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A remarkable specimen of the Silurian sea scorpion *Eysyslopterus patteni* (Arthropoda, Eurypterida)

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Kurzfassung

Ein bemerkenswertes Exemplar des silurischen Seeskorpions *Eysyslopterus patteni* (Arthropoda, Eurypterida)

Ein neues Exemplar des Seeskorpions *Eysyslopterus patteni* aus dem Silur von Saaremaa/Estland wird beschrieben und abgebildet. Es ist erst das zweite in der Literatur dokumentierte Fossil dieser Art. In Ergänzung zu dorsalen Merkmalen des Kopfschildes, welche im Wesentlichen schon anhand des Holotypus beschrieben werden konnten, zeigt der Neufund auch ventrale Strukturen, wie etwa die zahnbesetzten Gnathobasen der Kauladen (Coxen) und ein mögliches Endostoma. Die bisherige taxonomische Eigenständigkeit der Gattung und Art wird bestätigt.

Abstract

A new specimen of the Silurian sea scorpion *Eysyslopterus patteni* is described and figured. It is only the second specimen documented in the literature and confirms earlier descriptions and broadens our knowledge of this rare species. In addition to dorsal features of the carapace known already from the holotype, the new fossil shows some evidence of the ventral prosomal organisation, such as coxal gnathobases and a possible endostoma. The taxonomic autonomy of the species and genus is here confirmed.

Key words

Eurypterida, *Eysyslopterus*, Silurian, Saaremaa, Estonia, morphology

1. Introduction

In 1932 the Norwegian palaeontologist Leif STØRMER became aware of an interesting fossil eurypterid in the collections of Prof. William PATTEN, Hanover, N. H., USA. This specimen, an isolated prosomal shield, originated from the Silurian (Wenlock) of Rootsiküla on the island of Saaremaa (or Oesel)/Estonia and was later described as a new species *Hughmilleria patteni* (STØRMER, 1934). Based on differences in carapace shape and eye position with respect to *Hughmilleria* SARLE, 1903, TETLIE & POSCHMANN (2008) erected a new genus *Eysyslopterus* to accommodate this species. Hitherto, the holotype remained the only known specimen and the only published evidence available for the species. Now, a second specimen of *Eysyslopterus patteni* became available to the author. This new fossil largely confirms earlier descriptions and furthermore broadens our knowledge of this rare species and will therefore be figured and described here.

2. Material and Methods

Eurypterids from the Silurian of Rootsiküla/Saaremaa are famous for their unique preservation with the reddish to amber-coloured cuticle still present on a light grey to cream-coloured matrix of argillaceous dolomite. This excellent preservation allowed HOLM (1898) to separate their chitinous integument from the matrix and to depict minute details such as hair-like setae and pores. This makes Rootsiküla a key Fossil-Lagerstätte with respect to eurypterid anatomy (see also NIESZKOWSKI 1858, SCHMIDT 1883, TOBIEN 1937, WILLS 1965, DALINGWATER 1975, SELDEN 1981, DUNLOP & BRADY 1997, KAMENZ et al. 2011). Outstanding preservation is also seen in the new fossil, which has been acquired by the author from a commercial fossil market place via an appropriate internet platform. It is now part of the Landessammlung für Naturkunde Rheinland-Pfalz, Mainz, with repository number PWL 2020/6500-LS (former author's collection number 1327-S). According to the associated data, the fossil has been collected

from Silurian sediments of the Paadla Stage (Ludlow) at Silma Cliff on the west coast of Saaremaa Island. If this information is correct, the new specimen might be stratigraphically slightly younger than the holotype specimen from the „Eurypterus-beds“ (STØRMER 1934), which are attributed to the underlying Rootsiküla Stage (Wenlock) (see e. g. RAUKAS & TEEDUMÄE 1997).

The fossil was photographed immersed in alcohol (isopropanol) and under polarized light with a Canon EOS 600D SLR camera equipped with a Canon EFS 60 mm or, in case higher magnifications were employed, a Canon MP-E 65 mm macro lens. Multiple images with differing focal planes were stacked into a composite with enhanced depth of field using CombineZM software (by Alan Hadley). Photographs were processed and arranged into figures using Adobe Photoshop CS2.

