Chilodactylus Allporti.

D. $\frac{17}{27}$. A. $\frac{3}{8-9}$. L. lat. 55–56.

Allied to *Chilodactylus nigricans*, but with the body more elevated and with the ventral fin reaching to or even slightly beyond the vent.

The height of the body is contained twice and a half or twice and two thirds in the total length. Six simple pectoral rays, the second of which is the longest, but projects only a little beyond the membrane. Dorsal spines strong, the fifth, sixth, and seventh being the longest, not quite one half of the length of the head. The spinous and soft dorsal fins of nearly equal height; but the last spines are much shorter than the first rays. Scales very rough. There are five longitudinal series of scales above the lateral line; and a band of minute scales runs along the base of the entire dorsal fin.

Purplish brown, with six broad, slightly oblique, blackish cross bands; fins and opercular membrane deep black.

Mr. Morton Allport has presented to the British Museum two specimens, 11 inches long; but the species grows to a much larger size, as we possess from another collection a third example which is two feet long.

XXVII.—*On the Nomenclature of the Foraminifera.* By W. K. Parker, F.R.S., and Prof. T. Rupert Jones, F.G.S.

Part XV. *The Species figured by Ehrenberg.*

[Continued from vol. ix. p. 303.]

XIV. *Foraminifera from the Chalk of the Isle of Möen, Denmark.* (Monatsberichte, 1838, p. 192; Abhandlungen, 1838, table III. pl. 4. fig. II.)

Pl. XXIX. figs. 1, *a*, *b*, *c*, *Rotalia laxa*, and fig. 2, *R. perforata*, must both be referred to the subdiscoidal variety of *Globigerina bulloides* known as *Gl. cretacea*, D'Orb. Figs. 3 to 7 are neatly grown, young or arrested *Planorbulinæ*, with globose chambers, comparable with the early stages of growth in *Pl. farcta*. They may for convenience be grouped as *Pl. globulosa* (Ehr.). Such are figs. 3, *a*, *b*, *c*, *Rotalia densa*; fig. 4, *R. senaria*; fig. 5, *R. quaterna*; fig. 6, *R. globulosa*?, 1838; fig. 7, *R. leptospira*.

Fig. 8, *Rotalia*? (*Planulina*?) *monospira*, is a rotiform *Pulvinulina* (?), with thick marginal wall and strong straight septa, and with a curious symmetrical set of holes, one at the base of each chamber, around the large, convex, central cham-

ber. It seems to belong to the subtype *Pulvinulina elegans*, with its subquadrangular chambers; and it may be *P. Orbignyi* or *P. caracolla* (Rœmer), showing the high umbonate face. Fig. 9, *Rotalia cretæ*, is a relatively large *Planorbulina*, answering to Reuss's *Pl. ammonoides*. Fig. 10, *Planulina turgida*, and fig. 11, *Pl. sicula* (1838), are *Planulinæ*, near to, if not the same as, *Pl. ariminensis*, with falcate chambers. So also the much larger (fig. 12) *Pl. ocellaris*; but its large scattered foramina may, like those in fig. 8, possibly be due to parasitic borings*.

Figs. 13, *Pl. ampla*, and 14, *Pl. angusta*, are thick-margined and strongly septated, with triangular and oblong segments, as in fig. 8, and may be flat-face views of *Pulvinulina caracolla*, *P. ornata*, or some other of the *P. elegans* group. (See Phil. Trans. vol. clv. p. 390 &c.) Fig. 15, *Planulina spatiosa*, a young form of *Pl. spatiosa*, Ehr. (from the tripoli-shale of Oran, Africa), Monatsb. 1844, pp. 67 & 94, and 'Mikrogeol.' pl. xxi. fig. 95, is a variety of *Pulvinulina repanda*, near var. *pulchella*.

Fig. 16, *Textilaria sulcata* ("*Text. striata*, 1838") may well pass as *T. striata*, Ehr. Figs. 17, *a*, *b*, *Text. globulosa* (1838), is the common minute (arrested) form of *T. gibbosa*. Figs. 18, *a*, *b*, *Text. linearis* ("*T. aciculata*, 1838; see *Strophoconus*") is *Bolivina punctata*. As all Ehrenberg's *Strophoconi* are either *Bolivinæ* or closely allied *Virgulinæ*, the allusion to *Strophoconus* here might have been carried further with justice to our author's perspicacity. Fig. 19, *Text. dilatata* (1838), is a good *T. gibbosa*. Figs. 20, *a*, *b*, *Text. aculeata*, are separable,—20 *a* as a coarse aculeate *Text. gibbosa*, and 20 *b* as a thick-shelled variety of *Bolivina punctata*, bluntly aculeate on the outer margin of each chamber, and as such might be registered as *B. aculeata*; whilst the *Textilaria* falls to *T. subangulata*, D'Orb., 1846. Fig. 21 *a*, *Text. pachyaulax* ("compare *T. brevis*"), and fig. 21 *b*, *T. sulcata*, come under *T. striata*, Ehr.

Fig. 22, *Grammostomum polystigma*, is either a young specimen or the early chambers of a very broad strong-shelled *Bolivina dilatata*, Reuss, with short but transversely broad and falcate chambers; 23, *Gr. dilatatum*, is also a thick-shelled *Bolivina dilatata*, but with less curved and more quadrangular chambers; 24, *Gr. pinnula*, is a common *Textilaria* of the *gibbosa* type, with a smooth and evenly tapering subarcuate shell; 25, *Gr. convergens*, is probably a long-ovate well-grown *Bolivina punctata* (?), but without visible pores;

* In specimens from the Chalk of Meudon there are frequent borings (figs. 20, 37, & 38 of pl. xxvii.).

