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ORIGINAL ARTICLES.

I.—ON RECENT AND FOSSIL *PLEUROTOMARIÆ*.

By HENRY WOODWARD, LL.D., F.R.S., F.G.S.

(PLATE XI.)

THE progress of modern discovery, both in Palæontology and Zoology, has been steadily tending to bridge over the gap which seemed at one time to separate the past from the present life-history of our globe, and has brought each more closely into relationship with the other than seemed possible fifty years ago.

Palæontologists are constantly discovering fossil forms to connect the past with the present, and zoologists, with equal zeal, are seeking new living ones to connect the present with the past.

The discovery of *Trigonia* in the seas, and the existence of *Ceratodus* in the rivers of Australia, offer us living analogues for a long series of ancestral forms, carrying us back through all the Secondary strata to the Trias, and in the case of *Ceratodus*, to the Coal-period; whilst the *Lingula* and the *Pearly Nautilus*, living to-day, have found remote ancestors in Silurian and Cambrian times.

The almost simultaneous discovery of remains of Scorpions in the Silurian rocks of America, Scotland, and Sweden, closely resembling those now living, attests the presence of dry-land and Insect-life in pre-Carboniferous times, and furnishes another link in the "Enchainements du Monde Animal," by which the long-buried past lives again by the light of the life of the present day.

A similar interest, zoologically and palæontologically, attaches to the ancient genus *Pleurotomaria*, a Gasteropod which, previous to 1855, was only known in a fossil state.

A large proportion of the older trochiform fossil shells have their whorls, whether round or angular, marked by a peculiar band, usually terminating in a deep slit at the aperture. Most of these were solid nacreous shells, and have been referred to the genus *Pleurotomaria*. Others are slender and tapering, and resemble a *Cerithium* with a notched aperture: they are named *Murchisonia*, and are probably related to *Pleurotomaria* proper.

In Woodward's "Manual of the Mollusca" the genus *Pleurotomaria* is said to range from the Silurian to the Chalk formation, and the number of species then recorded (in 1854) was 400. Since that date the number of fossil forms described has been greatly increased. The palæontological gap which seemed to separate the fossil *Pleuro-*

*tomariæ* from the fauna of to-day has been also reduced by the discovery of seven Eocene, two Miocene, and two Pleistocene species; whilst the dredge of the zoologist and the nets of the fishermen have demonstrated with equal success that *Pleurotomaria* is living in the seas of the present time.

The following is a list of the Tertiary species of *Pleurotomaria*:—

(EOCENE)	<i>Pleurotomaria</i>	<i>Bianconii</i> , d'Archiac, India.
	—————	<i>concava</i> , Deshayes, Paris Basin.
	—————	<i>Duboisii</i> , Mayer, the Crimea.
	—————	<i>Genyi</i> , Mayer, Nice.
	—————	<i>Kadin-Kewiensis</i> , d'Archiac, Asia Minor.
	—————	<i>Lamarckii</i> , Mayer, Switzerland.
	—————	<i>Nicæensis</i> , Bayan, Nice.
(MIOCENE)	—————	<i>Sismondii</i> , Goldfuss, Bünde.
	—————	<i>tertiaria</i> , M'Coy, Australia.
(PLEISTOCENE)	—————	<i>Fischeri</i> , Mayer MS., Guadaloupe ?
	—————	<i>Duchassaingii</i> , Schramm, Guadaloupe ?

The rarity of living *Pleurotomariæ*, whether in public Museums or in private Collections, is an incontestable fact. Neither the British Museum (Natural History), nor the Museum of the Jardin des Plantes, Paris, possesses an example.

Mr. W. H. Dall, in his Preliminary Report on the Mollusca dredged in the Gulf of Mexico, etc., 1877-78, by the U.S. Coast Survey Steamer "Blake,"<sup>1</sup> in 1881, records the existence of eight individuals only, that were actually known to him to exist in collections; whilst M. H. Crosse (Journal de Conchyliologie, 1882, p. 20), a year later, mentions ten specimens of living species obtained up to that date:—viz.:—1 *Pleurotomaria Rumphii* (in the collection of the Jardin Zoologique, Rotterdam); 5 of *P. Adansoniana* (viz. 1 in the collection of M. H. Crosse (the type), 1 in the Museum of M. Lherminier, 3 in the Museum of Zoology and Comparative Anatomy, Cambridge, Mass.); 3 of *P. Quoyana* (viz. 1 in the collection of Miss De Burgh (the type), 2 in the Museum Zool. and Comp. Anat., Cambridge, Mass.); 1 *P. Beyrichii* (collection of Dr. Hilgendorf). We may now add a second specimen of *P. Beyrichii*, in the collection of Mr. R. Damon, F.G.S., of Weymouth (see Plate XI. Fig. 1). This specimen, obtained by Dr. C. Gottsche, of Berlin, during his residence in Japan, from a fisherman of Enoshima, was actually caught with the mollusc in it, but the *intelligent* native very carefully removed it, and thus a most valuable prize was lost to science. Dr. Gottsche obtained the shell from the fisherman two hours after it had been taken alive, and from the good state of its preservation, and its brilliant coloration, there is every reason to believe that it was an actual living example when found.

