X.—*Foraminifera and Ostracoda from the Cretaceous of East Pondoland, South Africa.*—By FREDERICK CHAPMAN, A.L.S., F.R.M.S.

Plate XXIX.

THE following interesting series of microzoa was obtained from a greenish argillaceous and sandy rock of Cretaceous age which came from East Pondoland.

The residuum after washing is of a rich brown colour, and contains numerous prisms of Inoceramus shell; a tetractinellid sponge spicule was also noticed, exactly resembling a specimen figured by Dr. G. J. Hinde * as *Pachastrella haldonensis* Carter, and occurring at Blackdown, Warminster, and Merstham.

The Foraminifera are in most cases fairly well preserved where the tests are naturally thick; but in others, as in the thin-shelled Polymorphinæ, the infilling of marcasite tends to break up the test on the accession of moisture. In this latter feature they resemble certain of the Gault Foraminifera from Folkestone, and especially those from the lower zones.

Eighteen species and varieties of Foraminifera were found, three of which are new; they are as follows:—

1. *Haplophragmium neocomianum* Chapman.
2. *H. meridionale* sp. nov.
3. *Bulimina trigonula* Chap., var. *inornata* nov.
4. *Pleurostomella subnodosa* Reuss.
5. *Nodosaria prismatica* Reuss.
6. *N. zippei* Reuss.
7. *Vaginulina humilis* Reuss sp.
8. *V. legumen* Linn. sp.
9. *V. intumescens* Reuss.
10. *Cristellaria subalata* Reuss.
11. *Polymorphina ? gibba* d'Orb.

* Phil. Trans., pt. ii., 1885, p. 442, pl. xliii., fig. 4*a*.

12. *Globigerina canaliculata* Reuss sp.
13. *Truncatulina schlœnbachi* Reuss sp.
14. *Pulvinulina elegans* d'Orb. sp.
15. *P. carpenteri* Reuss sp.
16. *P. reticulata* Reuss sp.
17. *P. pondensis* sp. nov.
18. *Rotalia soldanii* d'Orb. sp., var. *nitida* Reuss.

Of the fifteen species already described, two are from the Lower Cretaceous (Neocomian) or older formations, viz., *Haplophragmium neocomianum* and *Vaginulina intumescens.* Three appear to be restricted to the Albian stage, viz., *Vaginulina humilis, Pulvinulina reticulata,* and *P. carpenteri.* Five range from the Gault to the Upper Chalk, viz., *Pleurostomella subnodosa, Nodosaria prismatica, N. zippei, Truncatulina schlœnbachi,* and *Rotalia soldanii* var. *nitida.* The remaining five species have a still wider range, and extend into the Tertiary formations.

The species are all such as would be found in quite shallow water.

The valves of the Ostracoda are as a rule somewhat thin and fragile, but are well preserved as regards their superficial ornament.

Six species and varieties were found, two of which are new.

They are as follows:—

1. *Macrocypris simplex* Chapman.
2. *Bythocypris simulata* Jones sp.
3. *Cythere* ? *drupacea* Jones.
4. *Cythereis ornatissima* Reuss sp., var. *reticulata* J. & H.
5. *Cytheridea longicaudata* sp. nov.
6. *Cytheropteron elongato-concentricum* sp. nov.
7. *Cytherella williamsoniana* Jones.

Of the above seven species of Ostracoda one doubtful form is of Oolitic age, viz., *Cythere drupacea,* two range from the Neocomian to the Upper Chalk, viz., *Cythereis ornatissima* var. *reticulata,* and *Cytherella williamsoniana.* One species has occurred in a *remanié* bed of the Albian, viz., *Macrocypris simplex;* and one species appears to range throughout the Chalk formation, viz., *Bythocypris simulata.*

The general facies of the present series of Microzoa would lead one to conclude their position to be intermediate between the Lower and Upper Cretaceous series, but having a stronger affinity towards the latter group.

THE FORAMINIFERA.

FAMILY LITUOLIDÆ.

GENUS HAPLOPHRAGMIUM Reuss.

HAPLOPHRAGMIUM NEOCOMIANUM Chapman.

Plate XXIX., fig. 1.

H. neocomianum Chapman, 1894, Quart. Journ. Geol. Soc., vol. l., p. 695, pl. xxxiv., figs. 2*a*, *b*.

Idem, 1895, Ann. and Mag. Nat. Hist., ser. 6, vol. xvi., p. 315, pl. xi., fig. 7.

H. fontinense (non) Terquem, Egger., 1899, Abhandl. k. bayer. Akad. Wiss., Cl. ii., vol. xxi., Abth. 1, p. 140, pl. i., figs. 14–16, 19, 20, 25–29; pl. ii., figs. 40–42.

A few examples of the above species were seen in the washings, but owing to their resembling the sand particles in colour, and the absence of any very definite shape, they are easily overlooked. The first recorded specimens came from the Bargate Beds of Lower Greensand age, near Dorking, in Surrey, and the species was subsequently found both in the black and brown Rhætic clays of Wedmore, in Somerset, England. Dr. Egger's specimens came from the Cretaceous marl of the Upper Bavarian Alps; they are referred to *H. fontinense*, but that species is evolute in the earlier spiral chambers, whilst the Cretaceous specimens are involute.