26, *Gr. divergens*, is a subconical delicate *B. punctata*; 27, *Gr. lineare*, is a delicate subcylindrical *B. punctata* of typical character; 28, *Gr. rhomboidale*, is a relatively large *Virgulina squamosa*. *Virgulina* is a subgenus of *Bolivina*, having flattish, smooth, and delicate shells, with extremely fine pores, and with the chambers built up more or less regularly anglewise; whilst *Bolivina* is coarser in shell-structure, and its chambers are rounder, or at least shorter transversely. *Virgulina squamosa* comprises the very regularly Textilariform varieties; *V. Schreibersii* takes those that have long inflated chambers, variously arranged, parallel with the axis of the shell, or nearly so—sometimes resembling a *Polymorphina*, sometimes modified by a partial twist of growth and passing towards *Bulimina* proper, of which genus both *Bolivina* and *Virgulina* are sections.

Fig. 29, *Proroporus verrucosus*, is a tuberculated or coarsely granular entosolenian *Polymorphina tuberculata*, and may be added to the synonymy of that species in the "Monograph of *Polymorphina*," Linnean Soc. Transact. vol. xxvii. p. 242. Fig. 30, *Polymorphina glabra*, is *Virgulina squamosa*; and 31, *P. asparagus*, is a narrow subvariety of the same. Figs. 32–36 are various small individuals of *Virgulina Hemprichii* (Ehr.), described more fully in the 'Geol. Mag.' no. 89, p. 509; and they represent forms that may be said to be transitional between *V. Schreibersii* and *Bulimina* proper (32, *Strophoconus ovum*; 33, *Str. cepa*; 34, *Str. flosculus*; 35, *Str. gemma*; 36, *Str. gracilis*). Fig. 37, *Guttulina turrita*, = *Verneuilina pygmæa* (Egger); 38, *Pleurites turgidus*, = *Virgulina Hemprichii* (see above); an aperture, visible on the inner side of the terminal chamber, is diagnostic, as in pl. xxviii. f. 30, showing the really Bulimine character of the shell, and indicating the passage of the Virguline into the Cassiduline section of this genus.

Fig. 39, *Vaginulina linearis* (fragment), = *Marginulina ensis*, Reuss ('Böhm. Kreid.' ii. pl. 13. fig. 27). Fig. 40, *Vaginulina acuta* (fragment), belongs to the *Citharina* section of the subgenus. Fig. 41, *Planularia tenella*, is a delicate young or arrested *Cristellaria*, such as in the full-grown state would arrive at either the Planularian or the Marginuline condition.

Fig. 42, *Nodosaria aculeata*, is a very interesting thick-shelled and elongate variety of *N. radicula*, having numerous prickles, chiefly but not wholly on the base of the chambers, pointing backwards. Oblique and tapering (Dentaline) subvarieties of this form have been plentifully met with in Tertiary strata, as *Dentalina Adolphina* D'Orb. (almost straight

as figured by Bornemann, from Hermsdorf), *D. scabra*, Reuss, *D. spinescens*, Reuss; and *Nodosaria hispida*, D'Orb., and *Nod. conspurcata*, Reuss (both Tertiary), are straight forms very near to Ehrenberg's *N. aculeata*; and the first takes precedence. Figs. 43, *a*, *b*, *N. vulgaris*, and fig. 44, *N. truncata*, belong to the simple elongated *N. radicula* type, with short and close-set chambers. Herein they resemble *N. glabra*, D'Orb., and the almost straight *Dent. filiformis*, D'Orb.*, still more closely, as also does the foregoing *N. aculeata*, excepting as to its prickles and straightness. *Nod. subulata* (Reuss, 'Böhm. Kreid.' ii. pl. 13. fig. 11), however, is the earliest published form with which figs. 43 and 44 most nearly correspond. Indeed, as often stated already, the differences above alluded to are not of essential value in a zoological point of view.

Fig. 45, *Miliola ovum*, =*Lagena globosa*. Fig. 46, *Miliola caudata*, =*Lagena apiculata*, Reuss (1851). Fig. 47, *Synspira triquetra*, seems to be the spiral, non-segmented commencement of some Spirilline form, assuming a triangular outline externally as it advances in growth.

Xanthidia and Coccoliths are also figured on this plate as occurring in the Chalk of Möen.

Such Foraminifera as the above are found at about 100 fathoms depth.

Species and notable Varieties from the Chalk of Möen, figured by Ehrenberg.

1. Lagena globosa (*Montagu*).
2. —— apiculata, *Rss.*
3. Nodosaria hispida, *D'Orb.*
4. —— subulata, *Rss.*
5. Vaginulina acuta, *Ehr.*
6. Marginulina ensis, *Rss.*
7. Planularia tenella, *Ehr.*
8. Polymorphina tuberculata, *D'Orb.*
9. Bolivina punctata, *D'Orb.*
10. —— dilatata, *Rss.*
11. —— aculeata, *Ehr.*
12. Virgulina squamosa, *D'Orb.*
13. —— asparagus (*Ehr.*).
14. —— Hemprichii (*Ehr.*).
15. —— —— gemma (*Ehr.*).
16. Textilaria gibbosa, *D'Orb.*
17. —— subangulata, *D'Orb.*

* After Soldani, Ann. Nat. Hist. ser. 4, vol. viii. p. 156.

18. Textilaria pinnula, *Ehr.*
19. —— striata, *Ehr.*
20. —— globulosa, *Ehr.*
21. Verneuilina pygmæa (*Egger*).
22. Globigerina cretacea, *D'Orb.*
23. Planorbulina ammonoides, *Rss.*
24. —— globulosa (*Ehr.*).
25. Planulina ariminensis, *D'Orb.*
26. Pulvinulina elegans (*D'Orb.*)?
27. —— Orbignyi (*Rœm.*)?
28. —— spatiosa (*Ehr.*).
29. Synspira triquetra, *Ehr.*

XV. *Foraminifera from the Chalk of the Island of Rügen, Baltic.* (Monatsber. 1838, p. 192; Abhandlung. 1838, table II. pl. 4. fig. iii.)

