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CRITICAL ANALYSIS OF CAMBRIAN ICHNOGENUS *PLAGIOGMUS* ROEDEL, 1929

(Pl. I—II)

Rewizja kambryjskiego ichnorodzaju Plagiogmus Roedel, 1929

(Pl. I—II)

Abstract. The Cambrian ichnospecies *Plagiogmus arcuatus* Roedel is revised. *Arcuatichnus wimani* n. ichnogen., n. ichnosp. is proposed for some burrows excluded from the former ichnospecies and for additional material coming from the Świętokrzyskie Mts (Poland).

INTRODUCTION

The trace fossils at present allocated in the ichnogenus *Plagiogmus* Roedel, 1929, were the subject of several papers since the end of XIX c. and especially the 1960's. They were reported from Lower and Middle Cambrian deposits of several parts of the world. It appears that the name *Plagiogmus* is, however, used for fairly different trace fossils. The analysis has shown that at least 2 groups of trace fossils markedly differing in appearance and genesis were commonly described under the name *Plagiogmus arcuatus* Roedel.

Specimens figured here are housed in the collections of Institute of Geology, Warsaw University.

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PALEOICHNOLOGICAL DESCRIPTION

Inchnogenus *Plagiogmus* Roedel, 1929

Type species: *Plagiogmus arcuatus* Roedel, 1929.

Diagnosis. Trail bandy-like, straight to somewhat arcuate. Trail surface ornamented with clearly marked transversal ridges not reaching its margins. Spacing of the ridges may be variable. A furrow sometimes marked in the middle of the trail.

Remarks. The ichnogenus *Plagiogmus* was compared with *Arthrophycus* (= *Harlania* in Nathorst 1897; see also Häntzschel 1975, p. W38) and *Climactichnites wilsoni* (*Climatiechnites Wilsoni* in Nathorst 1897) from which it markedly differs as it was emphasized by the above autor. References to these comparisons were made by Högbom (1925) and Roedel (1929). *Plagiogmus* was also compared with Ediacarian fossil *Pteridinium* by Cloud and Nelson (1966), Glaessner (1968); however, any similarity between them was subsequently questioned by Cloud and Bever (1973). For comparisons with other trace fossils such as *Climatichnites, Scolicia, Olivellites* and *Psammichnites* see Glaessner (1969).

Arthrophycus differs from *Plagiogmus* in trails converging, overlapping along a certain section and subsequently diverging and thus apparently branching. This trace fossil is here assigned to hypichnia (vide Martinsson 1965) and not endichnia to which *Plagiogmus* belongs according to Glaessner (1969) and Crimes and al. (1977). The former differs also from *Plagiogmus* in much more clearly marked furrows which cannot be explained by the differences in consolidation of sea-floor deposits only.

Transversal ridges of *Arthrophycus* are similar to those of *Plagiogmus* in rectilinear outline, but they reach margins of the trail and do not end in a certain distance from them. In axial part of the mould of *Arthrophycus* there is marked "median depression" (Häntzschel 1975, W38) corresponding to axial concavity on the positive whilst in axial part of the positive of *Plagiogmus* a narrow furrow (= "median line") may be sometimes found (Högbom 1925).

Plagiogmus clearly differs from *Climactichnites* in size as well as shape and arrangement of ridges. *Plagiogmus* also clearly differs from *Scolicia* in shape of transversal ridges and nature of axial zone. It is very similar to Precambrian ichnogenus *Bunyerichnus* (see Glaessner 1969, pp. 377—378), differing in the presence of axial ridge as well as in the development of marginal zone with ridges not reaching the margins of the trail.

Occurrence. Known from the Lower Cambrian of Öland (Sweden), Finnmark (Norway), N Spain, E Greenland, Central Australia, California (USA) and early Middle Cambrian of Wyoming (USA). He is also known from metamorphic rocks in S Bulgaria.

