30.

## *Notes on some* New Species *and* Varieties *of* British Marine Diatomaceæ. By F. C. S. Roper, F.L.S., F.G.S.

Q.J.MS. 1858. Plate III

The greater part of the British fresh-water species of Diatomaceæ, from the facility with which they are obtained, and the frequent opportunities for collecting them offered to every observer with a microscope, have probably been already described; but that this is not the case with the marine species, is shown by the great additions lately made to this class by the researches of Dr. Gregory, Mr. Brightwell, and others; and, as they appear to have been hitherto somewhat neglected on our Southern coasts, I hope to draw more particular attention to this abundant field of original observation by pointing out the best means of obtaining the marine species, and at the same time propose to describe a few of the more

peculiar forms that have occurred to myself within the last two years.

The mud of tidal harbours, and the creeks and pools on the banks of estuaries, such as occur in the Thames, Poole Harbour, &c., have been the chief source of supply of our present marine flora of this class. But a large number of the more interesting species are only to be obtained by dredging or collecting the various species of filamentous marine Algæ at the lowest spring tides. These should be gathered in considerable quantity, thoroughly washed, and left for some short time in water, so that all the Diatomaceæ may become detached. The sediment must then be allowed to subside, a portion of it being preserved for the examination of any new or interesting forms in a living state, and the remainder treated with acid in the usual way. The sand and any remains of the Algæ not dissolved by the acid may then be removed by subsidence, on the plan recommended by my friend Mr. Okeden, in the 'Microsc. Journal,' vol. iii, p. 158, which is preferable to that of Dr. Munro, described at page 241 of the same volume, as it is impossible to prevent the admixture of gatherings from different localities by this process, though when that is not an object it has some advantages.

From an examination of the species described in Professor Smith's 'Synopsis,' I find that out of 455 species included in that work as indigenous to Great Britain, 231 are from fresh water, 82 occur in brackish water, and 142 are marine; and of this latter number 72 have been collected from Poole, Pevensey, Hull, and the Thames, whilst 10 were obtained from molluscs, and only 6 are described as dredged in deep water. That this gives a very imperfect notion of the numerous species to be found at a considerable distance from the shore is shown by the examination of the gatherings in which the greater part of the new species now to be described were found.

The Caldy gathering, which was made in five to six fathoms water, contains many rather rare and interesting forms, including *Coscinodiscus concinnus, Biddulphia Baileyii* and *rhombus, Eucampia zodiacus, Nitzschia spathulata,* and *Melosira Westii,* and I have altogether met with sixty-six species described by Professor Smith. In the Lyme Regis gathering, from a depth of five to eight fathoms, *Synedra undulata, Amphora costata, Campylodiscus Hodgsonii* and *Ralfsii, Navicula crabro,* and *Rhabdonema Adriaticum* occur, and I have already found seventy-nine species included in the 'Synopsis.'

In addition to the new species and varieties which I now proceed to describe, there are numerous other forms in both



these gatherings of which the characters are so doubtful that it is impossible to determine satisfactorily their specific, or, in some cases, even generic position. All the drawings are magnified 400 diameters.

*Eupodiscus tesselatus,* n. s.—Cellular structure distinctly hexagonal, with a small rounded nodule at each angle of the hexagons. The surface of the valve slightly elevated, flat, with a declining margin, of about one fifth of the diameter; pseudo-nodule single, submarginal. Colour of dry valve brown. Diameter ·002″; diameter of cellules ·000066″ (fig. 1 *a* and *b,* Pl. III).

Marine. Caldy, Pembrokeshire, Rev. J. Guillemard; Humber, Mr. Norman.

