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## XENOGNATH TYPE OF POLYCHAETE JAW APPARATUSES

*Abstract.*— A new type of ?eunicid jaw apparatuses designated xenognath is described; it differs from previously known jaw apparatuses in having the denticulated ridges in compound jaws perpendicular to apparatus axis. It includes the Ordovician genus *Archaeoprion* nov., assigned to a new family Archaeoprionidae.

## INTRODUCTION

Ehlers (1864—1868) during his investigations on the Recent eunicids recognized two types of jaw apparatuses for which he introduced the names labidognath and prionognath. Two other types, called placognath and ctenognath, were proposed by Kielan-Jaworowska (1963, 1966). Here is described the new type named xenognath. This type includes an Ordovician family Archaeoprionidae nov. with a single genus and species *Archaeoprion quadricristatus* gen.n., sp.n. representing a new line in the evolution of the Polychaeta Errantia (? Eunicida).

The material described here is derived from two calcareous erratic pebbles, similar lithologically to Baltic limestone, collected by authors near Orzechowo (Baltic coast, province of Koszalin):

Pebble MZ VIII.0/25 (0.40 kg.) yielded *Baltisphaeridium* sp., *Melanosteus dentatus* Eis., *Vermiporella fragilis* Stolley, Chitinozoa: *Cyathochitina campanulaeformis* (Eis.), *Parachitina curvata* Eis. and *Conochitina claviformis* Eis., Foraminifera, Conodontophorida: *Amorphognathus complicatus* Rhodes, *Drepanodus suberectus* (Branson & Mehl) and *Panderodus gracilis* (Branson & Mehl), Hydroida and Problematica: *Palaeotuba* sp., *Kystodendron longicarpus* (Eis.) and *Chitinodendron bacciferum* Eis., polychaete apparatuses: *Tetraprion* aff. *pozaryskae* Kielan-Jaw., *Vistulella kozlowskii* Kielan-Jaw., *Archaeoprion quadricristatus* gen.n., sp.n., *Pistoprion* sp. and *Rhytiprion* sp., isolated jaws of *Mochtyella* sp., *Polychaetaspis* sp., *Atraktoprion* sp. and *Nothrites* sp., fragmentary Dendroidea and Tuboidea, silicified Porifera, Ostracoda, Brachiopoda, Gastropoda and Bryozoa. The presence of *Amorphognathus complicatus* indicates the Upper Caradoc age (zone *Amorphognathus superbus*, Oandu or Lower Rakvere Stage of Estonian sequence).

Pebble MZ VIII.0/65 (0.29 kg.) yielded *Baltisphaeridium* sp., *Melanosteus dentatus* Eis., *Vermiporella* sp., Chitinozoa: *Cyathochitina campanulaeformis* (Eis.), *Parachitina curvata* Eis. and *Conochitina claviformis* Eis., Foraminifera, Hydroida and Problematica: *Palaeotuba* sp. and *Kystodendron longicarpus* (Eis.), a single jaw apparatus *Archaeoprion quadricristatus* gen.n., sp.n., isolated jaws of *Vistulella* sp., *Mochtyella* sp., ?*Xanioprion* sp., *Polychaetaspis* sp., *Ramphoprion* sp. and *Kalloprion* sp., fragmentary graptolites, silicified Ostracoda and Brachiopoda. The fossil assemblage and lithological features similar to those of the former pebble suggest the Caradoc age of the boulder.

The described material is deposited at the Museum of the Earth of the Polish Academy of Sciences in Warsaw (abbreviated as MZ).

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#### XENOGNATH TYPE

Specific size gradation of main row jaws (MI, MII, MIII, MIV, MV) is a common feature of all apparatuses described so far — the jaws nearest the mouth are smallest and the farthest ones are largest. Moreover, the dentary of these jaws, both compound and simple, is always parallel to the axis of the apparatus or only a little oblique to it. The apparatuses described below differ so distinctly from all other forms that one can assign them to none of types hitherto known. The denticulated ridges of their flat, compound jaws are perpendicular to the apparatus axis and the largest ridges are nearest the mouth, whereas the smallest ones are in the posterior part of the apparatus. Further, it is impossible to homologize anyone element of *Archaeoprion* gen.n. with jaws of other polychaetes. For these reasons, the authors introduce here a new type named xenognath (Gr. *xenos*-strange, *gnathos*-a jaw) to include this form. Unquestionable lack of homology with the other types necessitated the introduction of some new terms explained by Text-fig. 1.

