

ZOFIA MAŚLANKIEWICZOWA

SEMIONOTUS CF. *BERGERI* AGASSIZ, FROM THE LIAS OF THE
HOLY CROSS MOUNTAINS, POLAND

Abstract. — A specimen of a fish, described here as *Semionotus* cf. *bergeri* Agassiz, has been found in the siderite spherulite concretion from the gray claystones of the main ore-bearing series in horizon Ia of the „Edward” mine at Czarniecka Góra near Stąporków. This specimen represents two halves of the exoskeleton from their inner sides. The caudal fin and the endoskeleton are lacking. Sediments, in which this fish has been found, belong to the Lower Lias.

INTRODUCTION

The specimen of this fish, the elaboration of which was entrusted to me, has been found in 1955 by Professor R. Krajewski in the Zarzecze series (Samsonowicz, 1929) in the deposits of the main ore-bearing series (Krajewski, 1947), in gray claystones of the ore-bearing horizon Ia of the „Edward” mine at Czarniecka Góra near Stąporków (Końskie sheet).

This is the second successive specimen of a fish, coming from the main ore-bearing series. In 1837, fish impressions (considerably damaged during the excavation), identified by Agassiz (1844) as *Pholidophorus angustus* Agassiz, were found by Pusch (1837) in the ore-bearing deposits of the „Jan-Dziadek” mine near Stąporków. On the basis of this finding, Pusch regarded the ore-bearing series as Liassic.

The age of the ore-bearing series, was regarded by Kuźniar (1943) as Lias α . A similar age of this series was assumed by Krajewski (1958) who named it a main ore-bearing series. Cieśla and Kozydra (1958), calling it a Zarzecze series, assign it to the Lias α_1 . According to Karaszewski (1962), the Zarzecze series, in which also an upper part of the Gromadzice series is included by this author, corresponds with the Lias α_2 . The Lias α_3 age is ascribed to the Zarzecze series by Jurkiewiczowa (1963).

All authors are unanimous in regarding this series of the Lower Liasic age.

The Czałczyn ore-bearing horizon in which a fauna of marine pelecypods was found (Samsonowicz, 1929), testifying to a brief marine incursion that took place on the area of the northern slopes of the Holy

Cross Mountains (Góry Świętokrzyskie) in the final stage of the Lias, corresponds to horizon Ia of the main ore-bearing series of Czarniecka Góra. The most recent investigations (Dadlez, 1964) confirm this fact.

The fish described, found in the siderite spherolite, could also testify to the marine influence on the coastal basin in which clayey deposits were accumulated.

My thanks are due to Professor R. Krajewski who placed this material at my disposal for an investigation, to Professors: Z. Grodziński, R. Kozłowski, W. Krach, Dr J. Kulczycki and Dr A. Jerzmańska for their valuable help and remarks, as well as to Dr J. Małecki for his help and preparation of photographs and text-figures.

The specimen of this fish is housed in Prof. R. Krajewski's collection at the Department of Mining Geology of the School of Mining and Metallurgy in Cracow.

DESCRIPTION

Family *Semionotidae*¹

Genus *Semionotus* Agassiz, 1832

Semionotus cf. *bergeri* Agassiz, 1964

(Pls. I-II; Text-figs. 1-2)

Material. — One only specimen in two parts — its exoskeleton being seen from the inside. The trunk and the caudal part well-preserved, the scales distinct, the head and fins damaged, the caudal fin lacking. When the siderite spherolite was broken, the specimen was split in halves along its plane of symmetry.

Table 1
Dimensions of *Semionotus* cf. *bergeri* Agassiz

Dimensions	cm	%
Length of body without caudal fin	23.0	—
Greatest depth of body	6.8	20.5
Smallest depth of body	2.75	11.9
Length of head to posterior margin of oper- culum	5.5	23.9
Depth of head	4.8	20.8
Predorsal area	14.0	60.8
Prepectoral area	6.2	26.9
Preventral area	13.8	60.0
Preanal area	17.6	76.5
Length of maxilla	3.1	13.4
Length of mandibula	2.6	11.3

Description. — Body bilaterally moderately compressed. Trunk high. Its greatest depth equals $\frac{1}{4}$ of its length, the caudal fin excluded, and $\frac{1}{5}$, the caudal fin included. The length of the head is smaller than the greatest height.

