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A well-preserved specimen of the trilobite *Macroblepharum africanum* from the Wissenbach Shale (Devonian: Emsian–Eifelian transitional beds), Upper Harz Mountains (Lower Saxony, Germany)

Carsten Brauckmann & Elke Gröning*

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Abstract: A nearly complete specimen of *Macroblepharum africanum clausthalense* n. ssp., previously determined as *M. africanum* n. ssp. A (G. Alberti, 1969), is described. The specimen was collected from the Wissenbach Shale of the Emsian–Eifelian transitional beds at the Hut-Taler Widerwaage SE of Clausthal-Zellerfeld in the Upper Harz Mountains (Lower Saxony, Germany). Diagnostic characters are the very broad, pear-shaped glabella, the totally suppressed preglabellar field, and the smooth surface detail.

Kurzfassung: Ein nahezu vollständig erhaltenes Exemplar von *Macroblepharum africanum clausthalense* n. ssp. [früher als *M. africanum* n. ssp. A (G. Alberti, 1969) bezeichnet] wird vorgestellt. Es stammt aus dem Wissenbach-Schiefer aus dem Übergangsbereich Emsium/Eifelium an der Hut-Taler Widerwaage SE von Clausthal-Zellerfeld im Ober-Harz (Niedersachsen, Deutschland). Die wichtigsten diagnostischen Merkmale sind die sehr breite, birnenförmige Glabella, die völlige Unterdrückung des Präglabellar-Feldes und die glatte Panzer-Oberfläche.

Keywords: Trilobita, Proetida, *Macroblepharum africanum clausthalense* n. ssp., Wissenbach Shale, Devonian, Emsian–Eifelian transitional beds, Upper Harz Mountains

Schlüsselwörter: Trilobita, Proetida, *Macroblepharum africanum clausthalense* n. ssp., Wissenbach-Schiefer, Devon, Übergang Emsium/Eifelium, Ober-Harz

* Address of the authors:

Prof. Dr. Carsten Brauckmann (Carsten.Brauckmann@tu-clausthal.de), Institut für Geologie und Paläontologie, Technische Universität Clausthal, Leibnizstraße 10, D-38678 Clausthal-Zellerfeld;

Dr. Elke Gröning (Elke.Groening@tu-clausthal.de), Institut für Geologie und Paläontologie, Technische Universität Clausthal, Leibnizstraße 10, D-38678 Clausthal-Zellerfeld.

1. Introduction

During an examination of fossil collections deposited in the Institut für Geologie und Paläontologie of the TU Clausthal, the authors discovered a nearly complete, but previously overlooked, specimen of a new trilobite taxon. This specimen has previously been determined as *Macroblepharum africanum* n. ssp. A (G. Alberti, 1969). As noted on the accompanying label, it was collected by “Kortmann” (without collecting date) in the Wissenbach Shale at the Hut-Taler Widerwaage SE of Clausthal-Zellerfeld.

The Proetidae in the Wissenbach Shale of the Upper Harz Mountains are dominated by *Cyrtosymboloides barrandei* (F. A. Roemer, 1850) which frequently had been confused with “*Macroblepharum africanum* n. ssp. A” and thus with *M. africanum claustralense* n. ssp. The latter is a rather rare component within this trilobite fauna. As pointed out by G. Alberti (1969: 167) this taxon was indeed originally distinguished under open nomenclature by an almost complete carapace from the collection of F. A. Roemer. However, the specimen does not display better diagnostic characters, and the additional specimens are only represented by more or less incompletely preserved tagmata (mainly cephalata or cranidia).

The newly discovered specimen permits a more detailed description and a definition of a separate new subspecies presented below.

2. Biostratigraphy and biofacies

In the Upper Harz Mountains, the sequence of Wissenbach Shale is evidently distributed within two different biostratigraphic units. Though previously dated as later Eifelian [based on specimens of *Nowakia* sp. A. aff. *holynensis* Bouček, 1964; see G. Alberti 1970b], the main part (mined for a historically long time to produce roof slates in the Upper Harz Mountains) can now largely be correlated with the Late Dalejan in Bohemia by several index fossils (Ammonoidea, Trilobita, Tentaculita, etc.). It is now regarded as an equivalent of the Late Emsian–Early Eifelian transition (Bouček 1964; Lütke 1979; Chlupáč 1982: 368; Schubert 1995, 1996), and includes typical trilobite species such as *Macroblepharum africanum claustralense* n. ssp. and *Cyrtosymboloides barrandei*. It is undoubtedly contemporaneous with the Wissenbach Shale of the type region in northern Hesse.

