Acta Geologica Polonica, Vol. 50 (2000), No. 3, pp. 335-342

Amygdalophyllum sudeticum sp. nov. (Rugosa) from a Lower Viséan gneissic conglomerate, Bardzkie Mts., Sudetes (Poland)

LECH ŻOŁYŃSKI

Adam Mickiewicz University, Institute of Geology, ul. Maków Polnych 16, PL-61-606 Poznań, Poland.
E-mail: zol@main.amu.edu.pl

ABSTRACT:

ŻOŁYŃSKI, L. 2000. *Amygdalophyllum sudeticum* sp. nov. (Rugosa) from a Lower Viséan gneissic conglomerate, Bardzkie Mts., Sudetes (Poland). *Acta Geologica Polonica*, **50** (3), 335-342. Warszawa.

A new species of rugose coral, *Amygdalophyllum sudeticum* sp. nov., is described from specimens occurring in the matrix of a gneissic conglomerate cropping out in the northern part of the Bardzkie Mts., Poland. The paper includes diagnosis, description of the holotype, individual variability, diagenetic alterations and taphonomy. Comparison with closely similar corals from Russia and Belgium allows dating of the gneissic conglomerate as Early Viséan.

Key words: Rugose corals, Taxonomy, Diagenetic alterations, Taphonomy, Sudetes, Poland, Viséan.

INTRODUCTION

The corals described in this paper were derived from the gneissic conglomerate cropping out between Srebrna Góra and Nowa Wieś in the Bardzkie Mountains (Text-fig. 1). Most rock units in this geologically complex area have not been assigned univocal biostratigraphical positions. The gneissic conglomerate was previously dated with brachiopods derived from calcareous extraclasts – lithoclasts? occurring sporadically in the conglomerate. Poor preservation of this fauna, its scarcity and its occurrence in extraclasts have hindered precise age determination (OBERC 1957). In contrast to the brachiopods, the corals described herein occur as bioclasts surrounded directly by conglomerate matrix and their identification allows a much more precise age determination. They also allow correlation of this conglomerate with the Les Avins Formation in Belgium, which yielded specimens identified by POTY (personal communication, December 1998) as *Amygdalophyllum* sp. This occurrence suggests an Early

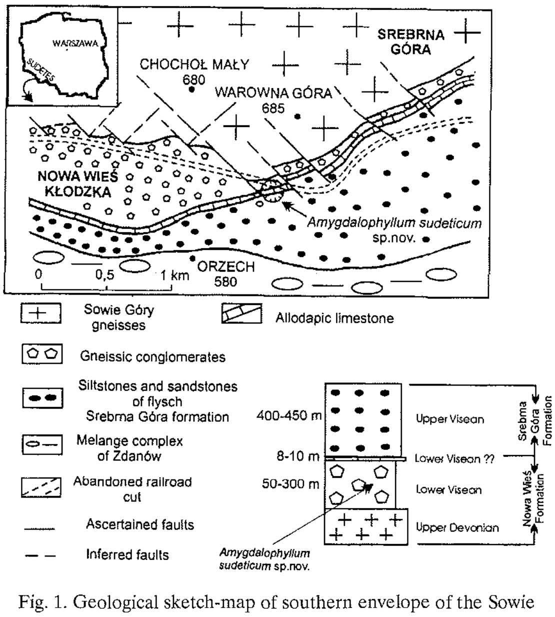

Fig. 1. Geological sketch-map of southern envelope of the Sowie Góry block (after PACHOLSKA 1978), with location of source localities of *Amygdalophyllum sudeticum* sp. nov.

Viséan age for the gneissic conglomerate, and perhaps for the remaining lithostratigraphical units of the "Nowa Wieś Formation" (WAJSPRYCH 1978) in the northern part of the Bardzkie Mts.

SYSTEMATIC ACCOUNT

Family: Aulophyllidae DYBOWSKI, 1873
Subfamily: Amygdalophyllinae GRABAU *in* CHI, 1935
Genus: *Amygdalophyllum* DUN & BENSON, 1920

Fig. 2. *Amygdalophyllum sudeticum* sp, nov., UAM.TcA026n/96, holotype ; 1 – transverse section section; 2 – longitudinal section

TYPE SPECIES: *A. etheridgei* DUN & BENSON, 1920.

Amygdalophyllum sudeticum sp. nov.
(Text-figs 2-6)

HOLOTYPE: UAM.Tc.A026N/96 (Text-fig. 2), from lowermost part of "Nowa Wieś Formation" (gneissic conglomerate), Lower Viséan, found in abandoned railroad cut, Bardzkie Mts.

DERIVATION OF NAME: *sudeticum* – for occurrence in Sudetes Mts.