The head is large, strong and rounded. The mouth short and wide; the upper jaw (maxilla) 3.1 cm. long and solid; its anterior part is slightly arching, posteriorly curved; the lower jaw is shorter (2.6 cm.)

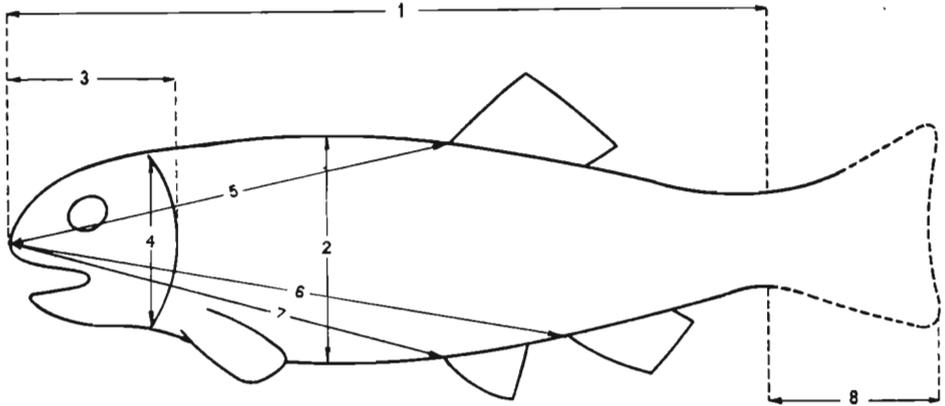


Fig. 1. — *Semionotus cf. bergeri* Agassiz, diagrammatic sketch of the fish with the measurements: 1 body length, caudal fin excluded, 2 body depth, 3 head length up to the posterior edge of operculum, 4 head depth, 5 predorsal space, 6 preanal space, 7 preventral space, 8 caudal fin length.

but also solid, its anterior part, together with the dentale on whose edges teeth are set, runs straight and then, arches upwards and backwards.

Teeth on the edges of both jaws (on the lower jaw much better visible) are small, spaced, conical, slightly concave on the inside and convex on the outside, with blunt tips (Pl. II, Fig. 1a). In addition to these marginal prehensile teeth, the inner, grinding teeth, un-aligned and in the form of low, flattened and widely based cones, are visible in the lower jaw (the mouth of the specimen is open). The angulo-articulare subtriangular.

On account of many fractures, boundaries between particular skull bones are difficult to trace (Pl. II, Fig. 1b). Tiny, rounded recesses, making up an impression of the granular configuration of the outer surface of the operculum, are visible in its upper part. The suboperculum is wide, triangular in outline and marked by densely distributed parallel rugae; some tubercles, as casts of the slime canal openings, are visible on the narrow, arched preoperculum; the interoperculum small, triangular; a fragment of the ceratohyale is marked between the angulo-articulare and the interoperculum.

Twelve fragmentary but clearly visible branchiostegal rays are disposed on the edge of the opercular apparatus; they are relatively narrow, delicate, distinctly articulated and arching towards the posterior part of the body. The gularis is present.

In the cheek region, two semicircular rows of circumorbital bones occur around the orbital part. Due to a poor state of preservation no further details could be determined.

The cleithrum and supracleithrum can be distinguished in the pectoral arch. Large, postcleithral scales are visible outside the pectoral arch.

The discernible morphological details, mentioned above, are shown in the reconstruction (Fig. 2).

The pectoral fin is situated just behind the head; it is small but was probably elongated, as indicated by its rays, partially outlined in the form of impressions. Three incomplete rays (lepidotrichia) of this fin have been preserved. Of further four, only their swelled basic parts (pterygiofores) are visible. Thereby a total number of rays variously preserved is seven.