I received the first specimens of this very pretty species in a gathering obtained by the Rev. J. Guillemard, by washing a collection of small Algæ, from the shore of Caldy Island, near Tenby, and have since met with it in some slides sent by Mr. Norman from dredgings in the Humber. It belongs to the same class as *E. crassus, fulvus,* and *Ralfsii;* which differ from *E. argus,* the typical species, in having merely one circular spot or pseudo-nodule near the margin, and not distinct processes, as in that species. The cellular structure is very peculiar, and unlike any other Diatom that I am acquainted with, excepting *coscinodiscus concinnus,* each angle of the hexagons being marked with a small dot or boss, as shown in fig. 1 *b,* requiring a magnifying power of 800 to 1000 diameters to bring out distinctly. The valves, when seen with a low power, have so much the appearance of a small piece of mosaic that I have named it *tesselatus.*

This species differs from *E. radiatus,* the only form with hexagonal cells, placed, I think doubtfully, in this genus by Professor Smith, in the peculiar arrangement of its cellules, and in wanting the elevated processes and spines, which would rather lead me to place that species with the Biddulphias than in its present position.*

* Professor Smith, at p. 47 of the second volume of the 'Synopsis,' alluding to this species, states that it differs from Biddulphia "in the orbicular outline of the valve, and in the processes being rather projections from the disc than produced angles." I have, however, specimens of *B. turgida,* which are very nearly orbicular, and I cannot agree that the processes simply rise from the surface of the disc, as shown in t. lxii, f. 255, of the 'Synopsis,' but are projections rising gradually from the centre of the valve, with cellular structure continuous nearly to their apices, exactly as in *B. rhombus,* many specimens of which are also nearly orbicular. In addition, the processes in Eupodiscus are all similar in structure, whilst in *E. radiatus* we have two cellular projections, and two spines, as in *B. Baileyii,* and generally in *B. aurita.*

From a careful examination of the figures in Ehrenberg's 'Microgeologie,' I consider this species may be synonymous with his *Coscinodiscus limbatus*, t. xx, f. 29, or *Cos. fimbriatus*, t. xxii, f. 2, but there is no pseudo-nodule given in the figures, and without authentic specimens it is impossible to refer it with any certainty to either of these species.

*Coscinodiscus concinnus*.—'Synopsis,' vol. ii, p. 85.

Marine. Caldy, Pembrokeshire, Rev. J. Guillemard; Humber, Mr. Norman (fig. 12).

This interesting species, discovered by Professor Smith, and described in the Appendix to vol. ii of the 'Synopsis,' occurs with tolerable frequency in the Caldy gathering, and I have received remarkably fine specimens, through the kindness of Mr. Norman, from dredgings in the Humber. Although not a new form, it has not yet been figured, and as the large size of the specimens enables me to add some further points to those already given by Professor Smith of the peculiarities of its structure, I may be excused for including it in these notes.

The description given in the 'Synopsis' is as follows: "Cellules arranged in radiating lines, equal except in centre of valve, where there occur three to eight larger cellules; cellules 24 in ·001″; diameter ·0025″ to ·0056.″" This is perfectly correct as far as it goes, except as to size, my specimens ranging from ·004″ to ·013″, or nearly double the size of Professor Smith's. But the larger specimens show plainly a point that is not easily discernible in those under ·004″ in diameter, namely, a submarginal row of minute spines varying from $\frac{1}{3000}$th to $\frac{1}{4000}$th of an inch apart, according to the size of the disc, and from each of which there is a radiating line almost to the centre of the valve. The cellules themselves are hexagonal and formed on the same peculiar plan as already described in *Eupodiscus tesselatus*, and shown in fig. 1 *b*. The large irregularly formed cells in the centre having likewise dots at their angles. The valve is very convex; so much so in the larger specimens, that when the central cells are in focus with a high power, the circumference is almost invisible. It differs in this respect from *Cosc. perforatus*, to which it is most nearly allied, that species having much the form of a lunette watch-glass, flat in the centre, with a narrow sloping margin. The cellules are also much smaller in *C. concinnus*.

With these new facts the following description might be given of the species: "Valves very convex, with minute hexagonal cellules arranged in radiating lines, divided at



short intervals by rays, extending from a band of submarginal spines almost to the centre, where there occur from three to eight irregularly shaped larger cellules." Cellules 10 to 26 in 001″; diameter ·0025″ to ·013″.

