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SHORT COMMUNICATION

Kaljoprion – a new enigmatic jawed polychaete genus from the Upper Ordovician of Estonia

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Abstract. A new Late Ordovician polychaete genus *Kaljoprion*, with *K. laevaensis* gen. et sp. nov. as the type species, is described from the Nabala Regional Stage of the Laeva-18 drill core, central Estonia. The genus has a labidognath-type apparatus with the first and second maxillae equipped with anterior denticles developed into characteristic transversal ridges. Similar dentaries are observed in the jaws of distantly related *Rhytiprion*, suggesting a common feeding habit of both genera and representing a case of convergent evolution among Palaeozoic polychaetes.

Key words: scolecodonts, jawed polychaetes, taxonomy, convergent evolution, Late Ordovician, Estonia.

Ordovician scolecodonts (polychaete jaws) of Estonia have been studied for more than ten years (Hints 1998). Together with earlier data from Poland, particularly by Kielan-Jaworowska (1966), the Estonian material has made the Baltic area the best studied region in terms of Ordovician polychaetes (Hints & Eriksson 2007). However, several stratigraphically and ecologically important taxa have hitherto remained under open nomenclature, which notably hinders further studies. In this paper a new enigmatic genus, *Kaljoprion*, is described, based on the reconstruction of its jaw apparatus.

The material was obtained from open shelf marls and limestones of the Nabala Regional Stage (middle Katian) of the Laeva-18 drill core (central Estonia, ca 20 km NW from Tartu). For detailed geological background see Raukas & Teedumäe (1997). The descriptive terminology used below follows that of Jansonius & Craig (1971). The collection is housed at the Institute of Geology at Tallinn University of Technology (acronym GIT).

SYSTEMATIC PALAEONTOLOGY

Class Polychaeta Grube, 1850

Order Eunicida Dales, 1963

Family *Incertae sedis*

Kaljoprion gen. nov.

Type species. *Kaljoprion laevaensis* sp. nov.

Derivation of name. Named in honour of Prof. Dimitri Kaljo, my former supervisor and a supporter since the beginning of my scientific career; Greek, *prion* – saw, a common suffix for naming scolecodont-bearing polychaetes.

Diagnosis. Asymmetrical jaw apparatus of labidognath type. Left MI with subtriangular outer face and prominent inner wing that extends for two-thirds of jaw length. Right MI with distinct ramus and bight, suggesting presence of basal plate. First to third denticles in MI developed into transversal ridges, anteriormost one occupying more than half of jaw width. Second maxillae subrectangular with deeply rounded bight. Anterior part of jaw occupied by long transversal ridge, shank with small knob-like denticles, slightly shorter than ramus.

Stratigraphical and geographical range. Upper Ordovician (Nabala Regional Stage) of Estonia.

Remarks. On the basis of characteristic denticulation the jaws of *Kaljoprion* are most similar to those of *Rhytiprion* Kielan-Jaworowska, a genus with a placognath-type apparatus. There are nevertheless several important differences, which also suggest that the jaw apparatus of *Kaljoprion* belongs to labidognath type: (1) symmetrical right and left MII with the ramus and denticulated shank, (2) presence of a prominent inner wing in the left MI, (3) presence of the subtriangular outer wing in the left MI, and the ramus and bight in the right MI, suggesting the existence of the basal plate, and (4) myocoele openings that are slightly enclosed (Figs 1, 2). No other polychaete with labidognath apparatus has similar transversal ridges, but some polychaeturids may have anterior denticles of the MI that are slightly transversally stretched (Hints 2000, pl. 2, figs 1, 2). On that basis Hints (2000, pl. 2, fig. 7)

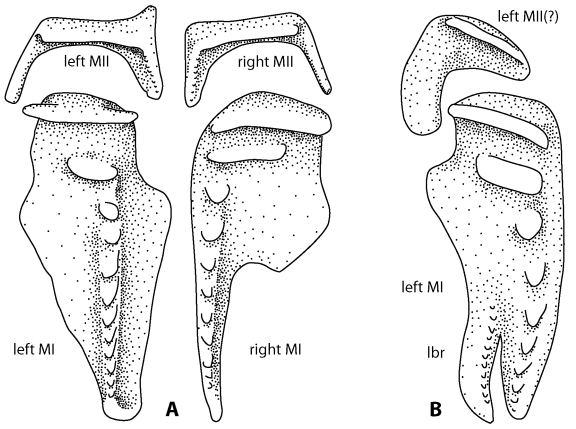

Fig. 1. Reconstruction of jaw apparatus of *Kaljoprion laevaensis* gen. et sp. nov. (**A**), and comparison with *Rhytiprion magnus* Kielan-Jaworowska, 1966 (**B**).