The section which is exposed, for example in the Schalke Syncline, overlies the *Calceola* Shale and is thus distinctly younger and should be characterized by a new lithostratigraphical name.

The biofacies of the “actual” Wissenbach Shale as exposed at the Hut-Taler Widerwaage and at the Ziegenberger Teich in the Upper Harz Mountains has recently been discussed in detail by Schubert (1996).

3. Systematics

Order Proetida Fortey & Owens, 1975

Family Proetidae Hawle & Corda, 1847

Subfamily Cornuproetinae Richter & Richter & Struve, 1959

(non Richter & Richter, 1956, as usually cited; see Lütke 1980)

***Macroblepharum* G. Alberti, 1964**

Type species: *Cornuproetus* (*Macroblepharum*) *africanus* G. Alberti, 1964.

Diagnosis: see G. Alberti (1970a: 45-46).

Discussion: Jell & Adrain (2003: 481) placed *Macroblepharum* as well as *Cornuproetus* and Cornuproetinae in total within the Tropicocoryphidae Přibyl, 1964. As shown by Lütke (1980: 103-104 and fig. 26), the Cornuproetinae and the Tropicocoryphinae have different origins: The Cornuproetinae have their root within the stem-group of the Proetinae + Dechenellinae + Cyphoproetinae, whereas the Tropicocoryphinae are phylogenetically more closely related to the Eremiproetinae + Proetidellinae. Thus, the analysis by Lütke (1980) clearly implies a polyphyletic origin for the Tropicocoryphidae sensu Jell & Adrain (2003). Like most current European trilobite specialists, we prefer to separate the Tropicocoryphidae from the Proetidae and Cornuproetinae.

***Macroblepharum africanum* (G. Alberti, 1964)**

Diagnosis: see G. Alberti (1969: 162).

Subspecies (following G. Alberti 1981: 25): *Macroblepharum africanum africanum* (G. Alberti, 1964); *Macroblepharum africanum iunius* (G. Alberti, 1981); *Macroblepharum africanum ribatelfatanum* G. Alberti, 1970; *Macroblepharum africanum tumidum* (Šnajdr, 1976) (as ranked by G. Alberti 1981: 25); *Macroblepharum africanum claustralense* n. ssp.

„*Cornuproetus (Macroblepharum) africanus termieri* G. Alberti, 1969” was mentioned as a subspecies of “*Cornuproetus (Macroblepharum) africanus*” in G. Alberti (1981: 25). However, in the same publication, G. Alberti (1981: 28) subsequently transferred the taxon to *Cyrtosymboloides* as a separate species. Šnajdr (1980: 275-

276) described a separate subspecies, *Macroblepharum africanum cap* Šnajdr, 1980, from the Třebotov Limestone (Dalejan = Late Emsian, late Early Devonian) of Hostim in Bohemia, which has not been mentioned under the subspecies of *M. africanum* by G. Alberti (1981: 25).

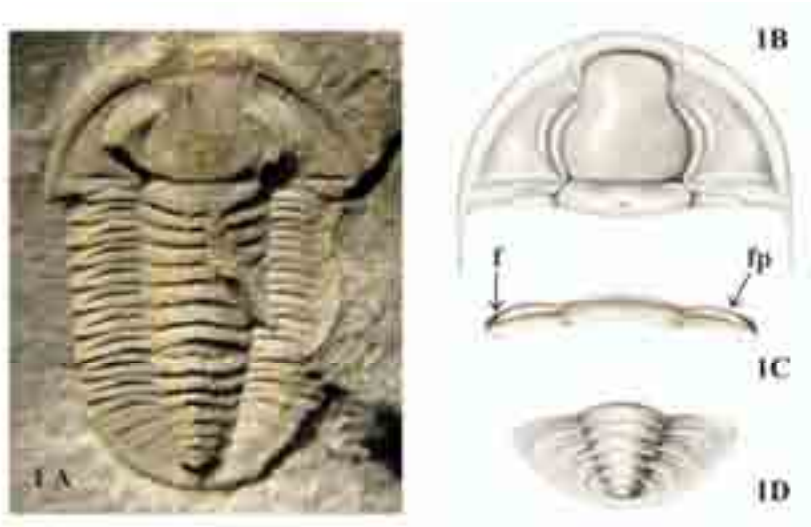


Fig. 1: *Macroblepharum africanum clausthalense* n. ssp., nearly complete specimen No. TU Cl P Tr 243, Wissenbach Shale, Emsian–Eifelian transitional beds (Early–Middle Devonian), Hut-Taler Widerwaage, SE Clausthal-Zellerfeld, Upper Harz Mountains, Lower Saxony, Germany; total length 13.4 mm. – 1A: Photograph, dorsal view. – 1B: Reconstruction of cephalon (genal spines completed according to the specimen figured by G. Alberti 1983: pl. 5, fig. 50). – 1C: Reconstruction of thoracic segment with facet (f) and fulcral point (fp). – 1D: Reconstruction of pygidium.

