Obermiozän durch das Meer überflutet. Das konnte aufgezeigt werden durch das Vorkommen von Transgressionskonglomerate mit untermiozänen Haifischzahnen die sich im Peel an der Basis der Hemmoorer Stufe vorfinden, aber bei Winterswijk und bei Antwerpen an der Basis der obermiozänen Ablagerungen.

Die Haifischfauna des Obermiozäns deutet auf eine offene Verbindung mit dem südlichen Ozean.

Es ist sonderbar, das die vorliegende Untersuchung und die des Herrn Dr. H. J. Anderson in Krefeld (1959, 1961) zu entgegengesetzten Ergebnisse kommen.

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FORAMINIFERA OF THE CRETACEOUS OF SOUTH-LIMBURG, NETHERLANDS. LXXIII.

THE GENUS *CYMBALOPORA*

by J. HOFKER

An exhaustive description of the outer and inner structure of the genotype, *Cymbalopora radiata* Hagenow, was given by the author in 1931, Natuurhist. Maandblad, vol. 20, No. 9, pp. 126-130, fig. 1-7. Shorter descriptions of transverse sections were given in For. dentata, West Indies, Spol. Mus. Haun., XIV, 1956, p. 187, pl. 28, fig. 2 and in Foram. der Oberkreide, 1957, Geol. Jahrb., Beih. 27, p. 90, fig. 95.

In the latter paper the author also described in detail another species, *Cymbalopora martini* (Brotzen) from the Coniacian-Santonian. This species also was found in the Santonian of Folx-les-Caves, Belgium (Foram. Tuff. arénacé de Folx-les-Caves, 1961, p. 558-559, fig. 4).

A third species has been described from the Upper-Paleocene of the Netherlands by Ten Dam. (Die stratigraphische Gliederung des Niederländischen Paläozäns und Eozäns nach Foraminiferen, Med. Geol. Stichting, C, V, no. 3, 1944, p. 123, pl. 6, fig. 3, 4), *Cymbalopora hemiglobosa* Ten Dam, and refound abundantly in the Lower Landenian of Orp-le-Petit in Belgium and by Brotzen in the Paleocene of Sweden(1948, p. 91, pl. 15, fig. 1). This species rarely gets the outer form as described from a single specimen by Ten Dam; mostly it has the more flattened form which is characteristic for the whole genus.

Reiss (1963, Reclassification of perforate Foraminifera, Geol. Survey Israël, Bull. 35, p. 67) stated that *Cymbalopora* has a lamellar structure, which is true; he doubts the agglutinated structure of the test, however, and does not exclude the possibility that the ancestral form of the Cymbaloporettidae, a calcareous group, is *Cymbalopora*. In order to give a clair account on the structure of the test, all three species known have been restudied on thin sections, from the best material available. The oldest species, *C. martini,* shows a trochoidally built test throughout, with sigmoidal sutures at the ventral side, and apertures of the chambers opening into the central ventral cavity. The dorsal test wall is only slightly thicker than the ventral walls, secondary thickening of the dorsal wall is not apparent. Dorsal and ventral walls consist in three distinct layers; a finely granular inner layer, a middle layer consisting of a single row of coarser sand grains, and a finer agglutinated layer at the outside. On transverse section the middle layer of coarser grains