PARATYPES: UAM.Tc.A026n/96, UAM.Tc.A025n/95, UAM.Tc.A022/95, UAM.Tc.A17w/95, UAM.Tc.A15w/95, UAM.Tc.A14w/96, UAM.Tc.A9w/95, UAM.Tc.A07w/95, UAM.Tc.Sr4/95, UAM.Tc.Sr1/95, UAM.Tc.Os2/95, UAM.Tc.Ab02/95,

MATERIAL: Approximately 50 incomplete, solitary corallites without proximal ends and external walls. Few specimens with partly preserved calices. Internal structure well preserved. Studied material housed in Museum of Adam Mickiewicz University, Poznań.

DIAGNOSIS: *Amygdalophyllum* with 35-40 × 2 septa at corallite diameter 20-25 mm; almost all major septa connected with elliptical or rounded columella, 2-4 mm in diameter; septal lamellae in columella correspond to major septa and to some minor septa; minor septa reach 2/3 length of major septa; cardinal fossula weakly marked; tabularium biform.

DESCRIPTION OF HOLOTYPE: In transverse section major septa straight, bilaterally arranged; in tabularium 0.5 –0.7 mm thick, thinning in dissepimentarium. Cardinal septum thickens where it joins columella. Almost all major septa connected with columella; only 1 or 2 septa adjacent to cardinal septum slightly shortened. Minor septa thin, isolated, locally contratingent, approximately 2/3 the length of major septa. 2-4 rows of angular dissepiments. In longitudinal section dissepiments irregular, elongated, convex, near vertical or steeply declined toward axis. Tabularium biform, indistinct 4 mm in diameter. Tabellae small, globose, often similar to dissepiments, locally parallel to each other at periphery. Elongated to strongly convex, locally S-shaped, steeply elevated near columella, locally subhorizontal near dissepimentarium. Columella elliptical, consisting of thin median lamella and septal lamellae corresponding to major septa and commonly to minor septa as well (Text-fig 2).

