

The Upper Homeric (Silurian) machaerid sclerite from Lithuania

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Machaerids are a branch of Lophotrochozoans closely related to the Annelids known from the Early Ordovician to the Mid Permian marine environments. One specimen of machaerid sclera was found in the Viduklė-61 well, Siesartis Formation, at the depth of 1 285.1 m. Along with the specimen, the graptolite species of *Colonograptus deubeli* (Jaeger) was found, which is a mark of the Late Homeric, Gėluva Age. Brachiopod fauna shows that at this time there was an anaerobic, low turbulence and low shelf marine environment, i. e. BA 4–5 zone of the benthic brachiopod assemblage. Machaerid studies have shown that it belongs to the Plumulites genus. Without a full animal print with all sclerites we cannot accurately describe these fossils.

This is the first specimen which was found in Lithuania, Gėluva Regional Stage. This finding will give more information about fauna recovery after extinction in the Early Gėluva Regional Stage, also known as the *ludgreni* Event. With the help of machaerid findings, we also could reconstruct palaeoenvironments and autecology.

Key words: Silurian, Upper Homeric, machaerid, Plumulites, Lithuania

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INTRODUCTION

Machaerids are a group of worm-like, problematic benthic marine, armored invertebrates of the Paleozoic (Högström, 1997) known from the Early Ordovician to the Mid Permian (Adrain, 1992). Their body is covered by an external, dorsal skeleton or scleretome, which consists of plates or sclerites arranged in two or four longitudinal rows (Högström, 2000). Sclerites are composed of calcite. Completely articulated specimens of machaeridians are very rare. The majority of found remains are disarticulated sclerites.

Machaerids have been known for more than 150 years (de Koninck, 1857) but the system-

atic position of this group has been a matter of controversy. They had been assigned variously to barnacles, mollusks, echinoderms and annelids (Vinther, Briggs, 2009). The systematic position of machaerids made matters clearer when the machaeridian was found with preserved soft parts (Vinther et al., 2008). So, now the dominant view is that machaerids are a branch of Lophotrochozoans closely related to the Annelids and they were armored annelid worms.

Data of machaeridians from Lithuania have been absent. There is only one brief report on Llanoverly machaerids of Lithuania (Radzevičius, Ekleris, 2012). However, the Silurian machaerids are known from other parts of the world. The

Silurian machaerids are known from Avalonia (de Koninck, 1857; Woodward, 1863; Withers, 1936; McCobb, Bassett, 2008), Baltica (Adrain et al., 1991; Högström, 1997, 2000; Högström et al., 2002), Gondvana (Chapman, 1910; Kobayashi, Hamada, 1976), Laurentia (Hall, Whitfield, 1875; Clarke, 1896; Withers, 1936; Högström, Taylor, 2001) palaeocontinents and the Perunica terrane (Barrande, 1872).

The purpose of this report is to document the first finding of Upper Wenlock machaeridians. Only one disarticulated sclerite has been found, but it is important for taxonomic and morphological investigations, as well as for the studies of palaeogeography, oryctocenoses and community dynamics.

MATERIAL

New material of machaerids comes from the Viduklė-61 well core. The Viduklė-61 well is located in the Central part of Lithuania (Fig. 1). One isolated sclerite has been found at the 1 285.1 m depth in the Siesartis Formation, Gėluva Regional Stage (Fig. 2). Together with the machaerid sclerite, the *Colonograptus deubeli* (Jaeger) graptolite has been identified, which shows the *deubeli* Biozone of the Upper Homerian, Lower Silurian (Kojelė et al., 2014). There is graptolite and conodont extinction in the Lower part of the Gėluva Regional Stage. These extinctions are called the *lundgreni* Event (Koren, 1987) or the Big Crisis (German Große Krise) (Jaeger, 1991) or the Mulde Event