HAPLOPHRAGMIUM MERIDIONALE sp. nov.

Plate XXIX., figs. 2, 2*a*.

Specific Characters.—Test very thin, diaphanous; subcircular to subelliptical. Sutures nearly straight, fairly well marked, but segments more clearly seen when the test is moistened; about six segments visible. Test white, composed of fine silicious particles. Surface fairly smooth. Largest diameter about 1 mm.; width ·6 mm.; thickness ·05 mm.

This species recalls the minute *Haplophragmium terquemi* * found in the French and English Gault and the Cretaceous marl of the

* Berthelin, 1880, Mém. Soc. Géol. France, sér. 3, vol. i.; Mém. v., p. 22, pl. ii., fig. 1. Chapman, 1898, Journ. R. Micr. Soc., p. 12, pl. ii., fig. 5.

Upper Bavarian Alps.* *H. meridionale*, however, is very much larger, is less elongate in the lateral aspect, and the test is somewhat clearer or more translucent, and white. It is fairly frequent in the washings.

Family TEXTULARIIDÆ.

Genus BULIMINA d'Orbigny.

Bulimina trigonula nom. nov.† var. inornata nov.

Plate XXIX., fig. 3.

The test is formed on the type of *B. elegans* d'Orbigny, that is, more or less regularly trigonal. The salient edges are more pronounced than in that species, and not so sharp as in *B. trigonula* (*trigona*) Chapman. It most closely approaches the latter form in general outline, but the aboral end is not studded with granulations, the surface being quite smooth.

The specific form *B. trigonula* (*trigona*) has been found in the Taplow Chalk, zone of *Belemnites* (*Actinocamax*) *quadratus*,‡ and a smooth form more nearly resembling our present variety was obtained from the Cretaceous marl of the Upper Bavarian Alps by Dr. Egger.§

Only one specimen of *B. trigonula* has been found amongst the present series from the Cretaceous of East Pondoland.

Genus PLEUROSTOMELLA Reuss.

Pleurostomella subnodosa Reuss.

Plate XXIX., fig. 4.

Dentalina subnodosa Reuss, 1851, Haidinger's Naturw. Abhandl., vol. iv., pt. i., p. 24, pl. 1, fig. 9.

Pleurostomella subnodosa Reuss, 1860, Sitzungsb. k. Ak. Wiss. Wien, vol. xl., p. 204, pl. viii., figs. 2*a*, *b*. Burrows, Sher-

* Egger, 1899, Abh. k. bayer. Akad. Wiss., Cl. ii., vol. xxi., Abth. 1, p. 138, pl. i., figs. 18, 35, 54, 56.

† The specific name *trigona* has already been used by Terquem to denominate a foraminiferal species of the genus *Bulimina* (Mém. Soc. Géol. France, sér. 3, vol. ii., 1882, p. 110, pl. xi. (xix.), figs. 28, 29), and therefore the specific name of the Taplow Chalk form is here amended to *trigonula*.

‡ Quart. Journ. Geol. Soc., vol. xlviii., 1892, p. 515, pl. xv., fig. 8.

§ Abhandl. k. bayer. Akad. Wiss., 1899, Cl. ii., vol. xxi., Abth. 1, p. 52, pl. xxiv., figs. 16, 17.

born and Chapman, 1890, Journ. R. Micr. Soc., p. 555, pl. viii., fig. 27. Bagg., 1898, Bull. U.S. Geol. Surv., No. 88, p. 34.

Nodosaria subnodosa (Reuss) Egger, 1899, Abhandl. k. bayer. Akad. Wiss., Cl. ii., vol. xxi., Abth. 1, p. 58, pl. vi., fig. 27.

At first sight our specimen seems to resemble a stumpy *Nodosaria consobrina*, but the alternating obliquity of the sutures precludes the possibility of its affinities in that direction.

By moistening the surface of this specimen the internal structure of the chambers is seen to be that of a *Pleurostomella*. The present specimen exactly resembles the aboral segments of Dr. Egger's *P.* (*Nodosaria*) *subnodosa* from the Cretaceous marl of the Upper Bavarian Alps. This species is very characteristic of Upper Cretaceous deposits, ranging from the Red Chalk of Speeton to the marls of the Bavarian Alps (Upper Chalk).

Family LAGENIDÆ.

Genus NODOSARIA Lamarck.

Nodosaria prismatica Reuss.

Plate XXIX., fig. 5.

N. prismatica Reuss, 1860, Sitzungsb. k. Ak. Wiss. Wien, vol. xl., p. 180, pl. ii., fig. 2. Id., 1862, ibid., vol. xlvi., p. 36, pl. ii., fig. 7.

N. prismatica Reuss, Burrows, Sherborn, and Bailey, 1890, Journ. R. Micr. Soc., p. 557, pl. ix., figs. 25*a*, *b*. Chapman, 1893, ibid., p. 594, pl. ix., fig. 21. Id., 1894, Quart. Journ. Geol. Soc., vol. l., p. 707. Egger, 1899, Abhandl. k. bayer. Akad. Wiss., Cl. ii., vol. xxi., Abth. 1, p. 74, pl. viii., fig. 8.

