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A Short Note on the Occurrence of the Upper Triassic Oyster *Umbrostrea*? *montiscaprilis* (Klipstein, 1843) (Mollusca: Bivalvia) in the Northern Alpine Raibl Beds of the Schafberg, Salzburg, Austria

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3 Text-Figures, 1 Plate

Österreichische Karte 1:50.000
Blatt 65 Mondsee

Northern Calcareous Alps
Northalpine Raibl Beds
Salzkammergut
Schafberg
Bivalvia

Contents

Eine kurze Mitteilung über das Vorkommen der obertriassischen Auster *Umbrostrea*? *montiscaprilis* (Klipstein, 1843) (Mollusca: Bivalvia) in den Nordalpinen Raibler Schichten des Schafbergs, Salzburg, Österreich

Zusammenfassung

Aus den Nordalpinen Raibler Schichten des Schafberg-Nordfußes wird eine für das Karnium charakteristische Bivalven-Faunula, die drei Arten umfasst, beschrieben. Trotz Rekristallisation weisen die Schalenstrukturen einiger Exemplare von “Ostrea” *montiscaprilis* Klipstein, 1843 darauf hin, dass diese Art der Gattung *Umbrostrea* Hautmann, 2001 angehört.

Abstract

Northern Alpine Raibl Beds exposed at the northern foot of the Schafberg yielded a bivalve faunula consisting of three species characteristic of the Carnian stage. Although the shells are generally recrystallized, preserved structures of some valves of “Ostrea” *montiscaprilis* Klipstein, 1843 indicate that this species belongs to the genus *Umbrostrea* Hautmann, 2001.

Introduction

Oysters are a distinct and successful group of marine bivalves. Due to the predominantly calcitic composition of their shells, they have a good fossil record especially from the early Jurassic onwards. By contrast, key characters of classification such as inner features as well as mineralogy and structure of the valves are much less known in Triassic oysters, as a consequence of the frequent loss or recrystallization of their inner, presumably aragonitic shell layers (Hautmann, 2001a, 2006a, b). In fact, generic assignment of several Triassic species is still debated. The last decade saw the publication of a remarkable series of papers dealing with the origin and early evolution of oysters (Checa & Jiménez-Jiménez, 2003; Checa et al., 2006; Hautmann, 2001a, b, 2004, 2006a, b; Malchus, 2008; Márquez-Aliaga et al., 2005). In the light of this renewed interest, the occurrence of *“Ostrea” montiscaprilis* – originally described by Klipstein (1843) from the Carnian of the Monte Caprile (Goat Hill, if translated) of the Southern Alps – in the Northern Alpine Raibl Group of the Schafberg (Sheep Mountain, if translated) seems worth describing.

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Geological Setting and Localities

Since the paper by Mojsisovics (1866) fossiliferous exposures of the Northern Alpine Raibl Formation are known from the surroundings of the Eisenaueralm on the northern slope of Mt. Schafberg, south of the eastern end of the lake Mondsee. The outcrops form a largely WNW-ESE striking, approx. 2 km long, wedge-shaped patch on the northern slope of the hill Weinkogel. A good and easily accessible succession of Raibl Beds usually strikingly poor in fossils is exposed along a creek (Sch 1 in Text-Fig. 1, see also Siblík, 2008). It comprises an alternation of limestones with grey marl and marly sandstones beds. At some places, however, bivalves occur in large quantities in limestone beds. Two localities were studied (Text-Fig. 1). Already Mojsisovics (1866) mentions fossil findings from there: in the grey sandstones of the Lunz Formation *"Equisetites"* fragments and from the overlying "Cardita Beds" *Avicula aspera* Pichler, *"Cidaris"* spines, *Pecten*, *Plicatula* and a bed with *Ostrea Montis Caprilis*.