Pl. xxx. fig. 1, *Miliola* (*Monocystis*) *arcella* ("*Orbulina universa*, D'Orb.?"), is *Orb. universa.* Fig. 2, *Nodosaria monile*, a few joints of a short-chambered *N. ovicula* (or elongated *N. radicula*); probably the straight form of *Dentalina monile*, Hagenow, from the same Chalk. Figs. 3, *a*, *b*, *Textilaria globulosa* (1838), =*b*, *T. gibbosa* and, *a*, its young form or early chambers. Figs. 4, *a*, *b*, *c*, *Text. sulcata* ("*T. striata*, 1838"), and figs. 5, *a*, *b*, *T. pachyaulax* ("compare *T. brevis*"), are strongly marked specimens of *T. striata*, which, though differing from *T. gibbosa* only in its ornament, is a convenient variety. Fig. 4 *c* shows that the septal apertures, otherwise normal, are slightly lipped. Figs. 6, *a*, *b*, *c*, *d*, *Text. linearis*, is a typical *Bolivina punctata.* Fig. 7, *Text. acuta*, is also *Bolivina punctata*, but somewhat irregular in shape; it well matches in outline *Virgulina Reussii*, Geinitz, as figured by Reuss, 'Böhm. Kreid.' i. pl. 8. fig. 61: figs. 9 & 10 of pl. xxvii. (Meudon Chalk) are very similar, but with thicker shell-walls. Fig. 8, *Text. subtilis*, is another *B. punctata*, small and regular, of a common elongate-ovate shape. Fig. 9, *Grammostomum gracile*, is a rather coarse *Virgulina Schreibersii.* Figs. 10, *a*, *b*, *Gram. platytheca*, is *Textilaria sagittula.* Fig. 11, *Gram. millepora*, is a well-grown *Bolivina dilatata* (see also fig. 15). Fig. 12, *Text. inflata* ("*T. aspera*, 1838, partly"), is a coarse-shelled *T. gibbosa*, with slight marginal prickles, like *T. subangulata* from Möen, p. 185; and fig. 13, *Gram. aculeatum* ("*Text. spinosa*, 1838, partly"), is a smaller individual with more abundant and coarser prickles on the outer edges of the chambers. These two are rough relatives of the beautifully neat and simply aculeate *Text. Mariæ*, D'Orb. Fig. 14, *Gram. pinnula*, seems to be the tapering subarcuate apex of a *Bolivina*

dilatata. In outline it much resembles fig. 24, pl. xxix., which is also named *Gram. pinnula*; but the latter is Textilarian in the arrangement of its chambers. Fig. 15, *Proroporus? clavulina*, is a strongly built *Bolivina dilatata*, corresponding with *Bolivina incrassata* of Reuss, which he has found in the Chalk both of Lemberg and of Rügen.

Fig. 16, *Sagrina cretæ*, is a large, pouting, lipped *Bigenerina*, with a rough shell of globose chambers. It presents a stage of growth further than that of "*Loxostomum tumens*," pl. xxviii. fig. 25 (Geol. Mag. no. 89, p. 508), having become quite uniserial, and thus passed into the subgenus *Bigenerina*; but its necked and rimmed aperture gives it the further distinctive characters of the subgenus *Heterostomella*, Reuss. The slight tuberculation visible on the edge of the figure indicates sufficiently the habit of growth so much more fully exposed in the blunt spines of *H. aculeata* (Ehr.), to which we refer also pl. xxvii. figs. 21 & 22, and pl. xxviii. figs. 25 & 26, on account of the tendency they show to take on the extension of the neck and its marginal thickening.

Fig. 17, *Grammostomum? decurrens*, is a beautiful and characteristic *Virgulina squamosa*. Fig. 18, *Polymorphina nucleus**, is a variety of *Virgulina Hemprichii*†, having a tendency towards *Cassidulina*. Fig. 19, *Pleurites calciparus*, is a Textilariform variety of *Virg. Hemprichii*. Figs. 20, *a*, *b*, *Strophoconus ovum*, is a small *Virg. Schreibersii*. Fig. 21, *Str. cepa*, being dark-shelled, is probably *Virg. Hemprichii*, young. Figs. 22, *a*, *b*, *Sphæroidina gemmula*, = *Sph. bulloides*, well figured. Figs. 23, *a*, *b*, *Rotalia globulosa* (1838), figs. 24, *a*, *b*, *R. leptospira*, and fig. 25, *R. pertusa*, are either young *Planorbulinæ* or young *Globigerinæ*; in this state they are with difficulty distinguishable. Figs. 23 & 25 resemble the early chambers of *Globigerinæ*, as shown in figs. 26 & 38; fig. 24 may be *Pl. globulosa* (Ehr.). Figs. 26, *a*, *b*, *Phanerostomum asperum*, is decidedly *Globigerina cretacea* of the subdiscoidal type. Fig. 27, *Rotalia obscura*, = *Cristellaria rotulata*, or a feebly keeled *Cr. cultrata*, like *Cr. producta*, Von Hagenow, from Rügen. Fig. 28, *Platyœcus? squama*, seems to be a variety of *Pulvinulina repanda*, and near to *Pulv. spatiosa* (Ehr.), pl. xxi. fig. 95, and pl. xxix. fig. 15. Fig. 29, *Planulina annulosa*, = *Planorbulina ammonoides*. Fig. 30, *Planulina po-*

* This is entered with doubt among the synonyms of *Polymorphina rotundata* in the "Monograph of *Polymorphina*," Linn. Soc. Trans. vol. xxvii. p. 234; but, together with several other Ehrenbergian species referred to in that Monograph, will have to be erased.

† For an account of this species, see also 'Geol. Mag.' no. 89, pp. 508, 509.

merana, = *Pulvinulina Micheliniana*, seen from the flat top. Fig. 31, *Pl. umbilicata*, looks somewhat like an umbonate *Cristellaria cultrata*, or rather *Cr. rotulata* with pinched edge; but it is doubtful. Fig. 32, *Nonionina? spira*, is also Cristellarian in most points, like the foregoing; but the speckled appearance is peculiar. Fig. 33, *Planulina ampliata*, =*Planorbulina ammonoides*. Fig. 34, *Cristellaria porosa*, is a fragment of some neatly grown *Planorbulina*. Fig. 35, *Cristellaria rota*, belongs to a limbated *Cr. cultrata*, such as *Cr. planicosta*, Von Hagenow, from Rügen.

