewa, *b* od strony dorsalnej, *c* od strony wentralnej; x 63.

Fig. 2. Holotyp, skorupka ♀, *a* skorupka lewa, *b* od strony dorsalnej, *c* od strony wentralnej; x 63.

Pl. IV

Poloniella tertia Krömmelbein

Fig. 1. Skorupka ♂, *a* skorupka lewa, *b* od strony dorsalnej, *c* od strony wentralnej; x 87,2.

Fig. 2. Skorupka ♀, *a* skorupka lewa, *b* od strony dorsalnej, *c* od strony wentralnej; x 87,2.

Pl. V

Poloniella diversa n. sp.

Fig. 1. Paratyp, skorupka ♂, *a* skorupka lewa, *b* od strony dorsalnej, *c* od strony wentralnej; x 92,4.

Fig. 2. Holotyp, skorupka ♀, *a* skorupka lewa, *b* od strony dorsalnej, *c* od strony wentralnej; x 92,4.

Pl. VI

Poloniella cingulata Warthin

Fig. 1. Skorupka ♂, *a* skorupka lewa, *b* od strony dorsalnej, *c* od strony wentralnej; x 79.

Fig. 2. Skorupka ♀, *a* skorupka lewa, *b* od strony dorsalnej, *c* od strony wentralnej; x 79.

ФРАНЦИШЕК АДАМЧАК

РОД *POLONIELLA* GÜRICH (OSTRACODA)

Резюме

Настоящая работа содержит результаты исследований онтогенеза, изменений и структуры раковины 6 видов *Poloniella* Gürich из среднего девона (район Лысогурский, Свентокржиские Горы) Польши. Материал для исследований был собран в 1955—57 годах. В общем из нескольких десятков тысяч створок разных Ostracoda отобрано около 500 раковин и створок отдельных зрелых и молодых представителей *Poloniella*.

Poloniella относится к семейству Kloedenellidae, большой группы палеозойских Ostracoda, важных стратиграфически. В результате произведенных исследований автор пришел к выводу, что выделенный американскими палеонтологами (Ulrich & Bassler, 1923 b) род *Dizygopleura*, выступающий в силуре, девоне и карбоне Соединенных Штатов, следует считать синонимом рода *Poloniella* Gürich, 1896, установленного на основании материала из среднего девона (Домброва около Кельц). Детальное сравнение морфологии створок родов *Dizygopleura* и *Poloniella* обнаружило, что в отношении общей скульптуры раковины и строения замочной зоны нет между ними существенных отличий.

Что касается систематического положения Kloedenellidae, то относят их к группе Palaeocopa. Однако в последнее время Покорны (Pokorný, 1958), принимая во внимание прежде всего половой диморфизм, высказал мысль, чтобы Kloedenellidae включить в одну из ныне живущих групп Ostracoda, а именно Platycopa или Podocopa. Способ проявления диморфизма у Kloedenellidae является, по мнению Покорного, достаточным основанием, чтобы принять это положение. Автор настоящего труда оспаривает такое положение и отвергает мысль, что диморфизм мог являться диагностической чертой для столь значительных таксономических единиц, как подотряды, что принимает Покорны (1958). Представлены доказательства, что способ проявления второстепенных половых свойств подвергается значительным флюктуациям и в связи с тем свойство это не применимо для установления соотношений в систематике для более значительных групп, напр. подотряда.

Другой проблемой, затронутой в настоящей работе, является онтогенез створок представителей *Poloniella*, для которых не были известны полные серии возрастных стадий. Установлено, что число стадий для *Poloniella* равно 8, это значит 7 личиночных стадий после которых приобретается половая зрелость (VIII стадия) и на створках проявляется диморфизм. Кроме того эти исследования дали возможность проследить способ эволюционных изменений. Новые свойства появляются в разных стадиях онтогенеза: напр. в последних, и тогда их эволюция осуществляется способом пролонгации (Franz, 1927, 1931), напр. в ряду *P. devonica* — *P. kielanae*, или когда новые свойства появляются в ранних, молодых стадиях и постепенно передвигаются на стадии взрослые (борозда соединяющая S1 с S3) напр. у *P. tertia* — *P. cingulata* (протерогенез, Schindewolf, 1927, 1950).