Locality Sch 1 was already reported by Siblík (2008). At the point where the marked tourist path leading from Schafling to the Eisenaueralm crosses the creek, dark grey limestone slabs with abundant remains of *Umbrostrea*? *montiscaprilis* can be found in the drift of the creek. Although obviously transported, these slabs were found to provide the only opportunity to collect *U.*? *montiscaprilis* by hand tools.

Two types of fossiliferous Raibl limestones could be distinguished macroscopically, which differ from each other in microfacies as well. Microfacies of the greenish-gray limestone containing abundant shells of *U.*? *montiscaprilis* is characterized by shell fragments of the fore-mentioned species (Text-Fig. 2a). The bluish-grey limestone slabs contain abundant black onkoids of up to 15 mm. Identified fossils include solenoporacean(?) algae, small agglutinated foraminifers, gastropods and echinoderms (Text-Fig. 2b–d). A similar onkolithic bindstone microfacies was reported by Belocky et al. (1999) from the Raibl Beds of the Gaisberg/Kirchberg in Tirol.

Slightly upstream, above the small waterfall exposing unfossiliferous marl beds the bed of the creek is formed by limestone bedding planes displaying abundant bivalves among which *Schafhaeutlia*? sp. cf. *mellingi* (Hauer, 1857) and *U.*? *montiscaprilis* could be identified (Text-Fig. 3a, b).

Some tens of meters upstream, megalodontid? bivalves can be seen in large quantities in a limestone bank forming the right flank of the creek (Text-Fig. 3c, d). The specimens are preserved as internal moulds with conjoined, closed valves and can not be extracted from the compact rock with hand tools.

Raibl Beds are also exposed higher on the right flank of the creek valley, along the path leading from Kreuzstein to the Eisenaueralm (Locality Sch 2). Two bivalve specimens, representing *S. mellingi* and *Rossiodus* cf. *columbella* (Hoernes, 1855) were found there by Dr. Miloš Siblík, Prague.

Bivalves

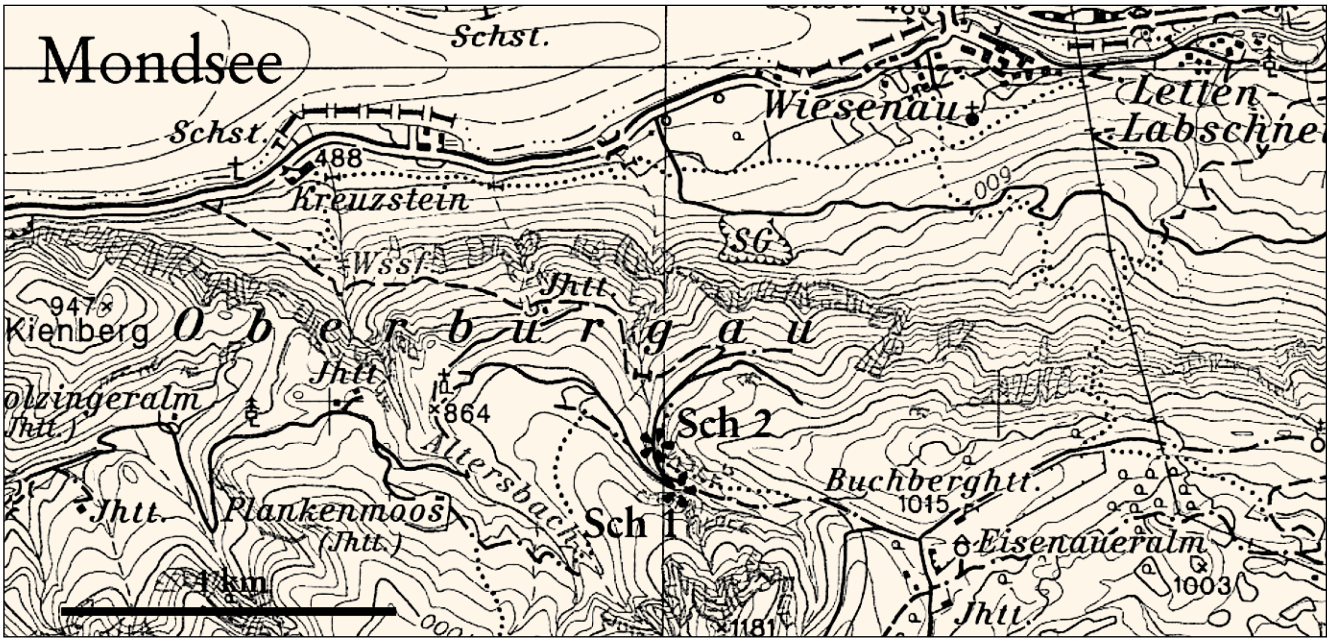
Umbrostrea? *montiscaprilis* (Klipstein, 1843)