The ventral fin, situated behind the body center near the anal fin, is also poorly preserved. Nine fin rays, in this number 7 distinct and 2 fragmentary, are visible. Lower parts of visible rays are straight and articulated; articuli are elongated and non-numerous; bifurcate parts of these rays are only very slightly outlined.

The anal fin (Pl. II, Fig. 2a) has seven articulated rays which bifurcate two times, displaying a very fine and regular articulation on their bifurcations. The height of the longest ray, measured from the posterior edge of the fin, amounts to 1.5 cm. Fragments of four large fin-fulcra are visible in the anterior part of this fin.

The best-preserved dorsal fin (Pl. II, Fig. 2b) is placed behind the center of the dorsum in the caudal region. Its posterior edge is almost aligned with anterior edge of the anal fin. The fin base is 4 cm. long (maybe, it was a bit longer). There are 17 clearly visible rays (maybe, there were more); four fragments of fulcra have been preserved in the anterior part of the fin. The exact height of this fin cannot be stated. The highest, the fifth in succession, central ray, together with the basic part and the top bifurcation (partially damaged), reaches 2.75 cm. On the basis of the rays preserved, it may be concluded that the dorsal fin was trapezoid in shape. The massive rays are slightly arched and inclined posteriorly. Anterior rays are higher than those following them. All of them are articulated from the base, articuli being elongated and uneven in size; the lower ones are longer than the upper; the top bifurcations of rays are double, articuli are fine and densely disposed.

The caudal fin (pinna caudalis) is lacking. Some notion as to its development may be supplied by the trace of a strongly outlined depression

in which the axis of the exoskeleton was impressed. In the distal part of the caudal region, the skeleton axis was arching upwards and dividing the tail into two asymmetrical parts, the upper one (lobus superior) smaller than the lower (lobus inferior). Since the trace of the inner axis gradually becomes ever thinner and ends on the boundary of the bases of the caudal fin rays, it may be assumed that this fin was homocercal and either even, or only slightly incised.

The lateral line (linea lateralis). — On some scales of the central part of the trunk and of the caudal region, approximately in successively following central parts of the scales, small tubercles may be associated with depressions on the outer (invisible) parts of the scales. The lateral line, in the form of a slight arch, dorsally bent, runs from the end of the caudal region up to the operculum. The course of its branchings is difficult to settle. Cheek pores (pori genales) are visible in the cheek region.

Scales. — The trunk is covered by rhomboidal scales, covered with ganoin. Oblique and horizontal rows may be distinguished in their system. The largest scales occur on the sides of the central part of the body, forming five horizontal rows. These scales are 0.45 cm. wide and 0.55 cm. high. Towards the dorsum, three successive rows consist of 0.3 cm. wide and 0.35 cm. high scales; the next five rows display scales 0.2 cm. wide and 0.25 cm. high. Clearly, then, the size of scales gradually decreases, their width being slightly smaller than the height along the entire stretch. The dorsal scales, both those on the trunk and in the caudal region, are acuminate and with a distinctly outlined dorsal ridge. Towards the belly, three successive rows display scales 0.4 cm. wide and 0.2 cm. high; the next four rows contain scales identical in width (0.4 cm.) but only 0.15 cm. high; the scales of this part of the trunk are clearly greater in width than in height; with identical width, the height of scales gradually decreases so that, in horizontal rows up to the ventral ridge, they take the form of narrow, elongated rectangles.

A considerable stretch of the caudal region is covered with smallest scales, shaped like regular rhombs 0.2 cm. in both width and height. It is only in a part of the caudal region where the axis of the exoskeleton (its trace) slopes upwards that the dimensions and shape of scales change, becoming greater in width than in height, or the scales become irregular in outline and considerably diminish. The last rows of scales of the distal part of the caudal region, in contradistinction to all others, do not directly reach the ventral or dorsal part but they contact narrow and elongated bases of the caudal fin rays.