It contrasts most favourably both in coloration and condition with Dr. Hilgendorf's specimen of *P. Beyrichii* (as figured by von Martens in the Conchological Mittheilungen, Cassel, vol. i. pl. vii. 1880), which does not display the slit, and is in an extremely poor state of

<sup>1</sup> Bulletins of the Museum of Comparative Zoology at Harvard College, vol. ix. Nos. 1-5, pp. 78-79, June-Dec. 1881.

conservation.<sup>1</sup> Indeed it seems very probable that it may have been, like the species first discovered (*P. Quoyana*), inhabited by a hermit-crab, at the time it was obtained.

In Mr. Damon's specimen the coloration is much more brilliant than is represented in von Martens' figure of Dr. Hilgendorf's specimen, and its altogether fresh and uninjured appearance suggests it to be the shell of a strong and healthy animal just caught alive. A small portion of the outer lip, on the lower side of the slit, has been broken away in removing the animal; otherwise the shell is quite perfect. The measurements recorded show Dr. Hilgendorf's specimen to be 8 mm. larger in diameter; its height is also 12 mm. greater than that of Mr. Damon's specimen.

[PLEUROTOMARIA BEYRICHII, Hilgendorf. (Pl. XI. Fig. 1, a, b.)

- Pleurotomaria Beyrichii*, Hilgendorf, 1877, Sitzungsber. Gesells. naturforsch. Freund. Berlin, p. 72.  
 ————— ————— Schepman, 1879, Tydschr. d. Ned. Dierk. Vereen, vol. iv. p. 166.  
 ————— ————— Crosse, 1880, Journ. Conchyl. vol. xxviii. p. 204.  
 ————— ————— Martens, 1880, Conch. Mittheil. vol. i. heft 3, p. 33, taf. vii.  
 ————— ————— Dall, 1881, Bull. Mus. Comp. Zool. Harvard Coll. vol. ix. p. 78.  
 ————— ————— H. Crosse, 1882, Journ. Conchyl. vol. xxx. p. 16.

Animal and operculum of *P. Beyrichii* unknown.

Shell trochiform, solid, whorls nine, surface ornamented with numerous broadly spiral ridges, intersected by somewhat strongly-marked lines of growth, which follow the same wave-like, or  $\omega$ -shaped, curve, as the mouth of the shell. Aperture subquadrate, with a deep slit (about one inch) in its outer margin. The part of the slit which has been progressively filled up forms a distinct band round the whorls. There are 9 spiral ridges above the slit, and 6 below, in the body-whorl; but these lower ridges are overlapped in the upper whorls as far as the line once occupied by the slit, which forms a band around the whorls of the shell just above the suture. The lower margin of the whorls is bent at a rather sharp angle, the somewhat flattened base of the shell having 19 spiral ridges on it. The lip near the columellar margin is much thickened and flexuous, the interior of the shell and the umbilicus being nacreous. Colour pale-yellow, streaked with bright orange red.

Largest diameter of base of shell 75 millimètres; smallest diameter of base 65 mm.; total height 70 mm.; diameter of aperture 35 mm.; height of aperture 25 mm.; length of slit 22 mm.

*Habitat*:—Found living off the coast of Japan, at Enoshima, depth unknown.

<sup>1</sup> Dr. C. Gottsche writes (Berlin, 22 July, 1885), "In Dr. Hilgendorf's specimen, which is a little rolled, and covered with Serpulae and Bryozoa, the aperture is entirely broken away, so that the slit can only be reconstructed from the band." He adds that two more specimens of *P. Beyrichii* were brought back by Dr. Doederlein, of Strassburg in 1882, but they do not exhibit the slit itself. This statement brings the total number of living specimens of *Pleurotomaria* of all species known, up to 13 individuals.

Mr. W. H. Dall gives the following general description of *Pleurotomaria* :

“Shell trochoid in form, internally pearly, the last whorl perforated or fissured for the escape of eggs, or fecal matters, in the direction of the coil of the whorl.

“*Operculum* horny, subspiral or multispiral. Branchiæ two, nearly symmetrical, one on each side of the slit in the mantle corresponding to the fissure or perforations of the shell.

“Animal with papillose edge to the mantle and lateral fringes; without elongated cirri as in the Trochids; with no frontal veil, or fissuring of the foot. Muzzle simple, without a proboscis, eyes on pedicels exterior to the bases of the simple tentacles. Jaws small, weak.” Then follows a description of the odontophore.

