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On the Genus *Paraclausastrea* ZLATARSKI, 1968 (Scleractinia; Hauterivian–Albian)

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1 Table, 2 Plates

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Schrattenkalk Formation

Contents

Abstract

The scleractinian genus *Paraclausastrea* ZLATARSKI is revised on the basis of the study of type and original material as well as original descriptions. Representatives of this genus have been known from Lower Cretaceous (Hauterivian–Albian) sediments of Eastern and Southwestern Europe (Bulgaria and southern France), as well as from South and West Asia (Iran and Georgia [in Caucasus]), and include the species: *P. chevalieri* ZLATARSKI, 1968, *P. grandidentata* ZLATARSKI, 1968, *P. pulchra* MORYCOWA & MASSE, 1998, and *P. valclusensis* MORYCOWA & MASSE, 1998. Furthermore, new material belonging to the lower Aptian part of the Schrattenkalk Formation of western Austria (Vorarlberg) was recently described (*P. vorarlbergensis* BARON-SZABO, 2015). In the present work, additional material from the lower Aptian part of the Schrattenkalk Formation from Switzerland (Canton of Schwyz) is documented which belongs to the species *P. kaufmanni* (KOBY, 1897). Up to now, representatives of the genus *Paraclausastrea* have been predominantly reported from reefal environments of the Urgonian Facies type.

Die Gattung *Paraclausastrea* ZLATARSKI, 1968 (Scleractinia; Hauterivium–Albium)

Zusammenfassung

Die scleractine Gattung *Paraclausastrea* ZLATARSKI wird auf der Grundlage des Studiums von Original- und Typusmaterial sowie der Einbeziehung von Originaldokumentationen revidiert. Vertreter dieser Gattung wurden von Sedimenten der Unterkreide (Hauterivium–Albium) von Ost- und Südwesteuropa (Bulgarien und Südfrankreich) sowie von Süd- und Westasien (Iran und Georgien) beschrieben und gehören zu den Arten: *P. chevalieri* ZLATARSKI, 1968, *P. grandidentata* ZLATARSKI, 1968, *P. pulchra* MORYCOWA & MASSE, 1998, and *P. valclusensis* MORYCOWA & MASSE, 1998. Zudem wurde kürzlich neues Material von der Schrattenkalk-Formation (unteres Aptium) von Westösterreich (Vorarlberg) beschrieben (*P. vorarlbergensis* BARON-SZABO, 2015). In der vorliegenden Arbeit wird weiteres Material von der Schrattenkalk-Formation (unteres Aptium, Kanton Schwyz, Schweiz) dokumentiert, wobei es sich um die Form *P. kaufmanni* (KOBY, 1897) handelt. Bislang wurden Vertreter der Gattung *Paraclausastrea* hauptsächlich in Riffvergesellschaftungen der Urgonfazies gefunden.

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Introduction

Up to now, species of *Paraclausastrea* ZLATARSKI, 1968, have been reported from only a small number of Lower Cretaceous strata of Western Europe, and South and West Asia. At present, six species are included in the genus *Paraclausastrea* (Table 1). The species *P. chevalieri* ZLATARSKI, 1968, and *P. grandidentata* ZLATARSKI, 1968, were described from the Aptian (or possibly uppermost Barremian?–Lower Aptian?; see ILCHEVA & MOTCHUROVA-DEKOVA, 2011) of Bulgaria. SIKHARULIDZE (1985) assigned material from the Hauterivian of Georgia (in Caucasus) to *P.* aff. *grandidentata* ZLATARSKI, 1968. Later, MORYCOWA & MASSE (1998) described from southern France the species *P. pulchra* from the upper Barremian–lower Aptian and *P. valclusensis* from the lower Aptian. Subsequently, the species *P. pulcha* was reported from the upper Aptian–Albian of the Esfahan region of central Iran (BARON-SZABO et al., 2003) and from the upper Aptian–lower Albian of the Koppeh Dagh region of northeastern Iran (described as *P.* cf. *pulcha*) (PANDEY et al., 2007). Most recently, the new species *Paraclausastrea vorarlbergensis* was described from the upper Barremian–lower Aptian part of the Schrattenkalk Formation at Brandalpe-Kuhberg, Vorarlberg, western Austria (BARON-SZABO, 2015). Furthermore, recent investigation of material from the lower Aptian part of the Schrattenkalk Formation at Käsernalp, Canton of Schwyz, Switzerland (KOBY collection housed at Basel, Switzerland) carried out by the author of the current work in July 2015 revealed the existence of another species of *Paraclausastrea* (= *P. kaufmanni* [KOBY, 1897]); originally described as *Latimeandra kaufmanni*).