assigned *Kaljoprion* tentatively to Polychaeturidae. Hints & Eriksson (2007, table 2) also referred to *Kaljoprion* as Polychaeturidae? gen. nov. A. The type and only species of *Kaljoprion* nevertheless differs from polychaeturids in having a shorter posterior margin in the left MI, differently shaped MII, and much more prominent transversal ridges in MI and MII. Therefore this family level assignment remains doubtful. It cannot be excluded that *Kaljoprion* belongs to a new family, but as only the first and second maxillae are known, it is more appropriate to keep it under open nomenclature for the time being.

Kaljoprion laevaensis sp. nov.

Figures 1A, 2

2000 Polychaeturidae? new genus; Hints, pl. 2, fig. 7.

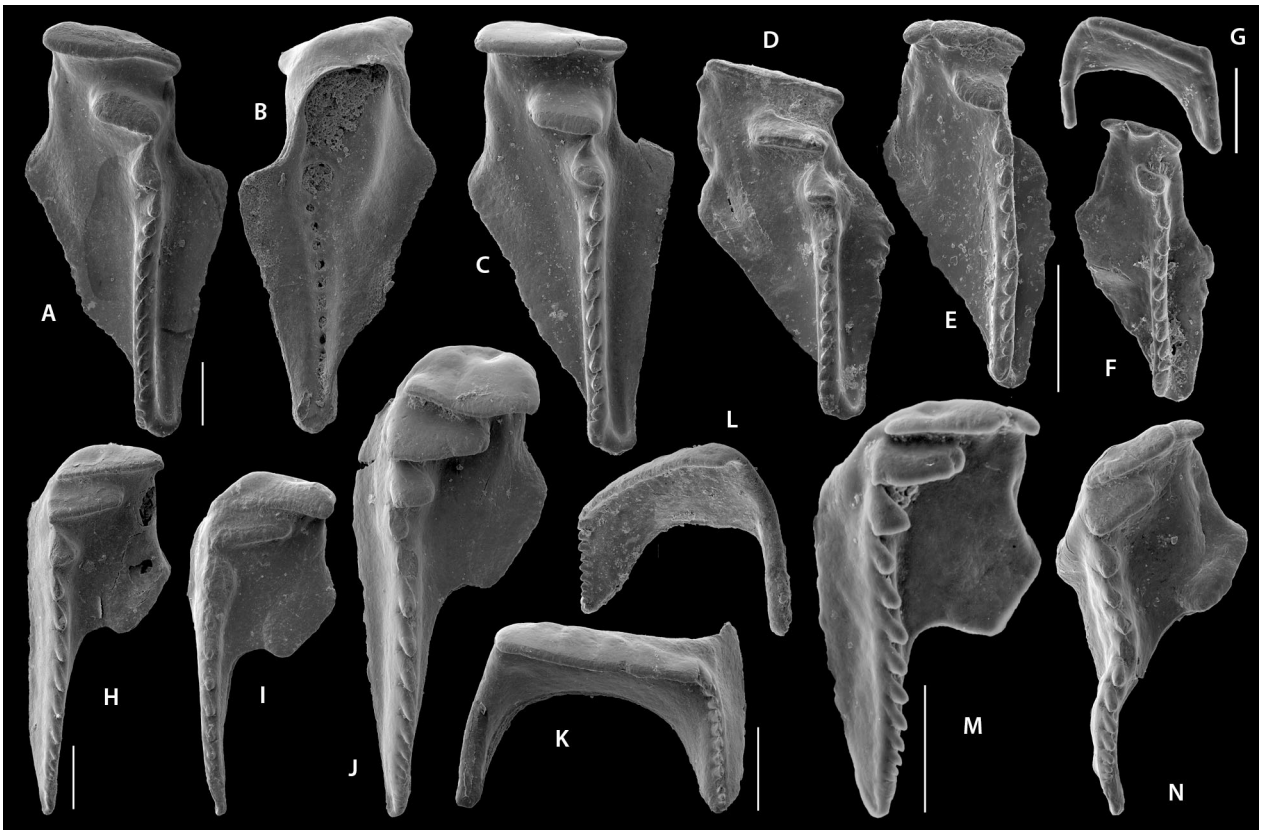

Fig. 2. SEM-micrographs of selected specimens of *Kaljoprion laevaensis* gen. et sp. nov. from the Nabala Regional Stage, middle Katian, of the Laeva-18 borehole, central Estonia. Scale bars correspond to 100 μm and apply to all consecutive photographs until the next scale bar appears. All specimens in dorsal view except B, which is in ventral view. **A–C**, **H**, **K**, **L** from sample M-14428, depth 224.0 m; **D**, **E**, **G**, **I**, **M**, **N** from sample M96-36, depth 225.15 m; **F** from sample OM97-206, depth 226.35 m; **J** from sample OM97-208, depth 224.50 m. **A**, **B**, left MI (holotype), GIT 388-1; **C**, left MI, GIT 388-2; **D**, left MI, GIT 388-3; **E**, left MI, GIT 388-4; **F**, left MI, GIT 388-5; **G**, left MII, GIT 388-6; **H**, right MI, GIT 388-7; **I**, right MI, GIT 388-8; **J**, right MI, GIT 388-9; **K**, left MII, GIT 388-10; **L**, right MII, GIT 388-11; **M**, right MI, GIT 388-12; **N**, right MI, GIT 388-13.

Derivation of name. Named after the type locality, the Laeva-18 borehole.

Holotype. Left MI, GIT 388-1, Fig. 2A, B.

Type locality and horizon. Laeva-18 borehole of central Estonia, depth 224.0 m, Saunja Formation, Nabala Regional Stage, middle Katian, Upper Ordovician.

Material. 22 right MI, 37 left MI, and 20 left and right MII from the Laeva-18 borehole, interval 224.0–226.8 m (see Table 1).

Diagnosis. As for the genus.

Description. Asymmetrical jaw apparatus of labidognath type consisting of paired MI and MII; basal plate most likely present, other jaws unknown.