There are 25 horizontal rows of scales, visible at the largest depth of the body. Of this number, 13 occur above the lateral line and 12 below it. In the tapering part of the caudal region the number of rows decreases to 17. In this area, 10 rows are situated above the lateral line and 7 below it.

Table 2

Comparison of characters of *Semionotus bergeri* Agassiz and of *S. cf. bergeri* Agassiz

Character	<i>Semionotus bergeri</i> Agassiz	<i>Semionotus cf. bergeri</i> Agassiz
Body length	18 cm.; 3 times larger than the largest depth	23 cm. (caudal fin excluded), presumably 28 cm. together with the caudal fin; about 4 times larger than the largest depth
Body shape	Fusiform; bilaterally moderately compressed; trunk deep	
Depth of the caudal region	About 1/3 or more of the greatest depth or equalling 1/2 of the greatest depth	Smaller than 1/3
Length of head + operculum	About 1/4 of the body length	Above 1/5 to 1/4
Snout	Short, wide, anteriorly rounded	
Upper jaw	Strong, slightly arched	
Lower jaw	Strong, shorter, posteriorly strongly arched	
Marginal (prehensile) teeth	Conical, spaced, found in both jaws	
Inner (grinding) teeth	Stronger*	Shaped like flattened cones with wide bases; not disposed in rows
Gulare	Present	
Preoperculum	Narrow and arched	
Pectoral fins	Just behind the head	
Ventral fins	Near the middle, between pectoral fins and anal fin; fulcra — present; 5 rays	Outside the middle, near the anal fin; fulcra? (anterior part of the fin damaged), 9 rays
Dorsal fin	Outside the middle of the dorsum; much deeper than 1/2 of the trunk in its anterior part; about 16 rays; 3-4 fulcra in the anterior part	Situated further outside the middle; its posterior ridge almost aligned with the anterior ridge of the anal fin; lower than 1/2 of the trunk; 17 rays; 5 fulcra situated in the anterior part

Table 2 (continued)

Character	<i>Semionotus bergeri</i> Agassiz	<i>Semionotus cf. bergeri</i> Agassiz
Anal fin	Opposite the posterior part of the dorsal fin; 6 rays; fulcra — present	Anterior ridge aligned with the posterior ridge of the dorsal fin; 7 rays; 4 fulcra situated in the anterior part
Fin rays	Strong; lower parts single, top parts forked with dense, fine segmentation	
Fin-fulcra	Strong, present on all fins	Recorded on the dorsal and anal fins; on account of impairments, on the pectoral and ventral fins — invisible
Scales	Rhomboid, disposed in oblique rows, thick, covered with ganoin, smooth except for the scales of the body flanks, displaying an ornamentation; the scales of the body flanks not much deeper than their width; the scales of the caudal region regularly rhombic	
Scale overlapping	Scales slightly overlap each other with their edges	
Manner of arranging	Scales extended in anterosuperior and posteroinferior angles	Scales join each other articulatingly in a manner, approaching the "peg-and-socket" joints
Dorsal ridge	Distinct; its sharpened scales form a sharp ridge	

* Except for a remark that the inner teeth are stronger than the marginal ones, no description may be found in the literature.

On a stretch between the head and distal part of the caudal region, there are 50 rows of scales and, therefore: $sqm = 13(50)12$, where $sqm =$ the system of scales, the value 13 before the paranthesis denotes the number or horizontal rows of scales above the lateral line, the value 50 in paranthesis refers to the number of oblique rows, counting from the head to the end of the caudal region, the value 12 behind paranthesis denotes the number of rows below the lateral line.

Slightly oblique costulae, either visible on the posterior edges of scales, or running almost along their entire surface, are outlined on some scales, particularly on the inner side of the anterior part of the trunk. No such ornamentation has been observed on the scales of the caudal part. The posterior edge of some scales, particularly in the anterior part of the trunk is fine-serrated.