This species is fairly common in the residues, but it is generally very fragmentary, the test breaking up into separate segments during the operations of washing and mounting. The specimens before us are not very typical of the species, but there is no doubt they belong to the type form so commonly associated with the Cretaceous faunas, both Lower and Upper, of England, France, and Germany. The chief difference in the present examples is the almost complete absence of sutural constrictions on the surface of

the test; in this respect they approach *N. obscura* Reuss, but the segments are too short for that species.

NODOSARIA ZIPPEI Reuss.

Plate XXIX., fig. 6.

N. zippei Reuss, 1845, Verstein. bohm. Kreidef., pt. i., p. 25, pl. viii., figs. 1–3. Rupert Jones, 1854, Lecture on the Geological History of Newbury, pl. ii., fig. 1. Chapman, 1893, Journ. R. Micr. Soc., p. 593, pl. ix., fig. 12. Bagg, 1898, Bull. U.S. Geol. Surv., No. 88, p. 45, pl. iii., fig. 1. Egger, 1899, Abhandl. k. bayer. Akad. Wiss., Cl. ii., vol. xxi., Abth. 1, p. 78, pl. viii., figs. 1, 2.

This is a somewhat aberrant variety of the elegant *Nodosaria* described by Reuss, differing chiefly in its larger growth and irregular costæ. The typical form is generally distributed through the Upper Cretaceous.

GENUS VAGINULINA d'Orbigny.

VAGINULINA HUMILIS Reuss sp.

Plate XXIX., fig. 7.

Cristellaria humilis Reuss, 1862, Sitzungsb. d. k. Ak. Wiss. Wien, vol. xlvi., p. 65, pl. vi., figs. 16, 17. Chapman, 1894, Journ. R. Micr. Soc., p. 648, pl. ix., figs. 7*a*, *b*.

It is difficult to satisfactorily separate certain of the cristellaroid forms found in the Lias, Cretaceous, and Tertiary formations, for they run so insensibly into the *Vaginulina* type of shell, which is flattened laterally, and has the commencement practically non-spiral.

The above species has likewise little or no spiral at the commencement of the shell, and therefore it appears more properly to belong to *Vaginulina*. The specific form here referred to is like a broad *V. legumen* with few chambers and a superficial sutural thickening or limbation. *V. humilis* seems to be restricted to the Neocomian and Gault strata of Germany and England. Somewhat rare in the Cretaceous of East Pondoland.

VAGINULINA LEGUMEN Linn. sp.

Plate XXIX., fig. 8.

Nautilus legumen Linn., 1758, System. Nat., 10th ed., p. 711, No. 248; 1767, 12th ed., p. 1164, No. 288.

Vaginulina legumen (Linn.), Brady, 1884, Chall. Rep., vol. ix., p. 530, pl. lxvi., figs. 13–15. Chapman, 1894, Quart. Journ. Geol. Soc., vol. l., p. 710. Bagg., 1898, Cret. Foram. N. Jersey, Bull. U.S. Geol. Surv., No. 88, p. 53, pl. iv., fig. 4. Egger, 1899, Abhandl. k. bayer. Akad. Wiss., Cl. ii., vol. xxi., Abth. 1, p. 98, pl. ix., figs. 29, 30.

This is generally a well-grown and handsome species. Our specimens have the sutural limbation often seen in this type of shell, and by which character it closely approaches the form previously mentioned; without a longer series of specimens, however, it would be difficult to point out the relationship of the two forms. The specimens found by Dr. Egger in the Cretaceous of the Bavarian Alps differ somewhat from the usual form in having a convex back; the sutures also are plain. *Vaginulina legumen* is known from various horizons in the Lias, from the Neocomian of Surrey, England, and the Cretaceous of New Jersey. It is also a well-distributed shell in the various foraminiferous strata of Tertiary age.

Not uncommon in the East Pondoland series.

Vaginulina intumescens Reuss.

Plate XXIX., fig. 9.

V. intumescens Reuss, 1862, Sitzungsb. d. k. Akad. Wiss. Wien, vol. xlvi., Abth. 1, p. 49, pl. iv., fig. 2.

The group of *Vaginulinæ* characterised by a thin compressed test, subtriangular in outline, with few oblique chambers, and having a conspicuous ornament of curved longitudinal striations, is typically represented by the present species. *V. intumescens* was originally described by Reuss from the Neocomian Beds of Germany. Closely related forms also occur in the Lias, and have been figured from time to time by Terquem and others; the Liassic species, however, generally possess a larger number of chambers, which are also proportionately shorter and narrower. Very rare in the present series.

Genus CRISTELLARIA Lamarck.

Cristellaria subalata Reuss.

Plate XXIX., fig. 10.

C. subalata Reuss, 1854, Denkschr. k. Ak. Wiss. Wien, vol. vii., Abth. 1, p. 68, pl. xxv., fig. 13.

Robulina megalopolitana Reuss, 1855, Zeitschr. d. Deutsch. Geol. Gesellsch., vol. vii., p. 272, pl. ix., figs. 5*a*, *b*.

