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THE DEVONIAN BRACHIOPOD *PHLOGOIDERHYNCHUS POLONICUS* (ROEMER, 1866) FROM THE HOLY CROSS MOUNTAINS, POLAND

Abstract. — The brachiopod species, *Camarophoria ? polonica* Roemer 1866, commonly known as *Leiorhynchus polonicus* (Roemer 1866), is included into the genus *Phlogoiderhynchus* Sartenaer 1970. Internal structure and morphology are studied and the whole range of intraspecific variability is shown. The stratigraphic range of the species and genus is established as being restricted to the Lower and Middle Polygnathus asymmetricus Zones (do I α). The species is distributed in three facies: in marly limestones and marly shales, very poorly fossiliferous, in limestones with abundant brachiopods and in limestones with coelenterates and differentiated other fauna.

INTRODUCTION

Ten years of the second author's field work in the Holy Cross Mountains has yielded a rich collection of rhynchonellida identified primarily as *Camarophoria ? polonica* Roemer 1866, and cited in many later geological papers as *Leiorhynchus polonicus* (Roemer) (Gürich, 1901; Sobolev, 1909; Czarnocki, 1927, 1948). It is a common species in the Holy Cross Mountains occurring on the boundary of the Middle and Early Upper Devonian and is of great value for local stratigraphical correlation, although previously its exact stratigraphical position was not recognised. In spite of its regional significance this species has not been studied palaeontologically and although often cited in geological papers it has been figured only twice (Roemer, 1866; Gürich, 1896). Of the old collections of "*Leiorhynchus polonicus*", mostly lost during the last war, only one specimen figured by Gürich (1896) is preserved and is housed at the Palaeontological Museum of the Wrocław University.

On the basis of a new and large collection of this species it has been possible to study both its external morphology and internal structure, including the limits of intraspecific variations. We consider the species as belonging to the genus *Phlogoiderhynchus* Sartenaer, 1970. The associated

conodonts enabled us to fix its stratigraphic position while a facies analysis has yielded some information on the ecology of the species.

The studied material of *Phlogoiderhynchus polonicus* (Roemer) is deposited at the Palaeozoological Institute, Polish Academy of Sciences in Warszawa, for which the abbreviation ZPAL is used.

HISTORICAL REVIEW OF WORKS ON *PHLOGOIDERHYNCHUS* (ROEMER)

Roemer was the first to find an exceptionally large Devonian rhynchonellid, which he named *Camarophoria ? polonica,* in a small outcrop at Szydłówek, N. of Kielce, accompanied by quite large atrypids and one specimen of *Cyrtoceras.* Unfortunately there is only a brief mention of this brachiopod species and only one specimen is illustrated (Roemer, 1866, p. 676, Pl. 13, Figs 9, 10). Roemer provisionally assigned his species to the genus *Camarophoria,* considering the younger individuals externally very similar to *Rhynchonella formosa* Schnur and the adults to *Rhynchonella cuboides* (Sowerby).

Subsequently, Gürich (1896, p. 280, Pl. 7, Fig. 8) gave a more detailed description of the species based on specimens from the bituminous limestone (Stinkkalke) at Szydłówek and between Szydłówek and Domaszowice. Although numerous specimens were found they were in a bad state of preservation. Gürich mentioned a greater similarity in his specimens to *Camarophoria megistans* Horn, figured by Tschernyshev from the Urals (Tschernyshev, 1887, Pl. 2, Figs 9—11) than to *Rhynchonella formosa* (Schnur, 1852, Pl. 22, Fig. 4). He did not discuss the generic status of the species considering it, as did Roemer, as belonging to the genus *Camarophoria.* In a subsequent paper, however, Gürich (1901) included the species in the genus *Leiorhynchus* Hall without comments. In addition, he mentioned some new localities e.g. Wola Jachowa, Radlin, where this species ocurred. Zaręczny (1889) listed *Leiorhynchus polonicus* (Roemer) in the Frasnian deposits of the Kraków region near Dębnik (Żarnówczany Dół) — the specimens, however, seem to belong to *Calvinaria cracoviensis,* a species highly characteristic of that region (Gürich, 1903).

Sobolev (1909) was the last to discuss and figure *Leiorhynchus polonicus* on the basis of specimens from the Świętomarz-Śniadka exposures of the Holy Cross Mountains. The new specimens he had from Szydłówek were, unfortunately, very incomplete showing only fragments of the preserved radial ornamentation. Sobolev maintained that his specimens were generally the same as Roemer's, but that a few vere more like that figured by Gürich. He also mentioned the great similarity of *Leiorhynchus polonicus* to *Terebratula formosa* Schnur and to *Camarophoria megistans*

Horn figured by Tschernyshev (*l.c.*) — the latter was included by Sobolev into synonymy with Roemer's species. It is noteworthy that the identification of the specimens from the Świętomarz-Śniadka exposures figured by Sobolev (1909, Pl. 6, Figs 6, 7) is doubtful. They do not appear to belong to *L. polonicus* and unfortunately Sobolev's collection is not available. Furthermore, at present, it is difficult to obtain new material from his locality. Thus, the generic assignment of specimens of Sobolev must remain, for the time being, unresolved.

"Leiorhynchus" polonicus has been listed rarely by geologists working in the Holy Cross Mountains and always without comments or figures (e.g. Czarnocki, 1927, 1948). As a result this species, although so notable within the Devonian rhynchonellids, has remained practically unknown until now.

Remarks. — When comparing the illustrations of *Camarophoria ? polonica* given by Roemer (1866, Pl. 13, Figs 9—10) and Gürich (1896, Pl. 7, Fig. 8), it is possible to recognize differences in their outline, the appearance of their posterior part and in their surface ornamentation, particularly in the length of costellae, although both specimens came from the same locality.

Roemer's specimen is less transverse having more arched lateral margins and radial costellae which cover about the anterior three-fourths of the shell length. The fold and sulcus are only moderately developed and less distinct.

Gürich's specimen is more transverse, possessing only moderately arched lateral margins and its postero-lateral angles are slightly more acute. The costellae are often slightly irregular and covering the anterior half of the shell. The interior is unknown except for the dorsal septum, which Gürich mentioned as being short, attaining about one-fifth of the whole shell length. This is, unfortunately, the only internal detail given for the species.

Resulting from a study of the previously published illustrations it is possible to distinguish two "morphological types" — the first one *sensu* Roemer and the second one *sensu* Gürich. However, the differences are slight, being partly caused by the idealised manner in which Roemer's specimen is drawn. In addition, the present studied specimens are quite variable and the two previously illustrated specimens fall within the limits of the species variability.

MATERIAL

The collection includes about 150 specimens of *Phlogoiderhynchus polonicus* (Roemer) from the Early Upper Devonian deposits consisting of marls, marly limestones and limestones of the localities: Kowala-railroad cut (set D in Szulczewski, 1971, fig. 5), Sosnówka hill near Chęciny, Ślu-

chowice hill at Czarnów, Kostomłoty (Laskowa quarry), Szydłówek (now suburb of Kielce city), comprising two places — one old overgrown exposure corresponding to the locality of Roemer (1866) and Gürich (1896); the second one which is a trench along Rewolucja Październikowa Street;

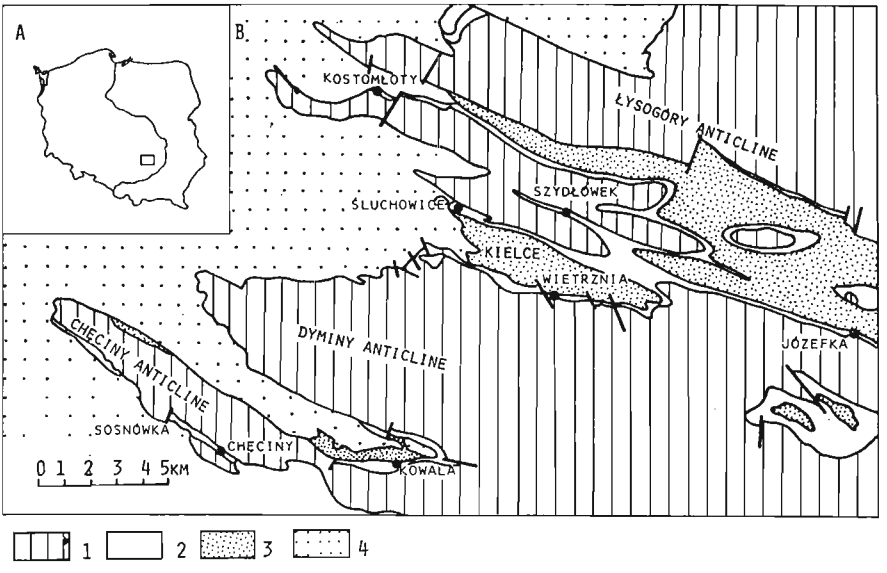

Fig. 1. A — general map of Poland: B — geological sketch map of the western part of the Holy Cross Mountains (after Czarnocki, 1938 — simplified) showing location of profiles and collecting localities for *Phlogoiderhynchus polonicus* (F. Roemer). 1. Cambrian — Middle Devonian, 2. Frasnian, 3. Famennian and Lower Carboniferous, 4. post-Variscan cover (Zechstein — Upper Cretaceous).

Józefka hill near Górno; Chęciny — east part of Zamkowa Góra and Wietrznia at Kielce.

