

reasons which have led me to distinguish the present species from the one described by DeFrance have already been stated. I have great pleasure in recognising the services of Mr. H. P. Woodward, F.G.S., Government Geologist of Western Australia (to whom I am indebted for the material that has supplied the foraminifera described in the present paper), by naming the present species after one who has done much valuable pioneer work in a country which, geologically, is but imperfectly known.

Until the present discovery the occurrence of *Frondicularia* in the Chellaston beds, referred to above, was the earliest record for the genus. The Western Australian examples carry the geological history of the genus back to the Upper Palæozoic.

TWO NEW SPECIES OF CRETACEOUS FORAMINIFERA.

By WALTER HOWCHIN, F.G.S.

[Read August 6, 1895.]

Plate X., figs. 9-13.

The southern limit of the great Cretaceous formations of Central Australia passes a little south of Hergott Springs on the main North line, 441 miles from Adelaide. At Hergott two bores, 150 yards apart, have been put down by the S.A. Government, and in No. 2 Bore a very strong artesian spring has been tapped. The beds passed through in these operations, and which in No. 2 Bore extend to a depth of 342 feet, appear to be of marine origin throughout. They consist of dark-colored mud shales and thin limestones. The section is only sparingly fossiliferous, and the foraminifera are relatively scarce. The material, however, being soft, and in a very fine state of division, can be easily reduced by washing and the microzoa concentrated. Fifty-six species in all have been noted from the bore material. A description of the microzoa of No. 1 Bore will be found in the Transactions of this Society, vol. VIII., p. 79; and a list of the foraminifera observed in No. 2 Bore has been given in "A Census of the Fossil Foraminifera of Australia," Aus. Ass. for Adv. of Science, vol. V., p. 362.

HAPLOPHRAGMIUM AUSTRALIS, *sp. nov.* Pl. x., figs. 12-13.

Ref.—*Haplophragmium australis*, How., M.S., Report of Fifth Meeting of Aus. Asso. for Adv. of Science, Adelaide, 1893, p. 364.

Test free, elongate, crozier shaped; earlier chambers plano-spiral, later chambers linear. Spiral portion compressed, exca

vated at the umbilicus; periphery rounded. Linear portion cylindrical, or oval in transverse section, slightly increasing in size towards the oral extremity. Segments about ten in number, inflated. Sutural lines marked by deep incisions. Test coarsely arenaceous. Aperture simple, central; marked by umbo produced from central portion of final segment.

Length of large specimen, $\frac{1}{9}$ in.

This form differs from *H. agglutinans* (d'Orb.), with which it has close affinities, in the deep constrictions of the sutures, inflation of the chambers, and prominent oral features. The strongly-marked septation in the spiral portion gives an appearance to the chambers as though set at different angles, and thus opposed to each other in the plane of growth.

H. agglutinans is also present in the same beds, but no passage forms were noted between this last-named species and the one now described.

One example was found in No. 1 Bore at a depth between 100 ft. and 200 ft., and about half-a-dozen in No. 2 Bore at a depth of 50 ft.

PATELLINA JONESI, *sp. nov.* Pl. x., figs. 9-11.

Ref.—*Patellina Jonesi*, How., MS. Report of Fifth Meeting of Aus. Ass. for Adv. of Science, Adelaide, 1893, page 365.

Test free; superior lateral surface an elongated obtusely pointed cone; usually asymmetrical; inferior face flat or slightly concave; height equal to greatest breadth, or more; peripheral edge, obtuse, rounded. Segments, of which there are about seven on either side, crescentic (or? annular); irregular both in size and position. Superior surface, punctured and minutely reticulated with lines of clear shell substance. Septation often indistinct exteriorly, but sometimes marked by slight sutural depressions or swellings of the test in irregular gyrate elevations. Chamber cavities simple, undivided by septa. Central portion of test filled with irregular growth of shell substance, which also penetrates to a great extent the chamber cavities themselves.

Height of cone in average specimens, $\frac{1}{60}$ in.; diameter, $\frac{1}{70}$ in.

This is an anomalous little shell. It appears to be a *Patellina* of a very simple type. In external form it somewhat resembles the recent and very rare *P. campaniformis*, Brady, and still more closely the conical, Carboniferous form, *P. Bradyana*, Howchin, and is akin to both these species in its simple undivided chambers. But it differs from both the species referred to in the irregular form of its chambers and the generally diffused shelly deposits within the chambers as well as in the umbilical region. In the examination of minute fossil forms there is always a danger of confounding infiltration of mineral matter with the proper testaceous structure, but in the examination of transparent sections of this form it is often impossible to mark the distinc.

tion between the substance of the test walls and the confused shelly deposits, or even in some cases where the well-defined walls terminate and the irregular deposits begin. It would seem that the habit of the genus to produce secondary shell substance and irregular chamberlets has in the present species found its extreme development. The reticulated superficial layer appears to be a rudimentary form of "the external or reticulated chamber-layer," which is more definitely developed in the European Cretaceous species, *P. lenticularis*, Carter. The range of variation in the external form of this species is very considerable; at times it forms a symmetrical cone, but more frequently the habit of growth is marked by sudden inflation or contraction of the test as shown in fig. 9.

The geological range of the genus, so far as known, dates from the Carboniferous Limestone,* but it was during the Cretaceous and Eocene periods that it reached its greatest development, not only in size, but in the range of its species and the complex structure of its investment. Since the early Tertiary period it has gradually declined until in the present day it is only represented by one or two minute and degenerate species.