Ichnospecies *Plagiogmus arcuatus* Roedel, 1929

1897 „Spar"; Nathorst, pp. 361—365, text-fig.
1925 „Fossil..."; Högbom, pp. 220—221, fig. 3.
1926 „Problematischen Spuren"; Roedel, pp. 22—26, text-fig.
1929 Plagiogmus *simplex*; Roedel, pp. 48—52, and *Plagiogmus arcuatus* Roedel, p. 49, text-fig.
1962 *P. arcuatus*; Häntzschel, p. W210, fig. 128, 6 (= Roedel 1929, text-fig.).
1969 *Plagiogmus arcuatus* Roedel; Glaessner, pp. 383, 385—390, figs 7a—h.
1970 *Plagiogmus* sp.; Banks, p. 30, Pl. 3a.
1970 *Plagiogmus* sp.; Cowie and Spencer, pp. 96, 98, Pl. 1b, 2g.
1973 *Plagiogmus* sp., *Plagiogmus* cf. *P. arcuatus*; Cloud and Bever, pp. 884—885, figs 1—4.
[non] 1974 *Plagiogmus arcuatus* Roedel; Peterson and Clark, pp. 767—768, fig. 1.
1975 *Plagiogmus* Roedel, *P. arcuatus*; Häntzschel, p. W95, fig. 59, 4b (= Roedel 1929, text-fig.).
1976 *Plagiogmus arcuatus* Roedel; Savov, p. 20, Pl. I, 1, 2.
1977 *Plagiogmus* sp.; Crimes and al., pp. 122, 124, Pls 7c, 8f.

Table = Tabela 1

	number of ridges along 5 cm trace distance																	
	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Nathorst 1897							x	x										
Högbom 1925	x		x				x											
Roedel 1926			x	x														
Roedel 1929								x								x		
Glaessner 1969							x		x	x						x	x	x
Cloud Bever 1973						x		x	x									
Peterson Clark 1974		x																
presented material			x	x														
	Arcuatichnus wimani n. gen., n. sp.					Plagiogmus arcuatus							Plagiogmus sp.					

D i a g n o s i s. Trail somewhat concave, 1 to 7 mm deep, band-like, 15 to 35 mm wide, rectilinear or slightly arcuate, with smooth surface; maximum length indefinite. Trail surface ornamented with clearly marked transversal ridges 1 to 3 mm wide; ridges not reaching the margins of the trace but ending at a distance roughly constant for a given trail.

Ends of the ridges commonly swollen, club-like; ridges rectilinear or slightly incurved. Inter-ridge distance somewhat or even sometimes highly variable; an index — number of ridges along 5 cm trace distance — is introduced here. Changes in spacing of ridges suggest that some of these specimens represent a separate species of *Plagiogmus* (vide: Roedel 1929, text-fig. — central specimen; Glaessner 1969, fig. 6a, b, c, g?, h). There are about 20—22 ridges (5 cm, in comparison with 10—14 ridges) 5 cm (see tabl. 1) in typical representatives of *P. arcuatus*.

A furrow in axial part of the trail may be more or less clearly marked (see e.g. Roedel 1929, text-fig.; Glaessner 1969, fig. 6h) or obscure. Besides rectilinear or arcuate ridges there may also occur less clear arcuate lines (Roedel 1929; Glaessner 1969, fig. 6g) after which the specific name was introduced.

The trails are usually very numerous and randomly cross one another.

The genesis of the trail. Nathorst (1897) was first to note that it is not imprint of „lower animal" but a trace. However he did not specify the trace marker. Roedel (1929) assumed that the trace was made by worm-like animal with annular structure and almost flat lower surface and he presented an attempt to reconstruct ventral surface of the animal in detail. Subsequently, Glaessner (1968, 1969) assumed that the trace was made by shell-less molluscans. This idea was followed by Cloud and Bever (1973). According to Glaessner (1969) the molluscans were moving within bottom deposits (endichnia) and mucus secretion facilitated burrowing and moving within the deposits. Some comments on the origin of that burrow were also made by Crimes and al. (1977).

Environment of dwelling of the trace marker. Earlier authors (Nathorst, Roedel) have had erratic material at their disposal which impeded any analysis. This problem was first undertaken by Glaessner (1969) who gathered specimens of *Plagiogmus arcuatus* from the Parachilna Fm. and upper part of the Arumbera Fm. where they are accompanied by numerous other trails and tracks. The origin of that trace fossil assemblage seems to result from the life activities of arthropods (partly ?trilobites), worm-like animals and possibly molluscans. The ichnocenosis comprises: *Phycodes pedum, Gordia, Diplichnites, ?Rusophycus, Plagiogmus* and *Scolicia*-like trails. Glaessner (op. cit.) interpreted the sedimentary environment of upper part of the Arumbera Fm. as a shallow-water, corresponding to the Cruziana facies (Seilacher 1967).