Cristellaria subalata Reuss, 1862, Sitzungsb. d. k. Ak. Wiss. Wien, vol. xlvi., Abth. 1, p. 76, pl. viii., fig. 10; pl. ix., fig. 1.

C. megalopolitana Reuss sp., Sherborn and Chapman, 1886, Journ. R. Micr. Soc., ser. 2, vol. vi., p. 755, pl. xv., fig. 30*a*, *b*. Chapman, 1894, Quart. Journ. Geol. Soc., vol. l., p. 714.

C. subalata Reuss, Chapman, 1896, Journ. R. Micr. Soc., p. 3, pl. i., figs. 3*a*, *b*.

The specimen from East Pondoland, whilst more than usually elongate, is sufficiently characterised by the limbation of the sutures and a minute umbilical protuberance indicating the presence of a megalosphere. The latter feature is also seen in Reuss' specimen from the Upper Cretaceous of Gosau, Eastern Alps. The Gault specimens are more spherical in outline, but possess similar superficial ornament. *C. subalata* has also been recorded from the Neocomian of Germany, and under the name of *C. megalopolitana* it has been figured from German (Neocomian and Tertiary) and English (Neocomian, Gault, and Eocene) fossils respectively.

Genus POLYMORPHINA d'Orbigny.

Polymorphina ? gibba d'Orbigny.

Plate XXIX., fig. 11.

P. (*Globulina*) *gibba* d'Orb., 1826, Ann. Sci. Nat., vol. vii., No. 20, p. 267, and modèles No. 63.

P. subsphærica Berthelin, 1880, Mém. Soc. Geol. France, sér. 3, vol. i., No. 5, p. 58, pl. iii., figs. 18*a*, *b*.

Polymorpha (*Polymorphina*) *ovata* Perner, 1892, Foraminifery Českého Cenomanu, p. 64, pl. viii., figs. 14–16.

P. gibba d'Orb., Chapman, 1896, Journ. R. Micr. Soc., p. 9, pl. ii., fig. 5. Egger, 1899, Abhandl. k. bayer. Akad. Wiss., Cl. ii., vol. xxi., Abth. 2, p. 128, pl. xvii., figs. 19, 20.

One or two somewhat broken tests occur in the washings, which show the internal septation of a *Polymorphina* allied to *P. gibba*. The reason of these specimens being fractured is the infiltration of the shell with pyrites, which splits the test by its decomposition and expansion. The oral aperture in one specimen is seen to be stellate.

Family GLOBIGERINIDÆ.

Genus GLOBIGERINA d'Orbigny.

Globigerina canaliculata Reuss sp.

Plate XXIX., fig. 12.

Rosalina canaliculata Reuss, 1854, Denkschr. k. Ak. Wiss. Wien, vol. vii., Abth. 1, p. 70, pl. xxvi., fig. 4.

Discorbina canaliculata Reuss sp., Karrer, 1870, Jahrb. k. k. Geol. Reichsanst., No. 2, p. 183.

Globigerina linneana d'Orb., Brady, 1884, Rep. Chall., p. 598, pl. lxxxii., fig. 12. Jones, 1896, Foram. Crag. (Pal. Soc. Mon.), p. 285, pl. vii., figs. 23*a–c*.

Globigerina canaliculata Reuss sp., Egger, 1899, Abhandl. k. bayer. Ak. Wiss., Cl. ii., vol. xxi., Abth. 1, p. 172, pl. xxi., figs. 15–17, 24–26.

Although closely related to *G. marginata* Reuss and *G. linneana* d'Orbigny, this form is distinguished by the crenulate and limbate margin. The nearest figure of this species to ours is that given in the Monograph of the Crag Foraminifera under the name of *G. linneana*.

This species is most frequent in Cretaceous strata, but it is not restricted to beds of that age. Brady regards *G. canaliculata* as synonymous with *G. linneana*, and closely related to *G. marginata*. The latter form differs in the less striking limbation of the peripheral edge and the distinct asperity of its surface in that region.

Family ROTALIIDÆ.

Genus TRUNCATULINA d'Orbigny.

Truncatulina schlœnbachi Reuss sp.

Plate XXIX., figs. 16, 16*a*.

Rosalina schlœnbachi Reuss, 1862, Sitzungsb. k. Ak. Wiss. Wien, vol. xlvi., Abth. 1, p. 87, pl. xi., figs. 5*a–c*.

Discorbina schlœnbachi Reuss sp., Egger, 1899, Abhandl. k. bayer. Ak. Wiss., Cl. ii., vol. xxi., Abth. 1, p. 164, pl. xviii., figs. 19–21.

The figures of the above species given by Reuss show the segments to possess a stronger curvature than is seen in our specimen ;

otherwise the forms are fairly comparable. Both occurrences as given above are from the Upper Cretaceous. The comparatively finely perforated test points to its relationship with *Truncatulina* rather than *Discorbina*.

Only one specimen found.

Genus PULVINULINA Parker and Jones.

Pulvinulina elegans d'Orbigny sp.

Plate XXIX., figs. 13, 13*a*.

