XVIII.—*On the Homologies of the Dental Plates and Teeth of Proboscidiferous Gasteropoda.* By John Denis Macdonald, M.D., F.R.S., Staff Surgeon, R.N.

[Plate XIII.]

All unisexual Gasteropoda furnished with a lengthy proboscis retractile from the base, have also large single spherical otoliths in the ear-sacs. The odontophore is ribbon-like, holding a fixed relation to the extremity of the proboscis, whether retracted or protruded; and their lingual dental characters indicate their division into two natural groups easily distinguished from each other.

In the first group the dental plates are arranged in seven longitudinal series, and the teeth are in general recurved from the anterior border of the plates—a character which is especially observable in the central and first lateral series, even where the two outer members are in the form of simple curved fangs. The buccal plates are generally well developed, and exhibit some diversity of form and structure. Very little need be said of the homologies of the dental plates and teeth of this group; for, with very few exceptions, resulting from suppression of one or two of the outer rows in the pleuræ, the odontophore is septiserial, and the corresponding parts in all the genera may be readily recognized. Even in cases of suppression, as in *Criocella* and *Lamellaria*, the remaining dental organs are unequivocally fashioned like those of the more perfect neighbouring genera. The recurvature of the dental processes, expressed by the word *Campylodonta*, is the most essential character of this section of Proboscidifera.

In the second group, which is eminently carnivorous, the dental processes of the central plates, and frequently also of the first lateral series, point directly backwards, without recurvature properly so called; and this being the distinguishing feature of its members, I have applied to them the name of *Orthodonta*. The eyes are variously situated on the outer side of the tentacula, viz. near the tip, in the middle, at the base, or on an external depressed lobe-like process. In some the propodium is largely developed, either simple, as in *Harpa*, or divided into two lateral portions by a median sulcus, as in *Oliva*. But in most of the families the propodium is marked off from the mesopodium by a more or less deep transverse groove dilaminating the anterior border of the foot.

The *Orthodonta* admit of division into two parallel sections, distinguished respectively by the uncinate or the comb-like character of the lateral teeth. Though the prevailing form of

dentition is triserial, its derivation from one of a higher number is indicated by the occurrence of five members in the tongue of *Clavatula* in the combed section, and in the tongue of *Olivella* in the uncinate. On the other hand, the lateral teeth, which are barely traceable in *Harpa*, are altogether suppressed in *Cymba* and *Marginella*, while the lateral fangs alone are present in *Mangelia* and *Pleurotoma*. The examples of suppression here noticed cannot be looked upon as equivalent to primary types, though they may be quite characteristic of the families in which they occur. The above remarks will be better understood on carefully comparing the annexed outline drawings of the leading forms of dentition occurring amongst the *Orthodonta*. (Pl. XIII.)

The lingual sac of *Conus* (fig. 1) presents a sigmoid flexure about its middle, the teeth in the fore part being in general directed forwards.

The fangs are separately erected or depressed (I have not accurately determined this point) by a special bundle of muscular fibres, arising by a fine point in front of the articulation of each, and being inserted by a kind of tendon a little below a trochanter-like process at their base, reminding one of the mode of insertion of the triceps muscle into the olecranon process of the ulna. This arrangement, however, cannot warrant the assertion that the teeth in the *Toxifera*, so-called, are inserted into the fleshy proboscis.

Notwithstanding the remarkable difference existing between the long spiral shell of *Terebra* and the depressed, almost involute, spiral form of *Conus*, the anatomy of the respective animals is remarkably similar, exhibiting an obvious natural affinity; and the dentition of both is modelled upon the same characteristic plan.

The genuine *Pleurotomæ*, which are notched in the outer lip, will be found, on accurate comparison with *Bela*, *Mangelia*, or such shells as are grooved at the suture, to present characters sufficiently well marked to suggest their separation.

The lingual cartilages of *Pleurotoma* form two comparatively large rounded masses, upon and between which the odontophore lies evenly, without the sigmoid flexure of *Conus* or *Bela*, but, on the contrary, it may be readily laid out quite flat for microscopic examination. The odontophore of *Pleurotoma* has very much the same relative proportions as that of *Mitra*; but the teeth are in two rows, long, smooth, rounded, tapering and gracefully curved (as it were, to inaugurate the uncinate series).

The Columbellidæ (Pl. XIII. fig. 11), including the beautiful little shells of the genera *Nitidella* and *Conidea*, seem to link

the true Pleurotomes with the Olives. No dentition can be more characteristic than theirs, or less likely to be confounded with any other. The lateral teeth become shorter, more strongly curved, and falcated in a manner peculiar to the family, while the central area only presents a series of unarmed plates. These, however, shadow forth their composite nature by a narrowing in the middle, suggesting their homology with all three central plates of *Clavatula* blended together. In *Olivella* (fig. 12) the corresponding plates are furnished with a row of fine teeth along the posterior border, and the more simple uncini are flanked externally by a single row of thin quadrilateral plates. In *Oliva* (fig. 13) the uncini are quite simple, without notches or foliations, and closely resemble their homologues in Turritidæ (fig. 17) and Muricidæ (fig. 18). In the Harpidæ (fig. 14), Volutidæ (fig. 15), and Marginellidæ (fig. 16) they are altogether suppressed.

I have placed *Clavatula* (Pl. XIII. fig. 4) by itself as the type of a provisional family until further information is obtained by the study of the numerous little shells in this alliance occurring in tropical seas. Much is to be anticipated also from the examination of an equally numerous group referable to the Olive type.