The purpose of the current paper is to revise the genus *Paraclausastrea* ZLATARSKI, and give a complete account of its stratigraphical and geographical distribution.

Material, Methods, Abbreviations

* = first description of taxon to which the assignment of specimen refers; v = material was studied by author. For identification of the material, upper surface views, polished surfaces and/or thin sections of both cross and lateral views of the specimens were utilized; (v) = material not examined by author but considered to be sufficiently documented to be reliably identified. The material used in this work includes specimens from:

BSPG	Bayerische Staatssammlung für Paläontologie und historische Geologie, Munich, Germany.
GIN	Geologicheskij Institut, Tbilisi, Georgia (in Caucasus).
GPIH	Geologisch-Paläontologisches Institut, Universität Hamburg, Deutschland (Department of Geology and Paleontology, University of Hamburg, Germany).
NMB	Naturhistorisches Museum Basel, Schweiz (Natural History Museum Basel, Switzerland).
NMNHS	Natural Museum of Natural History, Sofia, Bulgaria.
PAL-ERL.	Institut für Geologie und Paläontologie, Universität Erlangen-Nürnberg, Deutschland (Department of Geology and Paleontology, University of Erlangen-Nürnberg, Germany).
UJ	Jagiellonian University, Instytut Nauk Geologicznych, Kraków, Poland.
VNS	"*Inatura*" Museum, Dornbirn, Vorarlberg, Austria.

Systematic Paleontology

Order Scleractinia BOURNE, 1900
Suborder Faviina VAUGHAN & WELLS, 1943
Family Montlivaltiidae DIETRICH, 1926
Genus *Paraclausastrea* ZLATARSKI, 1968

Type species: *Paraclausastrea chevalieri* ZLATARSKI, 1968, Aptian of Bulgaria (or possibly uppermost Barremian?–lower Aptian?; see ILCHEVA & MOTCHUROVA-DEKOVA, 2011) (upper parts of Smochan Formation at Doyrentsi village area, Lovech district).

Species of *Paraclausastrea* ZLATARSKI, 1968	Distance of corallite centers (mm)	Number of septa in monocentric corallites	Septal density/ mm	Intertrabecular distance (µm) (* = estimated)	Length of lamellar columellar structures (µm) (*estimated)	Stratigraphic range
chevalieri ZLATARSKI, 1968	11–17	20–32	4–6/5	500–1,000*	1,000–2,000*	lower Aptian (or possibly uppermost Barremian?–lower Aptian?)
grandidentata ZLATARSKI, 1968	12–19	20–35	4–7/5	ca. 1,000*	800–1,500*	Hauterivian; lower Aptian (or possibly uppermost Barremian?–lower Aptian?)
kaufmanni (KOBY, 1897)	4–10	16–36	5–6/5	230–530	500–1,800	lower Aptian
pulchra MORYCOWA & MASSE, 1998	3.5–5.5 (same series); 6–11 (adjacent series)	21–26	7–9/5	200–600	300–600	(upper Barremian?) Aptian–Albian
valclusensis MORYCOWA & MASSE, 1998	5.5–9.5 (11)	24–32	8–10/5	150–560 (700)	400–1,100	lower Aptian
vorarlbergensis BARON-SZABO, 2015	2–8	(12) 24–48	5–6/2	200–1,000	300–1,000	upper Barremian–lower Aptian

Tab. 1.
Dimensions of skeletal elements of species of *Paraclausastrea* and their stratigraphic ranges.

Diagnosis: Massive thamnasterioid to submeandroid colony; cerio-thamnasterioid when corallites crowded; occasionally meandroid in peripheral areas of colony. Budding mainly intracalicular, extracalicular budding observed in a small number of places. Septa compact, have montlivaltiid microstructure, are confluent to subconfluent, non-confluent in a small number of places, straight to curved, unequal in length. Their distal edges have acute or rounded teeth. Lateral flanks of septa have granules and carinae that are perpendicular to distal edge. Septa arranged in bilateral and radial symmetries. Columella absent or present. When present, it is formed by lamellar to sublamellar segments or irregularly shaped trabecular portions. Columella free or fused with one or more axial edges of septa. Paliform structures absent or ?present in a few corallites. Synapticulae possibly present. Endothecal dissepiments vesicular to subtabulate. Wall absent or is formed by an incomplete paratheca.

Stratigraphic range: Hauterivian–Albian.

Affinities: The genus is related to *Clausastrea* D'ORBIGNY, 1849, *Dimorphocoenia* DE FROMENTEL, 1857, *Goldfussastrea* BEAUVAIS, 1964, *Isastrea* MILNE EDWARDS & HAIME, 1851, and *Meandrastrea* D'ORBIGNY, 1849. Regarding polyp integration as well as both axial and endothecal developments, *Paraclausastrea* is closest to *Goldfussastrea* (see BARON-SZABO, 2015).

