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VIII.—*On the Structure and Position of the genus Teredina of Lamarck.* By Dr. J. E. GRAY, F.R.S., V.P.Z.S., Pres. Ent. Soc. &c.

LAMARCK, in the 'Histoire Naturelle des Animaux sans Vertèbres,' published a genus under the name of *Teredina* for a Miocene fossil shell which he had before referred to *Fistulana*\*, a genus which he, in the work above referred to, further separated into several others, *Teredina* among the rest.

Lamarck formed the genus *Teredina*, with *Aspergillum*, *Clavagella*, *Fistulana*, *Septaria*, and *Teredo*, into a family, which he called "*les Tubicoles*," because they live in tubes, and separated them for this reason from "*les Pholadaires*."

The genus is thus defined by its author, who was evidently forming a character to separate it from *Aspergillum*, *Clavagella*, and *Teredo* :—"Fourreau testacé tubuleux, cylindrique ; à l'extrémité postérieure fermée, montrant les deux valves de la coquille, à l'extrémité antérieure ouverte" (vol. v. p. 438).

M. de Blainville, in his 'Manuel,' united the two families of Lamarck into one, under the name of *Adesmaceæ*, and arranges the genus *Teredina* between *Teredo* and *Pholas* ; he gives the following improved generic character, derived from a very perfect specimen in the collection of M. Deshayes :—

"Coquille épaisse, ovale, courte, très baillante en arrière, équivalve, inéquilatérale ; les sommets bien prononcés, un cuilleron épais sur chaque valve. Une pièce medio-dorsale, ovale, en bouclier, sur les sommets de la coquille, et se prolongeant en

\* The genus *Fistulana*, as first established in Ann. Mus. vii. 425, was divided, in the work above referred to, into several genera, and, as characterized in his later work above quoted, is a *Teredo*, which has been formed into a genus named *Xylotrya* by Leach.

arrière en un tube complet à orifice terminal unique?" (Man. Malacol. p. 579, 1825.)

The existence of the dorsal buckler or plate at once shows the affinity of these fossils to *Pholas*.

James Sowerby the elder figured the shell in his 'Mineral Conchology,' and referred it to the genus *Teredo*, under the name of *Teredo antenautica*, overlooking the character afforded by the dorsal plate, which is always absent in *Teredo*, and the absence of *palettes*, or terminal opercular valves, as they have been called, and a containing shelly tube, which are always present in that genus.

M. Deshayes, in his 'Coquilles fossiles de Paris,' retains the two families, *les Tubicoles* and *les Pholadaires*; of Lamarck, and gives nearly the same character for the genus as that quoted from De Blainville's work; only he calls the *cuilleron* of De Blainville *palettes*; but this is evidently a slip of the pen, as the part described is always called a *cuilleron* by French authors, in the genera *Pholas* and *Teredo*, which alone, with *Teredina*, possess the process under the umbo so referred to. He adds,—“Ce genre fait évidemment le passage aux Taret” (*Teredo*) (vol. i. p. 18).

Deshayes, more lately, in his notes to the new edition of Lamarck, observes, “Le genre curieux des *Térédines* n'a pas été bien connu de Lamarck; sans cela il lui aurait donné des caractères plus complets. La *Térédine* est une véritable *Pholade* globuleuse fixée à l'extrémité d'un tube” (vol. vi. p. 34).

Mr. Woodward, in his 'Manual,' which is specially devoted to the determination of fossil shells, overlooking these observations, and perhaps misled by the position of the shell in the old work of James Sowerby the elder, regards *Teredina* as a subgenus of *Teredo*! He further observes, “Valves with an accessory plate in front of the umbo, free when young, united by the margins of the shelly tube when adult (?). The tube is sometimes concamerated, its siphonal end is often truncated, and the opening contracted by a lining, which makes it hour-glass shaped or six-lobed (fig. 25 a).” ('Manual,' p. 330.)

The fossil *Teredina* has been considered as a *Teredo* by James Sowerby, a *Fistulana* by Lamarck, as a subgenus of *Teredo* by Woodward, and as a genus intermediate between *Teredo* and *Pholas* by Deshayes, but who still arranges it in a distinct family from the latter; and latterly, M. Deshayes has considered it as a species of the genus *Pholas*; and in my genera of the family *Pholadidæ* I placed it as a genus of that family.

A careful examination of the structure of the shell and its tube, as it has been called, show that it is, as M. Deshayes observes, a true *Pholas*. Indeed, it ought to have been referred

to that genus by the Lamarckian conchologist, as soon as the dorsal valves were discovered, and the genus *Teredina* erased from the list, as it has all the characters of *Pholas* as defined by Lamarck.