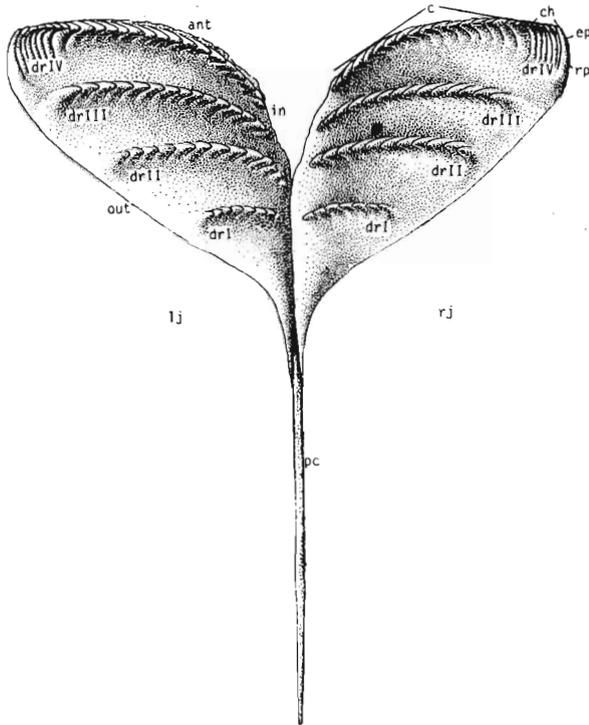


Fig. 1.—Terminology used for the description of xenognath jaw apparatuses: *am*—anterior margin, *c*—conoidal teeth, *ch*—chisel teeth, *dr*—denticulated ridge, *ep*—erect part of the chisel tooth, *im*—inner margin, *lj*—left jaw, *om*—outer margin, *p*—pseudocarrier, *rp*—recumbent part of the chisel tooth.

*Definition of xenognath type:* Jaw apparatus consisting of jaws with gaping myocoele openings and pseudocarrier; denticulated ridges perpendicular to apparatus axis.

#### DESCRIPTION

Order ?**Eunicida** Dales, 1962  
Family **Archaeoprionidae** nov.

*Diagnosis.*—Symmetrical jaw apparatuses of xenognath type consisting of two compound jaws and pseudocarrier. Compound jaws with some denticulated ridges.

*Discussion.*—The family is monotypic, erected to include *Archaeoprion* gen.n. with a single species *A. quadricristatus* sp.n.

The phylogenetic relations of the Archaeoprionidae with other polychaetes are not clear. Jaws with gaping myocoele openings are typical for placognath and ctenognath types too. But this similarity does not show

any phylogenetic relations. Kielan-Jaworowska (1961, 1966) regarded such jaws as very primitive. She thought that polychaetes jaws originate from folded and denticulated pharyngeal cuticle. Her opinion was supported by the authors during their electron microscopy studies (Mierzejewska & Mierzejewski, 1974). They observed in primitive Ordovician jaws a resemblance of the channel system with the position of collagen fibers in the polychaete cuticle (Pl. XXIV). Such resemblance could arise only during transformation of pharyngeal cuticle in jaws by the breakdown of collagen and some hardening processes (quinone tanning, mineralization). This way of jaw origin was found for eunicids, glycerids and nephtydid (Mierzejewska & Mierzejewski, in press). Supporting Kielan-Jaworowska's opinion means that jaws on the lower levels of evolution ought to have been characterized by gaping myocoele openings, regardless of systematic position.

Archaeoprionid apparatuses are very small, and there is a question whether they are juvenile stages of other apparatuses. This is impossible because:

a) immature specimens of all primitive hitherto-known Ordovician apparatuses differ only slightly from the adults, and the homology of both is clear (Kielan-Jaworowska 1966)

b) immature stages of Recent eunicids differ indeed from adults, but they are marked from the beginning by size gradation mentioned above, and their denticulated ridges are parallel to apparatus axis (vide Kielan-Jaworowska 1966, Pl. 1, Fig. 4; note that the pharyngeal cuticle of this specimen was disrupted during preparation, which is the cause of a little disturbance of jaw position),

c) all known jaws of archaeoprionids are represented by 5 individuals from two different pebbles. These jaws are almost equal in size and devoid any differences which may be treated as ontogenetic changes.

The assignment of Archaeoprionidae to eunicids is uncertain. They represent hitherto unknown phylogenetic line in polychaete evolution. One may assume that they died out in consequence of the competition for food of considerably larger eunicids. This is suggested by: (1st) the presence in their environment polychaetes armed with apparatuses several times the size of its, (2nd) the predacious and omnivorous (often cannibalistic) life habits of errant polychaetes, (3rd) the ineffectiveness of the delicate compound archaeoprionid jaws. The latter follows from Kielan-Jaworowska's (1961, 1966) reflections upon evolution of apparatuses.

