HETEROSPIRA, A NEW FORAMINIFERAL GENUS FROM THE TERTIARY OF BORNEO

BY

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In thinsections of tertiary limestones from Borneo I studied numerous specimens of a new genus of foraminifera showing an interesting and rather complicated structure.

The material belongs to the Geological Survey of the Netherlands East Indies („Dienst van den Mijnbouw in Nederlandsch Indië") at Bandoeng, Java. Syntypes[1]) are in the palaeontological collection of the „Instituut voor Mijnbouwkunde" at Delft. My thanks are due to Mr. A. C. DE JONGH, formerly director of the geological survey in the East Indies, who kindly lent me these rocks.

The material studied by me is from several localities, and contains besides *Heterospira* the following foraminifera and algae:

No. 2322, B 803, Rintis Tepian Liang Mahoengi p. 3 Ms. + 3 Meter coll. Ir. G. Pott 7. 7. 1926: *Discocyclina, Camerina, Pellatispira rutteni, Spiroclypeus, Miliolides, Textularia, Carpenteria, Lithothamnium, Halimeda.*

No. 4202, B 1271, Pasir; coll. Ir. G. Pott: *Discocyclina, Pellatispira irregularis, Spiroclypeus, Lithothamnium, Halimeda.*

No. 2406, B 821, Soengei Meringau p. 7, Rintis p. 13—247; coll. Ismail 26. 7. 1926: *Camerina, Discocyclina, Spiroclypeus, Lithothamnium.*

No. 2777, B 833, Rintis east of M. S. Empoenoeng Hidjo p. 5000 D; coll. DJIMAU 25. 7. 1926: *Camerina, Discocyclina, Spiroclypeus, Halimeda.*

No. 2435, B 813, Goenoeng Batoeloro, p. 5—92; coll. Ir. G. POTT 3. 8. 1926: *Camerina, Discocyclina, Spiroclypeus, Halimeda.*

No. 3141, B 1303 Pasir; coll. Ir. G. POTT: *Discocyclina, Camerina, Spiroclypeus, Pellatispira crassicolumnata, Miliolides, Gypsina globulus, Lithothamnium, Halimeda.*

The occurrence of several species of *Discocyclina* and *Pellatispira* seems to indicate an eocene age of the limestones. Fasciolitidae have

[1]) EDW. T. SCHENK and J. H. MC MASTERS, Procedure in Taxonomy 1936.

not been found. However, the presence of abundant specimens of *Spiroclypeus*, at first sight gives suspection of a miocene age. It is well known that a remarkable fauna, consisting of *Camerina, Discocyclina, Pellatispira, Lepidocyclina* and *Spiroclypeus* has been mentioned from Borneo by some authors. TAN [1]) who in 1930 discussed these data, was of the same opinion as I was [2]) namely that *Camerina, Discocyclina* and *Pellatispira* must have been washed out from eocene marls and redeposited with *Lepidocyclina* and *Spiroclypeus*.

I am not convinced that this process has played a part in the origin of the *Heterospira* limestones studied by me.

In a very recent paper TAN [3]) announces the future description of undoubtedly eocene *Spiroclypei* from Borneo, as revailed by detailed fieldwork.

A comparison with these eocene *Spiroclypei* may perhaps fix the age of the *Spiroclypeus* bearing Heterospira-limestones.

When comparing the structure of *Heterospira* with other foraminifera, especially to those with well developed tubular systems (*Camerinidae* and *Rotaliidae*) striking differences are observed. The tubular system (pores) of *Heterospira* shows no marginal plexus, so characteristic in the family of *Camerinidae*, and no spiral canals, always present in the family of *Rotaliidae* (in the sense of HOFKER [4])). No foraminifer known to me, has a structure comparable to that of *Heterospira*, which I regard to represent a still unknown family (: Heterospiridae). At the present state of knowledge it seems to me of no value to make a hypothesis on the possible relation of *Heterospira* to other families of foraminifera.

HETEROSPIRA genus novum.

Test lenticular, inflated or flat, circular and bilaterally symmetrical, in the early stage involute. Wall calcareous, perforate, with a complex system of pores (canals).