Rotalia (*Turbinulina*) *elegans* d'Orbigny, 1826, Ann. Sci. Nat., vol. vii., p. 276, No. 54.

Pulvinulina elegans d'Orb. sp., Parker and Jones, 1871, Ann. Mag. Nat. Hist., ser. 4, vol. viii., p. 174, pl. xii., fig. 142. Chapman, 1894, Quart. Journ. Geol. Soc., vol. l., p. 273. Chapman, 1898, Journ. R. Micr. Soc., p. 6, pl. i., figs. 8*a–c*.

Pulvinulina partschiana d'Orb. sp., Egger, 1899, Abhandl. k. bayer. Ak. Wiss., Cl. ii., vol. xxi., Abth. 1, p. 154, pl. xx., figs. 10–12.

This species is by no means common in our material, but the specimens seen are quite typical, and compare closely with the same form from other Cretaceous deposits in Europe and elsewhere.

Pulvinulina carpenteri Reuss sp.

Plate XXIX., figs. 14, 14*a*, 18.

Rotalia carpenteri Reuss, 1862, Sitzungsb. d. k. Ak. Wiss. Wien, vol. xlvi., Abth. 1, p. 94, pl. xiii., figs. 6*a–c*.

Pulvinulina carpenteri Reuss sp., Chapman, 1898, Journ. R. Micr. Soc., p. 8, pl. i., figs. 11*a–c*.

This is a neat *Pulvinulina* of the *P. caracolla* type, the distinguishing features being the smooth, non-excavate, superior surface of the shell and its thin, denticulate margin. The difference between the South African specimens and the English consist in the slightly smaller dimensions of the former, and the almost complete disappearance of the peripheral denticulæ in some specimens, an extreme case of which is figured here (pl. xxix., figs. 14, 14*a*).

The occurrence of this species in the Cretaceous of South Africa is extremely noteworthy, for up to the present it had been known only from the Gault of Folkestone, where it was first discovered by Reuss, and found later by Rupert Jones and the writer. At Folkestone *P. carpenteri* occurred both in the Lower and Upper Gault.

Pulvinulina reticulata Reuss sp.

Plate XXIX., figs. 15, 15*a*.

Rotalia reticulata Reuss, 1862, Sitzungsb. k. Ak. Wiss. Wien, vol. xlvi., Abth. 1, p. 83, pl. x., figs. 4*a–c*.
Epistomina reticulata Reuss sp., Uhlig, 1883, Jahrb. k. k. Geol. Reichsanst., vol. xxxiii., p. 768, pl. vii., figs. 8, 9.
Pulvinulina reticulata Reuss sp., Chapman, 1898, Journ. R. Micr. Soc., p. 8, pl. i., figs. 10*a–c*.
P. reticulata Reuss sp., var. *carinata*, Bagg, 1898, Bull. U.S. Geol. Surv., No. 88, p. 68, pl. v., figs. 3*a*, 3*b*.
Rotalina reticulata Reuss sp., Egger, 1899, Abhandl. k. bayer. Akad. Wiss., Cl. ii., vol. xxi., Abth. 1, p. 157, pl. xix., figs. 1–3.

This is one of the depauperated varieties of the group of *P. elegans* which seems to be restricted to the Mesozoic formations—the Jurassic and Cretaceous. It has been found in the "Ornatus" clays of Russia (Callovian), the basal beds of the Albian in North Germany, the Cretaceous marls of the Upper Bavarian Alps, the Gault of Folkestone, England, and the Navesink marls (Upper Cretaceous) of New Jersey, America. *P. reticulata* is represented by small but otherwise typical specimens in the Cretaceous of East Pondoland, and in the washings is quite common.

Pulvinulina pondensis sp. nov.

Plate XXIX., figs. 19, 19*a*.

Specific Character.—Test discoidal, gently convex on the superior face, whorls slightly terraced; inferior surface strongly convex. Peripheral edge and sutures limbate on the upper side; sutural margins of chambers on the lower surface greatly thickened and having a stellate arrangement, the rays thickest at the umbilicus. Outer whorl with about eight chambers. Both surfaces ornamented with fine circular or polygonal pittings. Peripheral edge fairly

sharp, and with an even outline. Diameter of test about ·8 mm. This species seems to be nearly related to Egger's *Truncatulina favosoides*,* but differs in its generally neater appearance, with flatter superior surface, more strongly limbate sutures, finer variolæ, and an even peripheral edge. It is of peculiar interest to note that the nearly allied form has only lately been discovered by Dr. Egger in the Cretaceous of the Upper Bavarian Alps, and also that no species at all approaching these in the style of ornament were met with either in the Gault of Folkestone or of North Germany.

Very common in the Cretaceous of East Pondoland.

Genus ROTALIA Lamarck.

Rotalia soldanii d'Orb. sp., var. nitida Reuss.

Plate XXIX., figs. 17, 17*a*.

Rotalina nitida Reuss, 1844, Geogr. Skizze Böhmen, vol. ii., pt. i., p. 214. Id., 1845–6, Verstein. bohm. Kreidef., pt. i., p. 35, pl. viii., fig. 52; pl. xii., figs. 8, 20.