The analysis of sedimentary environment of the Flathead Sandstone from Wyoming, carried out by Cloud and Bever (1973), has shown similarly small depth of water. In that case *Plagiogmus* is accompanied by anastomosing and branching hypichnial burrows resembling *Phycodes* and others such as those presumably representing basal parts of *Diplocraterion.* The assemblage of sedimentary structures gives support to the above mentioned shallow-water nature and high turbulence of the sedimentary environment.

Plagiogmus was also reported from shallow-water sandy-clay sequence in N Spain (intertidal, and shallow subtidal flats; Crimes and al. 1977), containing highly diverse trace fossil assemblage.

It follows that the *Plagiogmus*-maker lived in the marine basins in the zone between the waving basis and low water level (see Glaessner 1969) corresponding to the Cruziana facies and, possibly, it also occurred in the Skolithos facies. The present knowledge of ecological requirements of the trace maker is insufficient for reconstructing sedimentary environment solely of the basis of the ichnogenus *Plagiogmus*.

Remarks. According to the present author it is necessary to unite the ichnospecies *Plagiogmus arcuatus* Roedel, 1929, and *P. simplex* Roedel, 1929. According to original diagnoses the two ichnospecies were said to differ in the presence of arcuate lines printed over transversal ridges of the former. However, such features cannot be traced on the Roedel's (1929) text-figure and their presence seem not related to the parataxonomical position of a specimen but rather to its preservation and lithology. There are several features more efficient in differentiation of all the available specimens as e.g. presence of median line or crowding of ridges. In that situation the above mentioned criterion suggested by Roedel appears insufficient for discrimination of the two ichnospecies. The two species are united here and discribed under the name of *Plagiogmus arcuatus* Roedel as more widely used in the literature.

Occurrence. The representatives of *Plagiogmus* were initially known only from erratic sandstone boulders derived from Quaternary deposits from Öland Id. (Nathorst 1897; Högbom 1925) and Germany (Roedel 1926, 1929). On the basis of lithological premises it was assumed that the sandstones are of the Middle Cambrian age ("Tessini Sandstone"). However, similar rocks were reported from the Lower Cambrian ("Olenellus Sandstone"). Taking this into account Häntzschel (1975) assumed that the stratigraphic range of *Plagiogmus* comprises the Middle? and, Lower? Cambrian. According to Glaessner (1969, p. 390), the specimens derived from Öland Id. were dated at the Early Cambrian on the basis of lithological premises by Martinsson. Similarly, the specimens described by Glaessner were derived from upper part of Arumbera Fm. (Central Australia), the top of which was dated at the Early Cambrian on basis of numerous traces of life activity of various animals including arthropods (see also Alpert 1977). Other specimens derived from Europe and Greenland are also dated at the Early Cambrian. Banks (1970) reported *Plagiogmus* from Duolbasgaissa Fm. of Finnmark (Norway), dated at the Early Cambrian on the basis of numerous trace fossils made by trilobites (*Cruziana, Rusophycus* and *Diplichnites*). The Spanish specimen (Crimes and al. 1977) appears to be of the same age. *Plagiogmus* reported from Ella Island Fm. in East Greenland (Cowie and Spencer 1970) is excellently dated by the records of both trace fossil assemblage and numerous trilobites.

In the North America, *Plagiogmus* was reported from the middle of Deep Spring Fm. in California (Cloud 1973) where it seems to appear earlier than traces made by trilobites, below the Fallotaspis zone with paleontological record. The *Plagiogmus* fossils were analysed in detail by Cloud and Bever (1973) who compared them with those derived from Flathead Sandstone in Wyoming and Parachilna Fm. in South Australia. The Flathead Sandstone is dated at the early Middle Cambrian (Glossopleura zone; see Lochman-Balk 1972, fig. 2); it is of the transgressive character and treated as lithostratigraphic unit possibly markedly diachronous. Unfortunately, the stratigraphic record is insufficient for accurate dating of the specimens from Wyoming.