Paraclausastrea chevalieri ZLATARSKI, 1968

Pl. 1, Fig. 1

(v)*1968 *Paraclausastrea chevalieri* gen. n., sp. n.: ZLATARSKI, p. 161, Pl. 1, Fig. 1, Pl. 2, Figs. 1–2, Pl. 3, Fig. 1.

Dimensions: Distance of corallite centers in both thamnasterioid and submeandroid integration: 11–17 mm; number of septa: 20–32; number of septa/mm: 4–6/5; intertrabecular distance: estimated to range between 500–1,000 µm (estimation based on measurements taken from the illustrations in ILCHEVA & MOTCHUROVA-DEKOVA, 2011); length of lamellar to sublamellar columellar segments: estimated to range between 1,000–2,000 µm (estimation based on measurements taken from the illustrations in ILCHEVA & MOTCHUROVA-DEKOVA, 2011).

Description: Massive to lamellar colony with corallites that are in thamnasterioid to meandroid integration. Short meandroid series occur in peripheral parts of the colony. Corallite centers distinct to subdistinct. Septa developed in 2 size orders. Six to 12 septa reach corallite center. Endothecal dissepiments vesicular, abundant.

Distribution: Aptian of Bulgaria (or possibly uppermost Barremian?–lower Aptian?; see ILCHEVA & MOTCHUROVA-DEKOVA, 2011) (upper parts of Smochan Formation at Doyrentsi village area, Lovech district).

Material: NMNHS F-29854 (holotype); NMNHS F–26115–26116, –26138, –27713–27715, –27732–27733, –29860–29861, –28998, –29001, –29691, and Cr_1 6364–6373 (all paratypes; see ILCHEVA & MOTCHUROVA-DEKOVA, 2011, p. 134).

Paraclausastrea grandidentata ZLATARSKI, 1968

Pl. 1, Figs. 2–5

(v)*1968 *Paraclausastrea grandidentata* gen. n., sp. n.: ZLATARSKI, p. 161, Pl. 4, Figs. 1–2.

1985 *Paraclausastrea* aff. *grandidentata* ZLATARSKI, 1968: SIKHARULIDZE, p. 31, Pl. 15, Figs. 1a–b.

Dimensions: Distance of corallite centers in both thamnasterioid and submeandroid integration: 12–19 mm; number of septa: 20–35; number of septa/mm: 4–7/5; intertrabecular distance: estimated to range around 1,000 µm (estimation based on measurements taken from the original illustrations in ZLATARSKI (1968)); length of lamellar to sublamellar columellar segments: estimated to range between 800–1,500 µm (estimation based on measurements taken from the original illustrations in ZLATARSKI (1968)).

Description: Massive colony with corallites that are in thamnasterioid to submeandroid integration. Septa are confluent to subconfluent, developed in two size orders. 8–12 septa reach corallite center. Corallite centers distinct to subdistinct. Endothecal dissepiments vesicular, abundant.

Distribution: Hauterivian of Georgia (in Caucasus), Aptian of Bulgaria (or possibly uppermost Barremian?–lower Aptian?; see ILCHEVA & MOTCHUROVA-DEKOVA, 2011) (upper parts of Smochan Formation at Doyrentsi village area, Lovech district).

Remarks: Based on the original description by SIKHARULIDZE (1985: 31) and the measurements taken from the illustrations in SIKHARULIDZE (1985: Pl. 15, Figs. 1a–b), the material form the Hauterivian of Georgia (in Caucasus) described as *Paraclausastrea* aff. *grandidentata* ZLATARSKI, 1968, is characterized by corallite diameters ranging between 6 to around 10 mm; distance of corallite centers of 7–13 mm; corallites having 22–30 septa; lamellar to sublamellar columellar segments that are around 850 µm in length; septal density of 6–7 in 5 mm; and 8–10 dissepiments in 5 mm.

Material: NMNHS F–29695–29696 (holotype); NMNHS F–28996–28997 (paratype); NMNHS F–28999–29000 (see ILCHEVA & MOTCHUROVA-DEKOVA, 2011: 134–135); GIN 247/77.

Paraclausastrea kaufmanni (KOBY, 1897)

Pl. 1, Figs. 6–10, Pl. 2, Figs. 3–4

v*1897 *Latimeandra Kaufmanni*, KOBY, 1896: KOBY, p. 45, Pl. 11, Figs. 1–2.

non 2006 *Dimorphocoenia kaufmanni* (KOBY, 1897): LÖSER & FERRY, p. 482, Fig. 4(8).

