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CORAL GROWTH IN *OLIGOPHYLLOIDES PACHYTHECUS* RÓŻKOWSKA, 1969

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Coral growth in Heterocorallia is described and illustrated for the first time. It has been studied in *Oligophylloides pachythecus* Różkowska, 1969 from the Upper Famennian of the Świętokrzyskie (Holy Cross) Mountains, Poland. One single offset at a time was formed laterally with respect to the parent polyp. It did not inherit any septa from the parent corallite forming its own, independent set of septa. The young polyp was for a long time connected with the parent by soft tissue being separated from its skeleton by a tabulotheca. The theca and possibly all the other skeletal elements of the species studied grew centrifugally. Evidence is presented that *O. pachythecus* had a distal part of its corallite in the shape of a slender distal cone with a set of septa protruding on top of the cone.

K e y w o r d s: corals, Heterocorallia, coral growth, Devonian, Poland.

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INTRODUCTION

Coral growth has been studied in four specimens of *O. pachythecus*, Upper Famennian, by means of serial sections. All the specimens came from loose blocks gathered by the author in Łagów Dule near Kielce (Holy Cross Mts, Poland) in the years 1973—1979. For remarks on stratigraphy of the outcrop see Różkowska (1962: 21). The Heterocorallia-bearing strata were not exposed at the time of the present author investigation.

The present study was completed in the Department of Geology of the Silesian University under the scientific supervision of Dr. J. Fedorowski from Poznań University. The studied material is housed at the Department of Geology, Silesian University (abbreviated IGUS).

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HISTORICAL

Offsetting Heterocorallia were mentioned for three times: Hill (1956) pointed out rare indications of branching in this order — but no reference to this statement was given. Later on, however, she informed the present author (1979, personal communication) that she intended to remove this statement from the revised version of the *Treatise on Invertebrate Paleontology*. Scrutton (1977) announced investigations on branching *Hexaphyllia* by Mr P. J. Cossey of the University of Manchester. No further reports on this study were published, however. Wrzołek (1978) presented a preliminary report on coral growth in *Oligophylloides* — without description or illustrations.

Reconstruction of the distal part of the heterocorallid corallum has not been presented as yet. Discussion on distal convexity *vs.* concavity of tabulae are significant to this problem. Hill (1956) and Różkowska (1969) argued that the tabulae are distally convex whereas Schindewolf (1941) and Poty (1977) expressed the opposite opinion.

The following new terms are proposed:

distal cone (fig. 1*d*: from *A* to *B*) — the distal slenderly conical part of the *Oligophylloides* corallite with a set of septa protruding on its top. The distal cone surface is formed by the uppermost tabula;

common tabulotheca (fig. 1*h*: from *C-C* to *D-D*) — the part of the compound theca formed by the connected soft tissue of a parent and bud. For more details see an explanation to the fig. 1*h*.

DESCRIPTIONS OF THE SECTIONS

Specimen IGUS No. ŁDO2 (pl. 48: 1*a*—*h*): the parent corallite and two daughter offsets, both in one plane. One of the bifurcations has been sectioned transversely (1*a*—*g*), the other longitudinally (1*h*).

Blastogeny does not affect the parent corallite morphology. It retains all of its septa (except for the sections 1*c*—*e* where one septum is reduced) and the circular shape of its lumen. At the beginning of blastogeny (1*b*) the theca becomes discontinuous towards the left and the crescent-shaped lumen of the offset is seen. Two first septa of the offset are formed as early as this stage. They do not cross the offset lumen and have never been connected with septa of the parent being inserted on the external surface of the parental tabulotheca. A 0.15 mm thick structure separates parent and offset lumina (1*b*—*f*).

Elongation of the offset lumen (1*d*—*f*) is apparent and is caused by its deviation. Septa of the offset show sub-radial (1*d*) at the beginning, then radial (1*e*, *f*) arrangement. In the section 1*f*, septa of the offset lose contact with the parental theca and in the most distal section of this series (1*g*), thick, common tabulotheca between the two corallites is produced.