About a dozen examples were found in No. 2 Bore at Hergott, at a depth of 140-150 feet.

It is with much pleasure that I name the present species after J. W. Jones, Esq., Conservator of Water, under whose direction this very successful bore was carried out, and to whose courtesy and ready assistance I have been indebted for the material obtained from this as well as other Government borings.

EXPLANATION OF PLATE X.

Figs. 1-3.—*CORNUSPIRA SCHLUMBERGI*, *sp. nov.*

1. Lateral aspect.
2. Transparent, transverse section showing lamination of test walls.
3. Transparent, horizontal section showing irregular coiling of the chambers.

Figs. 4-6.—*FRONDICULARIA WOODWARDI*, *sp. nov.*

4. Opaque, lateral aspect. *a.* End view of same.
5. Opaque, lateral aspect of a short and broad variety.
6. Transparent, horizontal section.

Figs. 7, 8.—*NODOSARIA IRWINENSIS*, *sp. nov.* Lateral aspects of two average specimens.

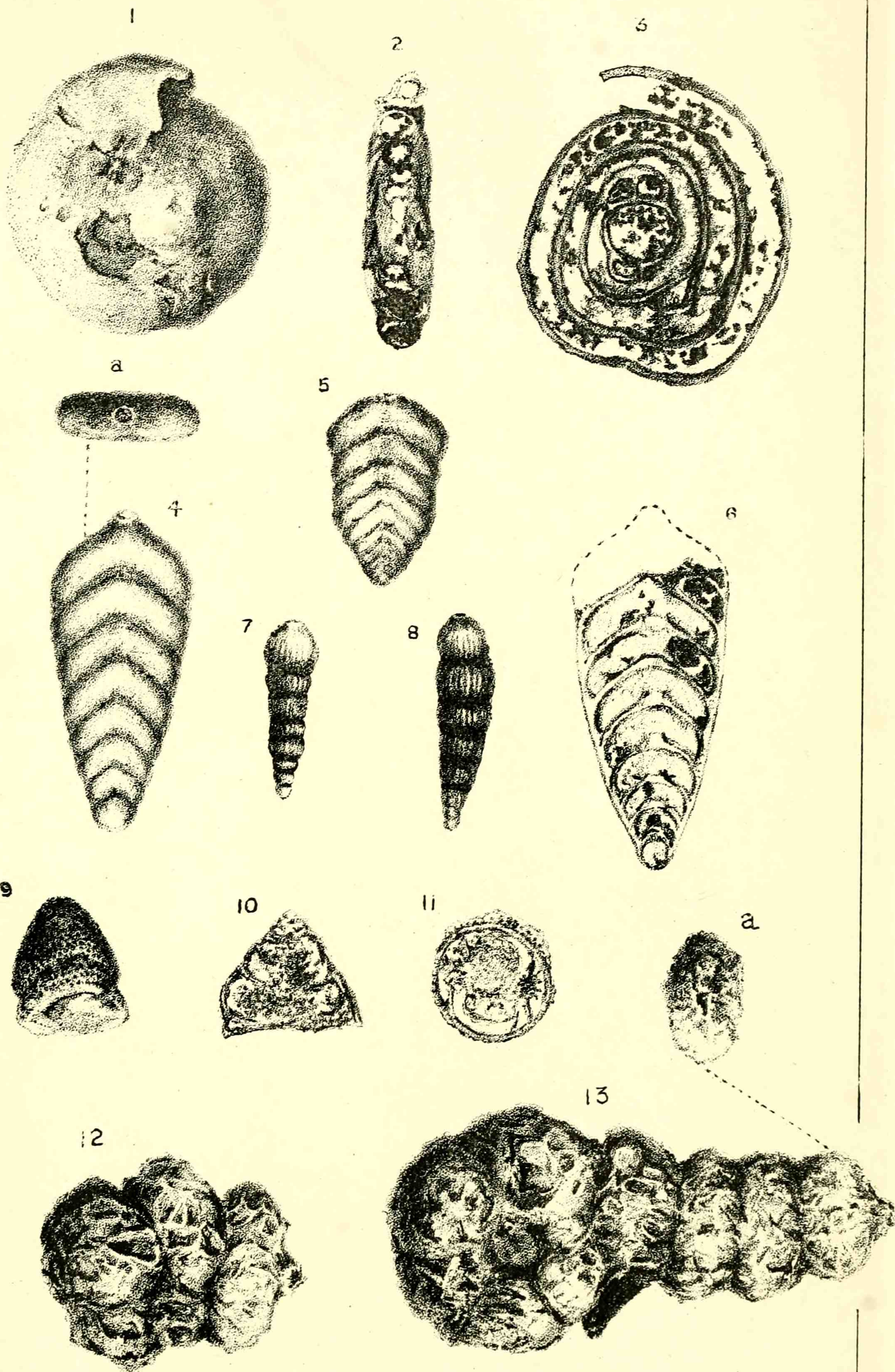
Figs. 9-11.—*PATELLINA JONESI*, *sp. nov.*

9. Lateral view.
10. Transparent, vertical section.
11. Transparent, transverse section.

Figs. 12, 13.—*HAPLOPHRAGMIUM AUSTRALIS*, *sp. nov.*

12. Few-chambered specimen.
13. Example showing rectilinear growth. *a.* Oral view of same.

* Carboniferous Foram., by W. Howchin, Jour. Roy. Micro. Soc., Aug., 1888.



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