In general, scales only slightly overlap each other; this overlapping is best marked in the first rows of the anterior part of the trunk; the scales on the sides of the body display articulated joints, related to "peg-and-socket" ones; in some of these scales, the anterosuperior angle is anteriorly and the posteroinferior angle posteriorly elongated, one or a few processes, entering the recesses in an overlapping adjoining scale, being visible on the edges of the scales. In further rows of the trunk scales, the processes are not so distinct and it is only in some scales that an anterior extension is visible in the anterosuperior angle. Similar conditions may be observed in the scales of the caudal region, except that the scales of its distal part near the base of the caudal fin do not display any distinct overlapping but are connected by processes, visible on upper and lower edges and have extended superior and inferior angles; some scales of the distal rows of the caudal region display short, serriform processes on their posterior edges.

Discussion. — The specimen described is not identical with a fish which, in 1837, was found by Pusch in this same horizon and which was identified by Agassiz as *Pholidophorus angustus* Agassiz. The latter species differs to a considerable extent in its slimly fusiform shape of the body with its small depth of the trunk, in pectoral fins much larger than ventral fins, in the smaller dorsal fin, thin scales and in the absence of the gular bone.

Our specimen resembles one of the representatives of the genus *Lepidotus* Agassiz in a similar shape of the body with its deep trunk, in a similar disposition of the fins and in the morphology of the scales. It differs, however, in the shape of the dorsal fin and jaws, particularly in the presence of the gular bone.

Such characteristics as, the strong jaws, the shape of the lower jaw, the shape and distribution of the fins, the morphology of the scales and the presence of the gular bone speak in favour of assigning this specimen to the genus *Semionotus* Agassiz.

As indicated by the following list of characters of *Semionotus bergeri* Agassiz and of the specimen investigated here (Table 2), the latter displays considerable similarity to *Semionotus bergeri* Agassiz.

Our specimen has much in common with *Semionotus bergeri* Agassiz and particularly, a characteristic structure of the jaws and of the dorsal fin, as well as a sharp dorsal ridge. Some differences may result, to a certain extent, from the imperfect state of preservation of the specimen described. The incompleteness of the fins may cause the number of their rays, mentioned previously, not to correspond with the accurate, real number. Likewise, the fulcra cannot be observed on pectoral and ventral fins on account of the lack of their anterior parts. The structure of the caudal fin may be reconstructed only on the basis of the trace