No marginal plexus and no spiral canals present.

The proloculum is followed by a single coil of chambers connected by a proximal foramen (primary coil of chambers in the equatorial plane, fig. 10 and fig. 1 centre).

From the distal walls of these primary chambers a great number

[1]) TAN SIN HOK. Over Spiroclypeus. De Mijningenieur 11, No. 9, 1930, p. 180.

[2]) J. H. F. UMBGROVE. Het genus Pellatispira in het Indopacifisch gebied (summary in English). Wetenschappelijke Mededeelingen No. 10, 1928, pag. 27.

[3]) TAN SIN HOK. Zur Kenntniss der Miogypsiniden. De Ingenieur in Nederl. Indië 1936, No. 3, IV, pag. 48, noot 3.

[4]) According to J. HOFKER. Siboga Expedition Monograph IV, part. 1, 1927. However, CUSHMAN (Foraminifera 1933) regards *Rotaliidae* and *Calcarinidae* (erroneously including the Camerinid genus *Pellatispira*) as separate families. On the other hand GALLOWAY (A Manual of Foraminifera) takes *Calcarina* and *Baculogypsina* together in one family including also *Tinoporus*, a genus which according to HOFKER is allied to the *Orbitoididae*!

of tubules proceed, running radially and bifurcating in the equatorial plane (equatorial pores[1]) fig. 3 and fig. 9).

From these equatorial pores, tubules branch off in lateral directions. Part of these lateral pores communicate with the surface of the foraminifer (fig. 6); partly they open in secondary chambers (fig. 4), which are arranged in two planes parallel to and on either side of the equatorial plane (vertical sections of secondary chambers fig. 4, 5, 6, 7 and fig. 11).

In a section parallel to the equatorial plane the secondary chambers are seen to be arranged in the shape of an irregular spiral, winding in a direction opposite to the primary single coil (fig. 1).

I could not definitely establish a connection between the distal walls of the primary chambers and the proximal walls of the adjoining secondary ones.

Genotype: *Heterospira mirabilis.*

HETEROSPIRA MIRABILIS species nova.

The principal characteristics of the species may of course be found in the above mentioned definition of the genus. It is difficult to determine special species characteristics, because only one species is known. The average diameter of megaspheric specimens amounts to 4 m.m.; the thickness varying according to the shape of the tests, up to $^1/_3$ of the diameter in lenticular specimens possessing a central boss. Other dimensions may be inferred from fig. 1—11. Few equatorial sections could be studied, because only thinsections of limestones and no free tests were available. No equatorial section of a mikrospheric specimen was seen. A few oblique sections of abnormal great dimension (10 m.m.) may belong to microspheric specimens. *Heterospira mirabilis* shows many large pillars protruding on the surface of the test, and surrounded by the openings of the lateral pores (fig. 2, 5, 6, 7, 8). In some specimens surface chambers occur; into them lateral pores are opening (fig. 7). These chambers especially occur in the marginal parts of the surface.

Delft, 25 June 1936.

[1]) As the tubules originate from the primary chambers they should be called pores (not: canals).

EXPLANATION OF THE FIGURES.

Fig. 1. Section nearly parallel to the equatorial plane, showing primary (single) coil, and one of the layers of secondary chambers, winding in an opposite direction to the primary chambers. (Locality 2777 B 833).

Fig. 2. Oblique section cutting through two layers of secondary chambers separated by the equatorial pores and showing pillars surrounded by the lateral pores. (Locality 2322 B 803).

Fig. 3. Nearly equatorial section through primary coil and equatorial pores. (Locality 2406 B 821).

Fig. 4. The connection between equatorial pores and secondary chambers (schematic).

Fig. 5. *Heterospira mirabilis*, dissected in different ways to elucidate the structure of the foraminifer (compiled from numerous thinsections).

Fig. 6. Vertical non-radial section showing connection between equatorial and lateral pores. (Locality 2322 B 803).