Although the collection is relatively numerous, many of the specimens (about 50%) are poorly preserved. Commonly the shells are thick and articulated, most of them are asymmetrical having been deformed with the partial displacement of one valve against the other or by compression in the dorso-ventral or antero-posterior directions. However, all the shells show reasonably well preserved morphological features. As to the internal details they are not very distinct, often fragmentary and some have suffered recrystallization (Kowala, Sosnówka samples). In some samples e.g. from Kowala, the shells are partly exfoliated showing the median dorsal septum, fragments of the muscle field and of the ventral pallial sinuses.

Internal structures of the specimens were studied by peels of serial sections. In addition, some shells of each sample were measured (e.g. height, length, thickness) and the variability in these samples is discussed.

Genus *Phlogoiderhynchus* Sartenaer, 1970

Type species: *Uncinulus arefactus* Veevers, 1959.

The genus was well defined from the external and internal characters of "*Uncinulus*" *arefactus* Veevers by Sartenaer (1970, p. 17). The main characteristics stated by Veevers for his species are the crura which are of moderate length and separated from the crural bases "posterior to dental sockets" (Veevers, 1958, p. 100).

Sartenaer (1970, p. 18) in his description of the type species mentions the characteristic appearance of the crural bases as resembling a flame. These features associated with a thick dorsal septum scarcely embedded in the shell substance and a lack of dental plates delimit this genus from others which are externally similar (e.g. Calvinaria) and led Sartenaer to erect the genus *Phlogoiderhynchus*.

Earlier Drot (1964, p. 193) suggested the possibility of a new generic name for her "*Camarotoechia*" *marocanensis*. She pointed out the great similarity of the Moroccan species to the Australian form, *Uncinulus arefactus* Veevers, 1959, mentioning also its close external resemblance to *Camarophoria polonica* Roemer as figured by Gürich (1896, Pl. 7, Fig. 8).

The external morphology of *Phlogoiderhynchus* species shows some characteristics which could be useful taxonomically: a) shell dimensions are generally comparatively large as for the Devonian rhynchonellids; b) transverse shell outline; c) umbonal regions tend to be very swollen; d) anterior margin is sulcate with a tendency to form a tongue, having a more or less arcuate anterior margin; d) radial costellae are normally fine of variable length and development, simple or very rarely dividing in the sulcus.

The above features are not restricted to this genus, being recorded also in *Calvinaria, Leiorhynchus* and *Caryorhynchus*. These morphological features when considered together with the described internal characters make the genus *Phlogoiderhynchus* distinctive.

Species assigned to the genus:

Phlogoiderhynchus arefactus (Veevers, 1959), Early Frasnian, Australia,

Phlogoiderhynchus marocanensis (Drot, 1964), ? Uppermost Givetian-Early Frasnian, Morocco,

Phlogoiderhynchus polonicus (Roemer, 1866), Early Frasnian, Poland.

These three species are extremely closely related and constitute one well defined group united both by morphological similarities and stratigraphical range.

Phlogoiderhynchus polonicus (Roemer, 1866)

(Pls. XXI—XXVIII; Text-fig. 2)

1866. *Camarophoria ? polonica*; F. Roemer, p. 676, Pl. 13, Figs 9, 10.

non 1889. *Camarophoria polonica* F. Roemer; Zaręczny, p. 57.

1896. *Camarophoria polonica* F. Roemer; Gürich, p. 280, Pl. 7, Fig. 8.
1901. *Liorhynchus polonicus* F. R.: Gürich, p. 378.
non 1909. *Liorhynchus polonicus* F. Roem.; Sobolev, p. 499, Pl. 6, Figs 6—7.

Neotype: G. Gürich, 1896, p. 280, Pl. 7, Fig. 6.

No type specimen was named in Roemer's paper (1866) and the figured specimen (Roemer, 1866, Pl. 13, Figs 9, 10) of his *Camarophoria ? polonica* is not preserved. As the specimen figured by Gürich (1896, Pl. 7, Fig. 6) is preserved in Gürich's collection, this specimen is here suggested as a neotype of *Phlogoiderhynchus polonicus* (Roemer).

Dimensions of the neotype (in mm):
length: 24.6; width: 38.6; width of sulcus: 28.8;
number of costellae: in the sulcus: 18; on each lateral margin: 12.

Diagnosis. — Commonly large, transverse with a broad and shallow sulcus, tongue of varying length, surface costellae numerous, covering up to about half of the shell length.

Material. — About 150 articulated shells and 6 disarticulated ventral valves, in addition some deformed and partly recrystallized shells. Almost all are adult, only a few young coming from Kostomłoty and Józefka hill.

Description. — Exterior. Subquadrate, width greatest at midlength, lateral margins moderately arcuate, postero- and antero-lateral edges more or less rounded, anterior margin broadly sulcate.

Ventral valve. Umbo low, in adults distinctly convex, beak small but incurved and overhanging the dorsal umbo, area very poorly developed, median sulcus wide and shallow, of traingular outline with a tongue extending anteriorly and dorsally having a variably developed arcuate anterior margin.

Dorsal valve. Umbo convex, sometimes more so than that of the ventral valve. Fold complimentary to the sulcus.

Ontogenetic variability. The few small specimens preserved are sufficient to show that ontogenetic variability is slight, but give some indication as to its general direction. The smallest specimen (samples from Józefka hill, Chęciny, Kostomłoty, Szydłówek — comprising a trench along Rewolucja Październikowa Street) range from 12.1 mm to about 15.3 mm in length. They are very moderately biconvex with well rounded margins, pointed ventral beak and radial costellae of a slightly wavy appearance cover much less than the anterior half of the shell. The anterior commissure is evenly uniplicated (Pl. XXIV, Fig. 3d) and these shells are well rounded, normally with a very slight transverse outline. With increased growth above a shell length of about 15.5 mm the shell becomes more transverse, the lateral margins progressively enlarged and the anterior margin became more sulcate; due to the development of the sulcus — fold region.

Ornamentation. Numerous fine costellae covering the anterior half of the shell length, sometimes of irregular distribution in the sulcus and

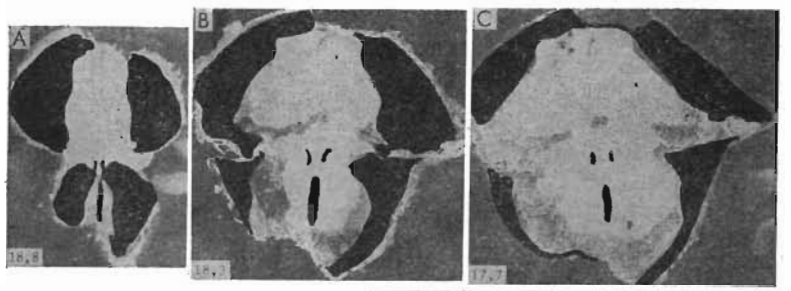

Fig. 2

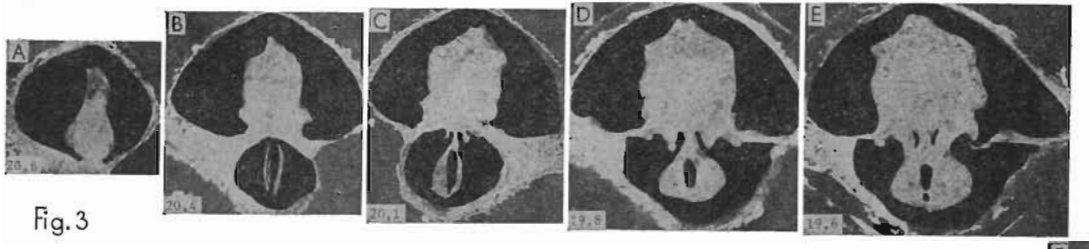

Fig. 3

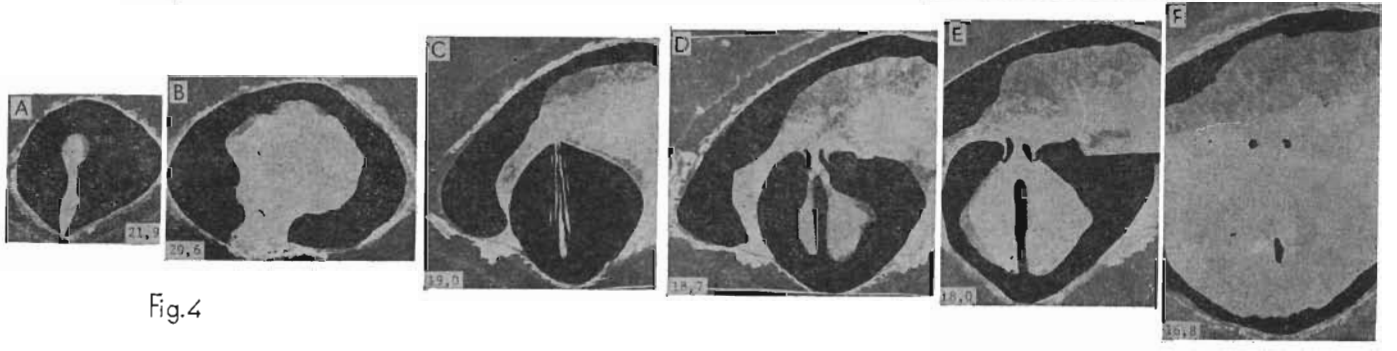

Fig. 4

Fig. 2. *Phlogoiderynchus polonicus* (F. Roemer), Józefka. A—C — Cross sections of a poorly preserved specimen (ZPAL Bp. XIX/40), 19.0 mm long and 15.0 mm wide. The crural bases and dorsal median septum form Y-like structure; approx. ×6.