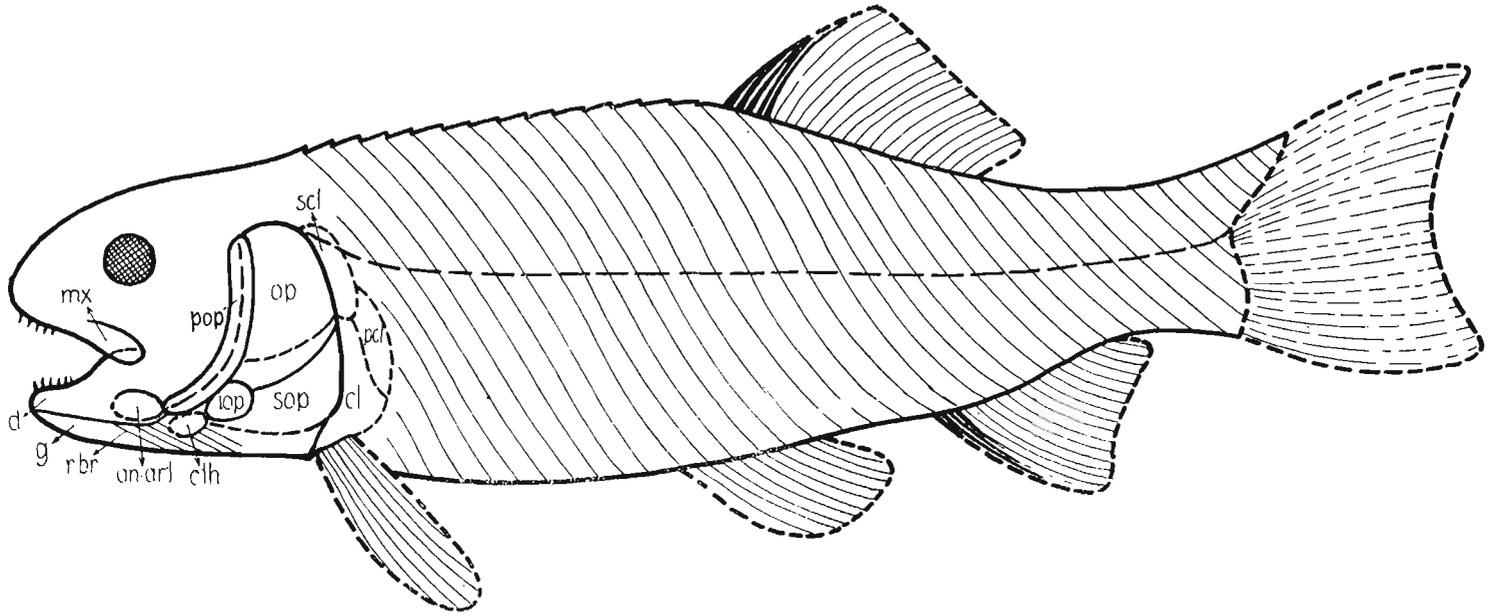


Fig. 2. — Reconstruction of *Semionotus* cf. *bergeri* Agassiz: *op* operculum, *sop* suboperculum, *iop* interoperculum, *cth* ceratohyale, *an-art* angulo-articulare, *rbr* radii branchiostegi, *g* gulare, *d* dentale, *scl* supracleithrum, *pcl* postcleithrum, *cl* cleithrum, *pop* preoperculum, *mx* maxilla.

of the endoskeleton axis and of the data, found in the literature, which allow one to consider it homocercal and slightly forked.

The incompleteness of the head does not also allow us for the distinction of many elements of which its particular regions consist (see Fig. 2).

Most species of the genus *Semionotus* Agassiz were described from non-European Upper Triassic deposits (Keuper), some of them, however, such as, *Semionotus pentlandi* Egert, *S. pustulifer* Egert (from Castellamare, South Italy), *S. leptcephalus* (de Boll-Wittenberg), *S. latus* (Seefeld near Innsbruck) were found in the European lagoon deposits of the Lower Jurassic. According to Agassiz (1843) and other authors, the sandstones of Coburg, from which *Semionotus bergeri* Agassiz was described, should be considered to be Lias and not Keuper.

Semionotus cf. *bergeri* Agassiz is the first representative of the genus *Semionotus* Agassiz, found on the territory of Poland.

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Kraków, August 1964*

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ZOFIA MAŚLANKIEWICZOWA

SEMIONOTUS CF. BERGERI AGASSIZ Z LIASU GÓR ŚWIĘTOKRZYSKICH

Streszczenie

W sferosyderycie pochodzącym z szarych iltów głównej serii rudonośnej, poziomu Ia, kopalni „Edward” w Czarnieckiej Górze koło Stąporkowa, został znaleziony okaz ryby. Okaz ten, na ogół w dobrym stanie zachowania, przedstawia dwie połowy zewnętrznego szkieletu od strony wewnętrznej. Brak mu płetwy ogonowej i szkieletu od strony wewnętrznej. Głowa i płetwy wykazują częściowe uszkodzenia. Osady, w których ryba została znaleziona, należą do dolnego liasu.

Mimo dużego podobieństwa do rodzaju *Lepidotus* Agassiz, cechy morfologiczne opisywanej ryby, a zwłaszcza odmienny kształt płetwy grzbietowej i szczęk oraz obecność gulara, nie pozwalają jej do niego zaliczyć.

Opisywana ryba różni się też od okazów, znalezionych w roku 1837 przez Puscha w tym samym poziomie rudonośnym, które Agassiz oznaczył jako *Pholidophorus angustus* Ag.