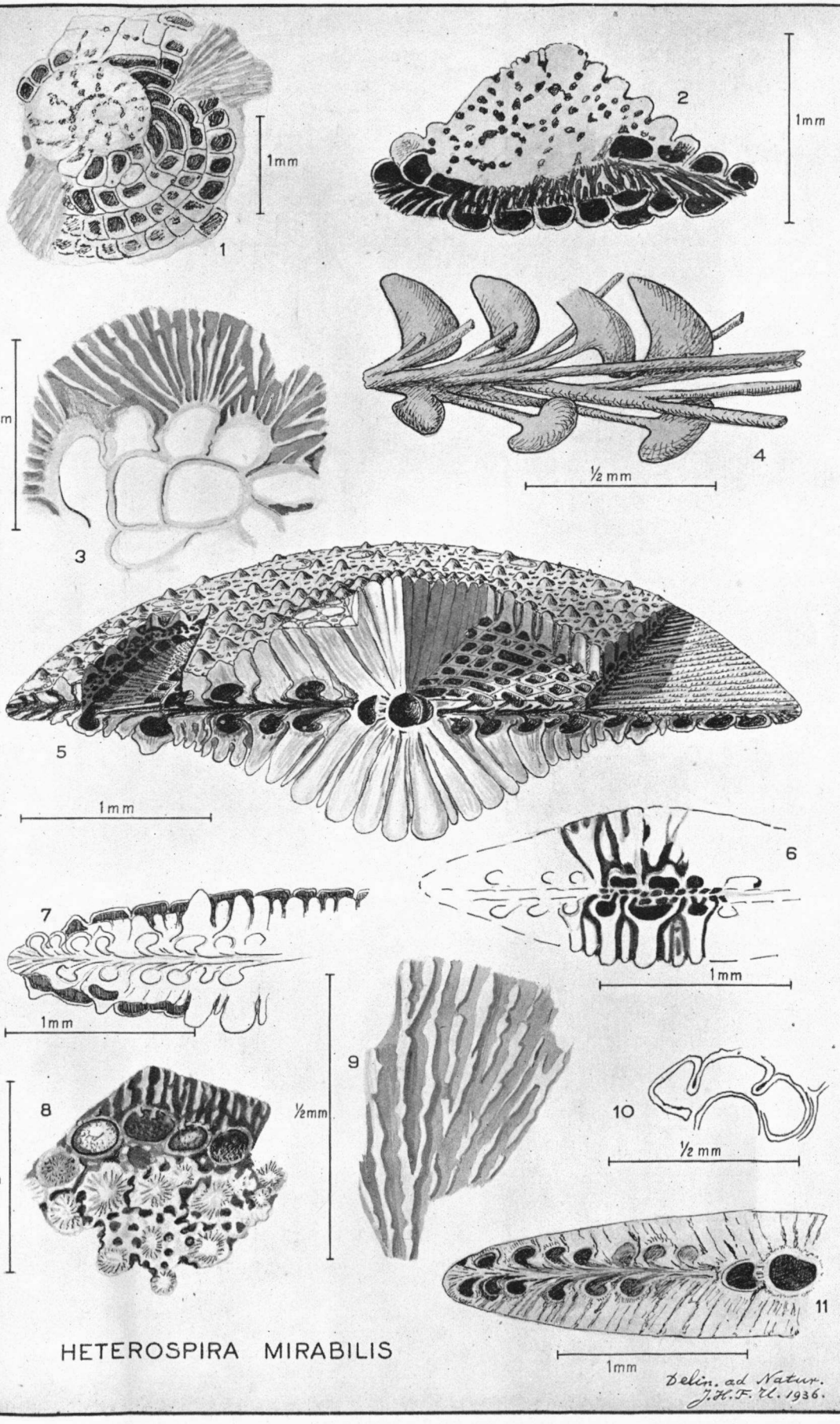
Fig. 7. Marginal portion of vertical section, showing surface chambers. (Locality 2435 B 813).

Fig. 8. Oblique section through pillars, lateral- and equatorial pores. (Locality 4202 B 1271).

Fig. 9. Bifurcating equatorial pores in equatorial section. (Locality 2435 B 813).

Fig. 10. Primary chambers showing foramina, equatorial section. (Locality 2435 B 813).

Fig. 11. Vertical radial section through a worn-off specimen. (Locality 2435 B 813).



HETEROSPIRA MIRABILIS