Dimensions: Corallite diameter: 4–7 mm; distance of corallite centers in both thamnasterioid and submeandroid integration: 4–10 mm; number of septa (monocentric corallite): 16–36; number of septa/mm: 5–6/5; intertrabecular distance: 230–530 µm; density of endotheca: 4–6 dissepiments/2 mm; length of lamellar to sublamellar columellar segments: 500–1,800 µm.

Description: Massive colony with corallites that are in thamnasterioid to submeandroid integration; cerio-thamnasterioid when corallites crowded. Corallite center free or

occupied by lamellar to sublamellar or irregularly shaped trabecular portions that are free or fused with one or more axial edges of septa. Up to 10 septa reach the corallite center. In peripheral areas of the corallites, septa are subequal in thickness. Regarding their length, they are developed in 3 to 4 size orders.

Distribution: Lower Aptian of Switzerland (Schrattenkalk Formation at Käsernalp, Canton of Schwyz).

Remarks: The taxonomic position of the species *Latimaeandra kaufmanni* KOBY, 1897, has long been discussed. TURNŠEK & MIHAJLOVIĆ (1981: 30) grouped the species *Latimaeandra kaufmanni* KOBY, 1897, with the genus *Latiastrea*. This assignment has been subsequently accepted by several authors. Recently, LÖSER & FERRY (2006: 482) transferred KOBY'S taxon to the genus *Dimorphocoenia* DE FROMENTEL, 1857, and assigned material from the Barremian of France to their newly combined taxon *Dimorphocoenia kaufmanni* (KOBY, 1897). However, in having polyps that are in plocoid to subcerioid integration, and showing both a weakly developed parietal columella in some corallites and nonconfluent septa, the French material differs from the genus *Dimorphocoenia* DE FROMENTEL, 1857, but shows similarities to the genus *Complexastrea* (possibly corresponding to *C. coronata* SIKHARULIDZE, 1985) (see discussion in BARON-SZABO, 2014: 72). In addition, recently carried out studies by the author of the current work revealed that KOBY'S species, in contrast to the statement in LÖSER & FERRY (2006: 482), differs from the genus *Dimorphocoenia* DE FROMENTEL, 1857, as it is characterized by 1) thamnasterioid to submeandroid corallite integration as can be typically seen in the type and original material of the type species of *Paraclausastrea* ZLATARSKI, 1968; 2) mainly intracalicular sometimes extracalicular budding; 3) mainly confluent but also subconfluent and nonconfluent montlivaltiid septa; 4) corallite centers that are free or have columellar structures that are formed by lamellar to sublamellar segments or irregularly shaped trabecular portions; 5) numerous vesicular to subtabulate endothecal dissepiments; and 6) a corallite wall that is absent or formed by an incomplete paratheca. Therefore, the species *Latimaeandra kaufmanni* KOBY, 1897, is grouped with the genus *Paraclausastrea* ZLATARSKI, 1968.

Material: NMB D–2490 (holotype); and new material GPIH–4844 (DR. W. LANGE coll.; topotype).

Paraclausastrea pulchra MORYCOWA & MASSE, 1998

Pl. 2, Figs. 1–2

(v)*1998 *Paraclausastrea pulchra* nov. sp.: MORYCOWA & MASSE, p. 748, Figs. 1a–3, Figs. 16A–B.

v2003 *Paraclausastrea pulchra* MORYCOWA & MASSE, 1998: BARON-SZABO et al., p. 204, Pl. 39, Fig. 1.

v2007 *Paraclausastrea* cf. *pulchra* MORYCOWA & MASSE, 1998: PANDEY et al., p. 34, Pl. 8, Figs. 1a–c.

Dimensions: Distance of corallite centers (same series); 3.5–5.5 mm; distance of corallite centers (adjacent series): 6–11 mm; number of septa: 21–26; number of septa/mm: 7–9/5; intertrabecular distance: mainly between 200–600 µm (measurements taken from images in MORYCOWA & MASSE, 1998); density of endotheca: 7–10 dissepiments/5 mm; length of lamellar to sublamellar columellar segments: 300–600 µm.

Description: Thamnasterioid to submeandroid colony. Septa are confluent, subconfluent or nonconfluent, subequal in thickness, and arranged in 3 irregular size orders. Usually 10–12 septa reach the corallite center. Corallite center generally free; in a few corallites, lamellar to sublamellar or irregularly shaped trabecular portions occur that are free or fused with one or more axial edges of septa.

Distribution: Lower Aptian (or upper Barremian?) of southern France (Monts de Vaucluse, Provence), Aptian–Albian of Iran.

Material: UJ Prov. –208 (holotype); BSPG PIW2007II–93; PAL–ERL B37 (SENOWBARI-DARYAN coll.).