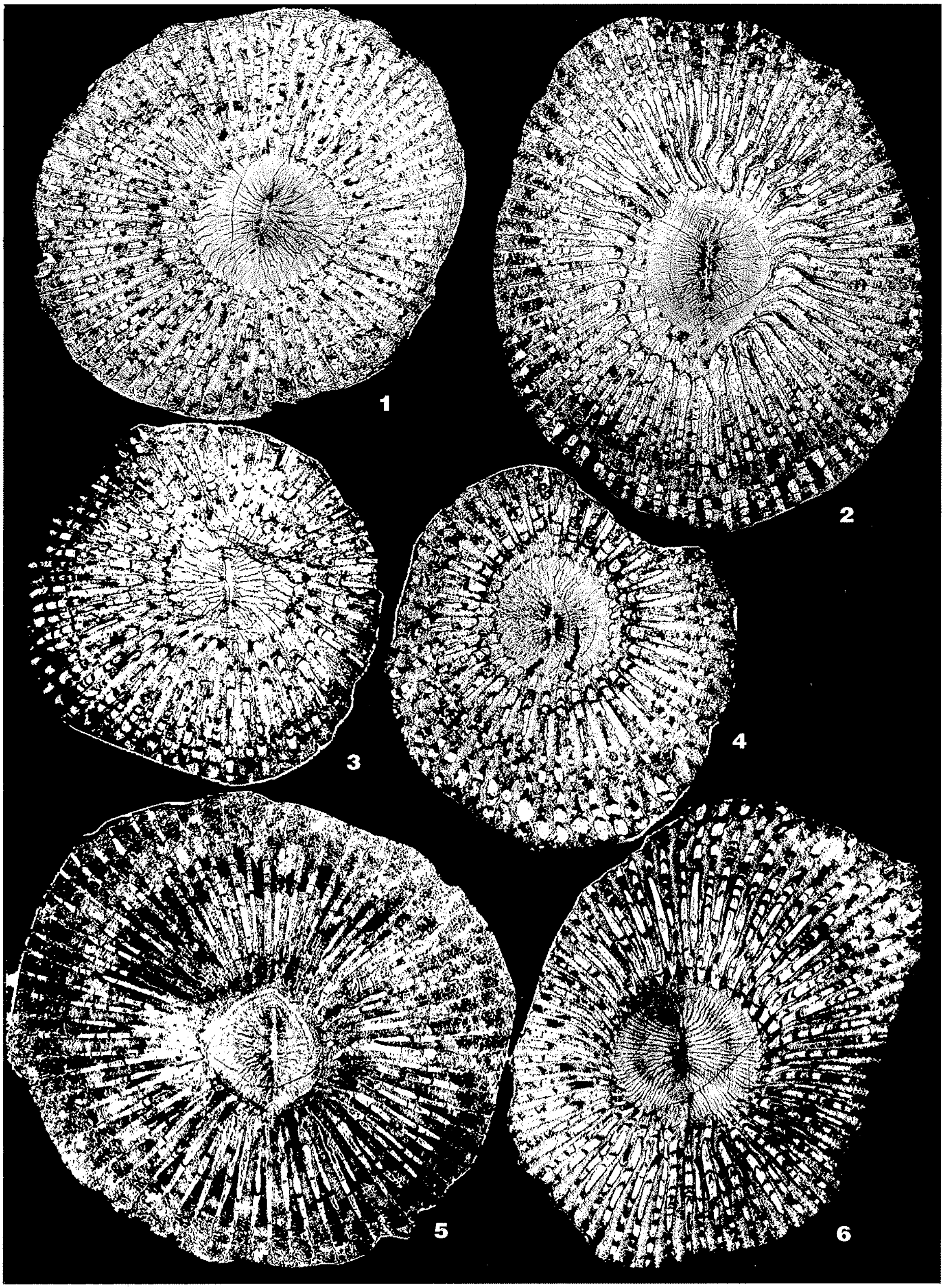

Fig. 3. *Amygdalophyllum sudeticum* sp. nov.; 1 – transverse section (UAM.Tc.A022/95); 2 – transverse section (UAM.Tc.Os2/95); 3 – transverse section (UAM.Tc.Sr1/95); 4 – transverse section (UAM.Tc.A14w/96); 5 – transverse section (UAM.Tc.A07w/95); diagenetic changes: results in partial micritization and iron oxide admixture; 6 – transverse section (UAM.Tc.A025n/95); all figures × 6

INDIVIDUAL VARIABILITY: In approximately 50 % of specimens 1-3 major septa adjacent to the cardinal septum, as well as the alar septa, are withdrawn slightly from the columella during their whole in all growth stages (Text-figs 2.1, 3.2, 3.3).The columella may be elliptical or circular in outline (Text figs 2.1, 3.1-3.2, 3.4, 3.6) throughout the ontogeny. An elliptical columella was observed in 40% of the investigated specimens. The change in the shape of the columella from elliptical to circular occurs where there is no thickening of the distal part of the cardinal septum adjoining the columella (Text-figs 3.1 and 3.4). The