Okaz nasz swymi silnymi szczękami, kształtem szczęki dolnej, kształtem i rozmieszczeniem płetw, morfologią łusek i ostrą krawędzią grzbietową oraz obecnością gulara odpowiada rodzajowi *Semionotus* Agassiz. Najbardziej zbliża się on do gatunku *Semionotus bergeri* Ag., chociaż nie jest identyczny. Ponieważ znaleziono tylko jeden okaz, częściowo niekompletny, prowizorycznie określono go jako *Semionotus* cf. *bergeri* Agassiz.

Jest to pierwszy i dotychczas jedyny przedstawiciel rodzaju *Semionotus*, znaleziony w Polsce w utworach dolnego liasu.

ЗОФИЯ МАСЛЯНКЕВИЧОВА

SEMIONOTUS CF. BERGERI AGASSIZ ИЗ ЛЕЯСА СВЕНТОКРЖИСКИХ ГОР
(ПОЛЬША)

Резюме

Описанная рыба найдена в сферосидерите, выступающим в серых илах главной рудоносной серии, горизонта Ia, рудника „Эдвард”, в местности Чарнецка Гура около Стомпоркова. Горизонт этот принадлежит к нижнему леясу. Образец, довольно хорошей сохранности, представляет две половины внешнего скелета от внутренней стороны. Отсутствует хвостовой плавник и внутренний скелет. Череп и плавники частично повреждены.

Рыба эта очень сходна с родом *Lepidotus* Agassiz, но ее морфологические признаки, а особенно иная форма спинного плавника и челюстей, а также присутствие *gulare*, не позволяют причислить ее к этому роду.

Образец отличается от форм найденных в 1837 году Пушом (Pusch) в этом самом рудоносном горизонте, а определенных Агассизом (Agassiz) как *Pholidophorus angustus* Ag.

Наш экземпляр, на основании крепких челюстей, формы нижней челюсти, формы и размещения плавников, морфологии чешуй и острого спинного края, а также присутствия *gulare*, соответствует роду *Semionotus* Agassiz. Наиболее близкий он к виду *Semionotus bergeri* Ag., хотя не идентичный. Так как найден только один экземпляр, и то не совсем полный, предварительно определено эту форму как *Semionotus* cf. *bergeri* Agassiz.

Это первый и пока единый представитель рода *Semionotus*, найденный в Польше в отложениях нижнего леяса.