3. Systematic Palaeontology

Phylum Chelicerata HEYMONS, 1901

Order Eurypterida BURMEISTER, 1843

Superfamily Adelophthalmoidea TOLLERTON, 1989

Family Adelophthalmidae TOLLERTON, 1989

Genus *Eysyslopterus* TETLIE & POSCHMANN, 2008

Species *Eysyslopterus patteni* (STØRMER, 1934)

Diagnosis: Carapace with evenly rounded to slightly pointed anterior margin and bordered by narrow marginal rim; lateral eyes reniform, with a bend at inner margin and closer to lateral margin than to ocelli; ocelli on posterior half of carapace; anterior half of carapace with cuticular sculpture of deep transverse furrows or “terrace lines” (emended from TETLIE & POSCHMANN 2008).

Description: The fossil is an almost complete dorsal prosomal shield (carapace) in dorsal view including the doublure, terrace lines, median ocelli, and lateral eyes. Some aspects of the ventral prosomal anatomy are also preserved, albeit somewhat displaced.

The carapace is 15.2 mm long and up to 22.2 mm wide, length/width ratio 0.68, with a shape close to semicircular (sensu TOLLERTON

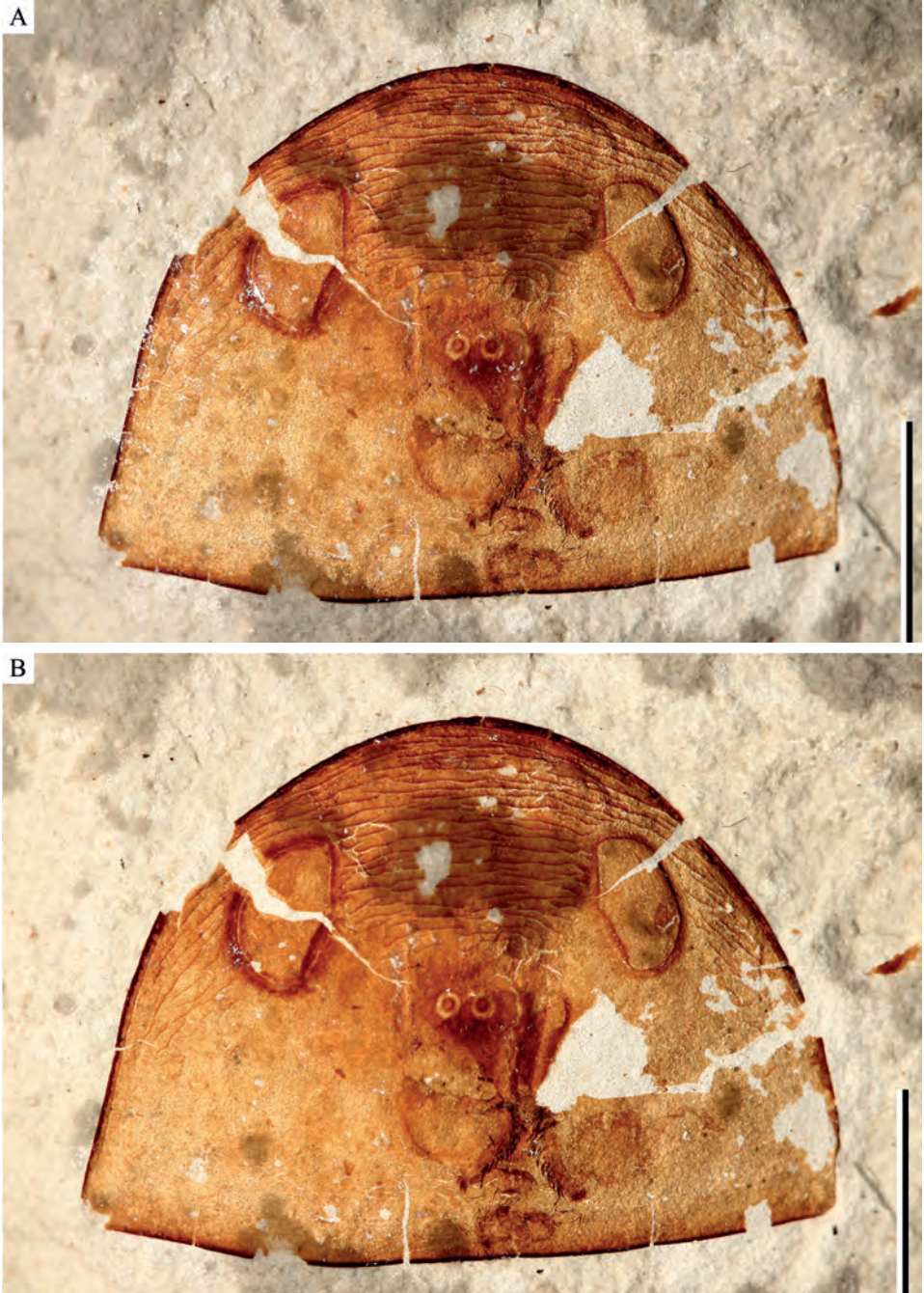


Plate 1: *Eysyslopterus patteni* (STÖRMER, 1934) from the Silurian (Ludlow) of Silma Cliff, Saaremaa, Estonia. Isolated prosomal shield (carapace) with associated and slightly displaced ventral parts. Specimen PWL 2020/6500-LS. A: In normal lighting. B: With polarizing filters crossed. Scale bars = 5 mm.