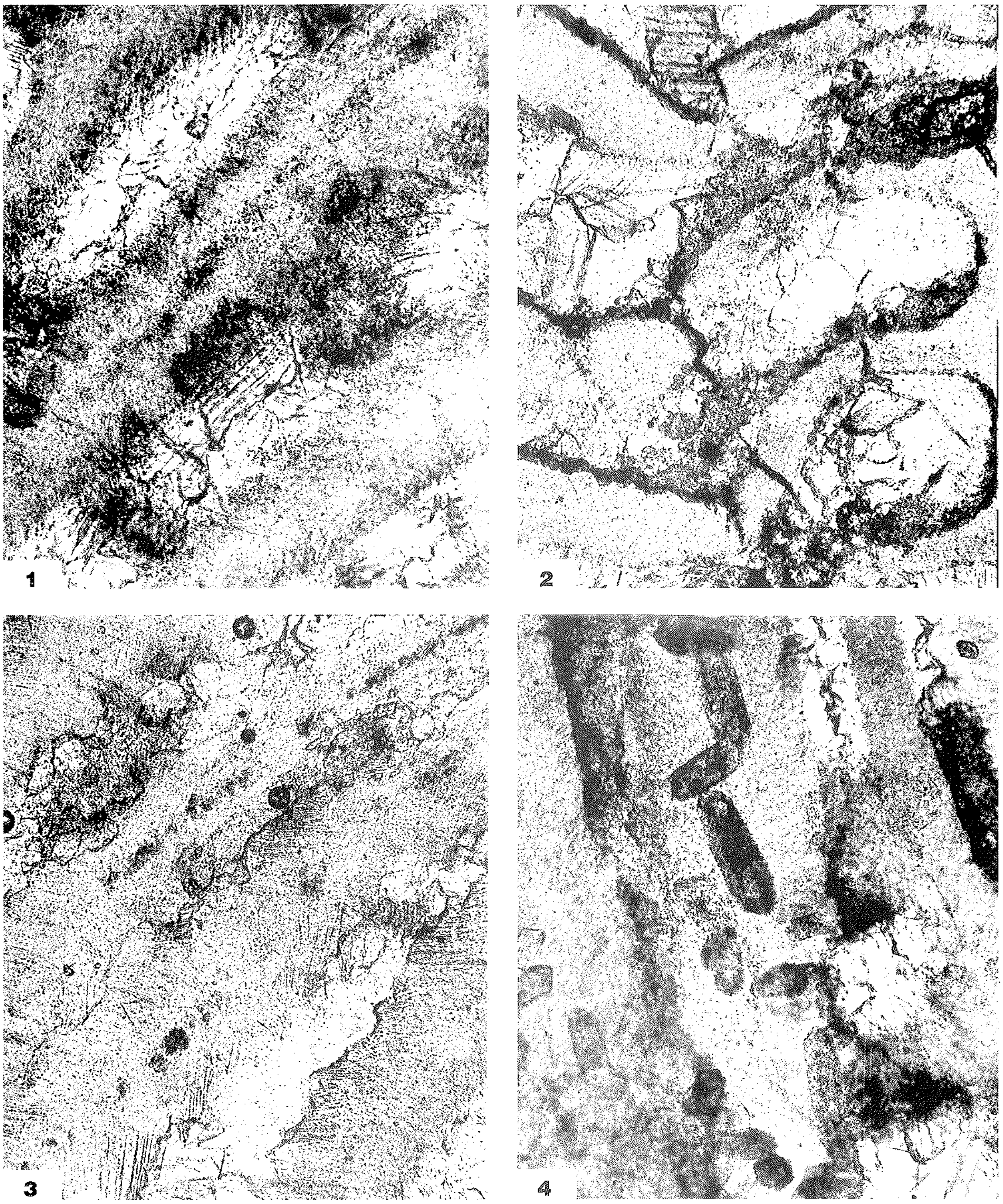

Fig. 4. *Amygdalophyllum sudeticum* sp. nov.; 1 – transverse section, relic of primary microstructure of septum (UAM.Tc.A14w/95); × 75; 2 – transverse section, breakage of septa (UAM.Tc.Ab02/95); × 70; 3 – transverse section, relic of primary microstructure of septum (UAM.Tc.Sr4/95); × 75; 4 – transverse section, replacement of septa by large cristals of calcite (UAM.Tc.A15w/95); × 75

length of the minor septa ranges from 2/3 the length of the major septa to a maximum almost equal to the latter (Text-fig. 3.1, 3.2, 3.5, 3.6). All minor septa, including the longest ones, are withdrawn from the columella. The longest minor septa occur only in specimens with a circular columella.

MICROSTRUCTURE: The microstructure of the septa is diagenetically altered and the scarcity of preserved, original, trabecular or diffusotrabecular microstructure precludes an exact classification (Text-fig. 4.1 and 4.3).