Paraclausastrea valclusensis MORYCOWA & MASSE, 1998

Pl. 2, Figs. 5–6

(v)*1998 *Paraclausastrea valclusensis* nov. sp.: MORYCOWA & MASSE, p. 748, Figs. 1a–3, Figs. 16A–B.

Dimensions: Corallite diameter: 4.5–6 (8) mm; distance of corallite centers: 5.5–9.5 (11) mm; number of septa: 24–32; number of septa/mm: 8–10/5; intertrabecular distance: 150–560 (700) µm (measurements taken from image of holotype); density of endotheca: 9–11 dissepiments/5 mm; length of lamellar to sublamellar columellar segments: 400–1,100 µm (measurements taken from image of holotype).

Description: Massive colony with corallites that are in thamnasterioid integration. Septa are generally confluent, subequal in thickness, and arranged in 3 irregular size orders. Usually 10–12 septa reach the corallite center. Corallite center generally free; in a few corallites, lamellar to sublamellar or irregularly shaped trabecular portions occur that are free or fused with one or more axial edges of septa.

Distribution: Lower Aptian of southern France (Monts de Vaucluse, Provence).

Material: UJ Prov. –94 (holotype).

Paraclausastrea vorarlbergensis BARON-SZABO, 2015

Pl. 2, Figs. 7–9

v*2015 *Paraclausastrea vorarlbergensis,* sp. nov.: BARON-SZABO, p. 331, Pl. 1, Figs. A–I.

Dimensions: Corallite diameter: 3–6.5 mm, in areas of intense budding often ranging between 1.8–2.5 mm; distance of corallite centers in both thamnasterioid and submeandroid integration: 2–8 mm; number of septa: (12) 24 to 48; number of septa/mm: 5–6/2; intertrabecular distance: 200–1,000 µm; density of endotheca: 6–10 dissepiments/2 mm; length of lamellar to sublamellar columellar segments: 300–1,000 µm.

Description: Massive colony with corallites that are mainly in thamnasterioid, sometimes submeandroid integration; cerio-thamnasterioid when corallites crowded. Occasionally, a small number of corallites (often 3–5) are arranged in short meandroid series. Corallite center free or occupied by lamellar to sublamellar or irregularly shaped trabecular portions that are free or fused with one or more axial

edges of septa. Up to 9 septa reach the corallite center. Septa are generally developed in 3 complete or 4 incomplete cycles in 6 generally irregular systems (often 24–30 septa). In a small number of corallites that are around 6 mm in diameter, 4 complete septal cycles are present (= 48 septa). In corallites that are around 2 mm in diameter, usually between 12 and 18 septa occur.

Distribution: Upper Barremian–lower Aptian of western Austria (Schrattenkalk Formation at Brandalpe-Kuhberg, Vorarlberg).

Material: VNS P.25192 (holotype).

Paleoenvironment of *Paraclausastrea*

Representatives of the genus *Paraclausastrea* occurred in various shallow-marine reefal and non-reefal environments.