Fig. 1: *Macroblepharum africanum clausthalense* n. ssp., fast vollständiger Panzer Nr. TU Cl P Tr 243, Wissenbach-Schiefer, Übergangs-Bereich Emsium–Eifelium (Unter- bis Mittel-Devon), Hut-Taler Widerwaage, SE Clausthal-Zellerfeld, Ober-Harz, Niedersachsen, Deutschland; Gesamt-Länge 13.4 mm. – 1A: Foto, Dorsal-Ansicht. – 1B: Rekonstruktion des Cephalons (Wangenstacheln ergänzt nach dem von G. Alberti 1983: Taf. 5, Fig. 50 abgebildeten Exemplar). – 1C: Rekonstruktion eines Thorax-Segmentes mit Facette (f) und Fulcral-Punkt (fp). – 1D: Rekonstruktion des Pygidiums.

***Macroblepharum africanum clausthalense*
n. ssp.**

Synonymy (selected):

1850 *Proëtus Barrandei* (sic!) F.A. Roemer: 20 [non pl. 3, fig. 33, = *Cyrtosymboloides barrandei*].

1969 *Cornuproetus (Macroblepharum) africanus* n. ssp. A. – G. Alberti: 167, pl. 13, fig. 11.

1970a *Cornuproetus (Macroblepharum) africanus* n. ssp. A. – G. Alberti: 47, 48.

1981 *Cornuproetus (Macroblepharum) africanus* n. ssp. A. – G. Alberti: 25.

1983 *Macroblepharum africanum* n. ssp. A. – G. Alberti: 27, pl. 5, fig. 50.

Etymology: clausthalensis, clausthalense (adjective); the material of the new subspecies was collected in the region of Clausthal-Zellerfeld.

Holotype: Specimen no. TU Cl P Tr 243, “Kortmann collection,” in the collection of the Institut für Geologie und Paläontologie, Technische Universität Clausthal, Clausthal-Zellerfeld.

Locus typicus: Hut-Taler Widerwaage, SE Clausthal-Zellerfeld, Upper Harz Mountains, Lower Saxony, Germany.

Stratum typicum: Wissenbach Shale, Emsian–Eifelian transitional beds (Early–Middle Devonian), *Nowakia maureri* zone (Zagora, 1962) to *N. holyocera* subzone (G. Alberti, 1980) in the tentaculitid zonation according to G. Alberti (1983).

Distribution: Restricted to the Wissenbach Shale of the Clausthal region of the Upper Harz

Mountains: Hut-Taler Widerwaage, Ziegenberger Teich; both SE of Clausthal-Zellerfeld.

Diagnosis: A subspecies of *Macroblepharum africanum* with the following combination of characters: Glabella very broad, pear-shaped; preglabellar field totally suppressed; dorsal side of anterior cranial border without visible terrace lines; surface smooth.

Morphology

Preservation: The specimen is preserved as a somewhat flattened external mould of a nearly complete carapace; only the genal spines are lacking. It is a little bit shortened in the sagittal line and therefore appears too broad. During the collecting process, the specimen was evidently broken into two pieces along a line from the anterior margin in front of the glabella across the cranidium and the six anterior thoracic segments to the right side of the thorax. Both pieces have been glued together without major damage. Due to the preservation and flattening, only a description of the dorsal view is possible.

Measurements (mm):

Total length 13.4 mm.

Cephalon: Total length (except genal spines) 5.21; glabellar length (except occipital ring) 3.57; length of occipital ring 0.97; length α - β 0.82; length β - γ 0.89; length of palpebral lobe (γ - ε) 2.31; total length of eye 2.35; total width of cephalon 9.46; width of glabella between γ - γ 2.35; maximum width of glabella 3.46; width β - β 3.20; width γ - γ 2.60; width δ - δ 4.24; width ε - ε 3.54; width ω - ω 7.15.

Thorax: Total length 5.21; maximum width 8.04; width of axis 3.72.

Pygidium: Total length 2.98; total width 6.33; length of axis 2.61; maximum width of axis 2.46.