Fig. 3. *Phlogoiderhynchus polonicus* (F. Roemer), Sosnówka. A—E — Cross sections of a specimen (ZPAL Bp XIX/4 z), 20.0 mm long, 22.0 mm wide, showing the dorsal septum with a protuberance (E); approx. ×6.

Fig. 4. *Phlogoiderhynchus polonicus* (F. Roemer), Kowala. A—F — Cross sections of a deformed adult specimen (ZPAL Bp. XIX/40), 22.7 mm long and 24.8 mm wide, showing the dorsal septum embedded in the shell substance (D) and a relatively long crural bases; approx. ×6.

fold due to branching. On the lateral slopes ribs are somewhat less distinct. In general, the ribs vary slightly in thickness and hence in number, but these differences are seen in specimens of one sample as well as in those of different samples. The costellae are commonly indistinct, but this depends upon the state of preservation.

Interior. Shell walls are much thickened. In ventral valve the teeth are simple with no dental plates. A residual umbonal cavity is sometimes present. The ventral median ridge is often present and traces of adductor scars are discernible in very thickened specimens. Ventral sinuses are preserved in one decorticated specimen — the pattern being very much of a lemniscate apocopate character giving off many branches peripherally. This pattern of sinuses looks very much like that of *Leiorhynchus* (Pl. XXVI, Fig. 1a, b).

The dorsal valve is like that of *Phlogoiderynchus arefactus* with crura slightly diverging anteriorly and dorsally. Crural bases are almost parallel one to another or a little divergent anteriorly, looking somewhat like a "flame". The dental sockets are simple, of moderate depth and the dorsal median septum is always thick posteriorly, increasing in height anteriorly and in old shells sometimes it has one or two prong-like proturberances. The length and thickness of the median septum vary.

VARIABILITY OF THE EXTERNAL CHARACTERS

The specimens are variable in appearance, the differences being greater between samples than amongst specimens within a particular sample. This variability concerns mainly the shell size and to a lesser extent the shape and appearance of the sulcus — fold region and radial ornamentation.

The variation observed in shell size (12.3 mm to 31.6 mm long) occurs within what are thought to be adult specimens. The largest shells attain about 32 mm in length (very rare, in locality Kostomłoty), but possibly this is not the maximum size (the gerontic characters are not observed).

The smallest specimens are confined to one sample only (Śluchowice). They vary only slightly, from about 12.3 mm to 17 mm in length and 15.5 mm to 21 mm in width. This is, probably, the maximum size attained by the individuals in the population from this site — this results from the analysis of the lithological data from the Śluchowice beds (p. 213). The specimens are very uniform in appearance and general morphology of the largest specimens suggests an advanced adult stage. Above all, these smaller shells are comparatively thick-walled with well developed sulcus-fold regions and they have distinct radial costellae like those in *Phlogoiderhynchus arefactus* (Veevers, 1959, Pl. 11, Figs 8—13) or *Ph. marocanensis* (Drot, 1964, Pl. 21, Figs 4—8) but with the difference that the co-

stellae are longer, covering the anterior half of shell. In their general appearance the Śluchowice specimens can be compared to *Calvinaria formosa* (Schnur, 1953, Pl. 22, Fig. 4).

Specimens from Szydłówek (Rewolucja Październikowa street and "Stinkkalke"), Józefka hill and Kostomłoty show a much greater range in size — from approximately 16 mm to 32 mm in length and 29.3 mm to 46.3 mm in width. By comparison with the Śluchowice specimens they are of a more progressively developed morphology, i.e. greater biconvexity of the posterior half of shell and a better developed and more exposed tongue. The radial ornamentation is slightly variable and, although dependent to a greater extent upon the state of preservation, the ribs seem to be coarse and their length variable, but still covering almost the anterior half of the shell. These shells resemble closely those of *Phlogoiderhynchus arefactus* and *Ph. marocanensis* in their transverse outline, similar posterior shell biconvexity and especially in the general appearance of the sulcus (Veevers, 1959, Pl. 11, Figs 8—13; Drot, 1964, Pl. 21, Figs 4—8).

A much smaller range in size (approximately 23.9 mm to 29.0 mm in length and 29.3 mm to 35.3 mm in width) occurs in samples from Sosnówka, Chęciny and Kowala, from where the shells are usually less transverse. These from Sosnówka and Chęciny possess the best developed tongues, prominently elongate antero-dorsally and with their anterior margins distinctly arcuate, as in *Phlogoiderhynchus polonicus* figured by Roemer (1866, Pl. 13, Figs 9, 10; Gürich, 1896, Pl. 7, Fig. 8). Specimens from Kowala have less arcuate lateral margins, more evenly biconvex valves over their whole length, a less prominent sulcus, the anterior margin of which is moderately arched and, in addition, the valves are more thick-walled, perhaps due to more favourable life conditions in this region (p. 214). Despite this slight external difference these shells are very like the specimen of *Ph. polonicus* figured by Gürich (*l.c.*), especially so if they are regarded as part of the whole collection. To sum up:

1. the collection displays a wide range of morphological variation but all the shells possess common specific features;
2. the differences observed are related to ecological factors; this variability is an evidence of a great susceptibility of the species even to small environmental changes;
3. the specimens resemble the Australian and Moroccan species. Specimens with less posterior biconvexity appear generally to be more of the "*arefactus*" type, those with a stronger biconvexity more of the "*polonicus*" type. However, as the growth stage is usually expressed by the degree of shell biconvexity it is possible that the above "types" result simply from the differences in the individual age of the specimens;
4. specimens from the two samples at Śluchowice and Kowala appear to

differ most, lying at the extremities of the above metioned morphological range and could be judged as two developing morphotypes;

5. regarding the collection as a whole it is difficult to distinguish new taxons on either specific or subspecific levels. This view is supported by the variability of specimens from particular localities as well as the general occurrence in the same main facies in one region and their limitation to the same stratigraphic unit.

VARIABILITY OF THE INTERNAL CHARACTERS

The rhynchonellids examined agree in general internal structure with *Phlogoiderhynchus*. Some features, like the teeth, dorsal septum and median ventral ridge prove very stable in appearance while others like the crural bases and crura are to some extent variable. The teeth are slightly variable in shape and outline, and fit well into the dental sockets, the bottoms of which correspond closely to the rounded outline of the teeth and have no furrows or ridges. In many specimens of some samples the "residual" cavities and vestigial thickenings underneath the teeth can appear just like those of *Calvinaria* Stainbrook (McLaren, 1962, text-fig. 8a; Sartenaer, 1955, Pl. 1); Ventral median ridge is low with an acute or rounded edge similar to that of *C. ambigua, C. formosa* (Sartenaer, 1955, Pls. 1, 3) and other rhynchonellids. Hinge plates, like those of *Phlogoiderhynchus arefactus,* are very poorly developed and bear laterally the dental sockets (Veevers, 1959, text-fig. 60; Drot, 1964, text-fig. 80—82). They show some similarity to those of *"Leiorhynchus" carya* (McLaren, 1962, text-fig. 29C). Dorsal median septum varies somewhat in its thickness and length. The observed prong-like structures in specimens from Kowala are associated with the progressive thickening of the shell substance. In general the septum is also very similar to that of *C. formosa, C. ambigua, "Leiorhynchus" carya* (Sartenaer, 1955, Pls. 1, 3; McLaren, 1962, text-fig. 29C). Crura are of moderate length and rather delicate in structure, and in cross-section they are slightly elongate to rounded in outline. The crural bases extend from both sides of the crural cavity, they are comparatively long, somewhat variable in appearance and thickness much depending upon the general shell size. They resemble a "flame"-like structure of *Ph. marocanensis* (Drot, 1964, text-fig. 82) and prevail in samples from Kowala and Sosnówka. In some specimens they look like a "comma" but are less arcuate and they diverge anteriorly, very much like those of *Phlogoiderhynchus arefactus* (Veevers, 1959, text-fig. 60) or *Ph. marocanensis* (Drot, 1964, text-figs 80, 81). In our collection they are recorded in specimens of smaller size, e.g. from Śluchowice, Szydłówek.

Consideration of the two "types" of crural bases in relation to the posterior end of the dorsal septum leads to the recognition of two struc-

tural elements which differ slightly in appearance. In the first case the crural bases are relatively well separated from one another and from the posterior end of the dorsal septum. In the second one, the crural bases which are almost straight are more close one to another and to the posterior end of the median septum so forming a structure somewhat Y-like, resembling slightly the structure known in *"Leiorhynchus" carya* (McLaren, 1962, text-fig. 29C).

The above difference is small and rather poorly defined, but it may be an expression of some variability within the species. It is possible that the Y-shaped structure indicates an early step in the development of septalium, like that of *Calvinaria*.

Of the other features, the "residual umbonal cavities" are common features within rhynchonellids and hence of problematic value for taxonomy. Such cavities are common in our collection and appear only sporadically even in specimens from the same locality. Their presence, however, can probably be interpreted as an indication of some tendency to develop ?dental plates similar to those of *Calvinaria, Leiorhynchus* or *Caryorhynchus*.

Although small, the other differences considered here merit some mention because their recognition can be helpful in a better understanding of the fossil species and also in the elucidation of its systematic position and relationship to its environment. All of specimens, despite the degree of variation discussed above, are believed to belong in *Phlogoiderhynchus* Sartenaer.

It is unfortunate that the variations to be seen in other species of the genus have not been specified and until such information is available a full definition of *Phlogoiderhynchus* is impossible.