I figure a small specimen as the structure is precisely similar, and cellules vary little in size from those in the largest valves, those with 10 to 20 in ·001 being rather rare, and I have only found them of this size in the specimens from the Humber.

*Coscinodiscus labyrinthus*, n. s.—Cellules hexagonal, minute, arranged in quincunx in large irregular hexagonal spaces, divided by lines of confluent cellules or dots; valves not spinous at the margin, but with a ring of minute submarginal papillæ. Diameter ·0018″ to ·00247″; diameter of hexagonal spaces ·00027″ to ·00038″; cellules 15 in ·001″ (fig. 2 *a* and *b*).

Marine. Caldy, Pembrokeshire, Rev. J. Guillemard.

I have only met with four specimens of this peculiar species in the slides I have examined from the Caldy gathering, but the arrangement of the cellules is so different from any yet figured, that it may fairly be entitled to rank as a new species. It has somewhat the aspect, under a low power, of a finely marked specimen of *C. eccentricus*, but differs in the absence of the spinous margin, and in the peculiar arrangement of the cellules, which have somewhat the appearance of whorls or coils of dots, as shown in fig. 2 *b*, the surface of the valve being thus divided into large and irregularly shaped hexagonal spaces, without any clearly defined margin. *C. eccentricus* occurs abundantly in this gathering; but neither in this nor in any other locality in which I have met with it, has there been any tendency to a similar arrangement of the cellular markings.

*Coscinodiscus* (?) *stellaris*, n. s.—Cellular markings very minute, with five or six larger cells or dots arranged as a star in the centre; surface slightly convex; margin not spinous; colour of dry valve, brown. Diameter ·00252″ (fig. 3).

Marine. Caldy, Pembrokeshire, Rev. J. Guillemard.

The detached frustules and single valves of this species are abundant in the Caldy gathering. The markings on the surface of the disk are exceedingly fine, and have much the appearance of the transverse striæ on *Pleurosigma angulatum*, even when seen with an $\frac{1}{8}$-objective and oblique light. The star-like arrangement of cells or dots is found in the centre of both valves, and is readily distinguished with a magnifying power of 200 diameters. The striæ are so inconspicuous, and

valve so hyaline, when mounted in balsam, that it has probably hitherto escaped notice, from being considered a detached ring or connecting membrane of *C. radiatus* or *eccentricus*.

I was at first inclined to refer this species to Podosira, but the slight convexity of the valve, and the absence of the apparent perforation at the apex characteristic of that genus, are, I consider, sufficient to preclude its being so classed. The frustules being always separate and never in filaments, distinguish it from Melosira, and the want of any process or pseudo-nodule separate it from Eupodiscus It differs from the finest-marked specimens of *Coscinodiscus eccentricus* in the absence of the eccentric lines and spinous margin, and from all other species of that genus in not having distinct cellular markings.

*Coscinodiscus* (?) *ovalis*, n.s.—Valves oval, with finely dotted striæ radiating from the centre to the circumference; of a dull slate colour when dry, and light brown in balsam. Length ·00158″ to ·0023″; breadth ·00128″ to ·00149″ (fig. 4).

Marine. Caldy, Pembrokeshire, and dredged off Tenby, Rev. J. Guillemard.

The valves of this species occur abundantly in the Caldy gathering, and in the washings of Vesicularia dredged in five fathoms off Tenby. Professor Smith informs me that he does not see any satisfactory evidence for referring this species to the Diatomaceæ; and although I differ from so high an authority with great reluctance, I still record it, though with some doubts as to its generic position, in the hopes that the attention of observers in other localities may be directed to it, in order to clear up the doubtful points in its structure. That it belongs to the Diatomaceæ I think admits of little doubt; the frustules are siliceous, composed of two valves very slightly convex, and occur abundantly in gatherings, almost confined to various species of marine Diatoms. The radiating striæ on the surface of both valves are delicate, and require a magnifying power of 400 diameters to make them out satisfactorily; but the arrangement of the dots or cellules is very similar to that of many other species of the class.