In the odontophore of *Clavatula* (fig. 4) we find the most interesting combination of the dentition of *Mangelia* or *Bela* (fig. 3) with that of *Cyrtulus* (fig. 5), explaining to us certain homological relationships which would be difficult to comprehend without its aid. Thus its fangs may be traced backwards to *Pleurotoma* (fig. 10), and thence through the uncinate series to the hooks of *Murex* or *Concholepas* (fig. 18), while its side combs may be followed through the pectinate series to the lateral teeth of *Buccinum* (fig. 9), from which it must be apparent that the hooks of *Murex* and the lateral teeth of *Buccinum* are not homologous organs, and therefore cannot be convertible.

Being well aware of the existence of certain fusiform species having neither plaits nor folds upon the columella of the shell, but with lateral combs in the odontophore, I conclude that these would form with *Cyrtulus* (Hind) a well-marked family. The Muricoid species, such as *Fusus proboscidalis*, should be carefully excluded, and only the Cyrtuloid members (e. g. *Colus raphanus*) retained. My reason for proposing the family name *Cyrtulidæ* is founded on the study of the anatomy of Mr. Hind's *Cyrtulus serotinus* ("Cyrtule du soir" of the French), the type of the genus; and I hold its name to be still intact, though it has been unhesitatingly absorbed into Swainson's *Clavella*, no sufficient data having been

advanced for such a proceeding*. The tongue of *Clavella distorta* is unequivocally Buccinoid, and the shell is now even taken as the type of the genus *Triumphis*. It is quite gratuitous to say that *Fusus longævus* of Solander and *Cyrtulus serotinus* of Hind are members of the same genus. It may be very pleasant to discover a living species of a genus fossil as far back as the Eocene period; but where is the proof of such a position? The naming-difficulty is nowhere more remarkably illustrated than in the members of this family, for which I have chosen the name *Cyrtulidæ*.

Fasciolaria (Pl. XIII. fig. 6) and *Mitra* (fig. 7) form the types of two distinct families: the former, with its lengthy ribbon and narrow median series, differs remarkably from the latter, in which the odontophore is short and broad; moreover the shell-characters are sufficiently distinctive.

Conchologists in general assume that *Turbinellus* and *Cynodonta* belong to the same family; but the proof of this has never been made plain. *Cynodonta* (fig. 8) alone appears to have undergone examination; and a family is certainly required for its reception, as it is not conformable with any other already established.

In *Harpa* the propodium is largely developed; but it is simple or without the median fissure above which characterizes all the Olividæ proper. The head and tentacula are remarkably small as compared with the great mass of the foot. The proboscis is in keeping with the head and very small, and the odontophore is so minute as to be readily overlooked by inexperienced observers.

The lateral plates are quadrilateral, bearing a broad triangular tooth; but both are so delicate and rudimentary as to require a nice adjustment of the light to render them visible at all. The central plates are also quadrilateral, but concave in front and convex behind, bearing a large conical tooth in the middle, with a very small one on either side, near its base. It would appear that the diminutive size of the whole ribbon, or the rudimentary nature of one or more of its elements, anticipates as it were some decided change in the plan of the dentition of the next succeeding family. Thus the rudimentary pleural teeth of *Harpa* indicate the alliance of that genus with some other in which those teeth are more highly developed; and in keeping with this reasoning, if no pleural teeth are at all present in the Volutidæ and Marginellidæ, we cannot affirm on this ground alone that their lingual dentition is typically uniserial.

* The young *Cyrtulus* is a veritable Lamarckian *Fusus*.

EXPLANATION OF PLATE XIII.

Fig. 1. Dentition of *Conus*: *a*, one fang, with its muscle remaining intact; *b*, extremity of the other fang, more highly magnified, to show the barbed processes more distinctly.
Fig. 2. Dentition of *Terebra*.
Fig. 3. „ *Bela*.
Fig. 4. „ *Clavatula*.
Fig. 5. „ *Cyrtulus*.
Fig. 6. „ *Fasciolaria*.
Fig. 7. „ *Mitra*.
Fig. 8. „ *Cynodonta*.
Fig. 9. „ *Buccinum*.
Fig. 10. „ *Pleurotoma*.
Fig. 11. „ *Columbella*.
Fig. 12. „ *Olivella*.
Fig. 13. „ *Oliva*.
Fig. 14. „ *Harpa*.
Fig. 15. „ *Melo*.
Fig. 16. „ *Marginella* (from memory).
Fig. 17. „ *Costellaria*.
Fig. 18. „ *Concholepas*.

XIX.—*Notes on the Fleshy Alcyonoid Corals* (Alcyonium, *Linn.*, *or* Zoophytaria carnosa). By Dr. J. E. Gray, F.R.S., V.P.Z.S., &c.

This group of Corals was named *Alcyonium* by Linnæus and Pallas, but has been more lately subdivided into several genera. The polypes are social, generally with elongated tubular bodies, which are united to one another into a more or less fleshy crust or lobulated or branched coral. The inner substance between the tubular bodies is sometimes rather fleshy and permeated with vessels. The polypes and the flesh are often strengthened with various-shaped calcareous, sunken or superficial spicules; but there is no central axis as in the horny or stony Alcyonoid Corals.

In one genus at least (*Paralcyonium*) the lateral younger polypes are short, and there is direct communication between their bodies and the central cavity of the older or mother polype; and in some other genera, as *Sympodium* and *Erythropodium*, which form only a thin crust, the body of the polype is short, as in the animals that form a thin bark on the central axis, *e. g.* in *Gorgonia* and *Corallium*.

The part of the polype at the base of the tentacles, and the tentacles themselves, are often armed with a series of spicules generally placed obliquely in two parallel series; they protect the polype when it is protruded: in some these spicules are so numerous as to prevent the complete contraction of the polype.