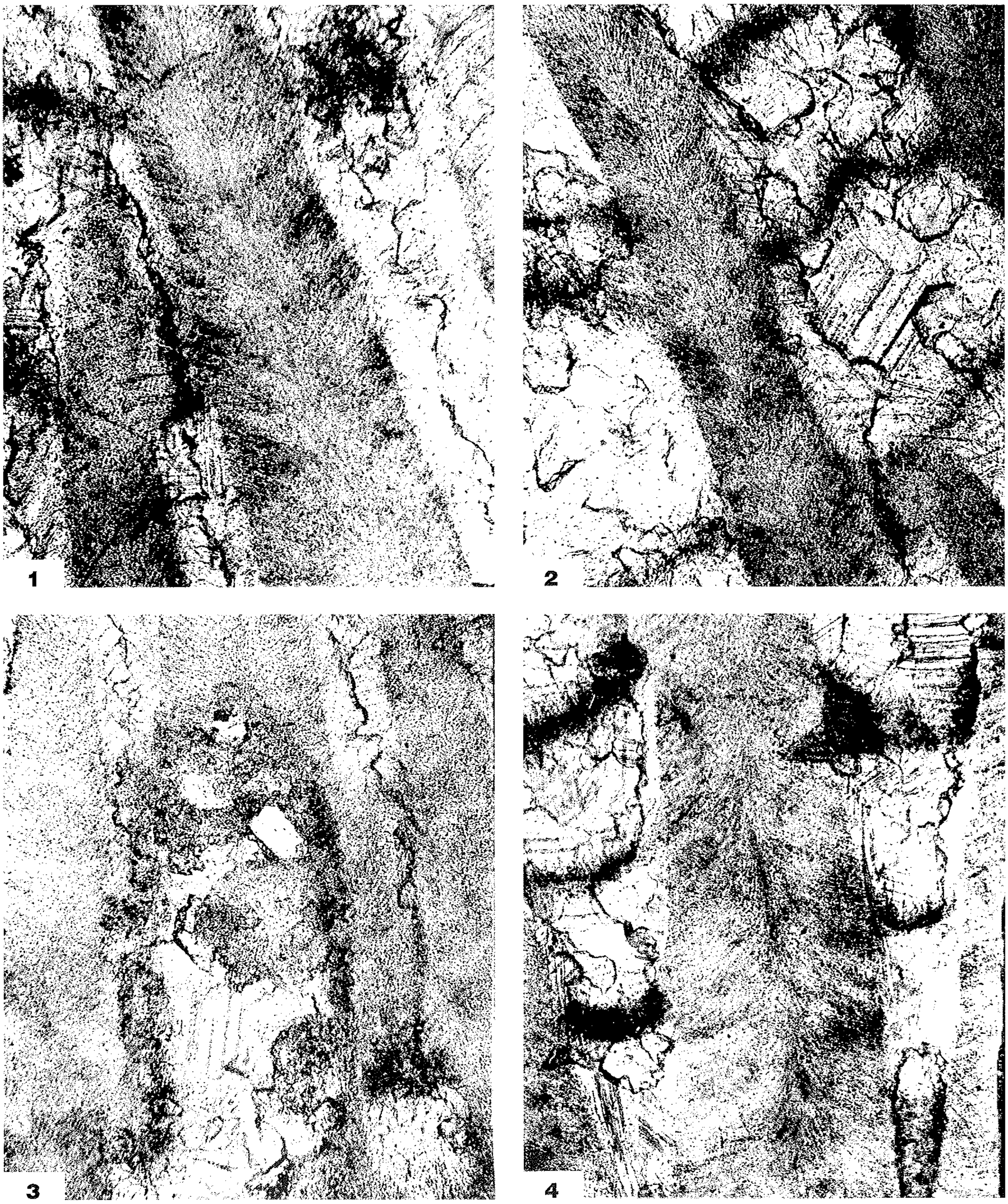

Fig. 5. *Amygdalophyllum sudeticum* sp. nov.; 1 –transverse section of septum, pinnate structure (UAM.Tc.A15w/95); × 75; 2 –transverse section of septum, pinnate structure (UAM.Tc.A9w/95); × 75; 3 –transverse section of septum, pinnate structure (UAM.Tc.Os2/95); first stage of late diagenetic transformation; × 75; 4 –transverse section of septum, pinnate structure (UAM.Tc.Rs4/95); × 75

DIAGENETIC ALTERATIONS: All corallites exhibit early diagenetic alterations. The first stages of late diagenetic transformations are also visible in some specimens. Early diagenetic alterations are characterised by the presence of cement only in the interseptal loculae, not replacing any element of a skeleton (Text-fig. 6). According to KATO (1963) diagenetic changes in the skeletal elements of corals can be classified as:

— mechanical:
a) breakage of septa
b) crushing;

— chemical:
c) recrystallization
d) replacement (i.e. dolomitization, silification) and cementation.

SPECIES	DISSEPIMENTARIUM	TABULARIUM	MAJOR SEPTA	MINOR SEPTA	COLUMELLA	FOSSULA
A. etheridgei Dun] & Benson, 1920	Numerous, closely spaced, steeply declined, regular	Incomplete	Straight, n/d 60/40 sometimes curved, connected with columella; trabecular	Approximately 2/3 length of major septa	Large, elliptical, Consist of septal lamellae corresponding with major septa (seldom with minor septa)	Absent
A. asselense Semenoff-Tian-Chanski, 1974	Dissepiments regular, thickened	Near columella tabule rising toward axis, curved and elongated	Thick in dissepimentarium, connected with columella, partly creating septotheca, trabecular	Approximately 2/3 length of major septa	Small spindle-shaped, consist of septal lamellae	Clearly visible
A. axophylloides Fedorowski, 1970	Dissepiments regular	Tabulae incomplete, steeply declined – elevated? toward columella	Straight, almost reach columella	Approximately 2/3 length of major septa	Small, consists of septal lamellae	Clearly visible
A. conicum Hill, 1934	?	Incomplete, tabellae concave	n/d 30/20, in young stage straight, connected with columella, in more mature stage, variously arranged	Approximately 1/2 length of major septa	Small, elliptical	Large in young stage
A. columellare breviseptatum Pickett, 1966	See *A. columellare, columellare*	See *A. columellare, columellare*	Not connected with columella	See, *A. columellare, columellare*	See , *A. columellare columellare*	See *A. columellare columellar*
A. columellare columellare Pickett, 1966	Dissepiments: irregular, globose, flat or locally lonsdaleoid	Tabelle steeply elevated toward axis	n/d 30/20, straight, connected with columella	Approximately 2/3 length of major septa	Large, almost circular, consistof septallamellae probably corresponding to both major and minor septa	?
A. naosoidea Minato, 1955	Dissepiments small, regular	Tabellae steeply elevated towards columella;	n/d 33/30 thick, almost reach columella	Approximately 2/3 length of major septa	Large, consists of septal lamellae probably corresponding to both major and minor septa	Clear visible
A. inopinatum Hill, 1934	Dissepiments numerous, herringbone	Large incomplete tabulae, tabellae concave	n/d 64–99/ 40 not connected with columella, could be interrupted in dissepimentarium	Approximately 1/2 length of major septa	Small, oval, consists of septal lamellae	Narrow, strongly lengthened
A. thomsoni de Koninck, 1877 (see Hill, 1937)	Narrow, regular	Tabule large, complete or incomplete, steeply declined towards dissepimentarium	n/d 40-50/20, not connected with columella	Approximately 1/3 length of major septa	Large, consists of septal lamellae corresponding to major septa only	Clearly visible
A. sp. of Ivanovsky, 1967;	2 or 3 regular rows of dissepiments	Tabulae thin, incomplete convex	n/d 50/21 straight, not connected with columella; cardinal septum shortened	Approximately 1/3 length major septa	Elliptical, consists of septal lamellae corresponding to both minor and major septa	Broad, open, with parallel walls
A. sp. of Poty, 1981.	Dissepiments regular?, locally lonsdaleoid	?	Straight, connected with columella	Aproximately 1/2 length of major septa	Elliptical, consists of septal lamellae (sporadically of axial tabellae)	Absent or poorly developed