In the longitudinal section another bifurcation was found (1*h*). This has been identified as bifurcation because of the opposite convexity of the tabulae in the upper-left and in the upper-right parts of the section. The remainder of the thin parental theca is seen in the left corallite (arrow). It is the only longitudinal section of the bifurcation (offsetting) examined (compare fig. 1*h*).

Specimen IGUS No. ŁDO1 (pl. 49: 1*a*—*f*): In the earliest stage available for study

(1*a*) septa are already present and sub-radially arranged. In further development the parental septa first thicken (1*b*), then disintegrate and lose their radial arrangement, the parent theca disappears (1*c*); still further up (1*d*, *e*) the offset forms its own theca and acquires a radial arrangement of septa while the parent seems to be relatively retarded. In the next sections, an at first vesicular, then "normal", continuous common tabulotheca between the two corallites is produced and the two become separated (1*f*).

Specimens IGUS Nos ŁDO5 and ŁDO6 are distinguished by a perpendicular arrangement of offsets in respect to the parent corallites. When sectioned serially they showed transverse sections of the parent and longitudinal sections of the offset as in pl. 49: 3.

Specimen IGUS No ŁDO3 (pl. 49: 2*a*—*d*) and the proximal part of the specimen IGUS No ŁDO2 bear single, wart-like, elevations on their walls. The lumina of these elevations are separated from the corallite lumina by thick walls (0.75 mm in IGUS ŁDO3 and about 1.5 mm in IGUS No ŁDO2). No contact of these "extra" lumina with