(Pl. 1, Figs. 1–9, 11?)

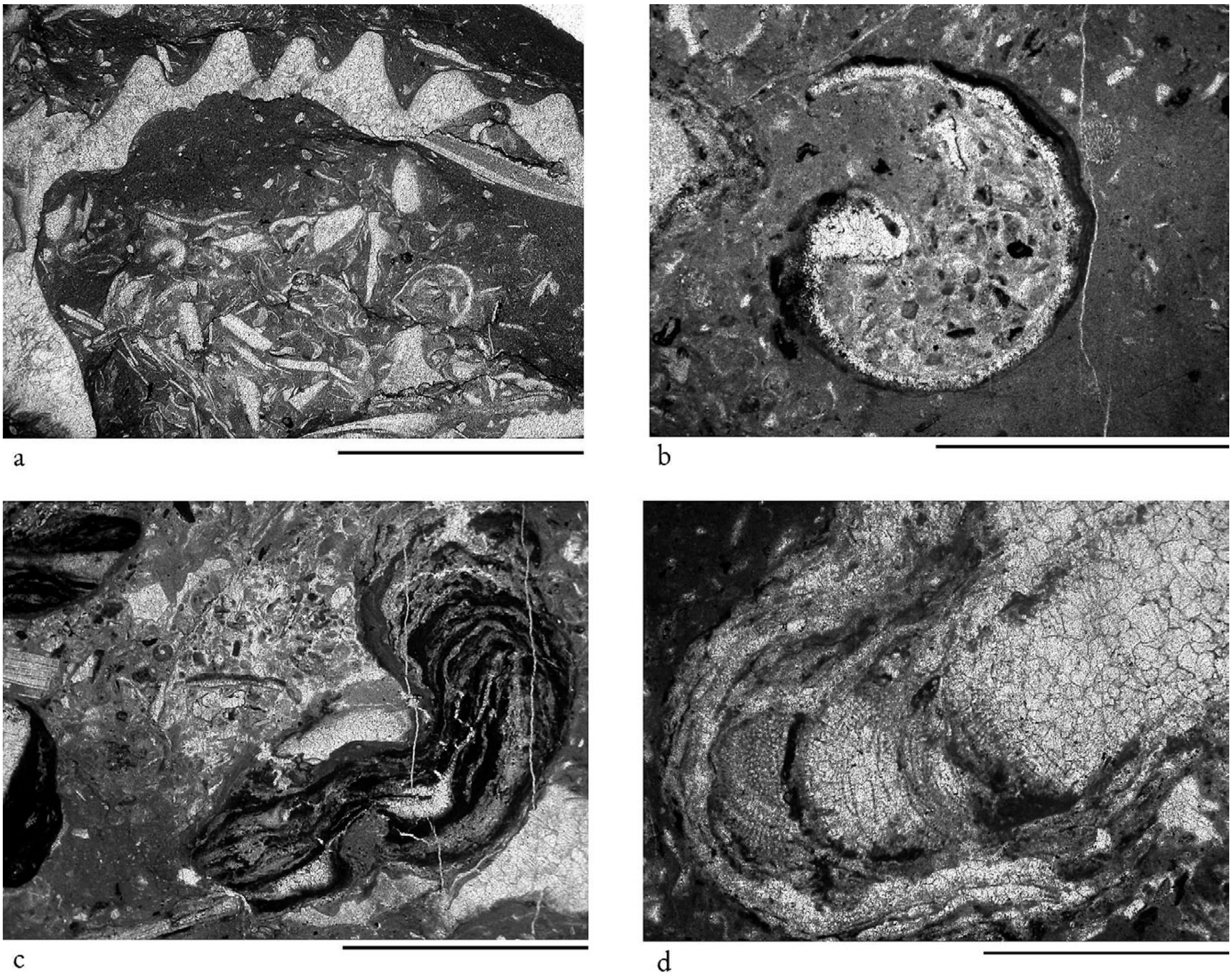
Material: about a dozen specimens, presumably all left valves, embedded in compact limestone.