Следующей важной проблемой является географическое и стратиграфическое распространение видов *Poloniella*. Первые виды этого рода появляются в силуре (McKenzie fm.) Соединенных Штатов. На территории Европы из этого периода известен только один вид в валунах Германии (Krause, 1891). В Польше представители *Poloniella* появляются в переходных слоях между силуром и девоном — *P.* cf. *symmetrica* (Hall) (материалы неопубликованные). В кувине выступают: *P. devonica*, *P. brevis* n. sp., *P. tertia* (Выдрышув) и *P. diversa* n. sp. совместно с *P. devonica* (Гржегоржовице), а в живете *P. kielanae* и *P. curta* (1 экземпляр не описанный в настоящей работе) (Скалы).

ДИАГНОЗЫ НОВЫХ ВИДОВ

Poloniella brevis n. sp.
(фиг. 9; пл. III, фиг. 1, 2)

Створка удлиненная, четырехлопастная, суживающаяся к заднему краю. Дорсальный край прямой. На лопастях ребра. Борозды широкие. Лопасть L4 отделена от L3. Левая створка больше правой. Ясно выраженный диморфизм.

Poloniella diversa n. sp.
(фиг. 12, 13; пл. V, фиг. 1, 2)

Створка самок почти прямоугольная, сзади срезанная, четырехлопастная. Борозды проходят перпендикулярно к замочному краю. Дорсальный край выпуклый. Лопасти округлены. Борозды S1 и S3 не соединены. Ясный диморфизм.

PLATES

EXPLANATIONS OF PLATES

Pl. I

Poloniella devonica Gürich

Fig. 1. Valve ♂, *a* left valve, *b* dorsal view, *c* ventral view; × 67.5.
Fig. 2. Neotype, valve ♀, *a* left valve, *b* dorsal view, *c* ventral view; × 67,5.

Pl. II

Poloniella kielanae Přibyl

Fig. 1. Valve ♂, *a* left valve, *b* dorsal view, *c* ventral view; × 82.5.
Fig. 2. Valve ♀, *a* left valve, *b* dorsal view, *c* ventral view; × 82.5.

Pl. III

Poloniella brevis n. sp.

Fig. 1. Paratype, valve ♂, *a* left valve, *b* dorsal view, *c* ventral view; × 63.
Fig. 2. Holotype, valve ♀, *a* left valve, *b* dorsal view, *c* ventral view; × 63.

Pl. IV

Poloniella tertia Krömmelbein

Fig. 1. Valve ♂, *a* left valve, *b* dorsal view, *c* ventral view; × 87.2.
Fig. 2. Valve ♀, *a* left valve, *b* dorsal view, *c* ventral view; × 87.2.

Pl. V

Poloniella diversa n. sp.

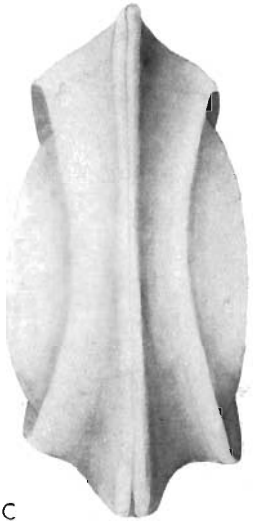
Fig. 1. Paratype, valve ♂, *a* left valve, *b* dorsal view, *c* ventral view; × 92.4.
Fig. 2. Holotype, valve ♀, *a* left valve, *b* dorsal view, *c* ventral view; × 92.4.