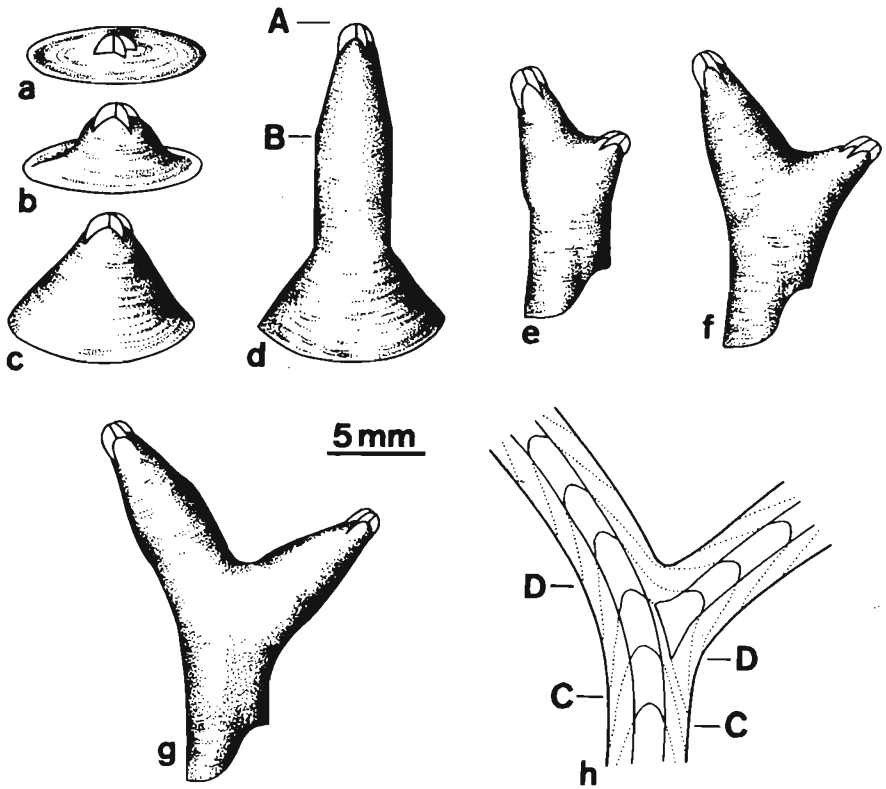

Fig. 1. *Oligophylloides pachythecus* Różkowska 1969. Reconstructed stages of coral growth: *a* basal plate and a set of septa, *b* first tabula, *c* the complete talon, *d* adult protocorallite; typical, slender distal cone is shown between points *A* and *B*, *e*—*g* successive stages of an offset growth, *h* longitudinal section through bifurcating corallites; solid lines — coral outlines, its lumina and tabulae; dotted lines — tabulae in the tabulotheca (=growth lines); *C-C* the bottom, *D-D* the topmost tabula of the common tabulotheca. The common tabulotheca shows continuous growth lines between the two corallites and has to be distinguished from the parental tabulotheca (below the *C-C* tabula and above *D-D* in the left-hand corallite) and from the offset tabulotheca (above *D-D* in the right-hand corallite).

the external environment (now limestone matrix) could be proved. No traces of septa have been found in these lumina, which precludes considering them as rudimentary offsets. Their appearance has some bearing on the reconstruction of the polyp morphology in Heterocorallia as it is discussed in the following chapter.

THE MODE OF CORAL FORMATION IN *OLIGOPHYLLOIDES PACHYTHECUS*

The following stages in coral growth have been distinguished (fig. 1):

1. The formation of the basal plate (fig. 1*a*) with a diameter of about 10 mm and about 0.4 mm in thickness (calculated from Różkowska's drawings — 1969: figs 67—69).

2. The appearance of initial septa (fig. 1*a*) forming approximately in the middle of the basal plate. They grow upwards and centrifugally with the main emphasis on upward growth. Septa do not reach the margins either of the basal plate or of the talon. In the slender part of the coral they penetrate only the innermost (about 0.15 mm) part of the tabulotheca.

3. The appearance of the first dome-shaped, relatively flat and broad tabulae (fig. 1*b*) located some distance apart, forming a vesiculous "talon" (fig. 1*c*). Such a structure might have been formed only by the soft tissue overhanging the talon.

4. In the next stage tabulae become more slender and conical. They are now tightly packed and the typical, slender corallite with thick, continuous tabulotheca is formed (fig. 1*d*). The distal part of the corallite (distal cone) bears a set of protruding septa (fig. 1*d*, from *A* to *B*).

5. Offsets arise on lateral sides of distal cones near their apices (fig. 1*e*—*g*). An offset is formed in much the same way as was the protocorallite, except for a large, vesiculous talon (compare pl. 48: 1*g* and pl. 49: 1*f*).

6. It is presumed that the wart-like structures (pl. 49: 2) arise when some foreign organism becomes attached to the distal cone. The foreign body becomes overgrown by the overhanging soft tissue, and covered by the corallite wall.

The unusual increase observed in the specimen IGUS no ŁDO1 (the "retarded" parent) can possibly be explained by an injury suffered by the parent polyp and by its recovery, aided by the sound tissue of the bud.

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EXPLANATION OF THE PLATES 48 AND 49

All figures ×15 unless otherwise stated. In the serial sections cumulative distances are given in the lower-right corners.