It follows that *Plagiogmus* surely occurs in the Lower Cambrian but it is not possible to precise its stratigraphic range within the Lower Cambrian. It may be supposed that *Plagiogmus*-maker appeared earlier than trilobite fauna and it may, eventually, enter the lower Middle Cambrian.

Ichnogenus *Arcuatichnus* n. gen.

Type species: *Arcuatichnus wimani* n. ichnogen., n. ichnosp.

Derivation of the name: arcuatus (Lat.) — arcuate, from arcuate outline of transversal structures visible within burrows.

Diagnosis. Band-like (endichnia) flat burrows, are infilled with sandy material derived from bioturbated layer. Weathering of the broken surfaces of sandstone layers show a nonuniform structure represented by arcuate ridges.

Remarks. The ichnogenus described here resembles *Olivellites* (see Häntzschel 1962, W215, fig. 135,3), differing in clearly marked axial ridge as well as in shape and size of transversal structures. It somewhat resembles *Arthrophycus* (Häntzschel 1975, W38, fig. 25,4), differing in orientation in relation to the bedding planes and in structure of transversal structures; moreover, *Arcuatichnus* is here assigned to endichnia whilst *Arthrophycus* — to hypichnia.

Högbom (1925) compared this trace with other fossils including *Plagiogmus*, formerly described by Nathorst (1897), and for that purpose he refigured the latter in his paper. According to him, *Plagiogmus* was very similar but not identical with *Arcuatichnus* and they were not treated as identical throughout the text. Peterson and Clark (1974) compared their finds with the material described by Glaessner (1969), Cloud and Bever (1973), placing these forms in the genus *Plagiogmus*.

Burrows of *Plagiogmus* have a distinct, smooth bottom surface of the trail. On the surface there are also smooth and narrow transversal ridges. Unlike the *Plagiogmus* trails, the surfaces with *Arcuatichnus* ones have a very differentiated relief due to irregular weathering. Ridges of *Arcuatichnus* are clearly arcuate being a burrow infilling. They are the only element of the trail. On account of their origin they cannot be compared with ridges of *Plagiogmus*.

Occurrence. Lower Cambrian of Sweden and Poland, lower part of Middle Cambrian (see below) of Utah (USA).

Ichnospecies Arcuatichnus wimani n. gen., n. sp.

Pl. I, Figs 1—3

1905 Spuren No 2; Wiman, p. 56, Pl. IV, figs 5, 6.
1925 „Fossil..."; Högbom, pp. 216—217, figs 1, 2.
1974 *Plagiogmus arcuatus* Roedel; Peterson and Clark, pp. 766—768, fig. 1.

Derivation of the name: In honour of C. Wiman, who figured this form for the first time.

Material: Three sandstone slabs with several specimens on the surface.

Holotype: Specimen on Pl. I, fig. 1, Lower Cambrian, Protolenus zone, Poland, Świętokrzyskie Mts, Widełki (Łapigrosz).

Diagnosis. Band-like traces of burrows uniform in width, usually 25—35 mm wide, rectilinear or somewhat arcuate. Surface of the trace with clearly marked, arcuate ridges about 5—6 mm wide and separated by narrow furrows 1—2 mm wide; crests of successive ridges are about 1 cm distant from one another. Traces are set parallel to the bedding. Some specimens display (Högbom 1925) sutural line or poorly marked median ridge.

Origin of the trace fossil. According to Högbom (op. cit.) this structure is not a trace from creeping but it represents either a trace made by tail of crustacean swimming just above the bottom or burrow made by animal with loosely connected segments disintegrating after its death. Peterson and Clark (1974) interpreted this trace fossil as *Plagiogmus arcuatus* Roedel and assumed genesis identical as that suggested by Glaessner for this ichnospecies of *Plagiogmus*. However, this interpretation may be questioned. Arthropods appear responsible for making these traces. The analysis carried out by the present author showed that the ichnogenus belongs to endichnia in the Martinsson (1965) scheme and it represents traces of feeding in subsurficial parts of bottom deposits. A marked concentration of these traces on surfaces of the known rock slabs may be explained by a break or decreased rate of sedimentation following deposition of the layer subsequently subjected to bioturbation. The depth of browsing of the animals presumably depended on granulation and compactness of the bottom deposits and the burrows occurred at a definite, optimal depth below the bottom surface. Horizons with especially high concentration of the trails display a trend to formation of planes of separation within individual layers.