The general outline of the valves agrees with that of some species of Cocconeis, but the absence of a median line and central nodule separate them from that genus. It is very probable that it may be entitled to rank as a distinct genus; but as I have not had any opportunity of examining it in a living state, I place it provisionally in Coscinodiscus, to which, in general structure, it appears most closely allied.



I have met with a few specimens of the same form in a gathering of M. De Brébisson's, containing *Nitzschia palpebralis*, &c., from Normandy, kindly sent me by Professor Smith.

*Actinocyclus triradiatus*, n. s.—Valve with three rays, the surface covered with minute puncta or dots, with faint lines connecting them; the rays formed by slight elevations, with a more closely dotted structure. Diameter ·003″ to ·004″ (fig. 5 *a* and *b*).

see note after 31.

Brackish water. Near Caermarthen.

This species occurs occasionally in clay, obtained by my friend, Mr. Okeden, from a brick-yard near Caermarthen, deposited probably by the tidal estuary that runs up to that town. The general structure of the valve differs from all the described species of this genus, having no distinct margins to the segments, or any pseudo-nodule in the centre of the valve. I consider, however, that it must be referred to Actinocyclus without hesitation, and should have adopted Ehrenberg's name of Ternarius, but, from the figure in the 'Microgeologie,' that species appears to have distinct cells, and the rays are similar to those in *A. undulatus*, and not elevations, or probably thickened cell-walls, as in this species. The peculiar arrangement of the dots is shown in the enlarged fig. 5 *b*.

*Nitzschia virgata*, n. s.—F. V. quadrangular, linear; S.V. linear-lanceolate, slightly arcuate, with produced and rather obtuse extremities; striæ distinct, dilated at intervals into prominent ridges on the inner margin. Length ·00405″ to ·0053″; striæ 26 in 001″. (Fig. 6: *a*, side view; *b*, front view.)

Marine. Dredged off Tenby, Rev. J. Guillemard.

The outline of this species differs but slightly from that of *Nitzschia amphioxys*, w. s.; but that is decidedly a fresh-water species; its extremities are more acutely lanceolate, and the valve more arcuate; the striæ also terminate in puncta or dots, instead of dilating into distinct bands, as in this species, which was dredged in five fathoms, at about five miles from the shore, and may be considered purely marine. The strongly curved inner margin, and slightly recurved obtuse extremities, as well as the peculiar thickened striæ, separate it from *N. vivax*.

The dark bands appear to arise from a thickening of the striæ at irregular intervals, varying from the third to the first in succession, and extend on an average about one third of the breadth of the valve, being shorter at the centre

and extremities, and rather above that length in the intermediate space.

*Amphora sulcata*, Bréb.—Valves oblong, with truncate extremities; the entire surface covered with longitudinal bands, formed of short transverse striæ. Length ·00266″; breadth ·001″; striæ 14 and 20 in ·001″ (fig. 7).

Marine. Caldy, Pembrokeshire, Rev. J. Guillemard.

This species differs from any figured in vol. i. of the 'Synopsis,' and though it approaches in structure some of the peculiar forms described by Professor Gregory in vol. v. of the 'Microsc. Journal,' I cannot refer it satisfactorily to either of the species he has figured. M. De Brébisson, in his 'Memoir on the Marine Diatomaceæ of Cherbourg,' gives a figure and description of *Amphora sulcata*, which appears only to differ in being rather more elliptical than the present species. I have therefore adopted his appellation, rather than make a further addition to our long list of native species. It appears to be rare, as I have only at present met with a single specimen.

It differs from *A. costata* in the absence of the distinct longitudinal costæ and moniliform puncta, and from the extremities being truncate and not produced as in that species; and from *A. affinis*, to which the outline of the valve more nearly approaches, by the peculiar structure of its longitudinal bands.

*Amphora membranacea* (fig. 8 *a* and *b*).

Brackish water. Pembroke Harbour. Barking Creek.