This is an instance of the careless manner in which a single species is elevated by some authors of that school into the rank of a genus, because its structure has been misunderstood or because it possesses some slight peculiarity of external appearance, while at the same time they retain, in other genera, a number of species possessing forms which offer quite as important characters to distinguish them.

It only resembles *Teredo* in the shape of its valves, but is immediately distinguished from it by the absence of the shelly case of the cavity in the marine body in which it resides, in the absence of any palettes (or opercula, as they are sometimes called) at the sides of the ends of the siphons, and in the presence of the dorsal plate over the umbo, which is never present in this genus. It has no affinity to such genera as *Aspergillum*, *Clavagella*, or *Gastrochæna*, to which Lamarck, G. B. Sowerby\*, and many authors compared it, as it does not live in a tube, the part which they described as a tube being only the sheath of the siphons lapidified by the process of fossilization, as is proved not only by its position as regards the valves, but also by its bulging form, which shows that it was formerly soft and yielding.

Mr. G. B. Sowerby, in his 'Genera of Mollusca,' says this genus "has an operculum, as we are informed, though we have never seen it, which covers the double opening;" and, further, he says it differs from *Pholas papyracea* in "having an operculum to cover the posterior aperture of the tube." I have searched for these opercula or *palettes* in a large series of specimens without discovering the slightest trace of them; indeed, the siphons are not formed as if they were present; and the absence of the tube covering the entire animal, siphon, and valves, with which they are always combined, renders their presence not to be expected.

Mr. G. B. Sowerby describes them as "gregarious, occurring in numbers in a bed of ferruginous sand," "living in cavities of its own terebrating." He further observes, "That in its young state it is destitute of a tube, and consists only of two valves and a membranaceous envelope, we cannot doubt." I do not believe that there is any difference between the old and young in this respect, as in both states I think it is evident the tube

\* Mr. G. B. Sowerby observes that "the tube in *Teredina* never covers the two valves, but appears to be soldered to them, as in *Aspergillum*." (!) ('Genera.')

was soft and flexible when the animal was living. There is little doubt that in the young state the large rhombic gape between the front of the valves is open, as in *Teredo*, *Zirfæa*, and the young of *Martesia*, though I have never seen a specimen showing this state of the animal, but always with this part closed, as in the adult example of the latter and several other genera of *Pholadidæ*.

Among the recent genera of *Pholadina* it is most nearly allied to *Martesia*, but it differs from that genus in several important particulars, which may be thus stated:—

1. The valves are small, compared with the size of the siphons, and the gape is larger and more rhombic.

2. The siphons are much larger, compared with the valves and shell, and swollen beyond them; in the fossil state they are covered with a hard calcareous coat, or rather coats, for the part which is described as the tube is formed of several concentric calcareous layers. These siphons, though in the fossil state they are hard and shelly, have all the appearance of having been soft and flexible in the living animal, like the siphons of *Zirfæa crispata*, which they greatly resemble in appearance; for they are bent in various directions, and are swollen beyond the edge of the valves behind, so as to have all the bag-like appearance which the fleshy flexible siphons of these bivalves present.

The surface of the stony siphons of the best-preserved specimens of *Teredina* presents the minutely wrinkled surface which is to be observed on the more or less coriaceous coat, similar to the periostraca of the valves which envelope the fleshy siphons of *Pholades*, *Myæ*, and others which have large, constantly exposed siphons.

It is to be observed, that the shelly cast of the siphons of this genus generally presents two very different appearances: the lower portion nearest the valves is usually hollow, and formed of several thin, concentric, shelly laminæ, as is easily seen when it is broken across. The upper portion is only provided with a thin, easily deciduous, shelly coat, filled within with a brown solid nucleus, pierced in the centre with two more or less distinct tubes. This portion appears to represent the part of the two siphons which is united together; as it is easily separated from the lower portion, many specimens contained in collections are destitute of this part, and, from Lamarck and De Blainville's descriptions, I should suspect that it was wanting in the specimens they described. The two portions are well figured in Sowerby's 'Genera of Shells,' fig. 1, and the lower portion, showing the laminated appearance of this part, in fig. 3 of the same plate.

It is probable that the upper portion may have been mistaken

by some observers, as mentioned by Mr. G. B. Sowerby, for *opercula* or *palettes*.

3. The gape in the front of the valves is filled up, as is the case with the adult specimens of *Martesia*; but here it is filled up with a single shelly plate, leaving only a small perpendicular slit in the middle of the well-marked medial line, while in *Martesia* the plates filling up the gape in each valve are always separate. This plate, as in *Martesia*, is formed by the gradual addition of shelly matter to the front margin of the gape of the valves, until it reaches the middle, where the two plates are united into one, leaving the central slit. The development of this plate is shown by the concentric lines of growth which are to be observed on its surface in well-preserved specimens.