PLATES

Plate I

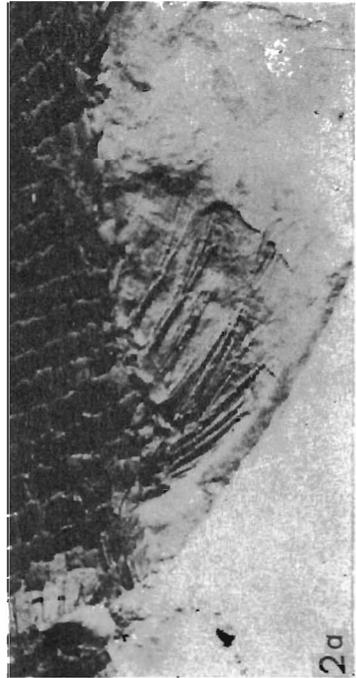
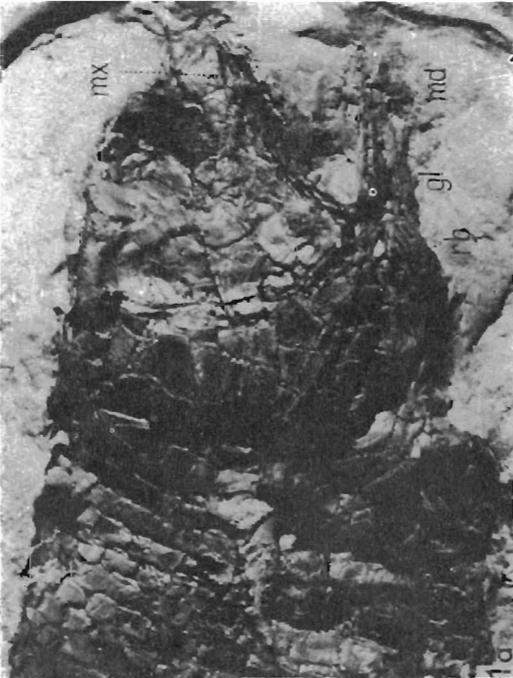
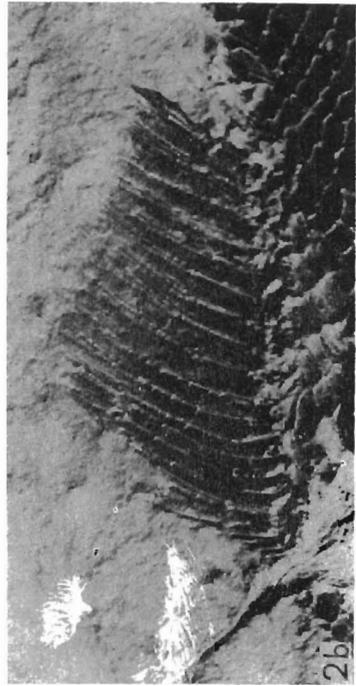
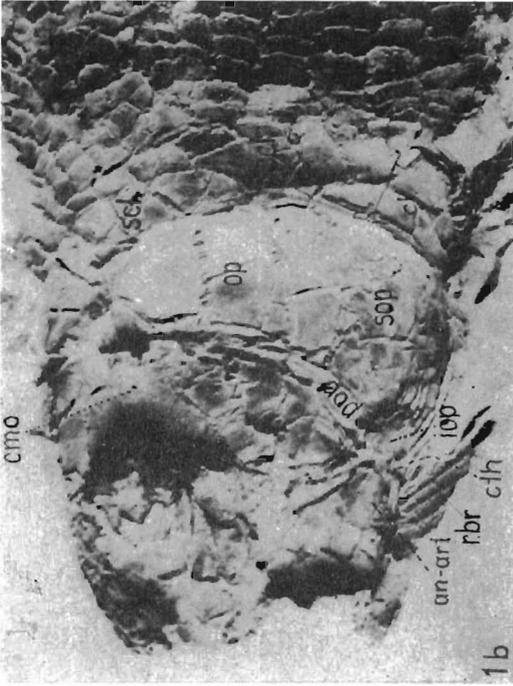
Semionotus cf. bergeri Agassiz

Fig. A. Right, inner side of the exoskeleton; 2/3 of nat. size.

Fig. B. Left, inner side of the exoskeleton; 2/3 of nat. size.



Phot. J. Malecki



5cm

0

A vertical scale bar is located to the right of the images. It has a total length of 5 cm, with a '0' at the bottom and '5cm' at the top. There are four tick marks between the 0 and 5 cm marks, dividing the scale into five equal segments of 1 cm each.

Plate II

Semionotus cf. bergeri Agassiz

- Fig. 1a. Head, viewed from the left inner side of the exoskeleton: *mx* upper jaw (maxilla) with teeth, *md* lower jaw (mandibula) with teeth, *gl* gulare, *rb* branchiostegal rays (radii branchiostegi).
- Fig. 1b. Head, viewed from the right inner side of the exoskeleton; head dermal bones: *op* operculum, *sop* suboperculum, *pop* preoperculum, *iop* interoperculum, *cmo* circumorbital bones (circumorbitalia), *cl* cleithrum, *scl* supercleithrum, *ps* postcleithral scales, *rb* branchiostegal rays, *an-art* angulo-articulare, *cth* ceratohyale (a fragment).
- Fig. 2a. Anal fin, 4 fragments of fulcra and 7 fin rays (lepidotrichia) visible.
- Fig. 2b. Dorsal fin, 4 fulcra and 17 fin rays (lepidotrichia) visible; articulation of lower, single rays and their top forkings is clearly outlined.