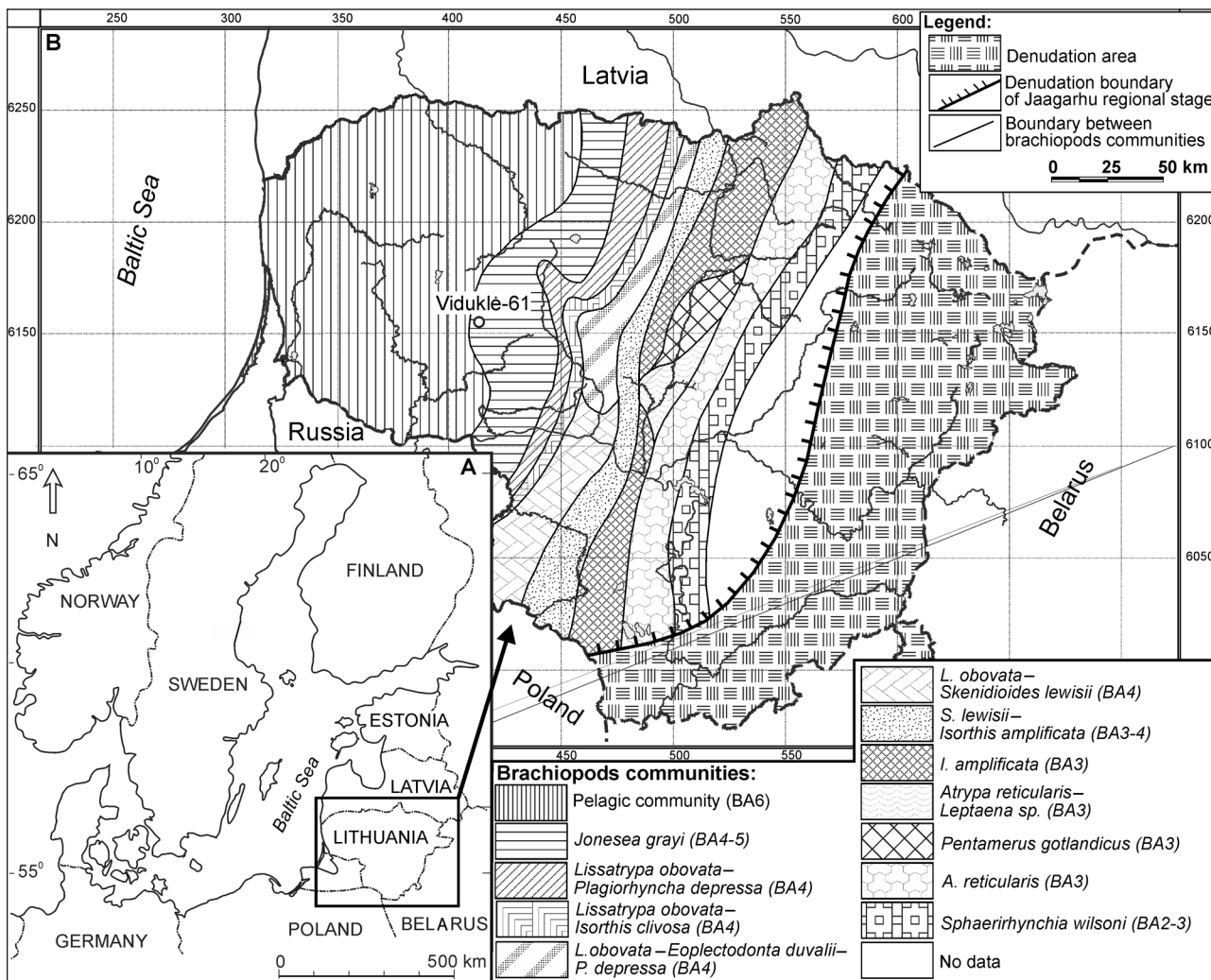


Fig. 1. A – General map of the Baltic area. B – Distribution map of the brachiopod communities for the Gėluva Age (Musteikis, 2005) and the location of the Viduklė-61 well

1 pav. A – Bendras Baltijos kraštų žemėlapis, B – Gėluvos amžiaus pečiakojų bendrijų paplitimo žemėlapis (Musteikis, 2005) ir Viduklės-61 gręžinio padėtis