Cephalon: Shape broadly rounded, as long as the thorax, distinctly larger than pygidium. Glabella broadly pear-shaped in dorsal view ("cornuproetid"), with rather short and truncated anterior lobe, moderate constriction between γ - γ and broad posterior lobe with the maximum width between δ - δ . Glabellar furrows (1p-3p) very faint, obsolescent. Occipital ring transversally extended, moderately long (sag.), with small occipital node shortly posterior to its centre, occipital furrow without lateral branches. Dorsal furrow weakly incised. Preglabellar field completely suppressed; anterior border broad (sag.), slightly convex in sagittal section. Facial suture: section α - β short, strongly divergent; β

broadly rounded; section β - γ slightly sigmoidal, strongly convergent; palpebral lobe very long (exsag.), but rather narrow (tr.), with the maximum width at δ ; δ extremely broadly rounded, situated distinctly distant of the longitudinal projection of β ; ε distinctly marked by a very narrow curvature, situated even slightly distant to the longitudinal projection of β ; ζ absent, no straight section ε - ζ ; ω situated nearly at two-thirds of the posterior margin. Due to the course of facial suture, fixigenae quite narrow. Librigenae: Broad, eye very long, quite narrow, ocellae small, numerous; genal field broad, without eye furrow; border furrow and posterior border furrow narrow, distinctly incised; genal border broad, convex; no terrace lines visible. Genal spines (not preserved in this specimen, but known from additional material) moderately long, narrow, sharply pointed. Surface without visible ornament.

Thorax: Conspicuously serial, composed of 9 segments; distinctly broader than long; width of axis 0.45 of total width; dorsal furrows distinctly marked; maximum width of pleurae 0.6 of width of axis; pleurae distally pointed; pleural furrows narrow, deeply incised; important characters of functional morphology, in particular of possible enrollment, visible: facets at anterior parts of the pleural tips flattened, beginning at short, pointed fulcral point close to middle of anterior pleural margin (Fig. 1C).

Pygidium: Short, length less than half total width; shape slightly triangular, with broadly rounded margin; axis relatively long, broadly conical in dorsal view, with 6 visible rings, posterior part with space for one additional ring; ring furrows narrow, distinctly incised in the anterior part, but continuously shallower to the posterior part; dorsal furrow distinctly marked; pleural fields with four pairs of ribs; posterior part with place for at least one additional rib; pleural furrows well developed, rib furrows less clearly developed; border furrow very faint; border moderately broad. Surface without visible ornament.

Discussion: As clearly pointed out by G. Alberti (1969), the *Macroblepharum* specimens from the Wissenbach Shale in the Upper Harz Mountains are close to *M. africanum* (G. Alberti, 1964). This can be confirmed emphatically by the virtually complete specimen described herein. Details displayed in this specimen further allow to introduce and define a separate new

subspecies named *Macroblepharum africanum clausthalense* n. ssp.

The fact that only the cranium is known from several subspecies, a detailed comparison has to be restricted to this part of the carapace. The main common characters are: (1) the very broad, typically pear-shaped glabella; (2) the broad anterior border of the cranium; and (3) the very narrow or even completely suppressed preglabellar field.

Macroblepharum africanum africanum (G. Alberti, 1964) differs by: (1) the less truncated frontal lobe of the glabella; (2) markedly broader palpebral lobes; and (3) the presence of 4 to 5 terrace lines in the distalmost part (2/5) of the anterior border.

Macroblepharum africanum ribatelfatanum (G. Alberti, 1970) can be distinguished by (1) the much more convex anterior border which is covered by terrace lines in the distal half; (2) the markedly incised border furrow; and (3) the distinct ornamentation of the glabellar surface which consists of delicate ridges.

Macroblepharum africanum iunius (G. Alberti, 1981) is clearly characterized by the conspicuous ornamentation which – similar to *Sculptoproetus* – consists of a combination of densely arranged and moderately coarse tubercles and ridges.

Macroblepharum africanum tumidum (Šnajdr, 1976) differs by (1) its even larger palpebral lobes; (2) the more conical glabella with long and narrow frontal lobe; and (3) the presence of a recognizable ornamentation.

Macroblepharum africanum cap Šnajdr, 1976 is distinguished by (1) the more violin-shaped outline of the glabella; (2) the presence of coarse terrace lines across the entire anterior border; and (3) the presence of undulated and concentrically arranged striae as well as sparsely distributed large granules of circular to oval shape on the glabellar surface.