Comparison. — *Phlogoiderhynchus polonicus* (Roemer) is a characteristic species, easily recognizable within the Devonian rhynchonellids of the Holy Cross Mountains. It differs from the type species, *Ph. arefactus* (Veevers), in being much more biconvex and larger. The sulcus is better developed usually forming a tongue-like extension. The radial costellae are finer and, as a rule, longer. Almost the same features differ our species from *Ph. marocanensis* (Drot). The Moroccan species possesses a much more anteriorly extended sulcal tongue, like our form, the radial costellae are slightly longer than in the Australian form. The Moroccan species appears to be intermediate between the Australian and the Polish forms. The general shell outline of all three species is much the same, being always subquadrate, the ventral beaks are similarly small and incurved and the lateral margins are, to a varying degree, always arcuate.

Ph. polonicus from the Holy Cross Mountains shows some relationship with *Calvinaria* as has been the opinion of previous authors considering the other species of *Phlogoiderhynchus* (Drot & Hollard, 1967; Sartenaer,

1970), but also with *Leiorhynchus* or with *?Caryorhynchus* as conceived from the illustrations of a holotype of *"Leiorhynchus" carya* (McLaren, 1962, text-fig. 29C).

STRATIGRAPHIC POSITION OF *PHLOGOIDERHYNCHUS POLONICUS* (ROEMER)

The present collection of *Ph. polonicus* comes from nine localities distributed over the western part of the Holy Cross Mountains, the principal localities being about 30 km from one another. Localities: Kostomłoty (Laskowa quarry), Czarnów (quarry at Śluchowice hill), Szydłówek (trench at Rewolucja Październikowa Street and the exposed "Stinkkalke") lie in the Łysogóry paleogeographical region and belong to the Szydłówek Limestone *sensu* Sobolev (1909). The stratigraphical unit consists of marls and marly shales. The stratigraphical position of this sequence and especially the fossiliferous "Stinkkalke" has been placed, mainly on the basis of corals, in the Upper Devonian (Roemer, 1866; Gürich, 1901); in the upper part of Middle Devonian (Gürich, 1896; Sobolev, 1909) or even in the Lower Givetian (Fedorowski, 1967). The whole Szydłówek Limestone, considered on a regional scale, was interpreted also as the upper part of the Middle Devonian (Sobolev, 1909, 1911; Czarnocki, 1957) or as the Frasnian (Czarnocki, 1938).

Unfortunately no conodonts have been found in this unit, but some corals have been collected together with *Phlogoiderhynchus polonicus* from the "Stinkkalke". Dr. J. Fedorowski kindly determined the specimens assigning them to *Disphyllum kweihsiense* Yoh., *D. wirbelauense bonae* Różkowska & Fedorowski and to the genera *Pterorrhiza* and *Grypophyllum*. The genus *Disphyllum* is of considerable stratigraphic value in the Holy Cross Mountains (Różkowska & Fedorowski, 1972) and its presence indicates an Early Frasnian age for the "Stinkkalke" (Dr. J. Fedorowski's personal information in 1974).

Although no conodonts are known from the deposits with *Ph. polonicus* at Śluchowice, they have been found in the overlying calcirudites (Szulczewski, 1971, p. 71, tabl. 3, samples 3, 4). In the lower of these samples were found *Ancyrodella rotundiloba rotundiloba* (Bryant) and *A. rotundiloba alata* Glenister & Klapper, indicating the Lower or Middle Polygnathus asymmetricus Zone (do I α). Consequently, *Ph. polonicus* occurs at Śluchowice no higher than this position.

A direct dating of *Ph. polonicus* by conodonts is possible in localities Józefka hill, Kowala, Zamkowa Góra at Chęciny and Sosnówka hill. All these localities, except of the first one, are situated in the southern basinal paleogeographical region of the Holy Cross Mountains (Szulczewski, 1971). At Józefka hill, *Ph. polonicus* occurs in the Lower Polygnathus asymmetricus Zone (Małkowski, 1971) associated with *Schmidtognathus* sp.,

Polygnathus asymmetricus ovalis Ziegler & Klapper and *Ancyrodella rotudiloba alata* Glemister & Klapper. At Kowala (railroad cut) *Ph. polonicus* occurs with conodonts characteristic of the Lower or Middle Polygnathus asymmetricus Zone (Szulczewski, 1971, p. 75, fig. 5, set D). It is, however, very probable that it is restricted only to the Lower Polygnathus asymmetricus Zone, for the *Ancyrodella gigas* Younquist, the first appearance of which defines the base of the Middle Polygnathus asymmetricus Zone, has been found much higher in the outcrop. It is interesting that the set D with *Ph. polonicus* overlaid the set C with *Fitzroyella alata* Biernat (Biernat, 1969; Szulczewski, 1971, p. 75, fig. 5). This stratigraphical relationship of the two species is closely similar to that between the Australian forms: *Fitzroyella primula* Veevers and *Phlogoiderhynchus arefactus* (Veevers), the first of which occurs in the saltica and torrida Zones, and the latter appears in the upper part of the stratigraphical range of the former. The position of *Phlogoiderhynchus* above *Fitzroyella* at Kowala may be connected with the facies change from a biohermal situation to a deeper water environment devoid of corals.

The locality at Sosnówka hill probably corresponds to a place named Skiby (village lying near the hill), from which specimens of *Ph. polonicus* were collected by Kontkiewicz (*fide* Gürich, 1902; Sobolev, 1909, p. 500). The marly rocks with *Ph. polonicus* in the Chęciny region were considered by Sobolev (1909) along with the Szydłówek Limestone, as the upper part of the Middle Givetian. Later, Czarnocki (1927, 1938) interpreted this unit as the Lowermost Frasnian, mentioning in addition the strata with *Leiorhynchus polonicus*. However, in a paper published after his death (Czarnocki, 1957) this sequence was considered as the Upper Givetian. A trench was made at Sosnówka hill in 1972 and some *Ph. polonicus* and conodont samples were collected. *Ancyrodella rotundiloba rotundiloba* (Bryant), *A. rotundiloba alata* Glenister & Klapper, *A. rugosa* Branson & Mehl and *Polygnathus asymmetricus asymmetricus* Bischoff & Ziegler were found together with *Ph. polonicus* showing that the whole sequence belongs to the Lower or Middle Polygnathus asymmetricus Zone. The conodont assemblage found in the underlying calcirudites at Zamkowa Góra near Chęciny and diagnostic of Middle Polygnathus asymmetricus Zone is additional evidence that the lower boundary of the marly sequence containing *Ph. polonicus* is within this zone.

From Wietrznia only two specimens have been found at the "Wietrznia I" quarry (Szulczewski, 1971, p. 69—71). Their detailed stratigraphic position is not known, but they too probably come from the Polygnathus asymmetricus Zone, which in this area is about 50 m thick (op. cit., fig. 1) in its lower and middle sections.

To sum up, *Ph. polonicus* occurs in the Polygnathus asymmetricus Zones corresponding with do I α; hence not higher than in the Middle Polygnathus asymmetricus Zone. It probably occurs in the two conodont

Zones: the Lower Polygnathus asymmetricus Zone (Śluchowice, Józefka hill, Kowala) and in the Middle Polygnathus asymmetricus Zone (Sosnówka hill, Zamkowa Góra at Chęciny). At present it is impossible to ascertain whether the range of *Ph. polonicus* extends below the Lower Polygnathus asymmetricus Zone. The upper limit of *Ph. polonicus* is marked in the exposures at Laskowa, Śluchowice and Kowala by a facies change similar to that bounding the lower limit of the species in the Zamkowa Góra range (Zamkowa Góra, Sosnówka hill).

The total stratigraphical range of the species presented here is based on the correlations of its several local occurrences. It seems improbable that the upper boundary of its total range results from the facies factors alone because marly facies occurs in the higher levels of the Frasnian in the Holy Cross Mountains, but nowhere containing *Ph. polonicus*.

Ph. polonicus is judged to be a good index fossil for the Early Frasnian. It is very useful in the correlation of the north and south basinal regions of the Holy Cross Mountains, the more so as this is often the only fossil occurring in the deposits where conodonts are lacking. The ability to correlate its stratigraphical range with conodont zones considerably enhances its stratigraphical importance.

STRATIGRAPHIC RANGE OF THE GENUS

Among three species assigned to the genus, the type species, *Phlogoiderhynchus arefactus* (Veevers), has been collected by Veevers (1959) from the *Emanuella torrida* Zone in the Fitzroy Basin, Australia. This zone is restricted (Veevers, 1959, p. 26 to the Sadler Ridge in the Emanuel Range and is situated in the upper part of the type section of the Sadler Formation. Veevers (op. cit., Pl. 1) shows the torrida Zone as Late Frasnian, but Glenister & Klapper (1966, text-fig. 2) regarded the Sadler Limestone as straddling the Middle/Upper Devonian boundary and as not younger than the conodont Lower Polygnathus asymmetricus Zone (do I α). Sartenaer (1970, o. 19) considered the Sadler "Formation" with *Ph. arefactus* as Early Frasnian, but did not exclude the possiblity of its being Late Givetian. Seddon (1970), however, using conodonts, presented strong evidence that the upper part of the Sadler Limestone, that in the torrida Zone, at the Sadler Ridge is Early Frasnian (do I α), probably the Lower Polygnathus asymmetricus Zone. The Frasnian ammonoid *Timanites pons* (Glenister), found in the upper part of the Sadler Limestone (Playford *in* Seddon, 1970, p. 732; see also Roberts *et al.*, 1972, p. 473), confirms this position of the torrida Zone. Veevers (1959, p. 25, 100) also found *Phlogoiderhynchus arefactus* in the "Avonia" proteus Zone of the Napier Formation in the Napier Range, together with the Zone fossil. The "Avonia" proteus Zone is placed in the upper part of Famenian (do III β — V or

do VI after Roberts *et al.*, 1972, p. 471, based mainly on Glenister & Klapper, 1966), but Sartenaer (1970) did not accept this Upper Famennian age for *Ph. arefactus* without, however, giving detailed reasons.