Pl. VI

Poloniella cingulata Warthin

Fig. 1. Valve ♂, *a* left valve, *b* dorsal view, *c* ventral view; × 79.
Fig. 2. Valve ♁, *a* left valve, *b* dorsal view, *c* ventral view; × 79.

1b



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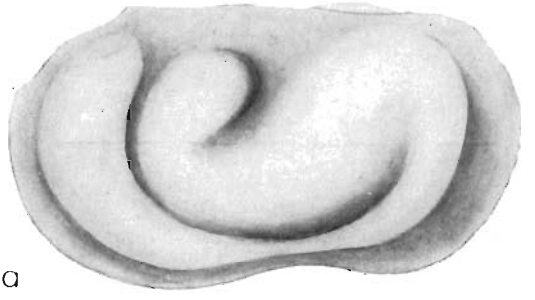

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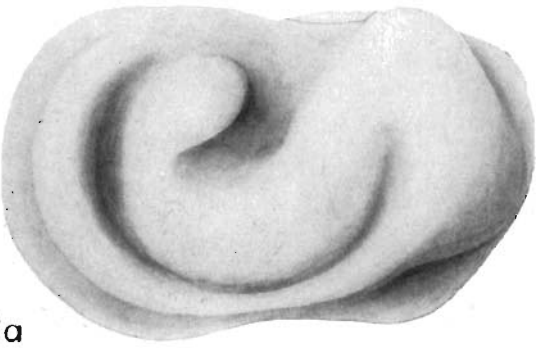

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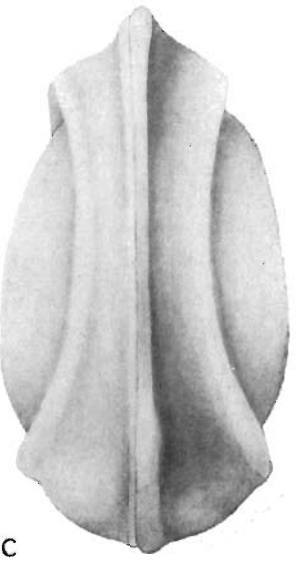

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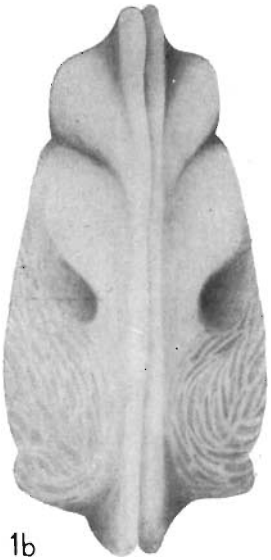

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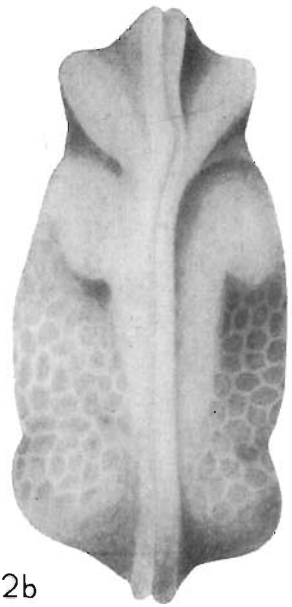

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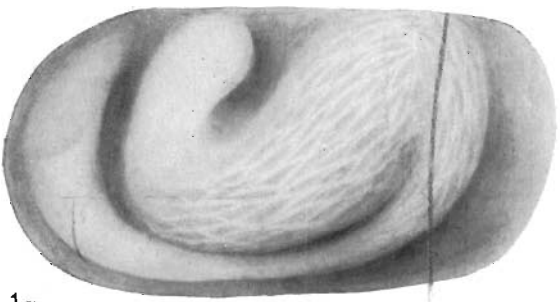