Description: Inaequilateral, backward-curved, higher than long shells ornamented with up to 15 squamose, antimarginal ribs/plicae whose number increases with intercalation of new ones at the postero-ventral region. Attachment area is subordinate if compared with the height of the valve. Umbonal cavity is well defined. Internal features can not be studied in the available material.

The shell structure has been completely obscured by recrystallization in most cases (e.g. Pl. 1, Figs. 5, 6). Some sections, however, display two shell layers of different structure (Pl. 1, Figs. 7, 8). The outer one seems to be of prismatic nature while the inner one is formed by



Text-Fig. 1.
Map showing the bivalve localities studied.



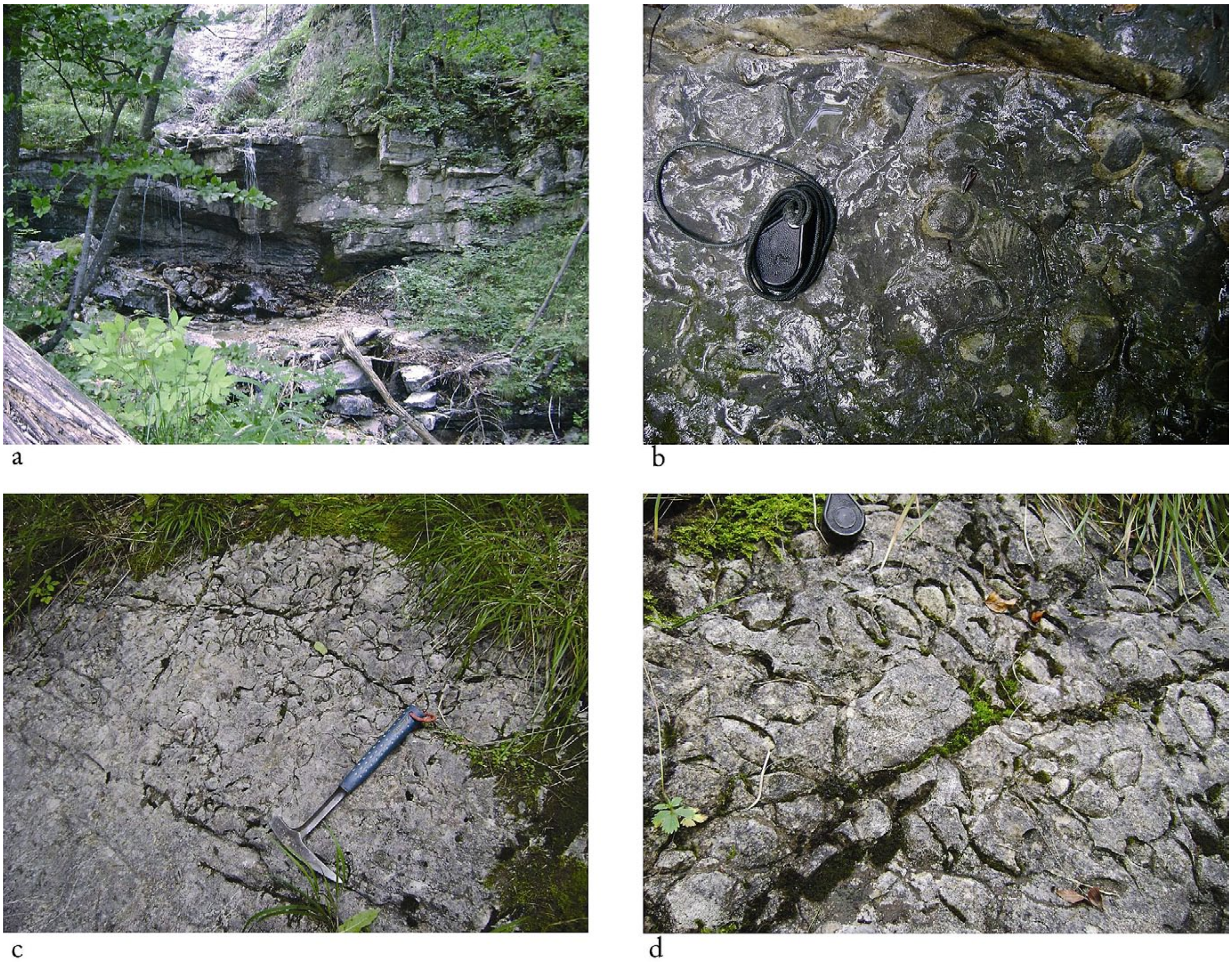
Text-Fig. 2.
Characteristic microfacies of Raibl limestones.
a: fragment of *U.*? *montiscaprilis*, ostracods and echinoderms; b: gastropod with coated and recrystallized shell; c: dark-coloured onkoids; d: partly recrystallized solenoporacean alga?
The bar represents 3 mm.