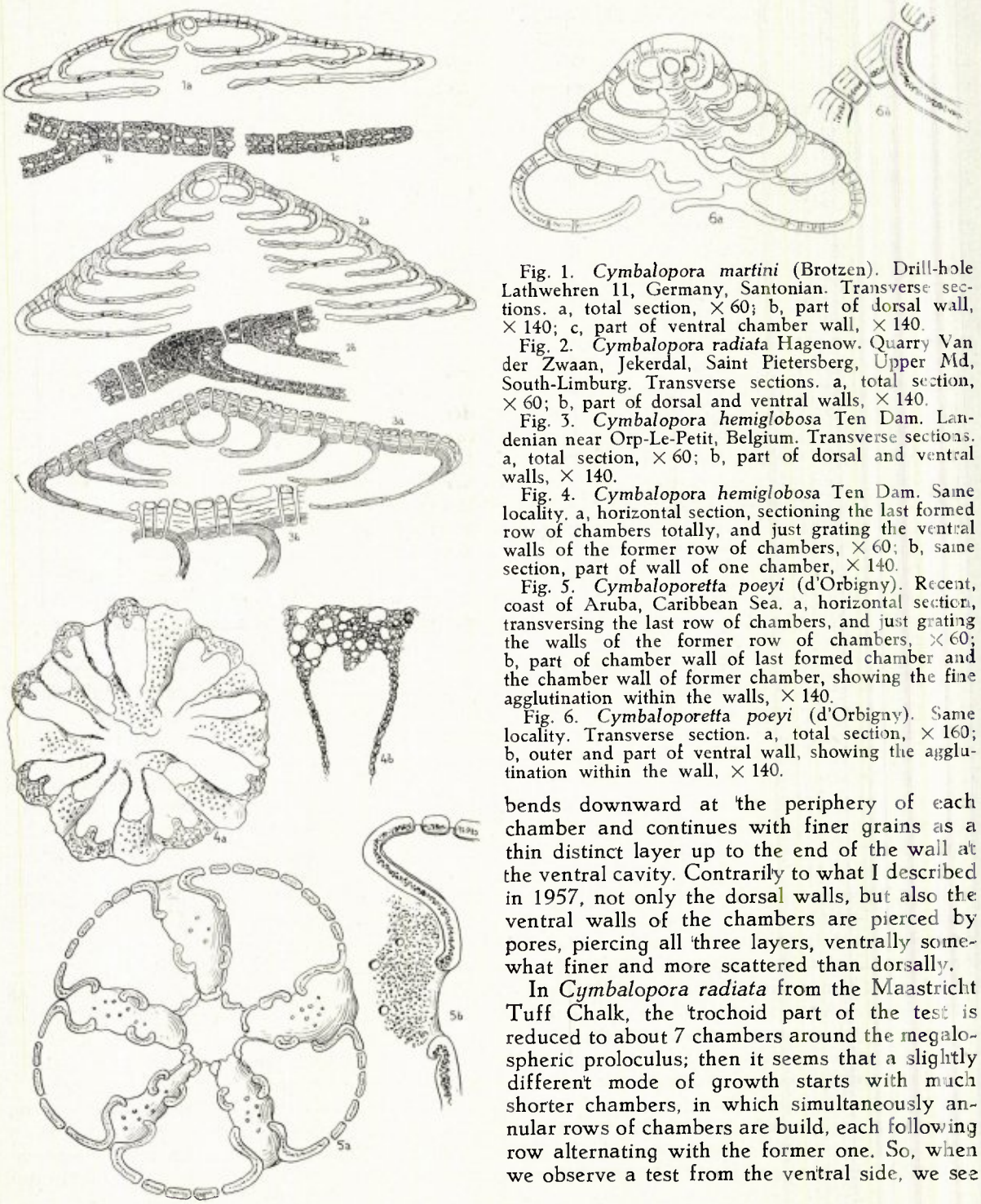

Fig. 1. *Cymbalopora martini* (Brotzen). Drill-hole Lathwehren 11, Germany, Santonian. Transverse sections. a, total section, × 60; b, part of dorsal wall, × 140; c, part of ventral chamber wall, × 140.

Fig. 2. *Cymbalopora radiata* Hagenow. Quarry Van der Zwaan, Jekerdal, Saint Pietersberg, Upper Md, South-Limburg. Transverse sections. a, total section, × 60; b, part of dorsal and ventral walls, × 140.

Fig. 3. *Cymbalopora hemiglobosa* Ten Dam. Landenian near Orp-Le-Petit, Belgium. Transverse sections. a, total section, × 60; b, part of dorsal and ventral walls, × 140.

Fig. 4. *Cymbalopora hemiglobosa* Ten Dam. Same locality. a, horizontal section, sectioning the last formed row of chambers totally, and just grating the ventral walls of the former row of chambers, × 60; b, same section, part of wall of one chamber, × 140.

Fig. 5. *Cymbaloporetta poeyi* (d'Orbigny). Recent, coast of Aruba, Caribbean Sea. a, horizontal section, transversing the last row of chambers, and just grating the walls of the former row of chambers, × 60; b, part of chamber wall of last formed chamber and the chamber wall of former chamber, showing the fine agglutination within the walls, × 140.

Fig. 6. *Cymbaloporetta poeyi* (d'Orbigny). Same locality. Transverse section. a, total section, × 160; b, outer and part of ventral wall, showing the agglutination within the wall, × 140.

bends downward at the periphery of each chamber and continues with finer grains as a thin distinct layer up to the end of the wall at the ventral cavity. Contrarily to what I described in 1957, not only the dorsal walls, but also the ventral walls of the chambers are pierced by pores, piercing all three layers, ventrally somewhat finer and more scattered than dorsally.