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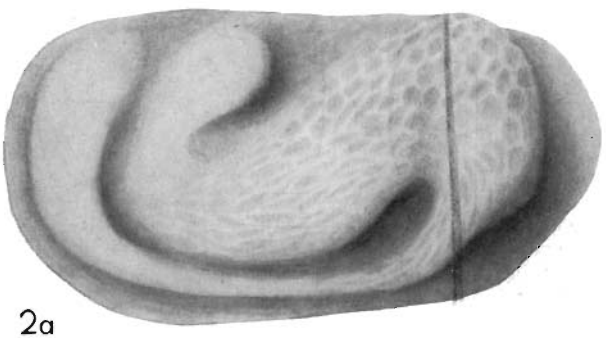

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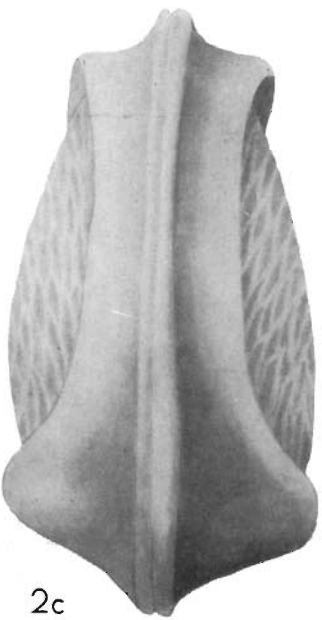

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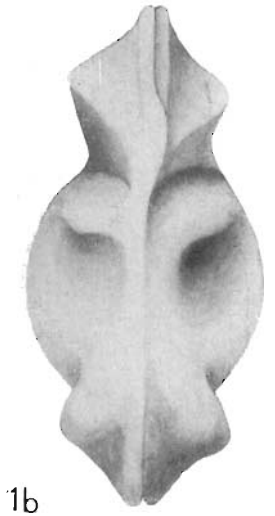

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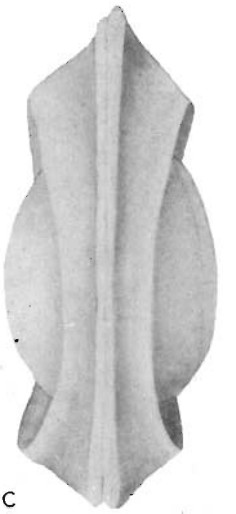

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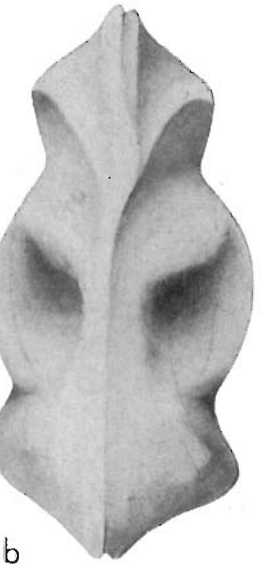

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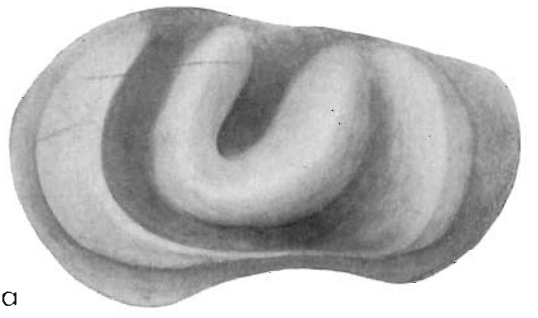

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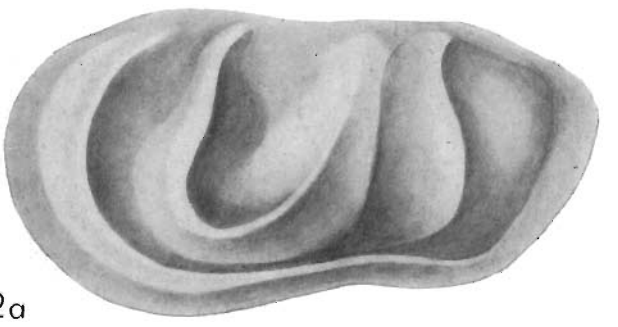