Fig. 36, *Lenticulina discus*, is *Planorbulina Haidingeri*, seen with the umbilical or lower face upwards. Fig. 37, *Heterostomum alternans*, is *Virgulina Hemprichii* in a fine condition, showing the characteristic notch-like infolded apertures in two chambers, and exhibiting a transition of form towards *Cassidulina*.

Fig. 38, *Globigerina cretæ*, is a full-grown *Gl. cretacea*, having the later chambers relatively large, globose, and nearly equal (compare D'Orbigny's figure 13, pl. iii. 'Mém. sur la Craie blanche,' &c.).

Coccospheres, Coccoliths, *Pyxidicula prisca* (?), *Gallionella aurichalcea* (1838), and Spongoliths are also figured on this plate, from the Chalk of Rügen.

The foregoing lived at about 100 fathoms depth.

In 1842 Herr von Hagenow contributed a memoir on the fossils of the Chalk of Rügen (3rd part, Mollusks) to the 'Neues Jahrbuch für Min., Geol. u. Palæont.' 1842, pp. 528–575; and at pages 568–574, and in pl. ix. figs. 20–26, are described and illustrated the Foraminifera he met with. In 1861 Prof. Dr. A. E. Reuss treated of all the Foraminifera known to him from the soft Chalk of Rügen, in 'Sitzungsberichte math.-nat. Cl. Kais. Akad. Wissensch. Wien,' vol. xliv. pp. 324–333, pl. v. figs. 6–9, pl. vi., and pl. vii. figs. 1 & 2. In cases where the species were merely mentioned by Von Hagenow in 1842, but figured and described by himself subsequently, he has decided to adopt the names given with the later and full account of the species. The following are recognized by Reuss:—

Lagena simplex, *Rss.*
—— apiculata, *Rss.*
Nodosaria monile, *v. Hag.* *Dentalina*, Rss. [=*Nodosaria monile*, Ehr.]
Dentalina sulcata, *Nilsson.*
—— Steenstrupi, *Rss.*

Frondicularia solea, *v. Hag.*
—— capillaris, *Rss.* (*Fr. lineata*, v. Hag.).
Flabellina lingula (*v. Hag.*).
—— reticulata, *Rss.*
Cristellaria rotulata (*Lam.*). [? Pl. xxx. figs. 31, 32, 'Mikrogeol.']
—— exarata, *v. Hag.*
—— planicostata, *v. Hag.* [=Pl. xxx. fig. 35, 'Mikrogeol.']
—— Spachholtzi, *Rss.* (*Cr. producta*, v. Hag.). [Compare pl. xxx. fig. 27, 'Mikrogeol.']
—— umbilicata, *Rss.*
—— Williamsoni, *Rss.*
—— navicula, *D'Orb.* (*Cr. obliqua*, v. Hag.).
—— retroflexa, *v. Hag.*
—— Marcki, *Rss.*
—— multiseptata, *Rss.*
—— nuda, *Rss.*
Haplophragmium ovatum (*v. Hag.*).
Nonionina quaternaria, *Rss.* [*Pullenia.*]
Planorbulina involuta (*Rss.*). [A plump variety of *Pl. Ungeriana*, D'Orb.]
—— constricta (*v. Hag.*). [A scarcely distinct subvariety of *Pl. ammonoides* (Rss.).]
—— ammonoides (*Rss.*) (*Planorbulina angulata*, v. Hag.). [Pl. xxx. figs. 29 & 33, 'Mikrogeologie.']
—— complanata (*Rss.*) (*Planorbulina umbilicata*, v. Hag.). [=*Pl. rotula*, (D'Orb.).*]
—— (Truncatulina) convexa (*Rss.*) (*Trunc. sublævis*, v. Hag.). [A thick subvariety of *Truncatulina lobatula.*]
Rotalia umbilicata, *D'Orb.* (*R. turgida*, v. Hag.).
—— globosa (*v. Hag.*). [Near *R. umbilicata*, D'Orb.]
Ataxophragmium obesum, *Rss.* (*Globigerina confluens*, v. Hag.).
—— Presli, *Rss.* (*Bulimina amphiconica*, v. Hag. in parte).
—— obliquum (Bulimina, *D'Orb.*), *Rss.*
Bulimina gibbosa† (Valvulina, *D'Orb.*), *Rss.* (*Valvulina quadribullata*, v. Hag.).
—— intermedia, *Rss.* (*Valvulina tribullata*, v. Hag.).

* In this case the name given by D'Orbigny in 1846, yields precedence to that applied by Von Hagenow in 1842, unless the want of full information about the species when mentioned by the latter interferes.

† Dr. Reuss observes that the Rügen specimens have no mouth-valve, but otherwise resemble D'Orbigny's *Valvulina gibbosa.* We are satisfied that the latter is a true *Valvulina*, as well as Reuss's *Valvulina spicula* from the Bohemian Chalk.

Bulimina brevis, *D'Orb.*
—— ovulum, *Rss.* (*Bul. amphiconica*, v. Hag. in parte).
—— Puschi, *Rss.*
Guttulina cretacea, *Alth.*
Bolivina incrassata, *Rss.* (*Textularia elongata*, v. Hag.).
[Pl. xxx. figs. 11 & 15, 'Mikrogeologie.']

The following, mentioned by Von Hagenow in 1842, are not noticed by Reuss in 1861. Under the circumstances of the case, they cannot be regarded as important elements in the fossil Foraminiferal fauna of Rügen.

Nodosaria linearis (?), *Rœmer.*
Marginulina nitida, *v. Hag.*
Planularia nodosa, *v. Hag. op. cit.* pl. 9. f. 21, p. 569.
—— compressa, *v. Hag.*
Globigerina globosa, *v. Hag.*
Robulina Comptoni (*Sow.*).
—— sublævis, *v. Hag.*
—— crenata, *v. Hag.*

Species and notable Varieties from the Chalk of Rügen, figured by Ehrenberg.