Placentula nitida Berthelin, 1880, Mém. Soc. Geol. France, sér. 3, vol. i., No. 5, p. 69, pl. iv., figs. 11*a–c*.

Discorbina oligostegia Perner, 1892, Foraminifery Českého cenomanu (Palæontographica Bohemiæ, No. 1), p. 65, pl. x., figs. 5*a*, *b*.

Rotalia umbilicata var. *nitida* Reuss, Id., 1897, Foraminifery Vrstev Belohorských (Pal. Bohem., No. 4), pp. 54, 55, 72, pl. vii., fig. 25 and woodcut p. 53.

R. soldanii d'Orb. var. *nitida* Reuss, Chapman, 1898, Journ. R. Micr. Soc., p. 9, pl. ii., figs. 2*a–c*.

R. nitida Reuss, Egger, 1899, Abhand. k. Akad., Cl. ii., vol. xxi., Abth. 1, p. 156, pl. xx., figs. 4–6.

The specific form, of which this is a smaller and more delicate variety, was described from the Tertiary Beds of the Vienna Basin. The variety *nitida* is a well-known form in the Upper Cretaceous, as the Albian of France and England, and the Cenomanian, Turonian, and Senonian of Bohemia and the Upper Bavarian Alps.

This variety is very rare in our material.

* Abhandl. k. bayer. Akad., Cl. ii., vol. xxi., Abth. 1, p. 150, pl. xx., figs. 22–5.

THE OSTRACODA.

Family BAIRDIIDÆ.

Genus MACROCYPRIS G. S. Brady.

Macrocypris simplex Chapman.

Plate XXIX., figs. 22, 22*a*, 22*b*.

M. simplex Chapman, 1898, Ann. Mag. Nat. Hist., ser. 7, vol. ii., p. 333, figs. 1*a–c*.

There are two specimens of the above form in the present series which agree with the example from the Cambridge Greensand (*remanié* bed, chiefly of Albian age) of England. One of our specimens—that figured—is slightly more arched on the dorsal side, but the other is exactly comparable with the English specimen.

Genus BYTHOCYPRIS G. S. Brady.

Bythocypris simulata Jones sp.

Plate XXIX., fig. 20.

Cythere faba Jones, 1849 (non Reuss), Mon. Cret. Entom., p. 13, pl. ii., figs. 4*a–c*.

Cythere simulata Jones, 1870, Geol. Mag., p. 75.

Bythocypris simulata Jones sp., Jones and Hinde, 1890, Mon. Cret. Entom., p. 11, pl. i., figs. 27–29. Egger, 1899, Abhandl. k. bayer. Akad. Wiss., Cl. ii., vol. xxi., Abth. 1, p. 179, pl. xxvii., figs. 58, 59, 60.

Two valves were found closely resembling the English Chalk specimens.

The example figured by Egger from the Upper Cretaceous of the Bavarian Alps viewed laterally has the ventral margin straight.

The South African specimens have the surfaces of the valves minutely punctate, and the anterior border vertically striate.

The ventral margin is distinctly undulate in side view. Length of valve 1 mm., height ·53 mm.

Family CYTHERIDÆ.

Genus CYTHERE Müller.

Cythere ? drupacea Jones.

C. drupacea Jones, 1884, Quart. Journ. Geol. Soc., vol. xl., p. 772, pl. xxxiv., fig. 30.

A single specimen of a *Cythere* with united valves occurred in the present series, which most resembles the above species. There are, however, one or two slight differences which make the determination doubtful, and only the discovery of a more extensive series of specimens would make a proper comparison possible. These differences are—a steeper face to the ventral border, approaching that of *Cytheropteron*, and a blunt spinose ornamentation of the anterior and posterior extremities towards the ventral angles.

The specimen described by Professor Rupert Jones came from the Great Oolite stratum of the Richmond boring, England.

Genus CYTHEREIS Jones.

Cythereis ornatissima Reuss sp., var. reticulata Jones and Hinde.

C. ornatissima Reuss sp., var. *reticulata* Jones and Hinde, 1890, Mon. Cret. Entom., p. 24, pl. i., figs. 67, 68, 77; pl. iv., figs. 9–12. Chapman, 1894, Quart. Journ. Geol. Soc., vol. l., p. 689. Id., 1898, Ann. Mag. Nat. Hist., ser. 7, vol. ii., p. 340.

A very perfectly preserved valve of this pretty variety occurred in the present series, having two rows of prickles along the anterior border, a characteristic median ridge and tubercle, and a small sharp posterior spine. This species ranges from the Neocomian to the Senonian in England and Ireland.

Genus CYTHERIDEA Bosquet.

Cytheridea longicaudata sp. nov.

Plate XXIX., fig. 21.

Specific Characters.—Carapace subtriangular, broad in front, attenuated behind. Both angles of the front margin well rounded;

ventral margin hollowed posteriorly; dorsal margin sinuous. Surface of the valve sloping gently from behind to the anterior border and depressed or even sulcated near the antero-dorsal angle. Towards the ventral margin the valve is steep and sometimes angulated and sloping away to the dorsal. Highest in the middle of the posterior third. Hinge showing the characteristic crenulated crests and grooves of this genus. Surface of valve marked with numerous impressed puncta, having a quasi-linear arrangement.