Tab. 1. Characteristic features of species of *Amygdalophyllum*

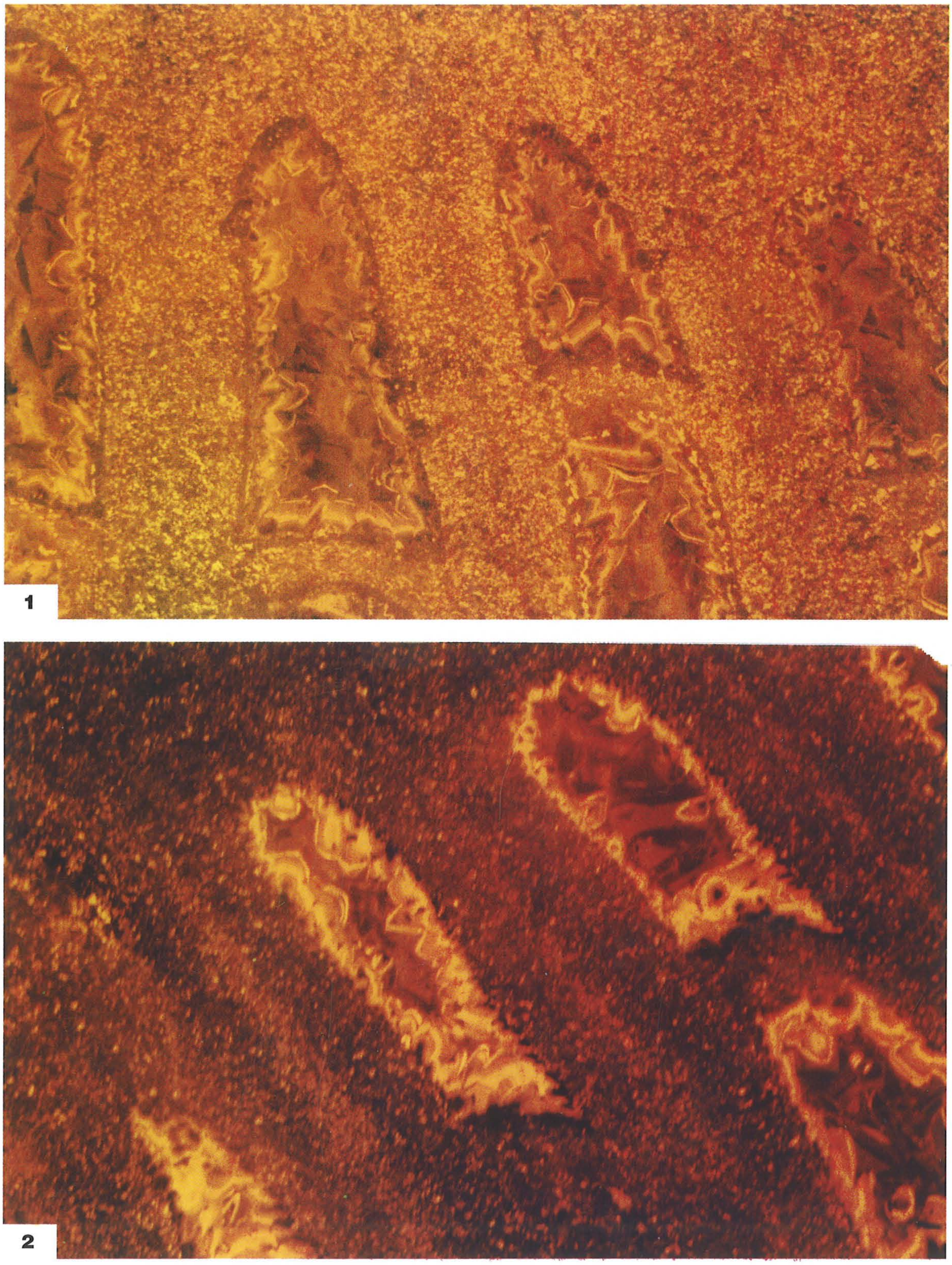

Fig. 6. *Amygdalophyllum sudeticum* sp, nov.; cathodoluminescent photo; 1 –transverse section of septum palisade and mosaic cement (UAM.Tc.A17w/95); 2 – transverse section of septum palisade and mosaic cement (UAM.Tc.Sr4/95); both × 90