1. Orbulina universa, *D'Orb.*
2. Nodosaria ovicula, *D'Orb.*
3. Cristellaria rotulata (*Lam.*).
4. —— cultrata (*Montf.*).
5. Bolivina punctata, *D'Orb.*
6. —— Reussii (*Geinitz*).
7. —— dilatata, *Rss.*
8. —— incrassata, *Rss.*
9. Virgulina squamosa, *D'Orb.*
10. —— Schreibersii, *Czjzek.*
11. —— Hemprichii (*Ehr.*).
12. —— —— nucleus (*Ehr.*).
13. —— —— calcipara (*Ehr.*).
14. Textilaria sagittula, *Defr.*
15. —— gibbosa, *D'Orb.*
16. —— subangulata, *D'Orb.*
17. —— striata, *Ehr.*
18. —— globulosa, *Ehr.*
19. Heterostomella aculeata (*Ehr.*).
20. Sphæroidina bulloides, *D'Orb.*
21. Globigerina cretacea, *D'Orb.*
22. Planorbulina ammonoides, *Rss.*
23. —— Haidingerii (*D'Orb.*).

24. Planorbulina globulosa (*Ehr.*).
25. Pulvinulina Micheliniana (*D'Orb.*).
26. —— squama (*Ehr.*).

XVI. *Foraminifera from the Chalk of Volsk, on the Volga, Russia.* (Ehrenberg, 'Das unsichtbar wirkende organische Leben,' 1842, p. 52.)

Pl. xxxi. figs. 1, *a*, *b*, *c*, *Miliola sphærula*, = *Orbulina universa*. Figs. 2 & 3, *M. paradoxa*, and fig. 4, *M. ovum*, appear to be isolated chambers of *Globigerina*. Fig. 5, *M. lævis*, is the *Lagena emaciata*, Reuss. Fig. 6, *M. stiligera*, is a *Lagena*, exactly like a recent one we have from the Abrolhos Bank, flat, elongato-lanceolate, and marginate, with a bimucronate base, due to the wing-like ends of the keel on each edge; excepting in the last-mentioned feature, it resembles fig. 46, pl. xxix. Fig. 7, *Vaginulina rotundata*, the first three chambers of a strong simple *Vaginulina* like *V. marginata*, D'Orb. Fig. 8, *Nodosaria monile*, is a rather thick-set *N. ovicula*.

Fig. 9, *Textilaria striata*, and fig. 10, *T. sulcata*? ("*T. striata*?"), are *T. striata*, Ehr. Fig. 11, *Text. amplior*, and figs. 12 & 13, *T. globulosa ampliata*, are *T. globulosa*, Ehr. (small arrested *T. gibbosa*). Figs. 14 & 15, *Text. linearis*, and fig. 16, *Grammostomum angulatum*, are small specimens of *T. agglutinans*. Fig. 17, *Text. aculeata*, is a coarse *T. gibbosa* with apiculate chamber-walls, like fig. 20 *a*, pl. xxix., and figs. 12, 13, pl. xxx., = *T. subangulata*, D'Orb. Figs. 18, 19, *Gram. rossicum*, and fig. 20, *Gr. secundarium* (?), are various specimens of *Text. sagittula*. Fig. 21, *Gr. incrassatum*, is a thick-shelled *Virgulina Schreibersii*. Fig. 22, *Gr. attenuatum*, is *Bolivina dilatata* with a strong shell. Figs. 23 & 24, *a*, *b*, *c*, *Gram. pachyderma*, and fig. 25, *Gr. thebaicum* (?), are coarse-shelled *Virg. Schreibersii*. Fig. 26, *Gr. laxum* (?), is *Polymorphina lactea*. Fig. 27, *Gr. megaloglossum*, is a fragment of a large *Virgulina squamosa*.

Fig. 28, *Sagrina cretæ*, represents a strong but somewhat ill-grown individual of the pouting *Bigenerina*, with slightly dentate chamber-margins, referred to *Heterostomella aculeata* (pl. xxx. fig. 16) at page 189. Fig. 29, *Loxostomum tumens*, is a fine, free-grown, smooth-shelled individual of the same species. Fig. 30, *Polymorphina acanthophora*, and fig. 31, *P. obtusa*, appear to be young Bigenerine specimens allied to the last mentioned, but with longer and straighter flask-like chambers, nearly parallel to the axis of the shell. A spike on the base of the shell gives the name to the larger specimen; but this feature is indicated on the other also. They nearly conform with *B.* (*Gemmulina*) *digitata*, D'Orb.

Fig. 32, *Strophoconus ovum*, and figs. 33 & 34, *St. spicula*, are small coarse-shelled *Virgulinæ Schreibersii*. Figs. 35 & 36, *Pyrulina ovulum*, = *Polymorphina lactea*. Fig. 37, *Pleurites turgens*, probably *Virgulina Hemprichii*, but doubtful; it may possibly be a *Polymorphina*. Figs. 38–53 represent different ages, stages, and conditions of *Globigerina cretacea* (fig. 38, *Rotalia perforata*; fig. 39, *R. quaterna*; figs. 40, 41, 43, *R. globulosa*; fig. 42, *R. laxa*; fig. 44, *R. aspera*; fig. 45, 49, *R. leptospira*; figs. 46, 47, *R. senaria*; fig. 48, *R. glomerata*; figs. 50, 51, *R. wolgensis*; fig. 52, *Planulina incurvata*, showing the diagnostic aperture; and fig. 53, *Pl. ocellata*).

Fig. 54, *Lenticulina? pachyderma*, = *Pulvinulina caracolla* (Rœm.). Fig. 55, *Planulina umbilicata* (?), represents the central chambers of a *Planulina*; compare fig. 60 for instance. Fig. 56, *Pl. porophœna*, and fig. 57, *Pl. pardalis*, are relatively large specimens of probably *Planulina ariminensis*. Fig. 58, *Lenticulina discus*, = *Planorbulina Haidingerii*, almost of the typical form. Fig. 59, *Planulina micromphala*, fig. 60, *Pl. ampliata*, and fig. 61, *Pl. ampla*, are all probably *Planulinæ* belonging to the *Pl. ariminensis* type.