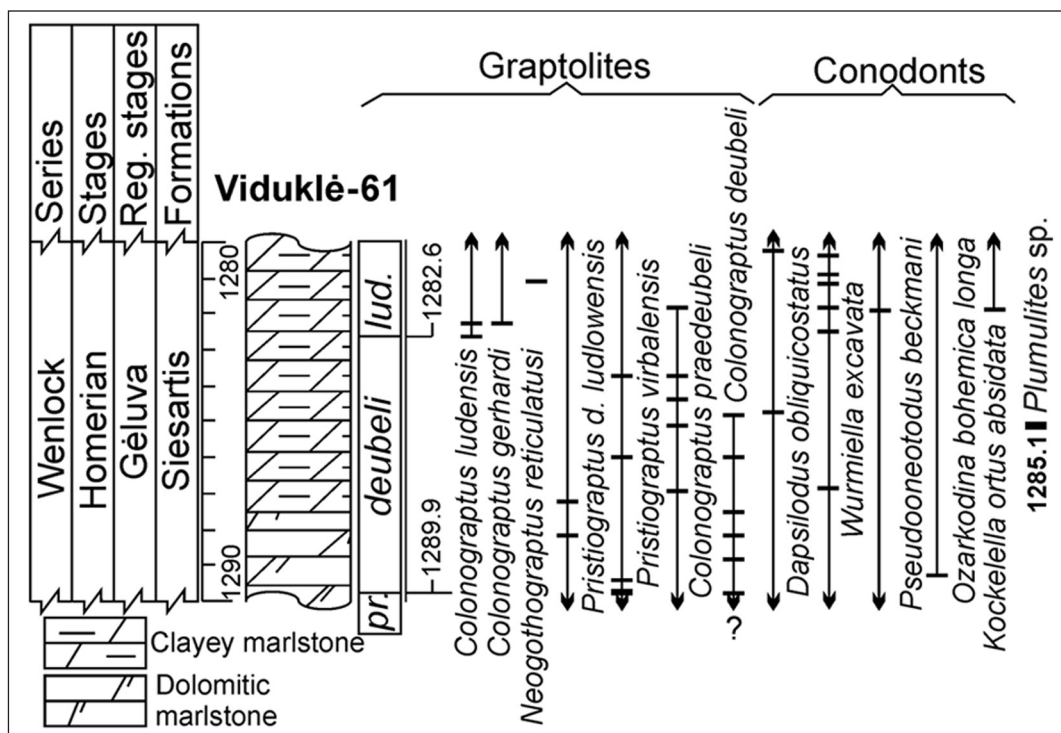


Fig. 2. Distribution of graptolites and conodonts in the investigated interval of the Viduklė-61 core (after Radzevičius et al., 2014)

2 pav. Tirtojo intervalo graptolitų ir konodontų paplitimas Viduklės-61 gręžinyje (pagal Radzevičius ir kt., 2014)

(Jeppsson et al., 1995). So, the sclerite has been found above the *lundgreni* Event in the *deubeli* Biozone in the fauna recovery interval (Cramer et al., 2012).

The Siesartis Formation consists of clayey marlstone and dolomitic marlstone in the investigated interval of the Viduklė-61 well. According to the brachiopods data there is distinguished the *Jonessea grayi* brachiopod community (Martma et al., 2005). It shows low turbulence in the dysaerobic and soft substrate environments of the BA4-5 zone (Musteikis, Juškutė, 1999).

The material is stored in the Department of Geology and Mineralogy of Vilnius University.

SYSTEMATIC PALAEOLOGY

Machaerids are a branch of Lophotrochozoans, closely related to the Annelids. There are three machaeridian families: Lepidocoleidae, Plumulitidae and Turrilepadidae (Adrain, 1992).

The machaeridian is described under the open nomenclature, though one disarticulated sclerite cannot be assigned to any species, which descriptions are based on complete articulated skeletons.

A descriptive terminology of machaeridians follows that of Adrain (1992), Hore et al. (1996), and Högström (1997).

Phylum ANNELIDA Lamarck, 1809
Class MACHAERIDIA Withers, 1926
Order TURRILEPADOMORPHA Pilsbry, 1916
Family PLUMULITIDAE Jell, 1979
Genus PLUMULITES Barrande, 1872
Plumulites sp. (Fig. 3)

Material and locality. One isolated inner right sclerite (VU-MACH-VID61-2). The sclerite comes from the Siesartis Formation, Gėluva Regional Stage, Upper Homeric, *deubeli* Biozone of the Viduklė-61 well core, from 1 285.1 m depth.

Description. Small, heart-shaped sclerite. The length is 1.7 mm, width 1.8 mm. Medial non-accreting and lateral non-accreting margins are not visible, marginal spines are invisible. The unbo area is crumbled off. Longitudinal fold is non-existent on the sclerite. Inflections (i_1 – i_3) are present. The total number of rugae ranges is 20, approximately 12 per mm.