4. The hinder part of the cardinal and ventral margins of *Teredina* is destitute of any additional shelly plates, which are generally developed in the species of the genus *Martesia*.

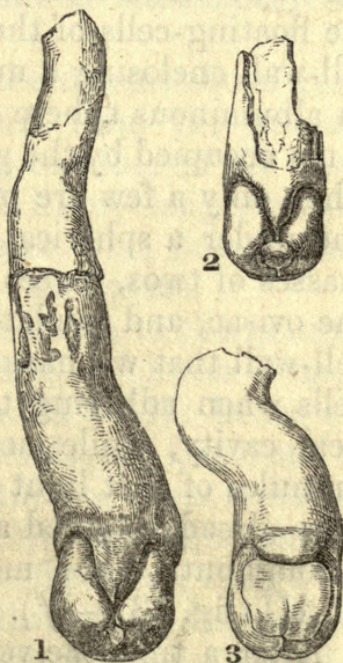
I think, after these comparisons, that we may conclude that *Teredina* is a genus of *Pholadina* allied to *Martesia*, but sufficiently distinct from it to be retained as a separate genus, as I suggested in my paper "on the Arrangement of *Pholadidæ* into Natural Groups," Ann. & Mag. Nat. Hist. viii. 1851, p. 384.

I believe that at present only a single species of the genus is known, which varies much in size according to the position it holds in the colony, some obtaining more and others less nourishment, from local causes.

They present so much variety in the form and state of development of the additional dorsal valve or *bouclier*, that if they were not all collected together from the same colony on the same piece of rock, one might be induced to consider them as belonging to two or more distinct species.

In some specimens the dorsal shield is small, placed entirely in front of the umbo, looking like a flattened bag, narrow in front, rather wider and more convex behind, and slightly contracted on the sides (fig. 2). In this state it is figured by M. Deshayes (Coq. Fossiles de Paris, tab. 1. f. 24).

In others it is large, convex, sub-quadrangular, covering the umbo and the upper central part of the base of the siphon, which is prominent behind



*Teredina personata*.

Showing how the siphons bulge over the valves. 1. In usual state, without the dorsal plate; 2, with a small, 3, with a large or perfectly developed dorsal plate.

the hinder part of the cardinal edge of the valves (fig. 3); it is deeply notched in the middle of the front edge over the separation of the valves, and more or less sinuous on the middle of the side edges over the convexity of the valves, as it is figured by Sowerby ('Genera,' f. 2 & 4)\*; but it is often of a much larger size compared with the size of the valves, and more sinuated in front and on the sides than it is here represented. In most specimens of these fossils the dorsal valve is wanting, and there is only a slight fracture between the front of the hinge-margin of the valves, showing the remains of the cast of the shell by which it was attached (fig. 1), as it is represented in fig. 3 of Sowerby's 'Genera.'

[A Postscript to this paper will be found on page 162.—ED.]

#### IX.—On the Spermatology of a new species of Nais.

By H. J. CARTER, Esq., H.C.S. Bombay.

[Concluded from page 33.]

##### *Development of Spermatozoa in the Ovisac.*

IN the ovisac, *pari passu* with the ovum, the spermatozoa also frequently become developed; and this takes place in the following way: viz. a number of cells identical to all appearance with the floating-cells of the peritoneal cavity, that is, consisting of a cell-wall enclosing a number of refractive vesicles supported on an albuminous sphere or centre, fill that part of the ovisac which is not occupied by the group of ova. These, at a very early stage, when only a few are present (Pl. II. fig. 3 *h*), may be seen loose and under a spherical or diffuent form (*i*), or in agglomerated masses of twos, threes or more (*k*), or attached to the surface of the ovisac, and caudate (*l*), thus evincing the same plasticity of cell-wall that we have observed in the cell-wall of the floating-cells when adhering together or to the parietes of the peritoneal cavity, while most of the cells present, respectively, a few granules of that light brown matter in their interior, to which I have already alluded as a distinguishing mark of the sperm-cell throughout. (For more magnified views of these figures, see Pl. III. fig. 13 *a—f*).

After a time the vesicles enlarge, through nourishment probably derived from the "branchial" vessels, and surround, either entirely, or partially in groups, globular masses of fine granular matter, which vary in size from that of the sperm-cell upwards (figs. 14, 15), most of which contain more or less of the

\* In the explanation of the plate, this figure is erroneously said to represent the form of the aperture of the shell.



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