Fig. 62, *Pl. turgida*, seems to be a small *Operculina*. This subgenus of *Nummulina* is rare in the Cretaceous strata, and therefore the Russian specimen is of great interest. Two *Operculinæ* (one described and figured by Reuss as *Amphistegina Fleuriasi*, D'Orb., and the other as *Op. cretacea*) occur in the Maestricht Chalk, 'Sitzungsber. Akad. Wien,' vol. xliv. pp. 308, 309, pl. i. figs. 10–12, and pl. ii. fig. 1, *a*, *b*. Another, described and figured by Reuss as *Amphistegina clypeolus* (Zeitschr. Deutsch. geol. Gesellch. vol. vii. pl. ix. fig. 9), was found, in Upper Chalk of the same age as that of Maestricht, at Mecklenburg. From the Lower Cretaceous formation in the Haute-Marne, France, M. Cornuel has a somewhat doubtful *Operculina* (*Op. angularis*), Mém. Soc. Géol. France, ser. 2, vol. iii. part 1, Mém. no. 3, pl. 2. figs. 20–22.

Coniostylis and Coccoliths are also figured on this plate.

The group of Foraminifera here represented belonged to a fauna inhabiting a shallower part of the sea than that with the western Chalk, probably from 50 to 100 fathoms in depth.

Species and notable Varieties from the Chalk of Volsk, Russia, figured by Ehrenberg.

1. Orbulina universa, *D'Orb.*
2. Lagena emaciata, *Rss.*
3. —— stiligera (*Ehr.*).
4. Nodosaria ovicula, *D'Orb.*

5. Vaginulina marginata, *D'Orb.*
6. Polymorphina lactea (*W. & J.*).
7. Bolivina dilatata, *Rss.*
8. Virgulina squamosa, *D'Orb.*
9. —— Schreibersii, *Czjzek.*
10. —— Hemprichii (*Ehr.*)?
11. Textilaria agglutinans, *D'Orb.*
12. —— sagittula, *Defr.*
13. —— gibbosa, *D'Orb.*
14. —— subangulata, *D'Orb.*
15. —— globulosa, *Ehr.*
16. Bigenerina acanthopora (*Ehr.*).
17. Heterostomella tumens (*Ehr.*).
18. —— aculeata (*Ehr.*).
19. Globigerina cretacea, *D'Orb.*
20. Planorbulina Haidingerii (*D'Orb.*).
21. Planulina ariminensis, *D'Orb.*
22. Pulvinulina caracolla (*Rœmer*).
23. Operculina turgida (*Ehr.*).

XVII. *Foraminifera from the Chalk of the Upper Missouri, North America.* (Monatsber. 1842, p. 187; Abhandl. 1841, pp. 365, 398, 429, 433 [1843].)

In the 'American Journal of Science and Arts,' vol. xli., October 1841, pp. 400–402, the late Prof. J. W. Bailey gave an account of some "American Polythalamia from the Upper Mississippi, and also from the Cretaceous Formation on the Upper Missouri;" and in vol. xlvi. p. 297, &c., the researches of Ehrenberg in these Cretaceous Foraminifera of America are treated of in connexion with a *résumé* of the results of his examination of large quantities of both North- and South-American Microzoic deposits, recent and fossil*. At page 307 a woodcut outline of *Textilaria missouriensis*, Ehr., is inserted in a footnote. In the Am. Journ. Sc. vol. xlviii. (1845), p. 341, Prof. Bailey gives a list of the American rocks in which Foraminifera had been found, and from which specimens had been sent to Dr. Ehrenberg.

Pl. XXXII. I. figs. 1, *a*, *b*, *Miliola*? (*Vaginulina*?) *bursa*, are obscure; possibly *Euglypha* or *Protocystis*. Fig. 2, *Nodosaria vulgaris*, two chambers of *N. glabra*, D'Orb. Fig. 3, *Nod. acus*, is the early portion of an extremely attenuate and scarcely segmented variety of *N. ovicula*. A similar specimen has been figured by Prof. Bailey from the deep soundings off New Jersey and Delaware ('Smithsonian Contrib.' 1861, fig. 8). Fig. 4, *a*,

* Abhandlungen Akad. Berlin for 1841 (1843).

Textilaria americana ("1843, pp. 398, 429"), is a variety of *T. striata*, with the outer margins of the younger and larger chambers more or less produced and aculeate. Fig. 4 *b*, *T. striata*, is the early portion of *T. americana*, simply *T. striata* with pores in the fine furrows*. Fig. 5, *T. missouriensis*, is *T. gibbosa* becoming laterally aculeate, as in fig. 4 *a*, but without striæ. Fig. 6, *T. proroconus*, is simply *T. gibbosa* with bored holes. Fig. 7, *T. americana* (?), young, is the same as fig. 4 *b*, with thicker shell. Fig. 8, *T. globulosa*, is a small, stout, oblong *T. gibbosa*. Fig. 9, *T. euryconus*, is a much larger *T. gibbosa*. Fig. 10, *T. gomphoconus*, is a neat, narrow, tapering *T. gibbosa*. Fig. 11, *Grammostomum americanum*, is *Virgulina Schreibersii*. Fig. 12, *Gr. validum*, is a small, stout, squarish *Textilaria* of the *gibbosa* type. Figs. 13, 14, *Spiroplecta americana* ("*Heterohelix*, 1843, p. 429"), is the same as 4 *a*, excepting that the first segments have a spiral growth. This variation is common in the *Textilaridæ*, and, like analogous differences in growth, has been accepted as the basis for subgeneric division.