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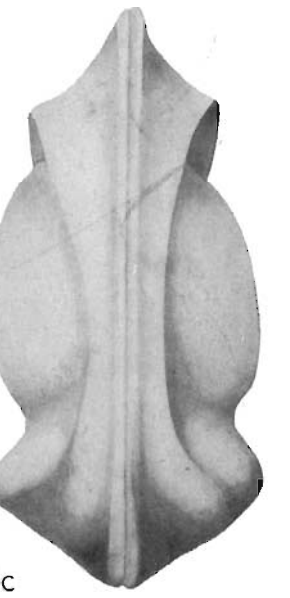

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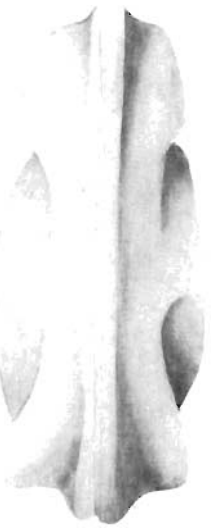

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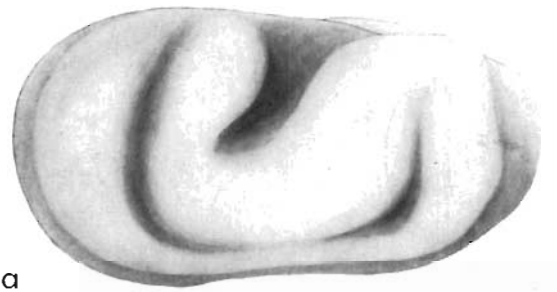

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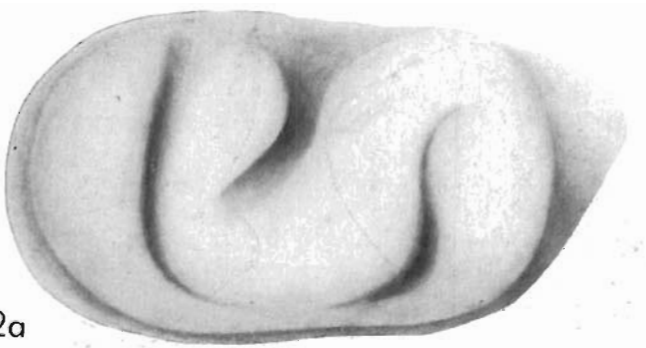

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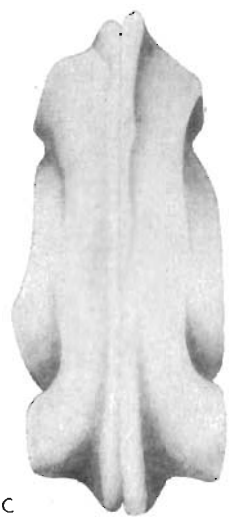

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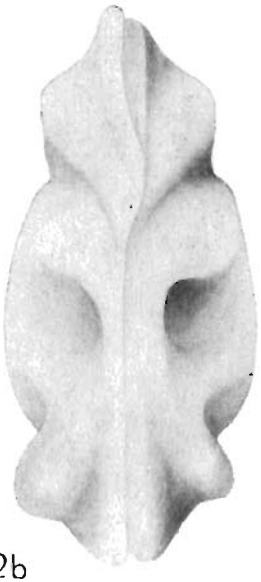

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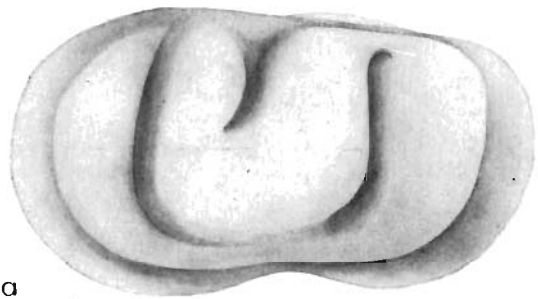