Length of left valve 1·16 mm.; height ·66 mm.

Length of right valve of a larger specimen 1·3 mm.; height ·83 mm.

The shape of the carapace in this species may be compared to an extremely attenuated form of *Cytheridea perforata* (Römer).* The tumid form of the posterior portion makes its resemblance to *Cytheropteron sphenoides* (Reuss) † very close, but the hingement is different and the ventral margin hardly high enough. In addition to the evidence of the hinge characters of *Cytheridea*, our specimens have the impressed puncta seen also in *Cytheridea perforata*.

Genus CYTHEROPTERON G. O. Sars.

Cytheropteron elongato-concentricum sp. nov.

Plate XXIX., figs. 23, 23*a*.

Specific Characters.—Valves subrhomboidal, elongate, with a broad posterior flange, and one less strongly marked, anteriorly. Ventral border steep and well rounded. Surface tumid, and highest just behind the middle of the valve. Surface ornamented with polygonal excavations, not so numerous nor so distinctly concentric as in *C. concentricum* (Reuss),‡ with which this present specimen seems most nearly allied.

Length ·66 mm.; height ·33 mm.; thickness ·16 mm.

The elongate carapace, the conspicuous posterior flange, and the comparatively coarse pittings serve to separate this from the well-known and widely distributed *Cytheropteron concentricum* of Europe.

* See Jones and Hinde, 1890, Mon. Cret. Entom., p. 29, pl. i., figs. 1–4.

† See Jones and Hinde, 1890, Mon. Cret. Entom., p. 33, pl. i., figs. 18–20.

‡ See Jones and Hinde, 1890, Mon. Cret. Entom., p. 31, pl. i., figs. 5–10; pl. iv., fig. 19.

Family CYTHERELLIDÆ.

Genus CYTHERELLA Jones.

Cytherella williamsoniana Jones.

C. williamsoniana Jones, 1849, Mon. Ent. Cret., p. 31, pl. vii., figs. 26*a–h*.

Cypridina leioptycha Reuss, 1851, in Haidinger's Naturw. Abhandl., vol. iv., pt. i., p. 49, pl. vi., fig. 11.

Cytherella williamsoniana Jones, Bosquet., 1854, Mém. Comm. geol. Neerlande, vol. ii., p. 62, pl. v., figs. 2*a–d*. Reuss, 1874, Elbthalgeb., &c., pt. ii., p. 153, pl. xxviii., figs. 9, 10*a, b*. Marsson, 1880, Mittheil. nat. Ver. Neu-Pommern und Rugen, Jahrgang 12, p. 31, pl. ii., figs. 8*a–c*. Jones and Hinde, 1890, Mon. Cret. Entom., p. 48, pl. iii., figs. 55–62. Chapman and Sherborn, 1893, Geol. Mag., Decade III., vol. x., p. 347. Chapman, 1898, Ann. Mag. Nat. Hist., ser. 7, vol. ii., p. 344. Egger, 1899, Abhandl. k. bayer. Akad. Wiss., Cl. ii., vol. xxi., Abth. 1, p. 188, pl. xxvii., figs. 63–65.

A single left valve of this peculiar and variable species was found in the East Pondoland material, having a flat surface with the bordering ridge and a sinuous median one, which ends towards the postero-ventral angle in a thickened knob. Our specimen comes nearest to fig. 56 of Jones' and Hinde's monograph. It also bears a certain resemblance to *C. jugosa* Jones,* which occurred in the Great Oolite of the Richmond Boring.

As regards geological range, this species first appears in the Gault in zone V at Folkestone, and it ranges upwards to Upper Chalk in England, Ireland, the Isle of Rügen, and on the Continent of Europe.

* Quart. Journ. Geol. Soc., vol. xl. (1884), p. 773, pl. xxxiv., fig. 44.

EXPLANATION OF PLATE XXIX.

FIG.

1. *Haplophragmium neocomianum* Chapman, × 40.
2. *H. meridionale* sp. nov.; 2*a*, edge view, × 30.
3. *Bulimina trigonula* var. *inornata* nov. Chap., × 30.
4. *Pleurostomella subnodosa* Reuss, × 40.
5. *Nodosaria prismatica* Reuss, × 30.
6. *N. zippei* Reuss, × 30.
7. *Vaginulina humilis* Reuss sp., × 30.
8. *V. legumen* Linné sp., × 15.
9. *V. intumescens* Reuss, × 30.
10. *Cristellaria subalata* Reuss, × 30.
11. *Polymorphina* ? *gibba* d'Orb., × 30.
12. *Globigerina canaliculata* Reuss, × 30.

13, 13*a*. *Pulvinulina elegans* d'Orb. sp.: 13, superior aspect; 13*a*, peripheral view.

14, 14*a*. *Pulvinulina carpenteri* Reuss sp.: 14, superior aspect; 14*a*, inferior aspect, × 30.