This species occurs abundantly in the mud from Pembroke Harbour, but does not appear to be common in many other localities, and I meet with it but rarely in the Thames and its tributaries. I merely give a figure, as that in vol. i. of the 'Synopsis' appears to be taken from a frustule shortly after self-division, and gives an erroneous impression of the full-grown valve. The longitudinal striæ are so marked a feature, and the breadth between the central nodules so much greater than in the specimen figured by Professor Smith, that the form now given might readily be mistaken for a distinct species. Fig. 8 *a* may be considered as fairly representing the state in which *A. membranacea* usually occurs. Fig. 8 *b* is a frustule in process of self-division.

*Cocconeis scutellum*, var. *γ* (fig. 9).

Marine. Lyme Regis.

I figure this species as a variety of *C. scutellum*, as at present I have only met with it in one marine gathering, in which, however, it is not uncommon. The valve is oval, with the nodule dilated into a stauros, and differs from *C. scutellum*, var. *β*, in the fineness of the dotted striæ, and peculiar ocelli or semi-oval markings cutting off a portion, on each side of the valve. Professor Smith informs me that in his opinion they belong to the connecting membrane, but they appear to be rather a thickening on the inner surface of the cell-wall. This species of Cocconeis is so very variable in size and appearance, that without having specimens with the same peculiar structure from several localities, I think it better to consider it as a variety, though more extended observation may prove that it should be classed as a distinct species.



*Navicula liber*, var. *β*.—Valve oblong, contracted towards the rounded extremities; striæ faint, parallel, not reaching the central line. Length ·0033″; breadth ·001″ (fig. 10).

Marine. Caldy, Pembrokeshire, Rev. J. Guillemard.

Professor Smith having, in vol. ii of the 'Synopsis,' placed Ehrenberg's *Nav. amphigomphus* as a cuneate variety of *N. firma*. I refer this species with little hesitation as a somewhat similar variation to the nearly allied marine form *N. liber*, from which it appears to differ only in having bluntly cuneate extremities, and rather larger space between the termination of the striæ and the median line. It is probably synonymous with Ehrenberg's *N. dilatata* of the 'Microgeologie,' t. ii, f. 10.

*Pleurosigma transversale*, var. *β*.—Valve elliptical, lanceolate, with acute extremities, and very slightly curved median line; striæ obliqne. Length ·0032″ to ·004″; breadth ·0009″ to ·001″ (fig. 11).

Marine. Caldy, Pembrokeshire, and dredged off Tenby, Rev. J. Guillemard.

The typical species of *P. transversale* is by no means uncommon in both the gatherings above alluded to, whilst the variety here figured is rather rare. The general outline and structure of the valve is, however, so similar to that species, that having only at present met with it in these gatherings from Tenby Bay, I figure it merely as a variety, though more extended observation may prove it to be a distinct species. The valves are much broader in proportion to the length than in the typical species, the extremities are acute instead of obtuse, and the median line nearly straight instead of having a considerable curvature. The striation also is finer and more difficult to resolve, than in that species.

# DESCRIPTION OF PLATE III,

## Illustrating Mr. Roper's paper on some New British Diatomaceæ.

Fig.

1.—*Eupodiscus tesselatus.*

*b.* Ditto, structure highly magnified.

2.—*Coscinodiscus labyrinthus.*

*b.* Ditto, structure highly magnified.

3.—*C.* (?) *stellaris.*

4.—*C.* (?) *ovalis.*

5.—*Actinocyclus triradiatus.*

*b.* Ditto, structure highly magnified.

6.—*Nitzchia virgataab.*

*a.* Side view.

*b.* Front view.

7.—*Amphora sulcata.*

8.—*A. membranacea.*

*b.* Ditto, represents self-division.

9.—*Cocconeis scutellum*, var. γ.

10.—*Navicula liber*, var. β.

11.—*Pleurosigma transversale*, var. β.

12.—*Coscinodiscus concinnus.*

*a.* Ditto, structure highly magnified.

Micr. Journ. Vol. VI. Pl. III