In *Cymbalopora radiata* from the Maastricht Tuff Chalk, the trochoid part of the test is reduced to about 7 chambers around the megalospheric proloculus; then it seems that a slightly different mode of growth starts with much shorter chambers, in which simultaneously annular rows of chambers are build, each following row alternating with the former one. So, when we observe a test from the ventral side, we see

a group of radiate chambers somewhat bulging over the former row which is seen deeper on and alternating with that deeper row. Each chamber opens into the ventral cavity. The structure of the wall in principle is the same as in *C. martini:* a middle layer of coarser grains can be distinguished, but the outer layer with finer grains at the dorsal chamber walls is secondarily thickened by several layers, suggesting a lamellar structure. The ventral chamber walls, however, remain thin and only consist of the three layers mentioned.

The pores at the dorsal side are distinct, though somewhat finer than those found in *C. martini.* Pores in the ventral walls only can be detected in very well preserved specimens.

Cymbalopora hemiglobosa from the Paleocene begins with a very large proloculus in the megalospheric generation, the average proloculus of *C. radiata* is smaller and the smallest proloculus is found in *C. martini.* As a consequence, well known also in other groups of Foraminifera, the spiral initial part of the test is yet more reduced, comprising only three or four trochoidally coiled chambers, followed by the „annular" or simultaneous chambers; the alternation of these chambers is not only expressed at the ventral side, as described in *C. radiata,* but also at the periphery of the test, which in consequence becomes strongly lobulated, since the former row is shorter than the last formed row. The structure of the wall differs from that of the two former species. An inner layer consists of many very fine lamellae of possibly chitinous substance; this layer also forms the perypheral and ventral walls as a whole. Over this lamellar layer are found, only at the dorsal side, several layers of calcareous material, often separated by distinct foreign granules. The test is covered by an outer layer consisting of very coarse but smoothly imbedded sand grains. Both in the thickened dorsal wall and in the thinner ventral walls distinct pores are visible, which pores also can be detected when a whole test is observed from the ventral side in a clarifier. In horizontal section the radiate chambers do not seem to connect by any apertures, or they are very inconspicuous.

In horizontal sections, especially in the later forms of *Cymbalopora radiata* and *C. hemiglobosa,* there is another feature which is worth to signalize: many of the later chambers show, at the periphery, a short division of shell-material protruding into the inner lumen of the chamber, so that each chamber ends into two lobes. This is a characteristic also found in many other more advanced agglutinated groups, such as the Orbulinids.

Is there any real connection between the genus *Cymbalopora* and the genus *Cymbaloporetta?* The general structures of both are very similar; in *Cymbaloporetta* also the test begins with a coiled initial part, followed by radially placed, somewhat annular chambers, also alternating in growth. The dorsal walls are pierced by distinct pores, which in the ventral walls are found more scattered. On transverse section the walls lack any coarse granules, and on a whole the walls are calcareous. Yet on close observation the walls have three layers, a ventral one, hyaline, an inner layer consisting of very fine granules which seem foreign, and a dorsal one, once more consisting of hyaline chalk. At the dorsal side, this layer often is thickened considerably, especially in the apex of the test, as are, however, the initial ventral walls which often form a kind of umbilical filling. There is, on transverse section, however, a difference with sections through *Cymbalopora:* the ventral cavity is transversed by the distinctly built tena of the chamber walls, often forming regular ventral closing of this cavity. Horizontal sections differ greatly from those made through *Cymbalopora.* For each chamber of a row has two distinct apertures left and right, and the opening into the ventral central cavity; the side openings are provided by distinct lips, and are opening into the next following row of alternating chambers. The walls of the chambers are once more, in horizontal sections, built up of three layers, two layers, outer and inner ones, consisting of hyaline chalk, whereas the middle layer, thin in the radial walls, consists of fine grains. In nearly all chambers there is an inner pseudochitinous lining, also protruding into each of the coarse pores and closing these pores with a thin, possibly finely porose plate.

I could prove, that the two side-apertures gradually are formed by the proto- and deuteroforamina of the initial coiled chambers, whereas the tenon between forms the plates protruding

into the ventral central cavity. Of these structures in *Cymbalopora* nothing can be found. When we would assume the genus *Cymbalopora* to be the ancestor of *Cymbaloporetta*, we had to change the distinct agglutination of *Cymbalopora* into the calcareous wall of *Cymbaloporetta*, which might be possible, since here too three layers are found; but the initial chambers as well as the later chambers of *Cymbaloporetta* have a proto- and deuteroforamen, which is not found in *Cymbalopora*, and in *Cymbalopora* only some traces of connections between the different rows of chambers can be found, not the distinct connections as always found in *Cymbaloporetta*. Moreover, till now no trace of an inner pseudochitinous lining could be found in *Cymbalopora*, though, especially in the Paleocene form, this lining, when present, would have been detected.