- Corals of this genus were recorded from the so-called Urgonian Facies type (sensu Rat, 1959) (referring to assemblages of 1) southern France; 2) western Austria; 3) central Switzerland, and 4) Georgia [in Caucasus]). This facies type represents shallow water platform developments that are characterized by various reefal developments like patch-reefs, bioherms, and biostromes. Generally, it is dominated by alternating layers of massive limestones, bioclastic limestones, and various types of silty-sandy layers. In addition to scleractinian corals, other macrofossils like, e.g., rudists, sclerosponges, bryozoans, and echinoderms often occur. Benthic foraminifers and dasycladacean algae are usually abundant (Scholz, 1984; Bollinger, 1988; Morycowa & Masse, 1998; Morycowa & Decrouez, 2006; Baron-Szabo, 1997, 2014):
  1) In the lower Aptian (and upper Barremian?) of southern France (Monts de Vaucluse, Provence; Morycowa & Masse, 1998), *Paraclausastrea* occurred in association with colonial scleractinians like, e.g., *Actinastrea, Amphiaulastrea, Calamophylliopsis, Clausastrea, Columnocoenia, Cyathophora, Donacosmilia, Eugyra, Heliocoenia, Rhipidomeandra, Stylina*, and the solitary genus *Saltocyathus*.
  2) In the upper Barremian–lower Aptian of western Austria (Schrattenkalk Formation at Brandalpe-Kuhberg, Vorarlberg; Baron-Szabo, 2015), *Paraclausastrea* occurred with colonial forms like, e.g., *Amphiaulastrea, Clausastrea, Diploastrea, Eugyra, Fungiastraea, Heliocoenia, Latusastrea,* and *Paretallonia* (Baron-Szabo, in prep.).
  3) In the lower Aptian of Switzerland (Upper Schrattenkalk Formation at Drusberg, Käsernalp; Canton of Schwyz) (this paper), *Paraclausastrea* occurred with colonial forms like, e.g., *Dimorphocoenia, Eugyra, Latiphyllia,* and *Stylina,* and various branching (e.g., *Cladophyllia*), plocoid (e.g., *Ovalastrea*), and thamnasterioid (cf. *Actinarea*) forms (Koby, 1896, 1897, 1898; Baron-Szabo, 2014, Baron-Szabo, in prep.).
  4) *Paraclausastrea* was found in coral dominated bioherms or biostromes (Hauterivian, Dzirul Massif, Georgia [in Caucasus]; Sikharulidze, 1985). *Paraclausastrea* occurred in association with colonial scleractinians like, e.g., *Actinastrea, Clausastrea, Dimorphocoenia, Eugyra, Heliocoenia, Microsolena, Stylina*, and *Thamnasteria,* and solitary genera like, e.g., *Epistreptophyllum*.
- Furthermore, *Paraclausastrea* was recorded from allochthonous limestone blocks with corals as the main reef-building organisms (Razavi-Chorasan, Sanganeh Formation, upper Aptian–lower Albian of northeastern Iran; Pandey et al., 2007). Scleractinian corals appeared together with bivalves, sponges, and some brachiopods. Colonial scleractinians like, e.g., *Actinastrea, Calamophylliopsis, Cladophyllia, Columactinastrea, Cyathophora, Dermosmilia, Dimorphastrea, Fungiastraea, Heliocoenia, Meandrastrea, Stylina, Thecosmilia*, and *Turnsekophyllia*, and solitary genera like, e.g., *Montlivaltia, Peplosmilia*, and *Trochosmilia*, were found in the same formation.
- In addition, *Paraclausastrea* was found in massive limestone in which corals occurred in loosely associated assemblages with oysters (upper Aptian–Albian of Dizlu, Esfahan, central Iran; Baron-Szabo et al., 2003). Other scleractinians like, e.g., the colonial genera *Actinastrea, Columnocoenia, Cyathophora, Eugyra, Fungiastraea, Placocoenia,* and *Stylina,* and the solitary genus *Montlivaltia*, were also present.

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Plate 1

Fig. 1: *Paraclausastrea chevalieri* ZLATARSKI, 1968,

Holotype; upper surface of colony; NMNHS F–29854; image adopted from ILCHEVA & MOTCHUROVA-DEKOVA (2011: 134, Fig. 4); Aptian (or possibly uppermost Barremian?–lower Aptian?; see ILCHEVA & MOTCHUROVA-DEKOVA, 2011: 134) (upper parts of Smochan Formation at Doyrentsi village area, Lovech district), Bulgaria; scale bar: 20 mm.

Figs. 2, 3: *Paraclausastrea grandidentata* ZLATARSKI, 1968

Holotype; NMNHS F–29695–29696; Aptian (or possibly uppermost Barremian?–lower Aptian?; see ILCHEVA & MOTCHUROVA-DEKOVA, 2011: 134) (upper parts of Smochan Formation at Doyrentsi village area, Lovech district), Bulgaria.

Fig. 2: upper surface view of colony; image adopted from ZLATARSKI (1968: 171, Pl . 4, Fig. 2); scale bar: 20 mm.

Fig. 3: upper surface view of colony; image adopted from ZLATARSKI (1968: 171, Pl . 4, Fig. 1); scale bar: 14 mm.

Figs. 4, 5: *Paraclausastrea* aff. *grandidentata* ZLATARSKI, 1968

GIN 247/77; Hauterivian (Dzirul Massif), Georgia (in Caucasus).

Fig. 4: cross view of colony, thin section; image adopted from SIKHARULIDZE (1985: Pl. 15, Fig. 1a); scale bar: 10 mm.

Fig. 5: lateral view of colony, thin section; image adopted from SIKHARULIDZE (1985: Pl. 15, Fig. 1b); scale bar: 3 mm.

Figs. 6–10: *Paraclausastrea kaufmanni* (KOBY, 1897)

Holotype; NMB D–2490; lower Aptian of Switzerland (Schrattenkalk Formation at Käsernalp, Canton of Schwyz), Switzerland.

Fig. 6: upper surface of colony; scale bar: 35 mm.

Fig. 7: close-up of Figure 6; scale bar: 3 mm.

Fig. 8: close-up of Figure 6; scale bar: 7 mm.

Fig. 9: lateral view of colony, polished surface; scale bar: 3 mm.

Fig. 10: cross view of colony, polished surface; scale bar: 5 mm.