Left MI: L = 0.22–0.68 mm, L/W = 1.8–2.4 (holotype: L = 0.65 mm, L/W = 2.0). Outer face subtriangular, its maximum lateral extension located at about 0.3–0.4 of jaw length from anterior. Postero-lateral margin nearly straight or slightly sinusoidal, meeting the ridge before the posterior termination. Inner wing subtriangular, tapering posteriorly, occupying up to one-third of jaw width and reaching to about two-thirds of jaw length from posterior. Posterior margin narrow, convex, placed to the right of the ridge. Dentary composed of two transversal ridges in the anterior part, followed by one large, sometimes transversally slightly widened denticle and 7–11 small nearly equal-sized denticles. Transversal ridges slightly slanting postero-medially; the first ridge corresponds to about 0.75 of jaw width, the second one is half as long as the first. In ventral view, cover extends to about 0.1 of jaw length. In juvenile specimens the first transversal ridge is composed of three separate transversally widened denticles, the length of the second ridge forms about one-third of the first ridge.

Right MI: L = 0.31–0.74 mm, L/W = 1.8–2.6. Outer margin directed postero-laterally at anterior 0.3–0.4 of jaw length, then bending steeply and running postero-medially towards the tip of ramus. Ramus extends to 0.5–0.6 of jaw length. Shank is slender, tapering posteriorly. Dentary similar to that in left MI, with two long transversal ridges in anterior part. The first ridge corresponds to 0.7–0.85 of jaw width, the second ridge to 0.5–0.6 of jaw width. The following denticle is larger than others, transversally slightly widened or rounded and blunt. Remaining part of dentary composed of 8–10 normal denticles decreasing in size posteriorly. In ventral view, myocoele very slightly enclosed, cover extending to 0.1 of jaw length or less. In juvenile specimens a separate denticle is present in lateral portion of the first transversal ridge and occasionally in the second transversal ridge.

Left MII: L = 0.13–0.22 mm, L/W = 0.65–0.8. Sub-rectangular jaw, wider than long, with wide and straight anterior margin. Ramus is more slender and slightly longer than shank, bight is widely rounded. Anterior part of jaw has long transversal ridge similar to those in MI, corresponding to 0.75 or more of jaw width. Shank has 6–11 small equal-sized denticles; sometimes the denticles are indistinct.