sparry calcite. In another section layering of the middle part of the shell was found to be still preserved (Pl. 1, Fig. 9). No structural chambers ("Hohlräume") were observed. Some sections show elongated bodies composed of sparry calcite, associated with finely foliated calcite structures (Pl. 1, Fig. 11). Their relationship to *U.*? *montiscaprilis* is, however, not justified.

Remarks: *"Ostrea" montiscaprilis*, usually assigned to the genera/subgenera *Lopha* or *Alectryonia* was frequently recorded from various Carnian formations of the Northern Calcareous Alps (see TOLLMANN, 1976) but it was only rarely described and figured (e.g. WÖHRMANN, 1889, p. 200, Pl. 6, Figs. 1–3). The Schafberg specimens agree well in shape with the type (KLIPSTEIN, 1843), as well as with those more recently described and figured in the literature, e.g. by JELEN (1989) and LIEBERMAN (1979) (see also DIENER, 1923 for older references). The species was also recorded from North America (e.g. STANLEY, 1979), however, the specimens referred to have never been described or figured thus it is doubtful whether they are conspecific (MCROBERTS, 1997).

U.? *montiscaprilis* differs from *Actinostreon haidingerianum* (EMMRICH, 1853), a common species in the Rhaetian of the Northern and Southern Alps as well as of the NW Carpathians, by having more ribs/plicae (see e.g. ZAPFE, 1967, p. 438, Pl. 3, Figs. 7a, b; GOETEL, 1917, p. 169, Pl. 9, Figs. 4a, b.) and – probably – by its aragonitic inner shell layers (see below).