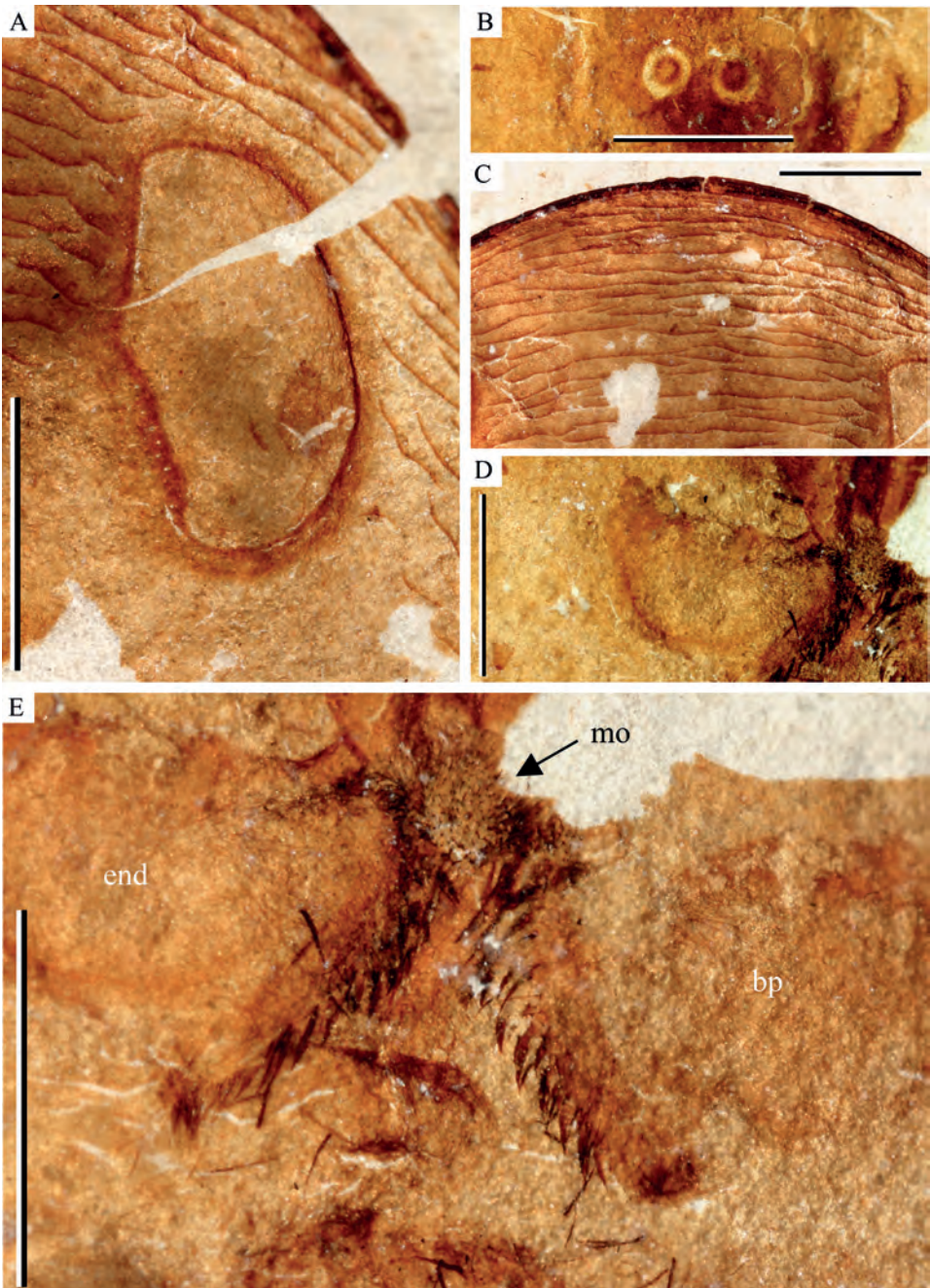


Plate 2: *Eysyslopterus patteni* (STÖRMER, 1934), details from specimen PWL 2020/6500-LS. A: Right lateral eye; note bend of the inner margin and insertion points of larger setae along the posterior inner margin. B: Median ocelli. C: “Terrace lines” on the anterior part of carapace. D: Possible endostoma. E: Coxal gnathobases, isolated setae, possible mouth opening (mo), basal plate of coxa (bp), and possible endostoma (end). Scale bars = 2 mm.

1989), but somewhat more pointed and even-ly rounded anteriorly (Pl. 1A, B). The posterior carapace margin is slightly convex, and the lateral sides slightly converge anteriorly. The carapace margin is smooth and the marginal rim (doublure) is very narrow. The lateral eyes are in anterior centrilateral to centrimedial position, i. e. they are closer to the lateral carapace margin than to the median ocelli, about 3.7 mm long, and reniform; inner eye margin with a characteristic bend slightly anterior to half the eye length (Pl. 2A). Posterior to this bend, there is a row of minute holes aligned along the inner eye margin, probably indicating insertion of setae. Smaller insertion points of setae are otherwise distributed over the entire carapace. A pair of round median ocelli is situated in the central part of the prosomal shield just posterior to a hypothetical line dissecting the carapace at half of its length; lenses spaced less than 1.0 mm apart; an ocellar mound is not pronounced (Pl. 2B). A conspicuous ornament consisting of "terrace lines" (sensu SELDEN 1981) covers the anterior part of the carapace (Pl. 1, Pl. 2C); it stretches from the anterior margin to about midway of the lateral eyes and then converges posteriorly and fades well before reaching the ocelli; lateral to the eyes, the terrace lines are oriented almost parallel to, or form a small angle with the carapace margin (Pl. 2A), extending into the posterior half of the carapace; the posterior third of the carapace is smooth and devoid of any ornament (Pl. 1).