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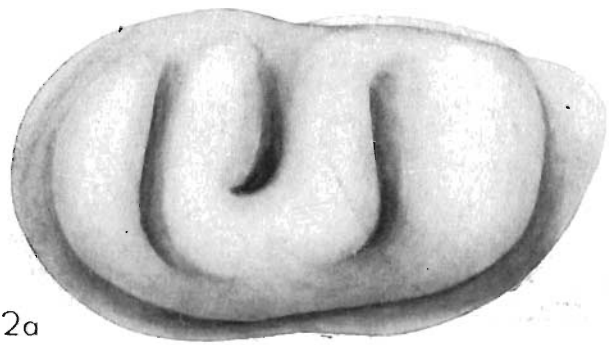

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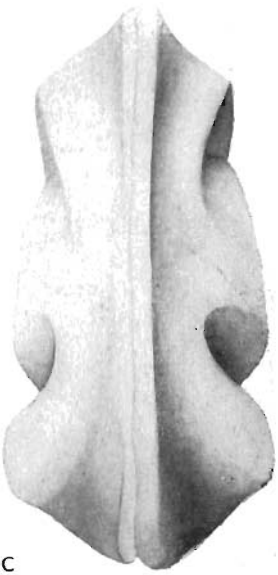

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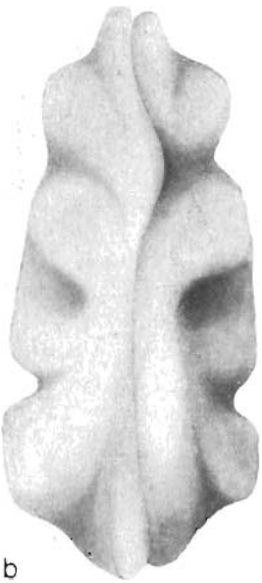

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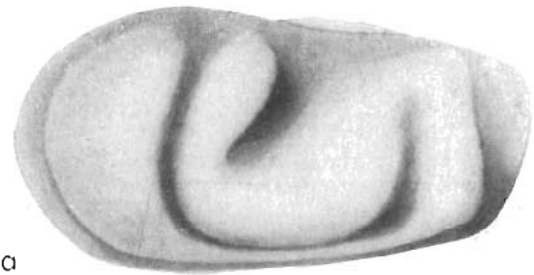

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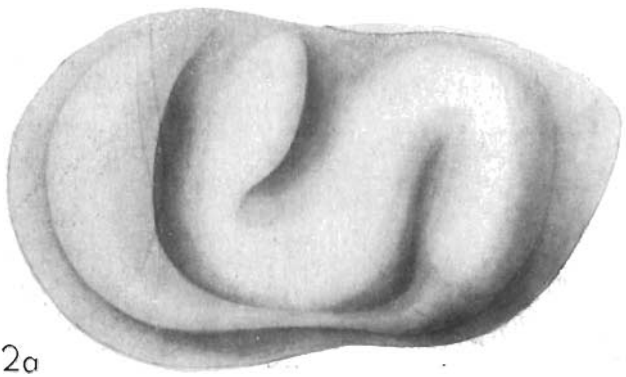

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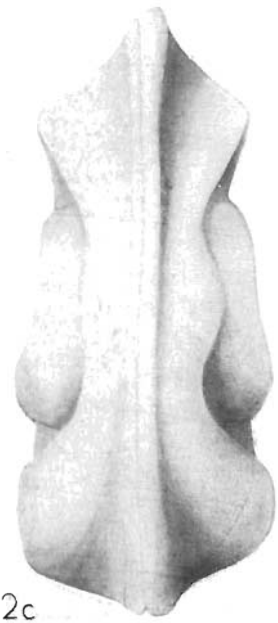

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