Uncertainty concerning the generic assignment of *"O." montiscaprilis* roots in the lack of appropriate knowledge of its shell mineralogy and structure. Differences between Triassic lophate oysters and *Lopha* RÖDING, 1789 were already recognized by MALCHUS (1990) who erected the new genus *Palaeolopha* based on *Ostrea haidingeriana* as type species, and including – although doubtfully – *Palaeolopha montiscaprilis* as well. According to HAUTMANN (2001a), however, the shell of *"O." haidingeriana* is entirely calcitic and similar in microstructure to that of *Actinostreon* BAYLE, 1878 as documented by SIEWERT (1972). Thus, *Palaeolopha* should be considered as a junior synonym of *Actinostreon*. On the other hand, evidence presented by HAUTMANN (2001a, b) and MÁRQUEZ-ALIAGA et al. (2005) suggest that shells of



Text-Fig. 3.
Field occurrence of Northern Alpine Raibl Beds.
a: unfossiliferous marl and limestone beds; b: bedding plane with bivalves (*Schafhaeutlia*? sp. cf. *mellingi*, *U.*? *montiscaprilis*); c, d: megalodontid? bivalves.
The hammer is 33 cm long, the hand lens is 32 mm wide.

Middle and early Late Triassic oysters contained aragonite layers as well. On the basis of shell mineralogy, these forms should be assigned to *Umbrostrea* HAUTMANN, 2001, whose valves consist of an outer layer of calcitic prisms, a thin middle layer of foliated calcite and a thick, originally aragonitic inner layer. Although shell preservation of the Schafberg specimens is far from suitable, the data available make their assignment to *Umbrostrea* the most plausible. The almost exclusive appearance of recrystallized, presumably originally aragonitic shell parts may be due to the peeling off of the thin outer calcitic layers, in a way found by SANDERS et al. (2007) in diceratid rudists. Spalling of the outer, prismatic layer of *U. iranica* HAUTMANN, 2001 was also figured by HAUTMANN (2001a).

Schafhaeutlia mellingi (HAUER, 1857)
Pl. 1, Figs. 10, 12–14

An internal mould of a left valve and another one formed by conjoined, closed valves were found. The umbo placed near the mid-length of the valves as well as the strong conical cardinal tooth of the left valve preserved as external mould are characteristic features of *S. mellingi*, a species well represented in the Carnian of the Northern Calcareous Alps (see e.g. WÖHRMANN, 1889; TOULA, 1910). In the older literature it is referred to as *Gonodon, Gonodus* or *Corbis mellingi*.

Rossiodus cf. *columbella* (M. HOERNES, 1855)
Pl. 1, Fig. 15

A single internal mould of a left valve may represent *R. columbella*, a characteristic Upper Carnian – Norian megalodontid species as described and figured by VÉGH-NEUBRANDT (1982).