Plate 48

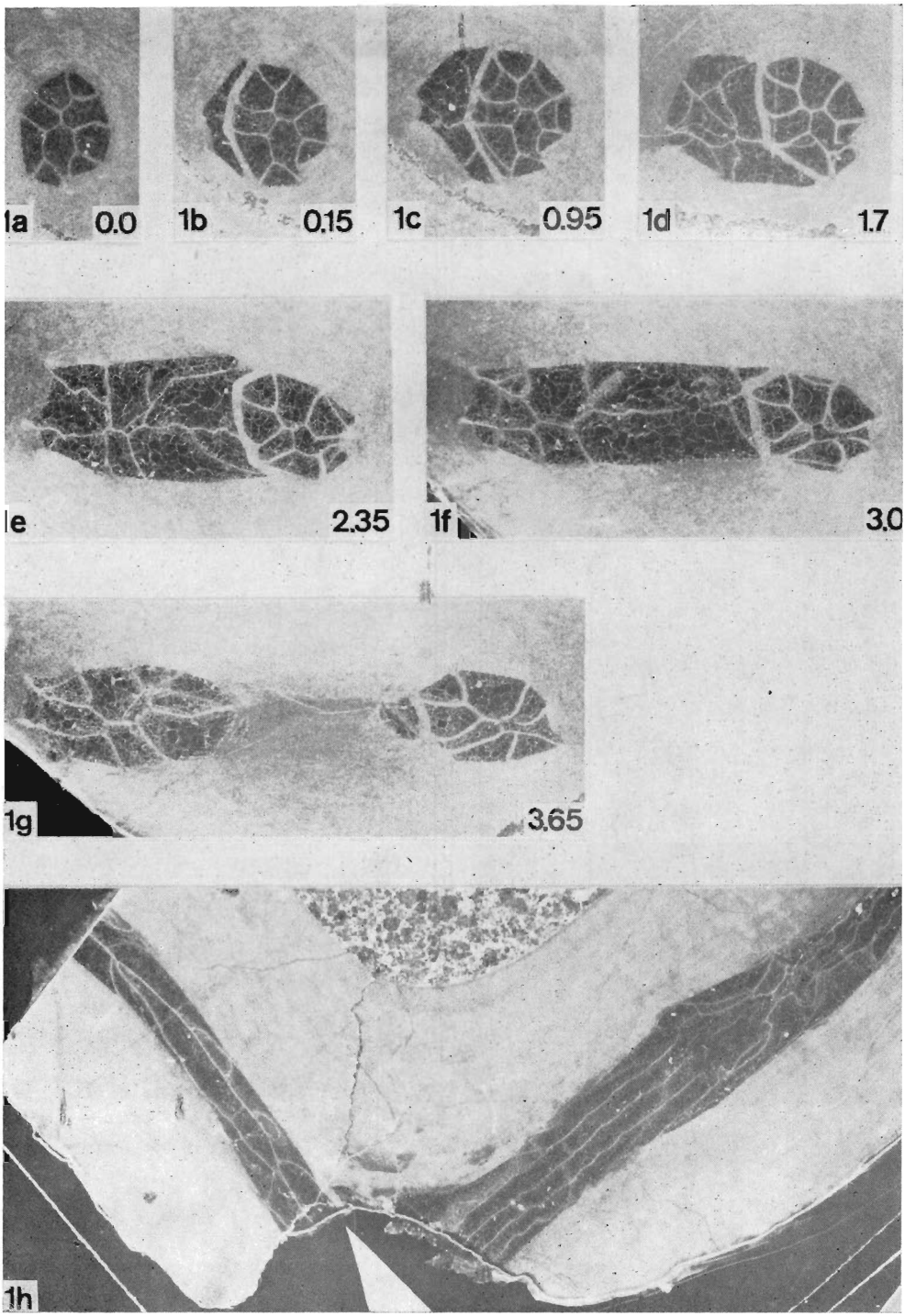
Oligophylloides pachythecus Różkowska, 1969 Upper Famennian, Łagów Dule

Specimen IGUS No. ŁDO2: 1*a*—*g* serial transverse sections of the bifurcating corallites; 1*h* longitudinal section of the bifurcating corallites. Note the directions of convexity of tabulae and presence of thin parental theca in the left corallite (arrow); ×10.