Although removed from *Macroblepharum africanum* by G. Alberti (1970: 28) and transferred to *Cyrtosymboloides* as a separate species, we include “*M. africanum*” *termieri* (G. Alberti, 1969) in this comparison. This taxon differs by (1) the presence of terrace lines across the entire anterior border; (2) the more conical shape of the glabella; and (3) the distinct tuberculation of the glabellar surface.

H. Alberti (1968: pl. 11, fig. 10) published a photograph of an isolated and partially preserved cranium which he determined as “*Cornuproetus* (*Macroblepharum*?) cf. *africanum*”. The

specimen was collected from limestone strata of early Eifelian age in the Mittleres Sau-Tal, western slope of a hill called Kleiner Knollen, E of Herzberg and NNW of Bad Lauterberg in the Lower Harz Mountains. This specimen differs markedly from *M. africanum* ssp. A by the distinctly broader (tr.) frontal lobe of the glabella, which is only slightly narrower than the posterior lobe at δ .

The previously established species of *Macroblepharum* merit the following comparisons with species from the Rhenish Massif:

Macroblepharum germanicum (G. Alberti, 1967) is known from the Ballersbach Limestone (Eifelian) of the Marburg area (Rhenish Massif). It differs mainly by (1) the less truncated frontal lobe of the glabella (with less marked constriction between γ - γ); (2) the presence of a preglabellar field; and (3) the relatively narrow anterior border. Additionally, G. Alberti (1967, 1969) emphasized the larger dimensions of *M. germanicum*, which appears to reach nearly twice of the length of *M. africanum* (total specimen).

Macroblepharum pmuelleri Basse in Basse & Heidelberger, 2002 from the late Emsian in the Lahn Syncline (Rhenish Massif) differs by (1) the longer and much narrower glabella with anteriorly clearly rounded frontal lobe and poorly marked constriction between γ - γ ; (2) the presence of a narrow preglabellar field; and (3) the narrower and more convex anterior border. The same differences can be noted for *M. sp. n.* aff. *M. pmuelleri* Basse in Basse & Heidelberger, 2002.

Other species of *Macroblepharum* differ in more distinct morphological characters so that a detailed comparison is not provided herein.

Within the Wissenbach Shale of the Upper Harz Mountains, *Macroblepharum africanum clausthalense* n. ssp. is associated with *Cyrtosymboloides barrandei* (F. A. Roemer, 1850). Both taxa have often been confused, but the latter is clearly distinguished by (1) its much shorter and narrower palpebral lobes; and (2) the presence of only 8 thoracic segments. For further differences between these two species see G. Alberti (1969: 302-303).

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„Zahntürkis“ an einem Mandibelfragment von *Propalaeotherium isselanum* aus dem eozänen Geiseltal bei Halle (Saale), Deutschland

Meinolf Hellmund*

Hellmund, M. (2011): „Zahntürkis“ an einem Mandibelfragment von *Propalaeotherium isselanum* aus dem eozänen Geiseltal bei Halle (Saale), Deutschland. [„Zahntürkis“ covering a fragmentary mandible of *Propalaeotherium isselanum* from the Eocene Geiseltal near Halle (Saale), Germany.] – Hallesches Jahrbuch für Geowissenschaften, 32/33: 165-170, Halle (Saale).

Kurzfassung: Es wird der erste Beleg für die Bildung von „Zahntürkis“ (Vivianit) an einem Mandibelfragment von *Propalaeotherium isselanum* aus der oberen Mittelkohle des Geiseltales (höheres Mitteleozän) vorgestellt und mit Funden anderer Provenienzen aus unterschiedlich alten stratigraphischen Ablagerungen verglichen. Der vermutliche Ablauf der Bildung von Vivianit wird für den Fund aus dem Geiseltal beschrieben.

Abstract: A first record of "Zahntürkis" (Vivianit) is proofed from a fragment of a mandible of *Propalaeotherium isselanum* found in the Upper middle coal (Upper middle Eocene) of the Geiseltal. The fragment is compared to other similar finds coming from very different stratigraphic sites. The putative genesis of Vivianit in the Geiseltal specimen is explained.

Schlüsselwörter: „Zahntürkis“, Vivianit, Geiseltal, *Propalaeotherium*, Mitteleozän

Key words: "Zahntürkis", Vivianit, Geiseltal, *Propalaeotherium*, Middle Eocene

* Anschrift des Autors:

Dr. Meinolf Hellmund (meinolf.hellmund@zns.uni-halle.de), Zentralmagazin Naturwissenschaftlicher Sammlungen, Geiseltalmuseum, Martin-Luther-Universität Halle-Wittenberg, Domstr. 5, D-06108 Halle (Saale).