Ph. marocanensis (Drot), was originally described from the West of Naider and Tizi n' Ressas, Morocco as Late Eifelian or Givetian in age. Later, Drot & Holland (1967) on the basis of some new observations reassinged the age as being younger than Early Frasnian with *Pharciceras* (do I α). Sartenaer (1970, p. 19), however, pointed out the similarity in the fossil assemblage associated with *Phlogoiderhynchus* in both Australia and Morocco, and believed the two species of the genus to be Early Frasnian.

Information on the geographical and stratigraphical ranges of *Plogoiderhynchus* is, as yet, fragmentary. However, the available data, based mainly on *Ph. arefactus* and *Ph. polonicus*, show that the stratigraphic range of the genus coincides with that of *Ph. polonicus*, i.e. it is restricted to the Lower and Middle Polygnathus asymmetricus Zone (do I α). Its occurrence in Australia, Africa and Europe allows it to be used for intercontinental correlation.

REMARKS ON PALAEOECOLOGY

Phlogoiderhynchus polonicus occurs in three types of facies:

1. Micritic marly limestones intercalated with marly shales (Laskowa, Śluchowice, trench at Szydłówek, Sosnówka hill) which are commonly very poorly fossiliferous. In extreme cases *Ph. polonicus* is the only fossil found, although sometimes abudantly (Śluchowice, trench at Szydłówek). At Sosnówka hill the species is dominant but accompanied by rare rhynchonellids, lingulids and tentaculids (mostly styliolins), rare crinoid ossicles, fish-teeth, scolecodonts and conodonts. Similarly at Laskowa, *Ph. polonicus* is dominant. For 50 shells of this species only one atrypid and one lingulid were found. Associated with these brachiopods are very rare ramose stromatoporoids, styliolins and crinoid ossicles. The limestones are thin-bedded and homogenous, devoid of any visible sedimentary structures.

2. Limestones with a differentiated brachiopod assemblage (Kowala) consisting of a few rhynchonellid, atrypid and lingulid species. *Phlogoiderhynchus polonicus* occurs here with greater abundance. The only other fossils found are conodonts. The limestones are thick-bedded, micritic and homogenous.

3. Limestones or marly limestones with coelenterates and a different assemblage of fossils ("Stinkkalke" at Szydłówek, Józefka hill). At Szydłówek the limestones are very bituminous and contain *Ph. polonicus*, *Chonetes divaricata* Gürich, atrypids, lingulids, ramose stromatoporoids

(*Stachyodes*), ramose and massive tabulates (*Striatopora, Alveolites*), branching rugose corals (e.g. *Disphyllum, Thamnophyllum, Ceratophyllum, Pterorrhiza, Grypophyllum*) and ostracods (see Gürich, 1896; Fedorowski, 1967).

Ph. polonicus is not recorded in the biolitites with massive stromatoporoids or in the detrital limestones of the same age which are thought to have developed above the wave base. The species always occurs in sediments of an open-sea environment with normal salinity and this environment appears to be the most characteristic. There is no traces of sediment or faunal redeposition or of sediment erosion so this environment is interpreted as one of relatively deep water, below the storm wave-base. The poor assemblage of benthic fossils reinforces the interpretation of a relatively deep-water environment, there being only pelagic styliolins and very rare branching stromatoporoids. In this environment *Ph. polonicus* is the only benthic form which occurs at all frequently.

In environment corresponding to the facies type 2 there is no evidence of wave action, although the different brachiopod assemblage suggests a slightly shallower environment than type 1.

Environment type 3 is probably the shallowest of those containing *Ph. polonicus*. It is characterized by a number of coelenterates with ramose stromatoporoids and corals dominating. The brachiopod assemblage is more diverse from other environments and *Ph. polonicus* is no longer dominant. It seems that this environment may be close to the limits of the ecological range of *Ph. polonicus*. This range is limited probably not only by physical factors but also by the competition of other animals which favour this shallower environment. One line of evidence for this is the difference in size to which *Ph. polonicus* grew in different localities. The smallest specimens are these from Śluchowice but rare small specimens are recorded also in marls at Szydłówek. At both these localities the species is confined to environment type 1 and is found alone. The lack of other fossils and the high proportion of clay to calcium carbonate are correlated with the small shell size of *Ph. polonicus* although it may be also that bathymetric factor had some direct influence upon shell growth. Larger size is attained by specimens from the environments types 2 and 3, e.g. Kowala, Sosnówka hill, Józefka hill, inhabited also by other animals, near the limits of their normal environments. Especially large and biconvex specimens came from the limestones of Kowala.

As stated above in the systematic section, the intraspecific variation observed differs according to the localities from which specimens came and it is believed that this is a reflection of the different environmental condition.

In some samples shell deformation or slight breakages allow an attempt to reconstruct the orientation and possible life position of the shells in

the sediment. Most of the damage to specimens occurred after death, probably as a result of diagenetic alterations.

Damage is particularly easily recognized in the very thick shells which dominate the samples from Kowala, Sosnówka hill and Chęciny. Shells from Sosnówka hill are usually very asymmetrical in outline having been crushed in the antero-posterior direction and in addition having suffered displacement of one valve relative to the other. This mode of preservation suggests that the natural orientation of the shell at the time of its death was with the umbo downwards resting on the substrate. This view is supported by the general shape of these shells, especially that of their posterior halves. It is judged that the very thickened umbonal regions, which in addition are strongly biconvex and laterally extended, could have served to stabilize the shell in the life position. In addition the tongue-like extension may have helped balance the shell.

There is no direct evidence as to whether these animals had a functional pedicle in their adult stage. Although adult shells retain traces of a pedicle foramen it is thought that the pedicle was lost in adulthood, as happens in some recent (Dall, 1951) or fossil (Ivanova, 1959) adult rhynchonellids. This opinion is supported by the fact that although many shells are damaged, as already mentioned, the beaks of both valves are extremely close to each other allowing very little room for the functional pedicle. If a pedicle existed it must have been very thin, capable to holding the animal only weakly to the substrate. Alternatively the pedicle was very thin posteriorly but more solid anteriorly, as in lingulids, and so could better able to anchor the shell to the substrate. The quiet environmental conditions indicated by a lack of turbulent water and a muddy bottom support the view that *Ph. polonicus* probably was not pedunculate in its advanced adult stage. No doubt the shells of younger individuals (e.g. from Śluchowice, Szydłówek) were pedunculate. These appear to have been directly anchored to the substratum by a functional pedicle which may have been slightly modified at its anterior end by branching. These conclusions are derived from a study of the general morphology of the shells and their state of preservation, in which almost all are squashed ventro-dorsally.

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REFERENCES

BIERNAT G. 1969. On the Frasnian Brachiopod genus Fitzroyella Veevers from Poland (Fitzroyella Veevers (Brachiopoda) z franu Gór Świętokrzyskich). — *Acta Palaeont. Pol.* **14**, 3, 373—389. Warszawa.

CZARNOCKI J. 1927. Sprawozdanie z badań, dokonanych w r. 1926, w związku z ogólnym poglądem na budowę mas mezozoicznych regjonu chęcińskiego. — *Post. Nauk PIG*, 17. Warszawa.

— 1938. Ogólna Mapa Geologiczna Polski. Arkusz 4: Kielce (Carte Géologique Générale de la Pologne. Feuille 4: Kielce). — Wyd. Państw. Inst. Geol. Warszawa.

— 1948. Przewodnik XX Zjazdu Polskiego Towarzystwa Geologicznego w Górach Świętokrzyskich w r. 1947 (Guide pour XX Réunion de la Société Géologique de Pologne dans les Montagnes de St. Croix en août 1947). — *Roczn. P. T. Geol. (Ann. Soc. Géol. Pol.)*. 236—299 Kraków.

— 1957. Prace geologiczne, t. 2: Tektonika Gór Świętokrzyskich, z. 3: Geologia regionu Łysogórskiego (v. 2: Tectonics of the Święty Krzyż Mts. fasc. 3: Geology of the Łysogóry region). — *Prace Inst. Geol.*, **18**, 1—138, Warszawa.

DELL R. V. 1951. Some animal communities of the sea bottom from Queen Charlotte Sound, New Zealand. — *New Zealand J. Sci. Technol.*, B, **33**, 19—29. Wellington.

DROT J. 1964. Rhynchonelloidea et Spririferoidea Siluro-Dévoniens du Maroc Pré Saharien. — *Notes Mém. Serv. Géol. Maroc*, **178**, 1—287. Rabat.

— & HOLLARD H. 1967. "Camarotoechia" marocanensis Drot, 1964. Position stratigraphique et affinités. — *Compte Rendu., Somm. Séances Soc. Géol. France*, **4**, 155—156. Paris.

FEDOROWSKI J. 1967. A revision of the genus Ceratophyllum (Rewizja rodzaju Ceratophyllum Gürich, 1896 (Tetracoralla)). — *Acta Palaeont. Pol.*, **12**, 2, 213—222, Warszawa.

GLENISTER, B. F. & KLAPPER G. 1966. Upper Devonian conodonts from the Canning Basin, Western Australia. — *J. Paleont.*, **40**, 4, 777—842. Menasha.

GÜRICH G. 1896. Das Paleozoicum in Polnischen Mittelgebirge. — *Verh. Russ. Kais. Miner. Ges. St. — Petersburg*, **2**, 32, 1—539, St. — Petersburg.