Plate 49

Oligophylloides pachythecus Różkowska, 1969 Upper Famennian, Łagów Dule

1. Specimen IGUS No. ŁDO1: *a*—*f* serial transverse sections.
2. Specimen IGUS No. ŁDO3: *a*—*d* serial transverse sections through the wart-like elevation on the wall.
3. Specimen IGUS No. ŁDO6: transverse section of the offset perpendicular to the parent corallite.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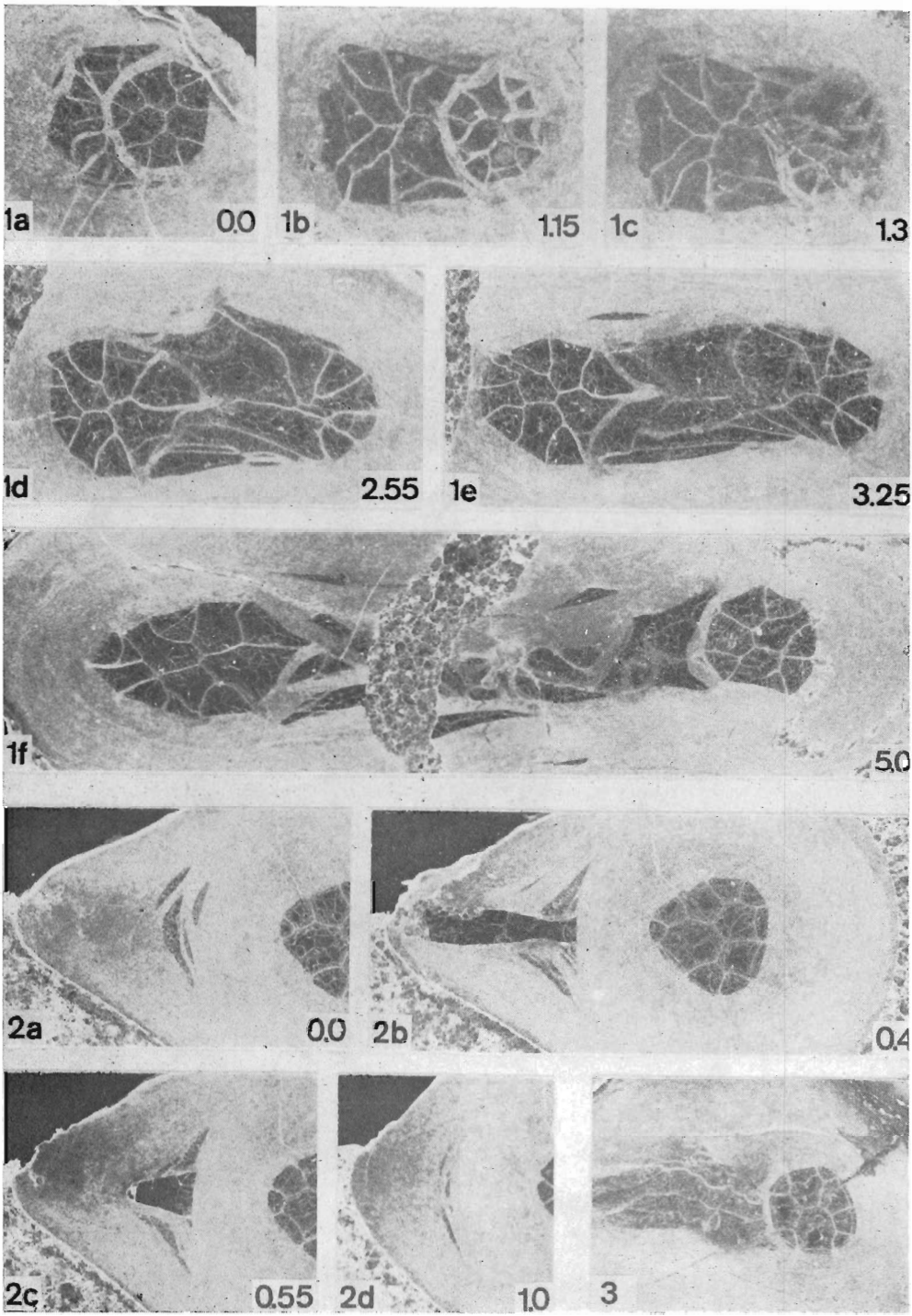
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