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Plate 1

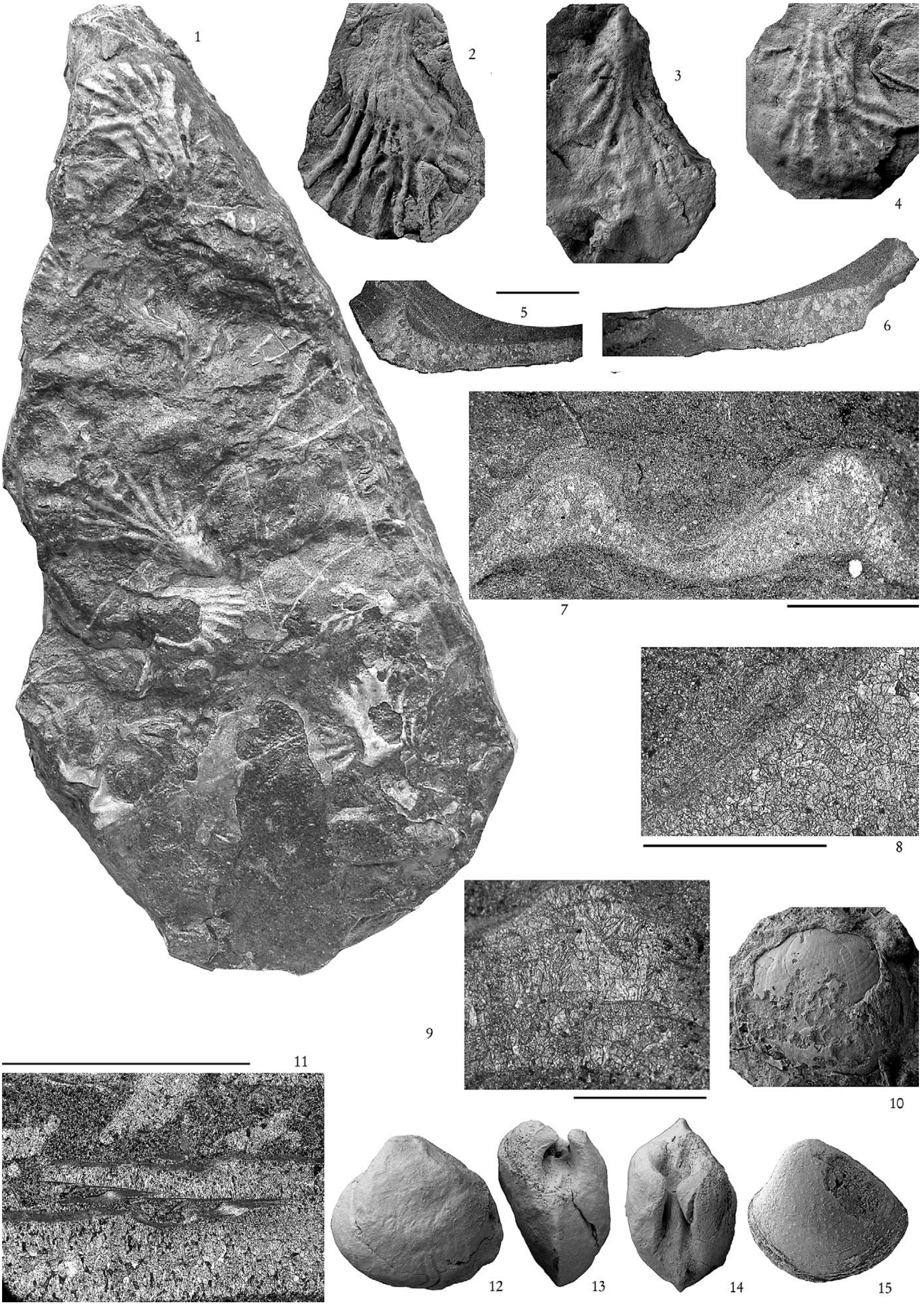
The specimens in Figs. 2–4, 10 and 12–15 are coated with ammonium-chloride.

The scale bar is 3 mm in Figs. 5–7 and 11, and 1 mm in Figs. 8, 9.

Figs. 1–9, 11?: *Umbrostrea*? *montiscaprilis* (KLIPSTEIN, 1843).
- Fig. 1: characteristic occurrence and preservation of valves, 0.6x.
- Figs. 2–4: left valves.
- Figs. 5, 6: longitudinal section of specimen in Fig. 2, umbo is to the left, acetate peels.
- Figs. 7, 8: cross section of ribs displaying traces of an outer calcitic prismatic? and an inner, originally aragonitic? shell layer, acetate peel.
- Fig. 9: preserved structure of the inner, recrystallized shell layer, acetate peel.
- Fig. 11: fine foliated calcite structures associated to recrystallized shell fragments, questionably interpreted as peeled off shell layers of *U.*? *montiscaprilis,* acetate peel.

Figs. 10, 12–14: *Schafhaeutlia mellingi* (HAUER, 1857).
- Fig. 10: internal mould of a left valve bearing fine commarginal and radial ornamentation.
- Fig. 12: lateral view.
- Fig. 13: frontal view.
- Fig. 14: dorsal view.

Fig. 15: *Rossiodus* cf. *columbella* (M. HOERNES, 1855).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