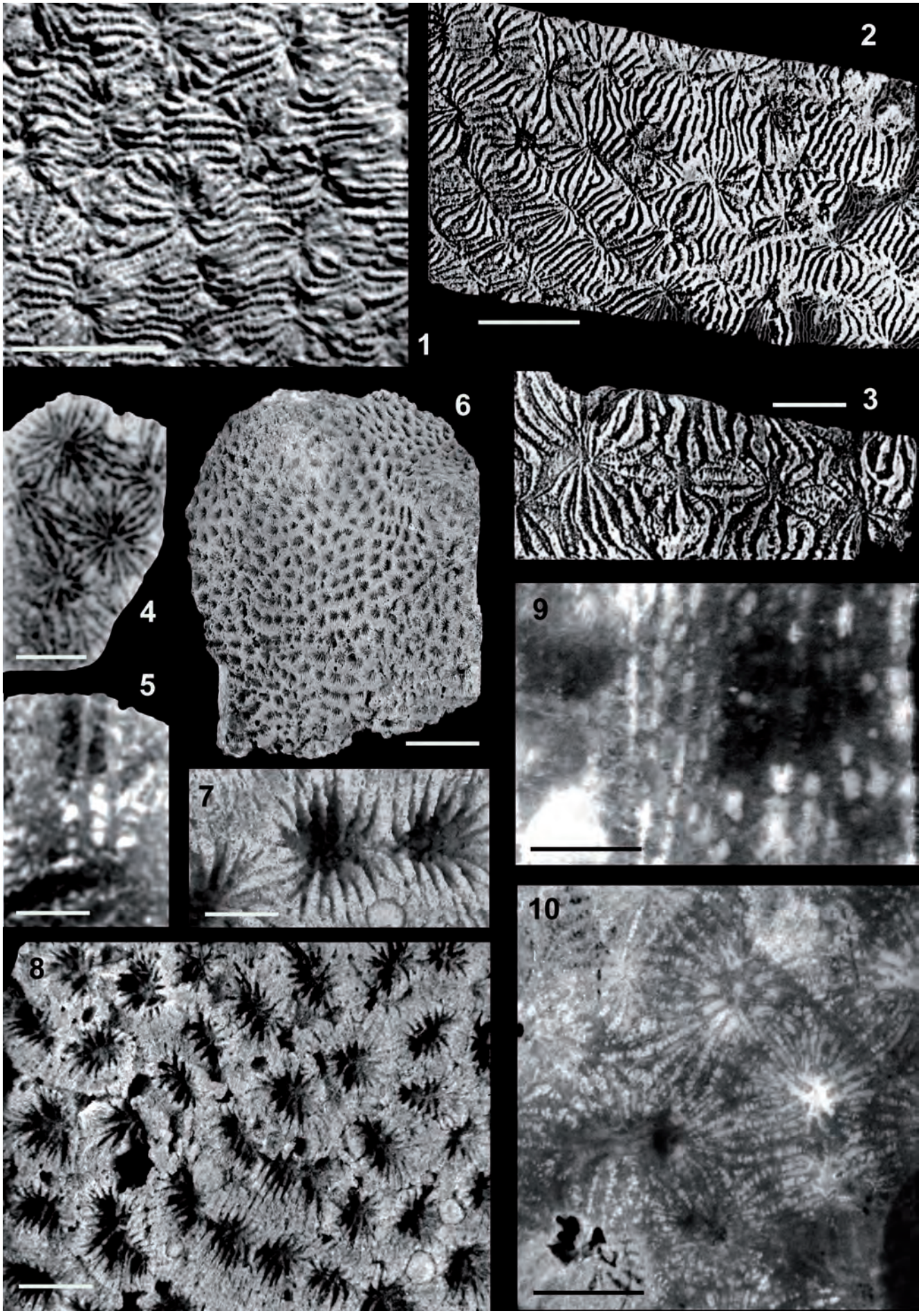
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Plate 2

Figs. 1, 2: *Paraclausastrea pulchra* Morycowa & Masse, 1998

Holotype; UJ Prov. –208; lower Aptian (or upper Barremian?) (Monts de Vaucluse, Provence), France.

Fig. 1: upper surface of colony; photograph courtesy E. Morycowa.

Fig. 2: close-up of Figure 1; scale bar: 4.7 mm.

Figs. 3, 4: *Paraclausastrea kaufmanni* (Koby, 1897)

Topotype; GPIH–4844 (Dr. W. Lange coll.); lower Aptian of Switzerland (Schrattenkalk Formation at Käsernalp, Canton of Schwyz), Switzerland.

Fig. 3: upper surface of colony; scale bar: 6 mm.

Fig. 4: close-up of Figure 3; scale bar: 4.5 mm.

Figs. 5, 6: *Paraclausastrea valclusensis* Morycowa & Masse, 1998

Holotype; UJ Prov. –94; lower Aptian (Monts de Vaucluse, Provence), France.