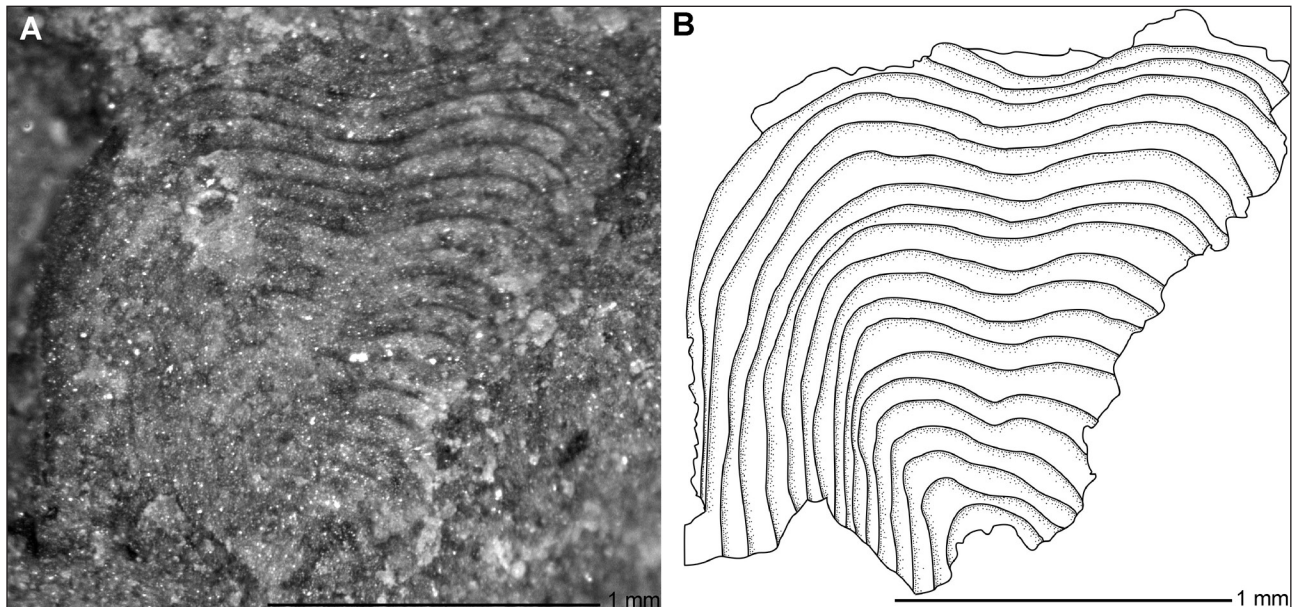


Fig. 3. *Plumulites* sp., isolated inner right sclerite (VU-MACH-VID61-2), Siesartis Formation, Gėluva Regional Stage, Upper Homeric, *deubeli* Biozone, Viduklė-61 well core, 1 285.1 m depth. A – Photo of sclerite. B – Picture of sclerite
3 pav. *Plumulites* sp. vidinis dešinysis skleritas (VU-MACH-VID61-2), Siesarties svita, Gėluvos regioninis aukštas, viršutinis homeris, *deubeli* biozona, Viduklės-61 gręžinys, gylis 1 285,1 m. A – nuotrauka, B – piešinys

Discussion. The differences between turrilepadids and plumulitids isolated sclerites are very minor. The major difference is in the number of sclerites inflexions (Adrain et al., 1991). Inner and outer sclerites of plumulitids have three inflexions. There are five inflexions on inner sclerites and three inflexions on outer sclerites of turrilepadids. The described sclerite is similar to the *Plumulites eueides* Högström and Suzuki inner sclerite from Sweden, Kallholn Quarry, Upper Ordovician (Katian) Boda Limestone (Högström et al., 2009; Fig. 2A). New material comes from the Uppermost Wenlock. There is a big age difference between these plumulitids. Other differences are in the rugae ranges and in the size of the sclerite. The inner sclerite of *P. eueides* is bigger: 3–3.5 mm, whereas the mean is 1.7 mm. The Lithuanian sclerite has approximately 12 rugae per one millimeter, whereas the average is 11. The new sclerite is smaller and with more rugae.

FINAL REMARKS

The *Plumulites* sp. presented in the Siesartis Formation, Gėluva Regional Stage hints at the importance of these invertebrates in the *deubeli* Biozone,

Upper Homeric marine communities. This finding will add new information about the post-extinction recovery of fauna.

The fact that a sclerite of plumulitid was found in the deep facial zone constrains ecological niche settings of these lophotrochozoans to dysaerobic settings. In addition, the coupling of information about brachiopod communities and machaeridian distributions promises better inferences on their community and autecology.

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LIETUVOS VIRŠUTINIO HOMERIO (SILŪRAS)
MACHAERIDO SKLERITAS

S a n t r a u k a

Machaeridai yra lophotrochozojų šaka, labai gimininga žieduotosioms kirmėlėms. Jų randama nuo ankstyvojo ordoviko iki vidurinio permio jūrinėse nuosėdinėse uolienose. Vienas machaerido skleritas buvo rastas Viduklės-61 grėžinyje, Siesarties svitoje, 1285,1 m gylyje. Kartu su juo buvo nustatyta *Colonograptus deubeli* (Jaeger) graptolitų rūšis, žyminti vėlyvojo homerio Gėluvos amžių. Pečiakojų fauna (BA4-5 bentoso standartinė pečiakojų zona) rodo, kad čia tuo metu buvo bedeguonė, mažos turbulencijos jūrinė aplinka. Ištyrus machaeridą nustatyta, kad tai yra *Plumulites* genties atstovas. Neturėdami visos gyvūno liekanos ir visų skleritų negalime tiksliau apibūdinti šios fosilijos rūšies.

Tai pirmasis machaerido radinys Gėluvos regioniniame aukšte Lietuvoje. Šis radinys papildoma informaciją apie faunos atsivėlimą po išmirimo Gėluvos amžiaus pradžioje, dar žinomą kaip *ludgreni* įvykis. Tikimasi, kad machaeridų radiniai padės atkurti paleoaplinkas ir autoekologiją.

Raktažodžiai: silūras, viršutinis homeris, machaeridai, *Plumulites*, Lietuva