— 1901. Nachträge zum Palaeozoicum des Polnisches Mittelgebirge. — *Neues Jb. Miner. Beil. Bd.*, **13**, 331—388. Stuttgart.

— 1903. Das Devon von Dębnik bei Krakau. — *Beitr. Paläont. Geol. Öster.-Ung.*, **15**, 127—164. Vien—Leipzig.

IVANOVA E. A. 1949. Uslovija suscestvovanija, obraz zizni i istorii razvitija nekotorych brachiopod srednego i verchnego karbona podmoskovskoj kotloviny. — *Trudy Paleont. Inst. AN SSSR*, **21**, 1—151., Moskva.

MAŁKOWSKI K. 1971. Stratygrafia górnego dewonu okolic Górna na podstawie konodontów. (Master Diplome Thesis — unpublished), Inst. Geol. Podst. Uniwersytetu Warszawskiego.

MCLAREN D. J. 1962. Middle and early Upper Devonian rhynchonelloid brachiopods from the western Canada. — *Bull. Geol. Surv. Canada, Dept. Miner.*, **86**, 1—122. Ottawa.

NARKIEWICZ M. 1973. Dewon Pasma Góry Zamkowej w Chęcinach. — Master Diplome Thesis — unpublished). — *Ibidem.*

ROBERTS J. *et al.*, 1972. Correlation of the Upper Devonian rocks of Australia. — *J. Geol. Soc. Aust.*, **18**, 4, 467—490. Sydney.

ROMER F. 1866. Geognostische Beobachtungem im Polnischen Mittelgebirge. *Ztschr. Deutsch. Geol. Ges.*, **19**, 667—690. Berlin.

RÓŻKOWSKA M. & FEDOROWSKI J. 1972. Genus Disphyllum de Fromentel (Ru-

gosa) in the Devonian of Poland and its distribution. — *Acta Palaeont. Pol.*, **17**, 3, 265—340. Warszawa.

SARTENAER P. 1955. Redescription du genre Nudirostra et considerations sur la validité du genre "Calvinaria" (Rhynchonellacea). — Inst. Royal Sciences Nat. Belgique; **31**, 6, 1—12. Bruxelles.

— 1970. Nouveaux genres Rhynchonellides (Brachiopodes) de Paleozoique. — Ibidem **46**, 32, 1—32. Bruxelles.

SCHNUR J. 1854. Zusammenstellung und Beschreibung sammtlicher in Uebergangsgebirge der Eifel vorkommenden Brachiopoden nebs Abbildungen darselben. — *Palaeontographica*, **3**, 4/6, 169—247. Cassel.

SEDDON G. 1970. Frasnian conodonts from the Sadler Ridge-Bugle Gap area, Canning Basin, Western Australia. — *J. Geol. Soc. Austr.*, **16**, 2, 11—16. Adelaide.

SOBOLEV D. 1909. Srednij devon kelecko-sandomirskogo kriaża. — *Mat. Geol. Ros.*, **24**, 1—536. St. Petersburg.

— 1911. O famenskom jaruse kelecko-sandomirskogo kriaża. — *Ann. Geol. Russia*, **13**, 1/2, 34—41. Nova Aleksandrija.

SZULCZEWSKI M. 1971. Upper Devonian conodonts, stratigraphy and facial development in the Holy Cross Mountains. — *Acta Geol. Pol.*, **21**, 1, 1—129. Warszawa.

TSCHERNYSCHEV TH. 1887. Die Fauna des Mittleren und Oberen Devon an West — Abhange des Urals. — *Mém. Comm. Géol.*, **3**, 1, 1—107. St. — Petersburg.

VEEVERS J. J. 1959. Devonian Brachiopods from the Fitzroy Basin, Western Australia. — *Surv. Min. Res. Geol. Geophys.*, **45**, 1—220. Canberra.

ZARĘCZNY S. 1889. Über. das Krakauer Devon. — *Jb. Geol. Reichsanst*, **38**, 47—68. Vien.

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DEWOŃSKI BRACHIOPOD *PHLOGOIDERHYNCHUS POLONICUS* (ROEMER, 1866) Z GÓR ŚWIĘTOKRZYSKICH, POLSKA

Streszczenie

Przedmiotem opracowania jest wszechstronna analiza dewońskiego ramienionoga znanego ze starszej literatury jako *Camarophoria polonica* Roemer 1866, albo *Leiorhynchus polonicus* (Roemer 1866). Mimo, że gatunek ten jest w Górach Świętokrzyskich dość pospolity i ma od dawna ustalone znaczenie dla lokalnej korelacji stratygraficznej (cf. Sobolev 1911, Czarnocki 1927), to jednak do tej pory nie doczekał się wyczerpującego opracowania paleontologicznego, a w konsekwencji jego przynależność rodzajowa była niepewna. Szczegółowe badania przeprowadzone na nowej kolekcji wykazały, że zarówno zewnętrzne cechy morfologiczne, jak i budowa wewnętrzna gatunku w pełni odpowiadają rodzajowi *Phlogoiderhynchus* Sartenaer 1970.

Obok charakterystycznych dla tego rodzaju cech zewnętrznej morfologii (poprzecznie wydłużony zarys muszli, wydatna dwuwypukłość zwłaszcza w części dziobowej, trapezoidalny zarys zatoki i siodła, ornamentacja licznymi żebrami o umiarkowanej wysokości) zbadany gatunek posiada także właściwe rodzajowi cechy budowy wewnętrznej, jak grube septum, podstawy kruralne w kształcie płomienia i brak podpór zębowych. Zebrany materiał pochodzi z 9 stanowisk znajdujących się zarówno w obszarze łysogórskim, jak i w strefie basenu ograniczającego od południa obszar kielecki, m.in. z *locus typicus* w Szydłówku i z innych stanowisk znanych już Gürichowi, Sobolewowi i Czarnockiemu. Występowanie gatunku jest kontrolowane zarówno przez czynniki ekologiczne, jak i czasowe. Występuje on w utworach marglistych lub wapiennych, powstałych poniżej sztormowej podstawy falowania, zazwyczaj jako jedyny lub dominujący element faunistyczny. Pozycję stratygraficzną gatunku, dotychczas nie pewne, sprecyzowano ściśle przy pomocy konodontów. Zasięg stratygraficzny *Phlogoiderhynchus polonicus* jest ograniczony do dolnego i środkowego poziomu Polygnathus asymmetricus (do I α), a więc do niskiego franu. Zasięg ten odpowiada jednocześnie zasięgowi rodzaju, reprezentowanemu jeszcze przez dwa gatunki: australijski *P. arefactus* (Veevers 1959) i marokański *P. marocanensis* (Drot 1964).

ГЕРТРУДА БЕРНАТ & МИХАЛ ШУЛЬЧЕВСКИ

ДЕВОНСКИЙ БРАХИОПОД *PHLOGOIDERHYNCHUS POLONICUS* (ROEMER, 1866) ИЗ СВЕНТОКШИСКИХ ГОР, ПОЛЬША

Резюме

Предметом работы является всесторонний анализ девонского плеченогого, известного в литературе под названием *Camarophoria? polonica* Roemer 1866 или *Leiorhynchus polonicus* (Roemer 1866). Несмотря на то, что этот вид распространен в Свентокшиских горах в довольно большом количестве и издавна используется в местной стратиграфической корреляции (Соболев, 1911; Чарноцки, 1927), до сих пор он не получил надлежащей палеонтологической характеристики и, следовательно, его родовая принадлежность не была определена достоверно. Деталь-

ное изучение новой коллекции показало, что как по внешним морфологическим признакам, так и по внутреннему строению этот вид полностью соответствует роду *Phlogoiderhynchus* Sartenaer 1970. Кроме характерных для этого рода элементов внешней морфологии (поперечно удлиненная раковина, сильная двувыпуклость, особенно в макушечной части, транпециевидное очертание лунки и седла, скульптура в виде густых ребер умеренной высоты), рассматриваемый вид обладает также деталями внутреннего строения, свойственными этому роду (толстая септа, круральные основания пламеневидной формы, отсутствие зубных поддержек). Исследованный материал был собран и 9 местонахождениях, расположенных в Лысогорском районе и в зоне бассейна, огибавшего с юга Келецкий район, в том числе в типичном местонахождении Шидлувек и в других местах, известных уже Гюриху, Соболеву и Чарноцкому. Распространение вида определяется экологическими и временными факторами. Этот вид распространен в мергелистых или известняковых отложениях, образовавшихся ниже базиса волноприбоя, как правило в качестве единственного или преобладающего фаунистического элемента. Стратиграфическая позиция вида, до сих пор не определенная достоверно, уточнена с помощью конодонтов. Интервал стратиграфизческого распространения *Phlogoiderhynchus polonicus* ограничивается нижней и средней зонами Polygnathus asymmetricus (doI *a*), следовательно нижним франом. Этот интервал совпадает также с интервалом распространения другого рода, представленного двумя видами: австралийским *P. arefactus* (Veevers 1959) и марокканским *P. marocanensis* (Drot 1964).

EXPLANATION OF PLATES

Plate XXI

Phlogoiderhynchus polonicus (Roemer)

Figs 1—2. Two adult specimens (ZPAL Bp. XIX/41, 30) from Śluchowice. These are slightly damaged but show the poorly preserved radial ornamentation along the shell margins; *a* — dorsal view, *b* — lateral view, *c* — ventral view, *d* — anterior margin view.