Figs. 15, *Phanerostomum porulosum*, fig. 16, *Ph. dilatatum*, figs. 17 & 18, *Ph. lacerum*, fig. 19, *Ph. lævе* (small and round), and fig. 20, *Ph. quaternarium*, are stages and conditions of *Globigerina hirsuta*, D'Orb., a subdiscoidal variety of *Gl. bulloides*, which is extremely acerose, and has very wide septal apertures. This is the *Globigerina* that abounds in the Red Sea and Indian Ocean; it is often outspread and very prickly, sometimes having its apertures closed over with the projecting and interlacing needles. Fig. 21, *Rotalia globulosa-protolepta*, is a small arrested or young *Planorbulina vulgaris* (*Pl. globulosa*). Fig. 22, *Phanerostomum hispidulum* (small and roughish), fig. 23, *Ph. hexaleptum* (small and smooth), fig. 24, *Ph. asperum* (tuberculate), fig. 25, *Ph. senarium* (aculeate), fig. 26, *Planulina globigerina* (large and tuberculate), fig. 27, *Ptygostomum senarium* (small and aculeate), fig. 28, *Pt. quinarium* (small and smooth), fig. 29, *Phanerostomum hispidulum* (small and tuberculate), fig. 30, *Ph. dilatatum* (aculeate), and fig. 31, *Ph. hexacyclus* (tuberculate) are also specimens of *Globigerina hirsuta*, D'Orb., 'Foram. Canaries,' pl. ii. figs. 4–6.

Fig. 32, *Rotalia lenticulina*, is possibly a *Cristellaria*; or it may be a *Nonionina*; but its scattered granules constitute a doubtful character, and the position of the septal apertures is not indicated. Other specimens referred to "*Rotalia lenticulina*," in other plates, appear to be *Planorbulinæ*.

* Dr. J. G. Egger figures and describes a Miocene *Textilaria* like this from Lower Bavaria; *Text. striato-punctata*, Eg. 'Neues Jahrb.' 1857, pl. 8. figs. 27–29.

Coccoliths are also given on this plate in fig. I. B.

This Chalk was probably formed in about 50 to 100 fathoms.

Species and noticeable Varieties from the Chalk of the Upper Missouri, figured by Ehrenberg.

1. Nodosaria glabra, *D'Orb.*
2. —— acus, *Ehr.*
3. Cristellaria?
4. Virgulina Schreibersii, *Czjzek.*
5. Textilaria gibbosa, *D'Orb.*
6. —— missouriensis, *Ehr.*
7. —— striata, *Ehr.*
8. —— (*et* Spiroplecta) americana, *Ehr.*
9. —— striato-punctata, *Egger.*
10. Globigerina hirsuta, *D'Orb.*
11. Planorbulina globulosa (*Ehr.*).

XVIII. *Foraminifera from the Chalk of the Upper Mississippi, North America.* (Monatsb. 1842, p. 187; Abhandl. 1841, pp. 365, 433 [1843].)

In the 'Americ. Journ. Sc.' vol. xli. p. 400, the material examined by Dr. Ehrenberg is described as "a light cream-coloured marl from a Mission-station on the Upper Mississippi, called there 'prairie chalk,'" and some unnamed woodcut outlines of the Foraminifera are given (p. 401), namely:—figs. 1 & 2, *Textilaria gibbosa*; fig. 3, *Cristellaria cultrata*, with narrow falcate chambers; fig. 4, a small *Planorbulina.*

Pl. XXXII. II. fig. 1, *Miliola striata*, = *Lagena costata*, Williamson. Fig. 2 *a*, *M. lævis*, = *L. emaciata*, Reuss. Fig. 2 *b*, *Ovulina clava*, = *L. clavata*, D'Orb. Fig. 3, *Dentalina americana*, = *D. Boueana*, D'Orb. Fig. 4, *Nodosaria tumescens*, = *N. ovicula*, D'Orb. Figs. 5, *N. vulgaris*, and 6, *N. ampla*, = *N. glabra*, D'Orb. Fig. 7, *Vaginulina calcipara*, fig. 8, *V. cretæ*, and fig. 9, *V. subacuta*, = *V. leguminiformis* (Batsch). Fig. 10, *Planularia elongata*, is a simple subcarinate *Planularia*, or an elongate Marginuline *Cristellaria cultrata*, and is known as *Pl. crepidula* (F. & M.).

Fig. 11, *Textilaria striata*, is a thick-shelled *T. striata.* Fig. 12, *Text. globulosa*, is the common small form of *T. gibbosa*, and so is fig. 13. Fig. 14, *T. striata*, is a rather narrow *T. striata.* Fig. 15, *Grammostomum americanum*, is *Bolivina dilatata*, with a faintly reticulated surface. Fig. 16, *Gr. phyllodes*, = *Virgulina squamosa.* Fig. 17, *Gram. invalidum*, is a small *Textilaria* of the *agglutinans* type. Fig. 18, *Gr.*

tessera, is an outspread, rhomboidal, Textilariform *Virgulina Hemprichii*. Fig. 19, *Gr. rhomboidale*, = *Bolivina dilatata*. Fig. 20, *Pleurites? americanus*, is a suboblong Textilariform *Virgulina Hemprichii*. Fig. 21, *Strophoconus spicula?*, is a young *Virg. Schreibersii*, with a mode of growth approaching that of *Bulimina elegantissima*.

Fig. 22, *Sagrina longirostris*, is "*Loxostomum tumens*," the smooth form of *Heterostomella aculeata*, not having grown gross enough to produce exogenous shell-matter. Fig. 23, *Proroporus obtusus*, is *Polymorphina compressa*. Fig. 24, *Pr. obtusus?*, is a Bigenerine *Textilaria*, near to *Bigenerina acanthophora*, pl. xxxi. figs. 30, 31, and may pass as *B. digitata*. Fig. 25, *Spiroplecta americana* ("*Heterohelix*, 1843, p. 429"), is *Text. gibbosa* with a spiral commencement, but without the ornament of figs. 13 & 14 on the upper portion of this plate. Fig. 26, *Spiroplecta rosula*, is a straight-sided *Textilaria* of the *agglutinans* type, but commencing its growth with a large coil of chambers. This species lives in the Atlantic, and in its sandy condition has of late years been named by us *Text. biformis**, and in the clear-shell state has received the name of *T. complexa* from Mr. H. B. Brady†; but Ehrenberg's name has precedence.