Fig. 5: cross view of colony, thin section; photograph courtesy E. Morycowa; scale bar: 4.5 mm.

Fig. 6: lateral view of colony, thin section; photograph courtesy E. Morycowa; scale bar: 2 mm.

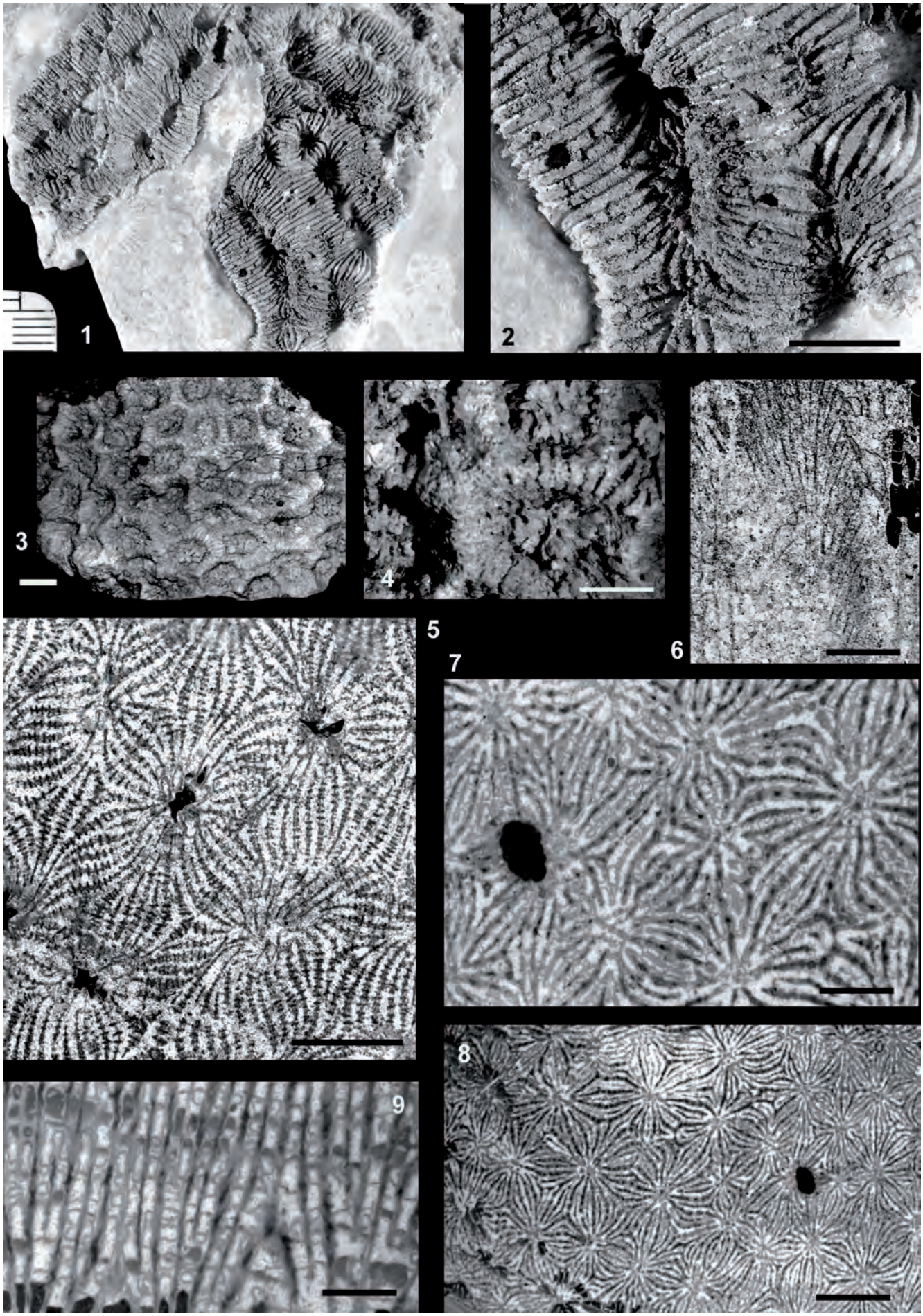
Figs. 7–9: *Paraclausastrea vorarlbergensis* Baron-Szabo, 2015

Holotype; VNS P.25192; upper Barremian–lower Aptian (Schrattenkalk Formation at Brandalpe-Kuhberg, Vorarlberg), Austria.

Fig. 7: close-up of Figure 8; scale bar: 2.5 mm.

Fig. 8: cross view of colony, thin section; scale bar: 6 mm.

Fig. 9: lateral view of colony, thin section; scale bar: 2 mm.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