Environment inhabited by *Arcuatichnus*-maker. The life environment of *Arcuatichnus*-makers may be reconstructed on the basis of indirect evidence: composition of accompanying fauna, ichnocoenosis, lithological characteristics of deposits and sedimentary structures. The accompanying fauna from the Kinnekulle locality in Sweden (Högbom 1925) comprises some brachiopods and the trace fossils appear to be represented by those made by trilobites (e. g., *Cruziana)* whilst *Skolithos* is lacking. The cooccurrence of *Arcuatichnus* and *Skolithos* was found by Peterson and Clark (1974). From unknown reasons these authors interpreted *Arcuatichnus* (*Plagiogmus* in Peterson and Clark 1974) as a facies index equivalent with *Cruziana* and on that basis they carried out a highly complex analysis on interrelationships between the Cruziana and Skolithos facies.

The specimens illustrated here were derived from the Lower Cambrian deposits of the Świętokrzyskie Mts (= Holy Cross Mts). The deposits yield also trilobites and inarticulate brachiopods. Faunal remains are relatively common here. Cranidia and thorax fragments are concentrated on surface of layers or, sometimes, scattered in the deposits. The fauna is accompanied by one of the richest ichnocoenosis associations of the Cambrian of the Świętokrzyskie Mts which includes *Cruziana* (Orłowski and al. 1970, pp. 346 and 354; Orłowski 1975a, Pl. 2, fig. 11), *Diplocraterion* (Pl. 2, figs. 1, 2a, b) and endichnia and hypichnia burrows (Pl. 2, Figs 3—5). Both the preservation of faunal remains and the composition of association of trace fossils indicate very shallow marine environment.

In the Widełki area in the southern part of the Świętokrzyskie Mts (see map in Samsonowicz 1960, fig. 1; or in Orłowski and al. 1970), where from the material figured here is derived, deposits of the Cruziana facies (sensu Seilacher 1967) predominate. A perennial predominance of shallow-water conditions (Skolithos facies) is evidenced by the records of *Diplocraterion.* It is not possible to state with facies are related *Arcuatichnus* trails found here.

The comparison of data presented by Högbom (1925), Peterson and Clark (1974) and here showed that the ichnogenus *Arcuatichnus* is typical of neither Cruziana nor Skollithos facies. *Arcuatichnus*-makers lived in shallowest parts of marine basins which correspond to these two facies.

O c c u r r e n c e. This ichnogenus is represented by still not very numerous specimens which makes difficult to define its stratigraphic range. Wiman (1905) reported it from Lower Cambrian of Sweden and Högbom (1925) from the basal Cambrian from the slopes of Kinnekulle in Sweden. In the latter case the lower part of the profile is built by Mickwitzia Sandstone and overlying Lingulid Sandstone. The lithological premises indicate that the material was derived from lower part of upper lithological member. Lingulid Sandstone is at present assigned to the

Schmidtiellus mickwitzi and Holmia kjerulfi zones (see Martinsson 1974). Other specimens familiar to Högbom were also assumed to be derived from that member.

The specimens described by Peterson and Clark (1974) were derived from the top of Tintic Quartzite in Utah (USA), where they were accompanied by a fragment of trilobite. This formation is dated by the analogy to a profile wherefrom specifically unidentifiable representative of the genus *Olenellus* was reported. The authors assumed that the lower part of the formation may be still of the Early Cambrian age and the upper — of the Middle Cambrian age. However, the faunal record is very poor so the datings may change in the future along with supply of a new material. The basal part of the formation is of the transgressive character and the upper yields numerous *Skolithos*. Tintic Quartzite presumably represents a deposit of transgressive, diachronous facies so it does not contribute to this problem.

The Polish material is well dated. *Arcuatichnus wimani* n. ichnogen., n. ichnosp. was accompanied by trilobites *Ellipsocephalus sanctacrucensis* (Samson.), *Strenuaeva orloviensis* (Samson.), and *S. kiaeri* (Samson.) (Samsonowicz 1959; Orłowski 1975a). The trilobites recorded and the stratigraphic setting indicate the late Early Cambrian age (Protolenus zone; Czarnocki 1927; Samsonowicz 1956, 1959, 1960) of the *Arcuatichnus* material. The deposits belong to Ocieseki Sandstone Formation in the lithostratigraphical scheme proposed by Orłowski (1975b). The above stratigraphic data make it possible to assume that *Arcuatichnus wimani* occurs in the middle and upper parts of the Lower Cambrian whilst its occurrence in the Middle Cambrian may be treated is doubtful.