In the central posterior area of the carapace, some features of the ventral prosomal organisation can be recognized shining through the translucent cuticle. Most conspicuous are the gnathobases of two coxae (= basal joints of appendages) in opposite position and bearing about a dozen relatively long, narrow and somewhat curved teeth in addition to setae (Pl. 2E). Judging from the broad morphology and large size of the gnathobases, these are interpreted to probably belong to coxae of the more posterior prosomal appendages.

In between the anterior parts of the gnathobases is a somewhat lighter, roundish cuticle area showing a dense cover of setae (designated mo in Pl. 2E). This is considered as the

possible cuticle surrounding the mouth opening. A further plate-like structure is situated to the left of the possible oral aperture. This structure is almost semicircular with evenly rounded posterior and lateral margins and an approximately straight anterior margin with centrally situated paired cuticle thickenings (orientation as it appears in Pl. 2D) and with wing-like extensions antero-laterally. Furthermore it is densely covered with fine setae. The structure is positioned where the basal plate of the left coxa is to be expected, but its shape is more reminiscent of an endostoma, a plate that borders the oral aperture posteriorly (for the description of adelophthalmid endostomas see also WILLS 1964, POSCHMANN 2006). Possibly, these two structures overlap each other here. Functionally, the endostoma is closely associated with the posteriormost pair of coxae and involved in food handling (SELDEN 1981). Thus, it is conceivable that the ventral prosomal parts in this fossil represent the slightly displaced area of the oral opening including parts of coxae VI and endostoma, which were closely associated in life.

4. Discussion

The new fossil proves, that the features seen in and described from the holotype specimen are recurrent morphological characters and that the placement of the species in an original genus is fully warranted. Furthermore, it broadens our knowledge of *Eysyslopterus patteni* in providing a glimpse into the ventral prosomal organisation of this rare sea-scorpion. The fossil is interpreted as representing a moult ensemble (cf. TETLIE et al. 2008).

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