Early diagenesis caused no change in the general shape of individual parts of the skeleton; these disappeared gradually during the initial stages of late diagenesis, through replacement by calcite crystals. The latter combined with interseptal cement to form an indistinguishable area of calcitic crystals (Text-fig. 5.3).Changes in septal microstructure constitute the main diagenetic alteration of the corallites. Originally, the septa were formed by a single row of trabeculae. Stereoplasmic deposits with C axes of calcite crystals directed perpendicular to the septum edge were secreted later (e.g. SCHOUPPE & STACUL 1955). Remnants of the original microstructure are visible sporadically (Text-figs 4.1 and 4.3). Diagenetic processes changed the above pattern of microstructure. Calcite fibres developed, arranged radially from the central parts of septa towards their margins, thus producing a feather-like structure (Text-figs 5.1-5.4). It is most likely that the fibres originated from the recrystalization of trabeculae, but the precise method of alteration is unknown because there is no record of succeeding stages. Microscopic analyses show that changes proceeded from the center of the skeletal elements (septa or septal lamellae) toward the outside. Fascicles of fibres, crystallised in their central parts (Text-figs 5.1 and 5.2), may confirm such an interpretation. SEMENOFF-TIAN-CHANSKI (1974) described very similar structures based on African species of *Amygdalophyllum* and considered it a fibrous mezoplazma of pinnate structure. Such a microstructure consists of tufts of fibres identical with those in the Sudetic specimens. SEMENOFF-TIAN-CHANSKI (1974) considered those pinnate structures to have been originally secreted by polyps (biomineralization). Contrary to that opinion, the structure of *Amygdalophyllum sudeticum* sp. nov. is here interpreted as secondary.

Crystallisation of cements is another diagenetic process distinguished. There are two types of cements:
a) The palisade cement (OEKENTORP 1978), or the cement of type A (OEKENTORP 1989), is early diagenetic. Its calcite fibres are arranged perpendicular to skeleton elements, it fills spaces between all skeletal element and it is bright yellow in cathodoluminescence (Text-fig. 6.1-6.2).
b) The mosaic cement (OEKENTORP 1978), or the cement of type B (OEKENTORP 1989), consists of small calcite crystals with a disorderly arrangement of C axes, growing in spaces lacking or partly filled by palisade cement (Text-fig. 6). It is dull brown under cathodoluminescence (Text-fig. 6).

The rarest and least important diagenetic alterations are:

a) partial micritization,
b) iron oxides admixtures,
c) replacement of septa by large crystals of calcite (Text-fig. 4.2),
d) mechanical deformation.

Partial micritization caused thickening of some skeleton elements, but equally in all directions (Text-fig. 3.5). Rarely occurring iron oxide has obscured the general aspect of the corallite (Text-figs 3.4, 3.5). Breakage of some septa was probably caused by compaction.

DISCUSSION: The genus *Amygdalophyllum* was established for Viséan corals from southern Australia. Several species were described (DUN & BENSON 1920; BENSON & SMITH 1923; HILL 1934, 1937; PICKETT 1966) with *Amygdalophyllum etheridgei* (DUN & BENSON, 1920) as the type species (see Table 1).

Amygdalophyllum sudeticum sp. nov. differs from the type species of the genus by having approximately ? the number of septa at 20-25 mm corallite diameter and a different shape of the peripheral parts of the major septa, which are considerably thinner and commonly sigmoidal in *A. etheridgei*. Also, septal lamellae in the columella of *A. etheridgei* are more distinct and larger and its dissepimentarium is much wider with pseudonaotic dissepiments at the periphery. The corallite in the type species is greater than in *A. sudeticum* sp. nov.

Amygdalophyllum sudeticum sp. nov. is morphologically very close to *A. columellare columellare* (PICKETT, 1966), but has considerably longer minor septa and a shorter, thinner median lamella in the columella. In contrast to *A. columellare columellare* the median lamella in *A. sudeticum* sp. nov. does not join the cardinal and counter septa and the columella is elongated towards the cardinal septum.

Amygdalophyllum sudeticum sp. nov. is similar to two European forms, both left in open nomenclature – *Amygdalophyllum* sp. IVANOWSKY, 1967, and *Amygdalophyllum* sp. POTY (personal communication, December 1998). From the former it is distinguished by an underdevelopment of the cardinal fossula and the lack of alar fossulae, which are well developed in IVANOVSKY's specimen (1967, Pl. 18, Fig. 1). Moreover, *S. sudeticum* has markedly longer major and minor septa. The structure of the columella is similar in the Polish and Russian species.

The structural element seen in the central part of the Russian corallite, interpreted by IVANOVSKY (1967) as a counter septum that surrounds the columella, is re-interpreted herein as a section of thickened tabulae.