Right MII: L = 0.17–0.23 mm, L/W = 0.7–1.0. Jaw is almost mirror reflection of right MII.

Variability. Jaws of *K. laevaensis* vary rather widely in size. In argillaceous sediments the jaws are commonly compressed and distorted; thus the length/width ratio and the general outline of the maxillae, including the shape of inner and outer wings, are also variable. The denticulation pattern and size of the transversal ridges are more stable, with the exception of ontogenetic changes discussed below.

Distribution. *Kaljoprion laevaensis* is a common taxon in the upper Mõntu and Saunja formations of the Nabala Regional Stage, accounting for up to 13% of specimens in the assemblage, but has not been recovered from the lowermost part of the Nabala Stage and from the overlying Vormsi Stage, which generally share similar polychaete faunas (e.g. Hints & Eriksson 2007). The limited vertical range indicates biostratigraphical potential of *Kaljoprion*. However, material from other localities is necessary to ascertain whether the spatial distribution of this species is facies-dependent.

Remarks. Although the apparatus types are not formal taxonomic units, they seem to convey broad phylogenetical relationships (Kielan-Jaworowska 1966). Since the jaw apparatuses of *Kaljoprion* and *Rhytiprion* are supposed to belong to different apparatus types, the transversal ridges most likely represent a polyphyletic character that has developed independently in two rather distantly related taxa.

Polychaetes use their jaws primarily for feeding and digging. The feeding habits of extant polychaetes are diverse and not directly related to the presence of jaws. Hence it is generally problematic to infer feeding habits of fossil polychaetes based on the jaws (Eriksson et al. 2004 and references therein). The transversal ridges are, however, exceptional, since they have developed independently in two different genera, suggesting clear functional benefit for a particular lifestyle, most probably a specific feeding type and diet. Bergman et al. (2003)

Table 1. Numbers of individual jaws of *Kaljoprion laevaensis* gen. et sp. nov. recovered from the Laeva-18 borehole

Sample	Depth, m	Left MI	Right MI	MII
M-14428	224.00	4	2	3
OM97-208	224.50	6	4	2
OM97-207	225.00	3	2	3
M96-36	225.15	14	11	7
OM97-206	226.35	9	3	5
M96-37	226.80	1	0	0
Total		37	22	20

suggested that the transversal ridges in the jaws of *Rhytiprion* may have been useful for crushing and grinding food rather than grasping or penetrating prey. Another plausible explanation is that the ridges were used for grazing, although hard substrates may have been difficult to find in the muddy facies that both *Rhytiprion* (see Bergman et al. 2003) and *Kaljoprion* seem to have preferred. In any case, the great morphological similarity between their jaws most likely indicates that *Kaljoprion* and *Rhytiprion* shared a common feeding habit and occupied a similar ecological niche. This is further supported by the fact that both genera co-occur in the studied samples and in similar abundance. Consequently, the transversal ridges can be taken as an example of convergent evolution among polychaetes. In juvenile posterior maxillae of *K. laevaensis* the first transversal ridge is commonly composed of two or three separate laterally widened denticles. This is especially evident in the smallest jaw recovered (see Fig. 2F, but also Fig. 2E, M, N). Such ontogenetic dimorphism may indicate a change in feeding habit during the life span (not accounting the larval stage). On the other hand, it may also suggest that the ridges have phylogenetically evolved through fusion of several denticles rather than through widening of individual ones. It remains to be studied if the same pattern may also apply to *Rhytiprion*.

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Kaljoprion gen. nov. – enigmaatiline lõuguslaste perekond Eesti Ülem-Ordoviitsiumist

Olle Hints

On kirjeldatud uut lõuguslaste (Polychaeta, Eunicida) perekonda *Kaljoprion* ja selle tüüpliiki *K. laevaensis* Laeva-18 puuraugust (Kesk-Eesti) Nabala lademest (Ülem-Ordoviitsium). *Kaljoprion*'i iseloomulikuks tunnuseks on labidognaatne lõuaaparaat ja transversaalselt laienenud hambad maksillidel. Sarnase hammastu esinemine plakognaatse aparaadiga *Rhytiprion*'il viitab selle tunnuse polüfüleetilisusele, olles tõenäoliselt seotud eri taksonite sarnase toitumisviisiga.