15, 15*a*. *Pulvinulina reticulata* Reuss sp.: 15, superior aspect; 15*a*, inferior aspect, × 30.

16, 16*a*. *Truncatulina schlœnbachi* Reuss sp.: 16, superior aspect; 16*a*, inferior aspect, × 30.

17, 17*a*. *Rotalia soldanii* d'Orb. sp., var. *nitida* Reuss: 17, superior aspect; 17*a*, inferior aspect, × 60.

18. *Pulvinulina carpenteri* Reuss sp.: superior aspect of another specimen with thin peripheral margin, × 30.

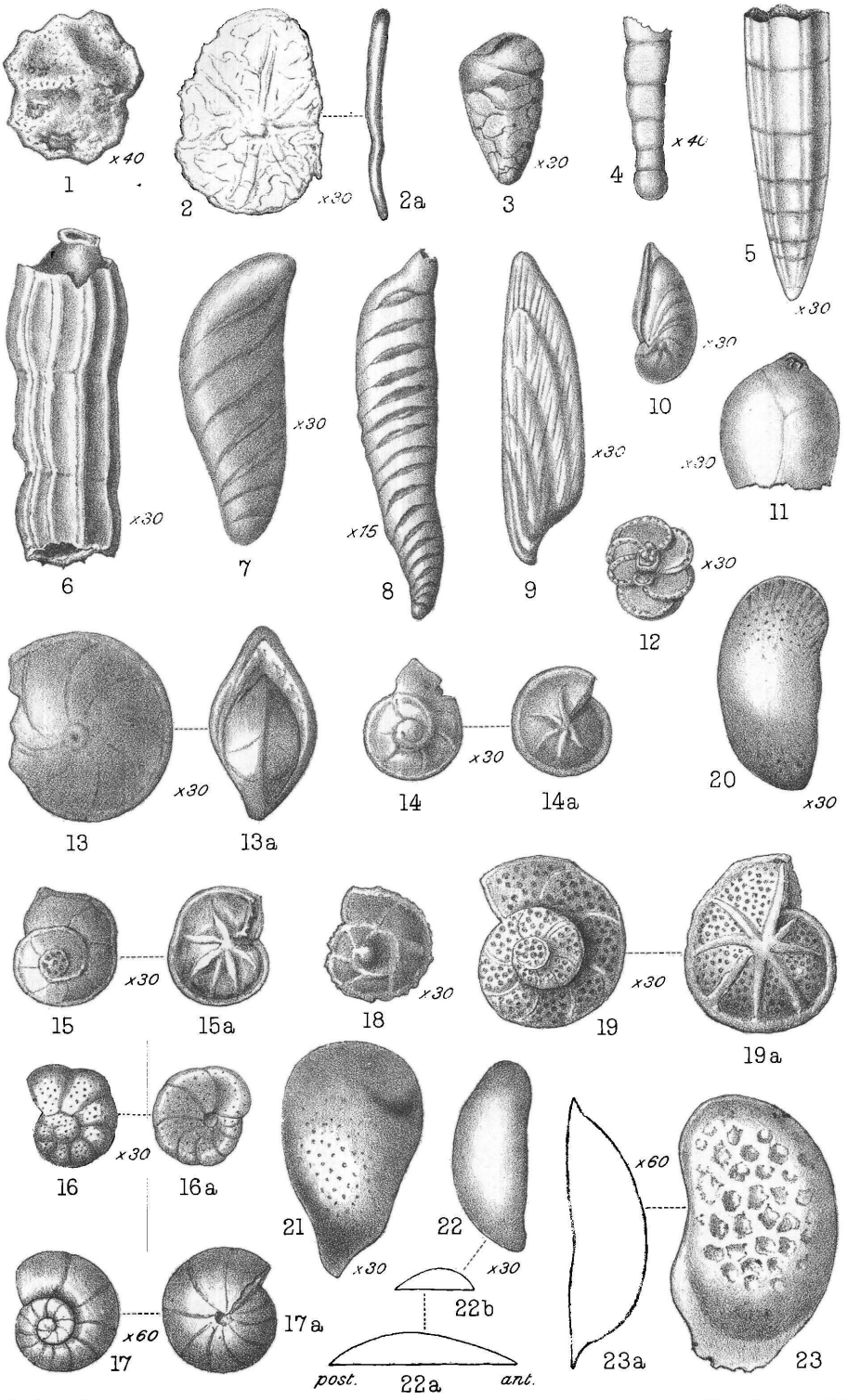
19, 19*a*. *Pulvinulina pondensis* sp. nov.: 19, superior aspect; 19*a*, inferior aspect × 30.

20. *Bythocypris simulata* Jones sp.: right valve, × 30.

21. *Cytheridea longicaudata* sp. nov.: left valve, × 30.

22, 22*a*, 22*b*. *Macrocypris simplex* Chapman: 22, right valve; 22*a*, edge view; 22*b*, end view, × 30.

23, 23*a*. *Cytheropteron elongato-concentricum* sp. nov.: 23, right valve; 23*a*, edge view, × 60.



F.C. ad nat. del. West, Newman lith.

Cretaceous Foraminifera and Ostracoda.

From East Pondoland.