Specimens of *Amygdalophyllum* found in the Les Avins Formaton of Belgium (zones Cf4a2, Cf4a1,Cf3g, BOLAND 1999 – personal communication) are strikingly similar to *A. sudeticum* sp. nov. Axial tabelae, occasionally present in the columella, and smaller dissepiments in Belgian specimens are differences inadequate for distinction on the species level, unless the number of septal lamellae can be determined. Existing data indicate that at least some additional lamellae occur in the Belgian specimens. The morphological resemblance and relatively small number of diagnostically unimportant differences between the Polish and Belgian specimens allow the present author to combine these two groups of specimens into the new species *Amygdalophyllum sudeticum* sp. nov. Its stratigraphical range is within the limits of foraminiferal zones Cf3g and Cf4a2.

TAPHONOMY: Only preliminary remarks are offered below. Full description of taphonomic problems will be presented in separate paper.

The corals described herein form bioclasts in gneissic conglomerate. All specimens examined have their peripheral parts destroyed – i.e. external walls and parts of dissepimentaria. All of these features indicate redeposition of the corals. Their primary environment – i.e., a carbonate platform (ŻOŁYŃSKI 1997) was supposedly only partly lithified at the time of erosion. Partly preserved calices of some corals filled with conglomerate matrix – i.e., empty when transported – indicate lack of pre-transportation burial in the lithified limestone in their original environment.

Acknowledgements

I would like to thank to E.W. BAMBER and J. FEDOROWSKI, journal referees, for valuable comments markedly improving the final version of this paper. E.W. BAMBER made also linguistic correction.

REFERENCES

BENSON, W.N., SMITH, S. 1923. On some Rugose Corals from the Berindi Series (Lower Carboniferous) of New South Wales. *The Quarterly Journal of the Geological Society of London,* **74** (2), 161-165. London.

DUN, W., BENSON, W. N. 1920. Palaeontology. *In:* W. N. Benson, Dun, W.S. & W.R. Browne The geology, palaeontology and petrography of the Currabubula district, with notes on adjacent regions. *Proceedings of the Linneian Society N.S.W.* **45**, 337-374. London.

HILL, D. 1934. The Lower Carboniferous Corals of Australia. *Proceedings of the Royal Society of Queensland*, **45**, 66-73. Queensland.

HILL, D. 1937. Type Specimens of Palaeozoic Corals from New South Wales in W.B. Clarke's Firssa Collection, and in the Strzelecki Collection. *The Geological Magazine*, **74** (4), 145-148. London.

IVANOVSKY, A.B 1967. Etudy o rannekamennougolnikh rugozakh. 100 pp. *Izdatelstvo "Nauka"*; Moskwa.

KATO, M. 1963. Fine skeletal structures in Rugosa. Journal of the Faculty of Science. Hokkaido university. *Hokkaido University Sapporo, Japan* pp. 571-630. Sapporo.

OBERC, J. 1957. Region Gór Bardzkich (Sudety). Przewodnik dla geologów. 242 pp. *Wydawnictwa Geologiczne*; Warszawa.

OEKENTORP, K. 1978. Diagenesis in Paleozoic Corals. Paper presented at the 10th International Congress on Sedimentology, Jerusalem 1978 pp. 1-8; Jerusalem.

— 1989. Diagenesis in corals: systaxial cements as evidence for post-mortem skeletal thickenings. *In:* Fifth International Symposium Fossil V Cnidaria, Brisbane; *Association of Australasian Palaeontologists*, 169-177. Brisbane.

PICKETT, J. 1966. Lower Carboniferous Coral Faunas from the New England District of New South Wales. *Department of Mines New South Wales (Paleontology),* **15**, 1-37. Sydney.

PACHOLSKA, A. 1978 – On the textonic breccias at southern edge of the Sowie Góry Gneiss Block. *Geologia Sudetica*, **13** (2), 44-59. Wrocław.

SCHOUPPÉ, A. & STACUL, P. 1955. *Verbeekiella* PENECKE, *Timorphyllum* GERTH, *Wannerophyllum* n. gen., *Lophophyllidium* GRABAU aus dem Perm von Timor. *Palaeontographica* (*Supplement*), **4** (5), 95-196. Stuttgart.

SEMENOFF-TIAN-CHANSKY, P. 1974. Recherches sur les tétracoralliaires du Carbonifére du Sahara Occidental. *Editons du Centre National de la Recherche Scientifique*, **7**, 1-315. Paris.

WAJSPRYCH, B. 1978. Allochtonous Paleozoic rocks in the Viséan of the Bardzkie Mts. (Sudetes). *Rocznik Polskiego Towarzystwa Geologicznego*, **48** (1), 91-122. Warszawa. [*In Polish with English summary*]

ŻOŁYŃSKI, L. 1997. Allodapic sequence in the NW part of the Bardo Structure (Sudeten, SW Poland); lithostratigraphic-facies analysis. *Przegląd Geologiczny*, **45** (8), 826-830. Warszawa. [*In Polish*]

Manuscript submitted: 10th February 2000
Revised version accepted: 12th May 2000