So, the assumption by Reiss could not be established, though a change from *Cymbalopora* into *Cymbaloporetta* remains possible. *Cymbalopora* till now is found in the Cretaceous and lower Tertiary.

I pointed out (1959, Cushman Found. For, Res., Contr., vol. 10, pp. 115-116, textfig. 16-20) that *Cymbaloporetta* is very close to *Planorbulina mediterranensis* d'Orbigny, the genotype of *Planorbulina*, and that both are allied to *Discopulvinulina* since the initial chambers of *Planorbulina* and *Cymbaloporetta* both have the characteristic of the chambers of *Discopulvinulina*. Moreover, the two apertures on both sides of the later chambers and the alternating of obviously simutaniously formed chambers in both genera are alike. The finer structure of the walls in *Planorbulina* is very similar to that of *Cymbaloporetta*. So I believe that *Cymbaloporetta* is close to *Planorbulina* and not to *Cymbalopora*.

The constant increase of the diameter of the megalospheric proloculus, together with the reduction of the trochoidal initial part suggests a single evoluting gens in *Cymbalopora*.

BOEKBESPREKING

Snakes, by H. W. Parker, London, 1963. Robert Halle Ltd.; 191 pp., 11 tekstfign., 16 pln. (23 foto's). Prijs (geb.) 21/—.

Merkwaardig genoeg hebben de meeste mensen een afkeer van slangen en zij zien in de onschuldigste slang al een bedreiging van hun veiligheid. Zij beseffen niet hoeveel interessante problemen de slangen ons bieden, in welke verschillende milieu's slangen worden aangetroffen (van de zee en het zoete water tot in dorre woestijnen; van gravend in de grond tot klimmend in de bomen), op welke verschillende manieren slangen zich voortbewegen (en waarbij de ribben echt niet als een soort pootjes worden gebruikt), enz., enz. Daarom is een boek, zoals thans door Parker is geschreven, zo'n bijzondere aanwinst. Hier geeft een man met een zeer grote ervaring en een grote belezenheid een in heldere stijl geschreven overzicht van de slangen. Hij vertelt van de lichaamsbouw en hoe die aangepast is aan de lange, slanke lichaamsvorm, van de aanpassingen die deze vertoont aan de zo zeer verschillende omgeving waarin slangen leven, over de zeer gevoelige zintuigen die sommige slangen hebben om temperatuurverschillen waar te nemen en die haar helpen in het donker een warmbloedige prooi op te sporen, enz. Er wordt met een aantal sprookjes afgerekend en er wordt gesproken over het nut en het gevaar dat slangen voor de mens kunnen opleveren. Aan ieder die zich voor slangen interesseert kan ik dit boek aanbevelen, want het bevat een schat aan gegevens. Wie een afkeer van slangen heeft zou ik dit boek eveneens willen aanbevelen, want hij zal na lezing een beter begrip voor deze dieren kunnen opbrengen.

L. D. BRONGERSMA.

Dierenwereld van Europa. Speurtocht door de levende natuur in 280 foto's door Franz A. Roedelberger — Vera L. Groschoff en 100 dierenfotografen. Nederlandse bewerking van J. J. Hoedeman. 232 bladz. Uitg. N.V. Gebr. Zomer & Keunings Uitg. Mij, Wageningen. 1964. Prijs geb. *f* 24,50.

Dit boek is inderdaad het resultaat van een speurtocht. De fotografen hebben niet zo maar links en rechts foto's gemaakt, maar met ontzettend veel geduld het juiste moment afgewacht. Men vraagt zich alleen af, hoe het mogelijk is, maar de feiten liggen er. Wij zien hier dramatische gebeurtenissen, zoals de omstrengeling van de prooi door de geelgevlekte gladde slang van Zuid-Europa of het openen van een mossel door een strandkrab, wij zijn getuige van het uit ei komen van de parelhagedis, wij werpen een blik in de kinderkamer van een berenfamilie in de Karpaten, wij genieten van het machtige schouwspel van een rendierkudde, die, op de grote voorjaarstrek, zwemmend een eiland voor de kust van Finmarken tracht te bereiken, en zo kunnen wij doorgaan. Ook zien wij interessant close-ups uit de insektenwereld.

Wie dit boek in handen krijgt en het in zijn vrije avonduren eens bekijkt, doet zeker niets anders dan plaatjes kijken en wellich de volgende avond weer. Dan wil hij er ook iets over lezen. De bij de platen behorende tekst zal hem zeker niet teleurstellen. Deze is voor iedereen begrijpelijk en boeiend, en voorzover ik heb kunnen controleren, ook biologisch verantwoord.

Niemand zal er spijt van krijgen, wanneer hij dit boek aanschaft.

K.