#### Genus *Archaeoprion* nov.

*Type species: Archaeoprion quadricristatus* sp.n.

*Derivation of the name:* Gr. *archaios*-archaic, *prion*-a saw, alludes to very low degree of jaw organization.

*Diagnosis.* — As for the species.

*Stratigraphical and geographical range:* Upper Ordovician erratic pebbles, Baltic region.

*Archaeoprion quadricristatus* sp.n.

(Pls XXI—XXIII)

*Holotype:* Jaw apparatus MZ VIII.0/25/1, figured on Pl. XXI.

*Type horizon and locality:* Erratic pebble MZ VIII.0/25 of Upper Caradoc age (zone *Amorphognathus superbus*), Orzechowo, province of Koszalin.

*Derivation of the name:* Lat. *quatuor*-four, *crista* — a comb.

*Diagnosis.* — Almost triangular, plate-like compound jaws. Each jaw with four denticulated ridges. Denticulated ridge I lowermost, sometimes smooth. Denticulated ridge IV with chisel teeth. Pseudocarrier delicate, longer than jaws.

Denticle formula of the holotype (ch — chisel teeth):

	left jaw	right jaw
denticulated ridge IV	10ch+14	7ch+13
"    "    III	20	14
"    "    II	12	10
"    "    I	8	0

*Material.* — In addition to the type specimen there are two apparatuses (one incomplete) and two left jaws (Mz VIII.0/25/2—4, MZ VIII.0/65/1).

*Description.* — Dimensions of the holotype: length 0.355 mm, width 0.178 mm, length of pseudocarrier 0.209 mm.

Both jaws, almost equal in size, are of triangular outline. Inner margin of jaws passes sometimes into a thin cuticle connecting them. Denticulated ridges are arcuate anteriorly. This curvature is marked strongly near the inner margin. All teeth lean back and increase in size toward the outer margin. Denticulated ridge I is the smallest, and is sometimes undenticulated. Teeth of this ridge, 0—8 in number, are very little. Ridge II, longer than the former has more teeth (8—16). Ridge III resembles ridge II but differs in number of teeth (14—20) and is a little longer. Ridge IV, the largest, has two kinds of teeth: chisel-like (5—10) and conoidal (16—20). Chisel teeth (Pl. XXI, Pl. XXII, Fig. a, b, Pl. XXIII, Fig. b) are dissimilar to any other teeth of Polychaeta. They are closely packed and form a common cutting edge in the outer end of the ridge. One can distinguish erect and recumbent parts in the chisel tooth. The recumbent part may be short or very long, in one specimen (Pl. XXII, Fig. a) it begins between ridges II and III. Sometimes chisel teeth are strongly bent posteriorly. The recumbent part gently curves into erect part, the diameter of the tooth is almost equal along all length. The greatest part of the ridge IV is formed of typical conoidal teeth, resembling teeth of ridges II and III. There is a lack of intermediate forms between chisel and conoidal teeth. A little conoidal tooth has grown in one specimen

between chisel teeth, but without interrupting the cutting edge (Pl. XXII, Fig. b).

The pseudocarrier in all three apparatuses is single, long and vertical. It is wedged between posterior parts of jaws (Pl. XXII, Fig. d, Pl. XXIII, Fig. c). The pseudocarrier of the holotype is slightly asymmetric: it has two unequal folds in front and a single fold posteriorly. Pseudocarriers of the other two apparatuses are devoid of folds.

All elements of apparatuses are yellow and transparent; only the teeth are brown, which suggests their greater thickness.

*Variation.* — On account of the small number of specimens not much can be said as to the variability of this species. In addition to the variation in the number and shape of teeth, the variability also concerns the shape and length of the pseudocarrier.

*Remarks.* — *Archaeoprion* compound jaws are the most primitive among those so far described. *Mochtyella*, regarded by Kielan-Jaworowska (1961, 1966) as most primitive, has three denticulated ridges of different height, whereas *Archaeoprion* has as many as four ridges almost equal in height. For these reasons, in agreement with Kielan-Jaworowska's opinion on jaw evolution, one may assume that archaeoprionid jaws represent the lowermost known degree of jaw development.