Figs 3—4. Two adult specimens (ZPAL Bp. XIX/1, 3) from Józefka hill, showing indistinct surface costellae in: *a* — ventral valve, *b* — lateral, *c* — dorsal valve, *d* — anterior margin views.

Fig. 5. A very old specimen (ZPAL Bp. XIX/4) from Sosnówka showing well preserved costellae in the sulcus; *a* — ventral valve, *b* — lateral, *c* — dorsal valve, *d* — anterior margin views.

Figs 6—7. Two very incomplete specimens with only their ventral valves preserved (ZPAL Bp. XIX/2, 1) from Szydłówek "Stinkkalke". Figs 6*a*, 7 — ventral valves, Fig. 6*b* — anterior half of Fig. 6.

All photographs natural size.

Plate XXII

Phlogoiderhynchus polonicus (Roemer)

Figs 1—6. Two adult deformed specimens (ZPAL Bp. XIX/8, 4) from Góra Zamkowa at Chęciny; *a* — ventral valve, *b* — lateral, 6*c* — dorsal valve, 1*c*, 6*d* — anterior margin views.

Figs. 2—5. Four adult specimens (ZPAL Bp. XIX/47, 48, 15, 23) from Sosnówka deformed antero-posteriorly. Figs 2*a*, 3 — posterior views of two different specimens; Fig. 2*b* — anterior view of Fig. 2*a*; Figs 4—5: *a* — ventral valve, *b* — lateral, *c* — dorsal valve, *d* — anterior margin views.

All photographs natural size.

Plate XXIII

Phlogoiderhynchus polonicus (Roemer)

Figs 1—4. Four adult specimens (ZPAL Bp. XIX/11, 14, 13, 12) of different sizes and states of preservation from Kostomłoty in: *a* — ventral valve, *b* — lateral view, *c* — dorsal valve, *d* — anterior margin, *s* — umbonal views.

Fig. 5. Anterior view of an adult specimen (ZPAL BP. XIX/9) from Wietrznia showing fine surface costellae.

All photographs natural size.

Plate XXIV

Phlogoiderhynchus polonicus (Roemer)

Figs 1, 4—5. Three different specimens (ZPAL Bp. XIX/30, 17, 19) from a trench at Rewolucja Październikowa Street at Kielce; 1*a* — ventral valve, 1*b*, 5 — dorsal valve, 4 — anterior valve.

Fig. 2. The proposed neotype — a specimen figured by Gürich in 1896, Pl. XXVII, Fig. 8 from Szydłówek; *a* — ventral valve, *b* — dorsal valve, *c* — lateral view, *d* — anterior margin view, *e* — posterior part of the shell.

All photographs natural size.

Fig. 3. Immature specimen (ZPAL Bp. XIX/19) from Szydłówek; *a* — dorsal valve, *b* — ventral valve, *c* — lateral view, *d* — anterior margin. *e* — posterior part of the shell; approx. ×2.7.

Plate XXV

Phlogoiderhynchus polonicus (Roemer)

Figs 1—2. Two adult specimens (ZPAL Bp. XIX/34, 38) from Kowala, partly exfoliated but showing poorly preserved surface costellae; Figs 1*a*, 2*a* — ventral valves, Fig. 1*b* — dorsal valve, Figs 2*b*, 1*c* — lateral views, Fig. 2*c* — anterior margin; ×1.

Fig. 3. Immature incomplete specimen (ZPAL Bp. XIX/40) from Kowala: *a* — ventral valve, *b* — dorsal valve, *c* — lateral view, *d* — posterior part of the shell; approx. ×2.2.

Fig. 4. Posterior view of an exfoliated adult specimen (ZPAL Bp. XIX/33) from Kowala, showing short medium septum; × approx. 2.

Fig. 5. Dorsal valve of specimen (ZPAL Bp. XIX/22) from Kowala, showing, due to exfoliation, the short median septum and traces of the muscle scars; approx. ×2.

Plate XXVI

Phlogoiderhynchus polonicus (Roemer)

Fig. 1. Adult specimen (ZPAL Bp. XIX/10) from Kowala with an exfoliated ventral valve showing well preserved pallial sinuses; *a* — anterior half of the ventral valve, *b* — ventral view; approx. ×4.

Plate XXVII

Phlogoiderhynchus polonicus (Roemer)

Śluchowice

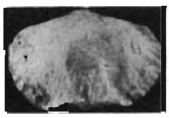
A—E. Cross-section of an adult specimen (ZPAL Bp. XIX/40a), 12.0 mm long and 20.0 mm wide, showing some structural elements: crural basses, crura, dorsal median septum; approx. ×6.

Plate XXVIII

Phlogoiderhynchus polonicus (Roemer)

Kowala

A—E. Cross-sections of a mature specimen (ZPAL Bp. XIX/31a), 24.2 mm long and 32.2 mm wide, showing well preserved crural bases. approx. ×6.



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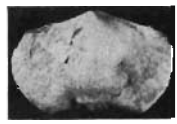
1b



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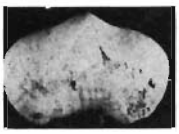
1d



2c

2b

2a

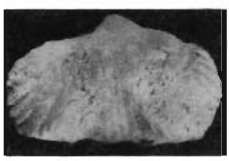
2d

3a

3b

3c

3d

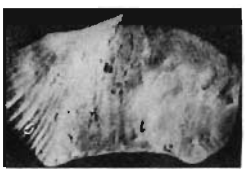


4a

4b

4c

4d



5a

5b

5c

5d

6a

6b

7

Phot. E. Mulawa

1a

1b

1c

2a

2b

3

4a

4b

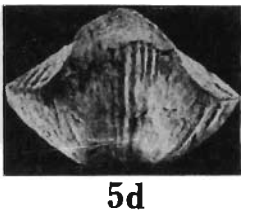
4c

4d

5a

5b

5c



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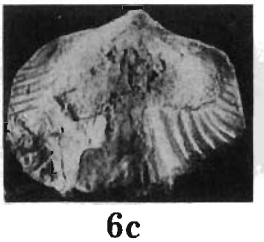
6b



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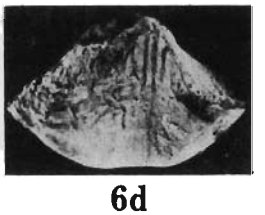
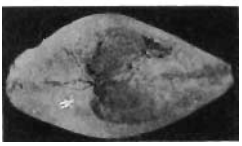


6d

Phot. E. Mulawa

1e

5



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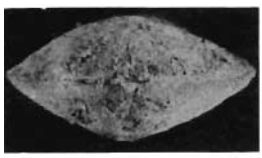

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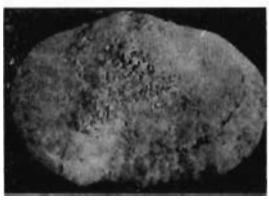
4e

1a

1b

1c

1d



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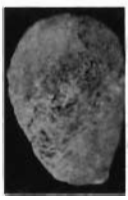

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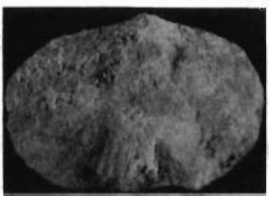

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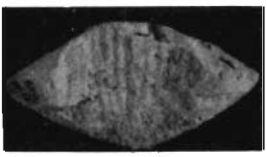

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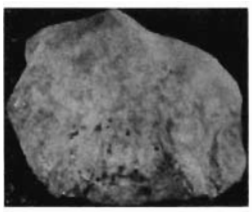

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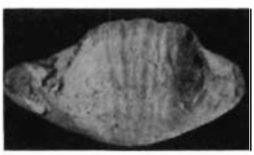

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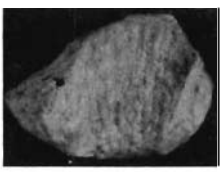
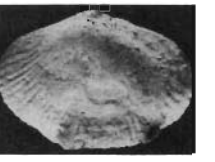


4d

Phot. E. Mulawa

1a

4



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2c

2e

2a

5

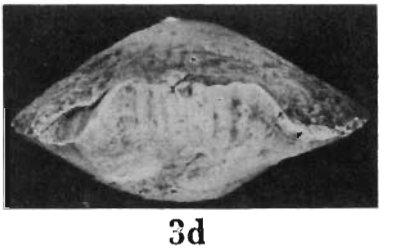
2b

3a

3c

3b

3e



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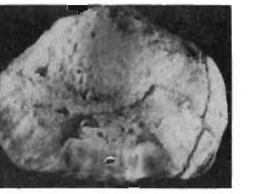
Phot. E. Mulawa

1a

2b



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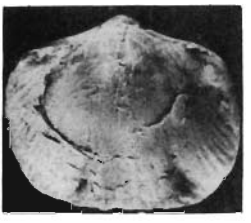

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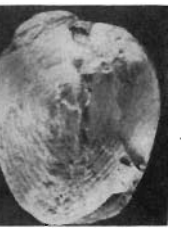

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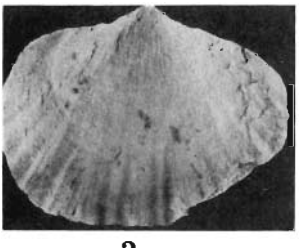

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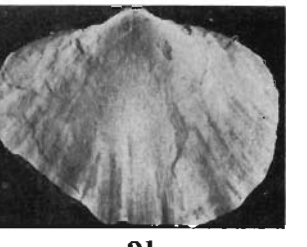