Fig. 27, *Dimorphina saxipara*, is an interesting specimen of *Virgulina Schreibersii* that has formed the latter part of its shell in a uniserial manner, and has thus become Dimorphine; but the name "*Dimorphina*" is limited to the Dimorphous forms of *Polymorphina*. In *Cassidulina*, which is a very close ally of *Virgulina*, we occasionally see evidences of weak and rapid growth in one-sidedness and linear direction of the segments (*Ehrenbergina*). In accordance with the plan of nomenclature among Foraminifera, the dimorphous varieties of *Bulimina*‡, *Virgulina*, *Bolivina*, and *Cassidulina* require one or more subgeneric appellations. We propose *Bifarina* for the dimorphous *Virgulina*; and *Bif. saxipara* is the name with which the interesting American specimen under notice will be registered.

Fig. 28, *Guttulina turrita*, = *Verneuilina pygmæa* (Egger). Fig. 29, *Frondicularia? strophoconus*, is a small, smooth, acute-ovate *Glandulina lævigata*, looking flat by reason of its transparency.

Fig. 30, *Rotalia senaria*, fig. 31, *R. globulosa-protolepta*, and

* Philos. Trans. 1862, vol. clv. p. 370, pl. 15. figs. 23, 24.

† Nat. Hist. Trans. Northumberland and Durham, vol. i. part 1, 1865, pl. 12. fig. 6, p. 101.

‡ *Bulimina variabilis*, D'Orb., may be said to be dimorphous in this sense.

fig. 32, *R. leptospira*, are smooth, polished and apparently poreless, and, with their numerous globose limbate chambers, are readily identified as *Pulvinulina canariensis* (D'Orb.), 'Hist. Nat. Canaries, Foram.,' pl. 1. figs. 34–36. Fig. 33, *Rotalia calcipara*, and fig. 34, *Omphalophacus? tenellus*, belong to a somewhat prickly variety of *Pulvinulina Menardii*, D'Orb. Fig. 35, *Planulina nebulosa*, is obscure; perhaps a *Planorbulina*.

Fig. 36, *Rotalia nonas* (?), may be an umbonate and limbated *Cristellaria rotulata* (?). Fig. 37, *Cristellaria alta*, is a young *Cristellaria cultrata*. Fig. 38, *Aspidospira saxipara*, is *Planulina ariminensis* with large scattered foramina. Fig. 39, *Robulina? denaria*, seems to be an umbonate *Cristellaria rotulata*. Fig. 40, *Rotalia heptas*, is probably the same as fig. 36. Figs. 41, *Planulina mississippica*, 42, *Phanerostomum asperum*, 43, *Planulina oligosticta*, 44, *Phan. globulosum* (young), 45, *Rotalia globulosa-protolepta* (young and smooth), and 46, *Phan. quaternarium* (young and smooth), are subvarieties and conditions of a large, outspread, tuberculated *Globigerina* of the *cretacea* subtype; and not nearly so acerose, nor with such patulous apertures, as the fossil *Globigerina* from the Upper Missouri, figured in the upper part of this plate. Fig. 47, *Robulina ocellus*, is a young *Cristellaria cultrata*. Fig. 48, *Planulina suboctonaria*, is *Planorbulina ammonoides*.

Coccoliths also are indicated in the text.

The group indicates about 50 to 100 fathoms depth.

Species and noticeable Varieties from the Chalk of the Upper Mississippi, figured by Ehrenberg.

1. Lagena costata, *Williamson*.
2. —— emaciata, *Rss.*
3. —— clavata, *D'Orb.*
4. Glandulina lævigata, *D'Orb.*
5. Dentalina Boueana, *D'Orb.*
6. Nodosaria ovicula, *D'Orb.*
7. —— glabra, *D'Orb.*
8. Vaginulina leguminiformis (*Batsch*).
9. Planularia crepidula (*F. & M.*).
10. Cristellaria rotulata (*Lamk.*).
11. —— cultrata (*Montf.*).
12. Polymorphina compressa, *D'Orb.*
13. Bolivina dilatata, *Rss.*
14. —— americana, *Ehr.*
15. Virgulina squamosa, *D'Orb.*
16. —— Schreibersii, *Cz.*, var.

17. Virgulina Hemprichii (*Ehr.*).
18. —— —— tessera (*Ehr.*).
19. —— —— americana (*Ehr.*).
20. Bifarina saxipara (*Ehr.*).
21. Textilaria agglutinans, *D'Orb.*
22. —— gibbosa, *D'Orb.*
23. —— striata, *Ehr.*
24. —— globulosa, *Ehr.*
25. Spiroplecta americana, *Ehr.*
26. —— rosula, *Ehr.*
27. Bigenerina digitata, *D'Orb.*
28. Heterostomella tumens (*Ehr.*).
29. Verneuilina pygmæa (*Egger*).
30. Globigerina cretacea, *D'Orb.*
31. Planorbulina ammonoides (*Rss.*).
32. Planulina ariminensis (*D'Orb.*).

[To be continued.]

XXVIII.—*A Monograph of the Genus* Thelyphonus.

By Arthur G. Butler, F.L.S., F.Z.S., &c.

[Plate XIII.]

The first monograph of this genus was that by M. Lucas in the 'Magasin de Zoologie' for 1835, in which six species were recognized, five of them being then described for the first time.

In 1843 Koch added five new forms in his 'Arachniden,' since which time three others have been diagnosed, one of them being probably the adult type of a previously described species.

I have now to add eight more species, which, considering that one of those described by M. Lucas is apparently a young form of the *T. proscorpio* of Latreille (hitherto confounded with *T. caudatus*, Linn.), will bring the number of known *Thelyphoni* up to twenty-one.

In the present paper I have separated the species into three sections according to the number of teeth on the second joint of the cheliceres. This important character, which appears to be very constant, has been much neglected in descriptions, and still more so in figures of the various species; very little attention has also been paid to the amount of rugosity, or the hairiness of the cheliceres, legs, &c., though in the order Coleoptera such characters are considered of the utmost importance, as, indeed, they may be shown to be in the present order.

The species of *Thelyphonus* in their general appearance remind one strongly of the two genera *Lucanus* and *Nepa*.