FINAL REMARKS

It is hoped that the above differentiation between ichnogenera *Plagiogmus* and *Arcuatichnus* will make possible to precise their stratigraphic ranges and thus their value as guide fossils. A record of *Plagiogmus arcuatus* from metamorphosed rocks of Bulgaria, hitherto considered as metamorphic Archaic deposits (Savov 1976) is an excellent example.

The origin of these traces is still disputable. The reconstruction is still based on logical premises and not on record of remains of organisms responsible for their formation.

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STRESZCZENIE

Wprowadzony przez Roedela (1929) ichnorodzaj *Plagiogmus* znany jest obecnie z licznych profilów kambru dolnego na świecie. Na podstawie opublikowanych dotychczas danych w niniejszej pracy uściślona została definicja ichnogatunku *Plagiogmus arcuatus*.

Analiza zasięgu stratygraficznego śladu wykazała jego obecność w niższej części kambru dolnego. Jedyne znalezisko uważane za środkowokambryjskie (Cloud i Bever 1973) nie jest udokumentowane biostratygraficznie. *Plagiogmus* występuje w osadach płytkowodnych odpowiadających ichnofacjom Cruziana i Skolithos według podziału Seilachera (1967).

Wyróżniony *Arcuatichnus* n. ichnogen. różni się od *Plagiogmus* brakiem wyraźnej powierzchni pełzania zwierzęcia. Nowy ichnorodzaj należy do endichnia (por. Martinsson 1965). Przemieszczanie się zwierząt doprowadziło do zmiany struktury osadu w obrębie rozkopań. Ślady ujawniają się na poziomych przełamach ławic w postaci przecinających się pasów zbudowanych z przylegających do siebie łuków. Struktury te podkreślone są przez nierównomierny rozpad piaskowców pod wpływem wietrzenia.

Dotychczasowe znaleziska pochodzą z osadów poziomów holmiowego i protolenusowego kambru dolnego. Znalezisko z Utah (Peterson i Clark 1974) pochodzi z utworów niedostatecznie datowanych biostratygraficznie. Ślady *Arcuatichnus* utworzone zostały w podobnym środowisku sedymentacyjnym jak *Plagiogmus*.

EXPLANATION OF PLATES — OBJAŚNIENIA PLANSZ

Plate — Plansza 1

Figs 1—3. *Arcuatichnus wimani* n. ichnogen., n. ichnosp. from quartzitic sandstone, Lower Cambrian (Protolenus zone), Ocieseki Sandstone Formation, Świętokrzyskie Mts, Widełki (Łapigrosz). Fig. 1 — holotype. The specimen from Fig. 2 is from Professor J. Samsonowicz collection.
Natural size, photo by B. Drozd, M. Sc.

Fig. 1—3. *Arcuatichnus wimani* n. ichnogen., n. ichnosp. z piaskowców kwarcytowych, kambr dolny (poziom protolenusowy), formacja piaskowców z Ociesęk (fm.), Góry Świętokrzyskie, Widełki (Łapigrosz). Fig. 1 — holotyp. Okaz przedstawiony na fig. 2 pochodzi z kolekcji Profesora J. Samsonowicza. Wielkość naturalna, fot. mgr B. Drozd.

Plate — Plansza 2

Fig. 1. *Diplocraterion* sp., large, retrusive form; arrowhead indicates preserved part of tube.

Fig. 2a, b. *Diplocraterion* sp., small, protrusive form.

Figs 3, 4. Horizontal tubes (endichnia) visible on broken surface of layer.