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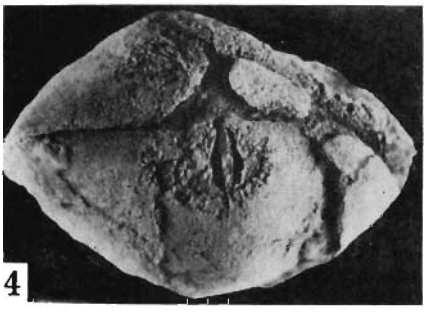

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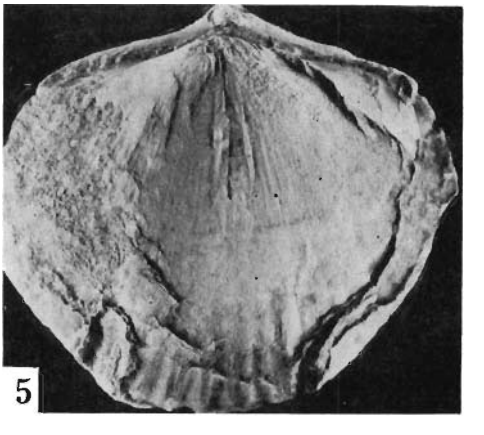

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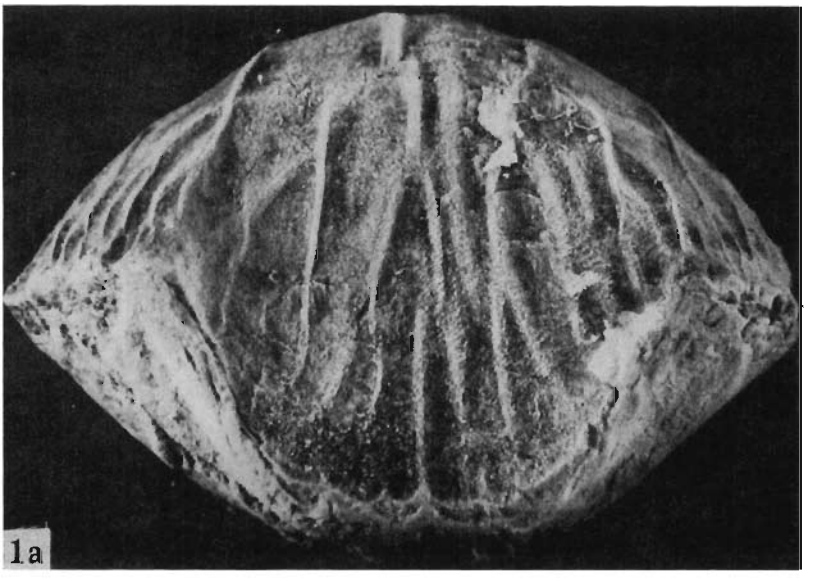
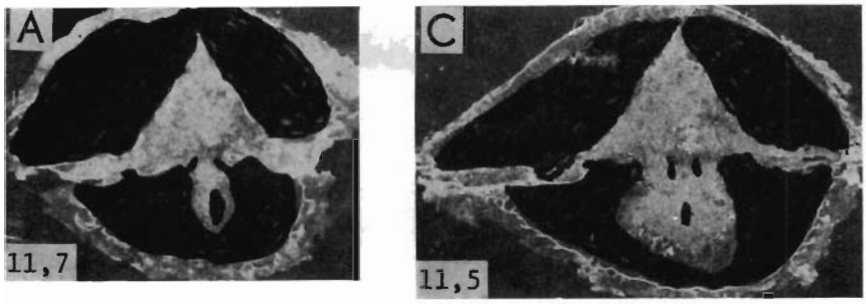
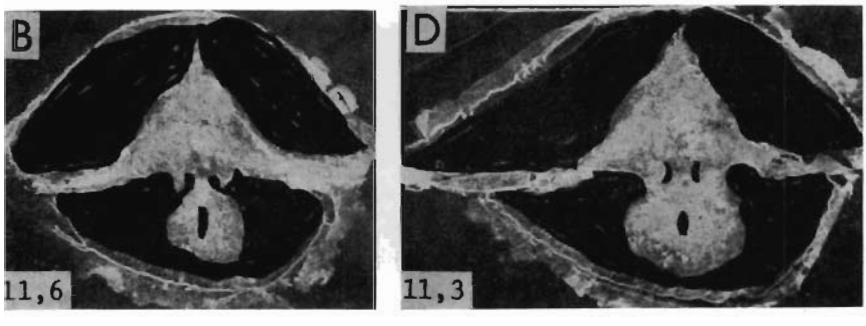
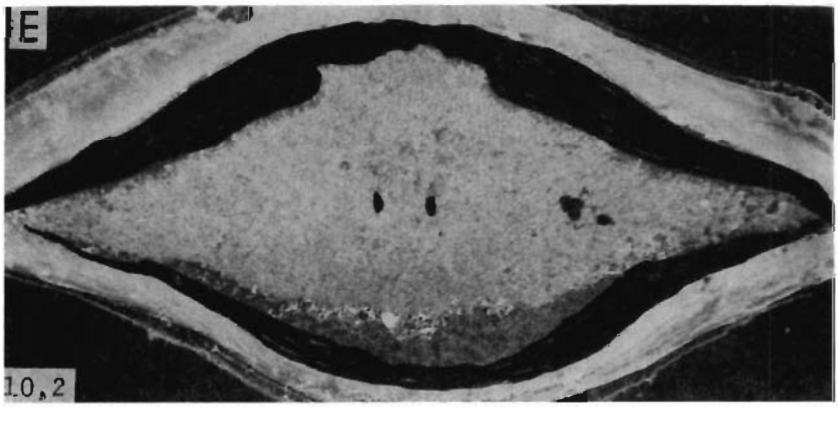


Phot. M. Czarnocka







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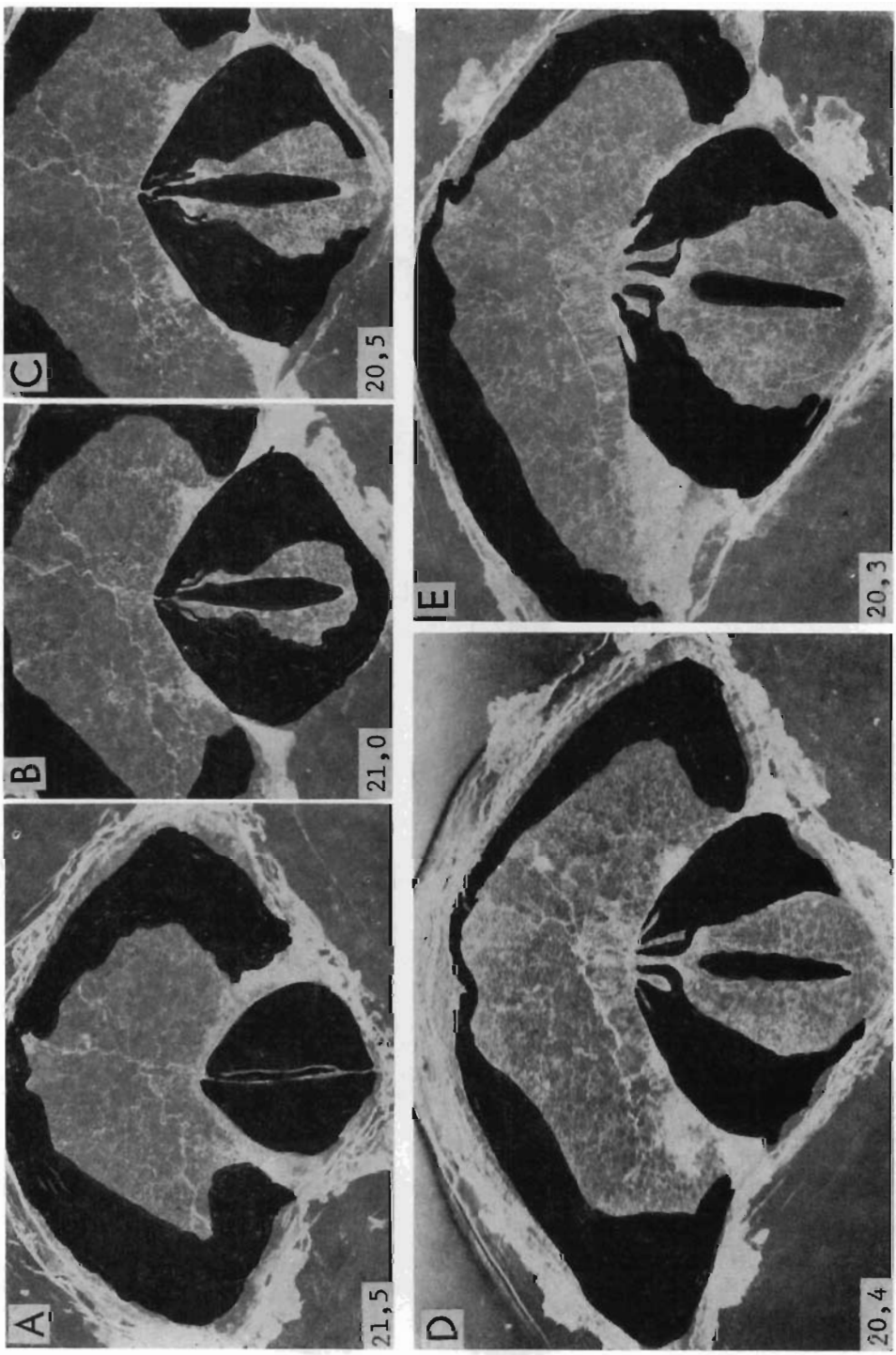

Phot. E. Mulawa