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## KSENOGNATYCZNY TYP APARATÓW SZCZĘKOWYCH WIELOSZCZETÓW

*Streszczenie*

Opisano pod nazwą *Archaeoprion quadricristatus* gen.n., sp.n., ordowickie aparaty szczękowe wieloszczetów nowego, nieznanego dotąd typu budowy, nazwanego typem ksenognatycznym. Żaden element typu ksenognatycznego nie daje się homologizować z elementami pozostałych typów aparatów. Powoduje to poważne trudności w ustaleniu powiązań filogenetycznych rodzaju *Archaeoprion* gen.n. z innymi wieloszczetami. Utworzona dla tego rodzaju nowa rodzina Archaeoprionidae, stanowiąca nieznanym dotąd kierunek rozwoju ewolucyjnego Polychaeta Errantia, została prowizorycznie zaliczona do rzędu Eunicida.

Płytkowate szczęki złożone *Archaeoprion* gen.n. reprezentują najprymitywniejszy etap z poznanych dotąd w morfologicznej ewolucji aparatów szczękowych.

Opisany materiał pochodzi z głazów narzutowych zebranych w okolicy Orzechowa (woj. koszalińskie). Wiek głazów, ustalony na podstawie konodontów, określony został jako górny karadok (zona *Amorphognathus superbus*).

ПЁТР МЕРЖЕЕВСКИ &amp; ГРАЖИНА МЕРЖЕЕВСКА

## КСЕНОГНАТНЫЙ ТИП ЧЕЛЮСТНЫХ АППАРАТОВ ПОЛЫЧАЕТА

*Резюме*

Представлено описание под названием *Archaeoprion quadricristatus* gen. n., sp. n. ордовических челюстных аппаратов многощетинковых червей нового, не наблюдавшегося до сих пор типа строения, названного ксеногнатным типом. Ни один из элементов строения ксеногнатного типа не проявляет гомологических признаков с элементами остальных типов челюстных аппаратов. Это создает большую трудность в определении филогенетической связи рода *Archaeoprion* gen. n. с другими многощетинковыми. Образованное по этому роду новое семейство Archaeoprionidae, представляющее не наблюдавшееся до сих пор направление эволюции Polychaeta Errantia, было предварительно отнесено к отряду Eunicida.

Пластинчатые сложные челюсти *Archaeoprion* gen. n. представляют самый примитивный этап морфологической эволюции челюстей многощетинковых.

Описанный материал был найден в эрратических валунах, распространенных в районе с. Ожехово (Кошалинское воеводство). На основании конодонтов был определен верхнекарадокский возраст валунов (зона *Amorphognathus superbus*).

## EXPLANATION OF PLATES

### Plate XXI

#### *Archaeoprion quadricristatus* gen.n. sp.n.

Holotype, dorsal view; pseudocarrier somewhat deformed during preparation for SEM investigation, see also Pl. XXII, Fig. 4 (M.Z. VIII.O/25/1). SEM micrograph MZ. EM90,  $\times 370$ .

### Plate XXII

#### *Archaeoprion quadricristatus* gen.n., sp.n.

- Fig. 1. Entire left compound jaw with undenticulated ridge I (M.Z. VIII.O/25/2). SEM micrograph MZ. EM61,  $\times 540$ .
- Fig. 2. Incomplete left compound jaw without posterior part and denticulated ridge I (M.Z. VIII.O/25/3). SEM micrograph MZ. EM62,  $\times 650$ .
- Fig. 3. Nearly complete jaw apparatus devoid of ridges IV; ventral view of the right jaw and lateral view of the left one (M.Z. VIII.O/25/4),  $\times 220$ .
- Fig. 4. Pseudocarrier of the holotype (the drawing was made before the preparation of the specimen for SEM investigations), ca.  $\times 370$ .

### Plate XXIII

#### *Archaeoprion quadricristatus* gen.n., sp.n.

- Fig. 1. Part of the myocoele of the ridge III of the right compound jaw (M.Z. VIII.O/25/4). SEM micrograph MZ. EM59,  $\times 2500$ .
- Fig. 2a. Chisel teeth and some conoidal teeth, ridge IV of the right jaw, holotype. SEM micrograph MZ. EM91, ca.  $\times 840$ .
- Fig. 2b. Connection between the jaws and the pseudocarrier, holotype. SEM micrograph MZ. EM63, ca. 420.

### Plate XXIV

#### *Mochtyella cristata* Kielan-Jaworowska

Part of transverse section through the left MI (left — outer surface of the jaw). Channels perpendicular or oblique to the jaw surfaces were filled by microvilli; the remaining ones were formerly occupied by collagen fibers. TEM micrograph MZ. EM261,  $\times 10350$ .