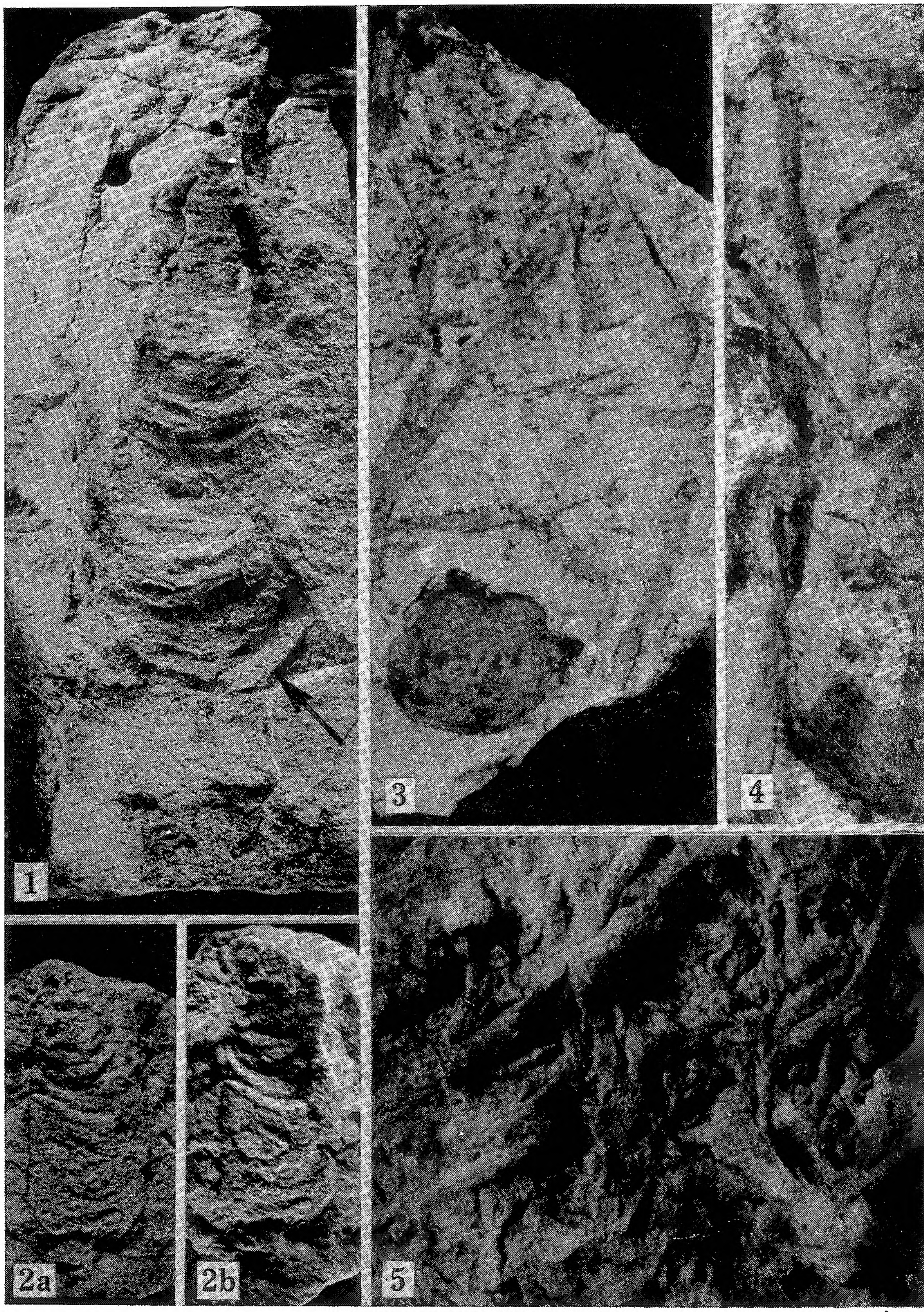
Fig. 5. *Phycodes-like* burrow (hypichnia).
All the specimens are derived from the same profile as those from Pl. 1; natural size, photo by B. Drozd, M. Sc.

Fig. 1. *Diplocraterion* sp., forma duża, retruzywna; strzałka wskazuje zachowaną część rurki.

Fig. 2a, b. *Diplocraterion* sp., forma mała, protruzywna.

Fig. 3, 4. Poziome rurki (endichnia) widoczne na przełamie ławicy.

Fig. 5. Rozkopania typu *Phycodes* (hypichnia).
Wszystkie okazy pochodzą z tego samego profilu co przedstawione na Pl. 1; wielkość naturalna, fot. mgr B. Drozd.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2a
2b
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