Mr. Dall adds: “A description of the soft parts of *Pl. Quoyana* and *Pl. Adansoniana*, with figures of the animal taken from life, is in preparation. It is to be regretted that the account will be rendered rather imperfect on account of the poor state in which the soft parts have come to hand. The more delicate portions were entirely destroyed. Those parts of importance in classification, being of a tougher nature, for the most part can be tolerably well made out. Sufficient is already known to show that the group possesses characters of family value, and stands nearest the *Trochidæ*, with features recalling *Halitidæ*; and that it has nothing whatever in common with the *Pleurotomidæ*” (*op. cit.* p. 79).

Remarks on the other living *Pleurotomariæ* :—

*Pl. Quoyana*, Fischer and Bernardi, 1856, was the first species of living *Pleurotomariæ* discovered. The type specimen (now in Miss De Burgh's cabinet) was figured in the *Journal de Conchyliologie*, 1856, vol. v. p. 165, pl. v. It is the smallest of living *Pleurotomariæ*, being only 35 millimètres in diameter, and 45 mm. in height.

The first specimen was obtained in a lobster-pot or trap sunk in deep water off the island of Marie-Galante, and between that little island and Dominique (H. Crosse, *op. cit.*, 1882, p. 15). It was occupied by a living hermit-crab.

Two other specimens were dredged *alive* off Barbadoes by the “Blake Expedition” under A. Agassiz, in 73 and 84 fathoms water (Mus. Comp. Anat. and Zool. Camb. Mass.).

*Pl. Adansoniana*, Crosse and Fischer (1861), is twice the size of *Pl. Quoyana*, and extremely like it in its neat and regular ornamentation; but the position of the slit-band, which is supramedian on the former, is median on the whorls of the latter species; whereas in *Pl. Beyrichii* it is inframedian in position. In both the West Indian species the coils of the shell are rather angular, and the slit-band is more prominent, and distinct.

(In *Pl. Beyrichii* the slit-band nearly coincides with the suture in all but the body-whorl, in which its position is seen to be much below the centre of the whorl. The whorls are more rounded than in the West Indian species, and the outline is therefore more graceful and elegant).

The specimens have been obtained as follows :—Islet of Fajou,

Guadaloupe, in the great bay of Pointe-à-Pitre, in 150 fathoms; Barbadoes, 69 fathoms (dead); 94 and 200 fathoms (living) (see *Journal de Conchyliologie*, 1861, tome ix. p. 163, pl. v.; and 1882, vol. xxx. p. 12, pl. i.).

*Pl. Rumphii* is the largest of living *Pleurotomariæ*, being 190 millimètres in diameter, and 170 in height. M. Crosse considers it to approach most nearly to *Pl. Adansoniana*, but the height of *Pl. Rumphii* is double that of *Pl. Adansoniana* or of *Pl. Beyrichii*, and nearly four times that of *Pl. Quoyana*. It is, says M. Crosse, a veritable giant of the genus (op. cit. 1882, vol. xxx. p. 10). This interesting specimen is figured, from a photograph, by A. J. Wendel, and described by M. Schepman, in the *Tijdschr. der Ned. Dierk. Vereen. Leiden*, 1882, Deel VI. p. 23, pl. ii. figs. 1-3. Its habitat is said to be the Moluccas. M. Schepman discovered it among a number of shells from Molucca, in the Museum of the Zoological Gardens, Rotterdam, where the specimen is still preserved.

From the annexed table of species of *Pleurotomariidæ*, it will be seen that the 400 extinct species, known to Dr. S. P. Woodward in 1854, have now grown to nearly three times that number; whilst the gap which formerly existed between the Cretaceous and the recent forms is now bridged over by eleven species from the Tertiary and Quaternary deposits of various countries. Nevertheless one is reluctantly compelled to admit that, although not extinct, *Pleurotomaria* is a genus of the past, and that, numerically speaking, its sun has set, both as regards individuals and distinct species, when compared with the grand extension the genus enjoyed in Jurassic times, indeed from the Chalk formation to the Silurian epoch. [See Table, on p. 438. For the enumeration of the fossil species summarized in this table, I am indebted to my friend and colleague in the Geological Department, Mr. R. Etheridge, F.R.S.]

In quoting these figures as a census of species of *Pleurotomariæ*, it must always be borne in mind, that, as regards at least a large number of the Palæozoic species, although they have been referred to *Pleurotomariæ*, they may possibly belong to quite a distinct genus, as we are entirely unacquainted with the animal itself.

We give on Pl. XI. Fig. 2, a representation of a very well-known and beautiful form of *Pleurotomaria* (*Pl. reticulata*, Sby.) common to the Coral Rag of Weymouth and the Kimmeridge Clay of Wotton Bassett. This species is interesting as illustrating Dr. S. P. Woodward's observation on the genus ("Manual of the Mollusca," 1st edition, p. 147), that "specimens from Clay-strata retain their nacreous inner layers; those from the Chalk and Limestone have lost them, or they are replaced by crystalline spar."

It will be observed that *Pl. reticulata* attains a size almost, if not fully as large as *Pl. Beyrichii*, but the slit-band in this fossil species is *supramedian*, and not *inframedian* as in *Pl. Beyrichii*. The whorls in *Pl. reticulata* are rather more angular than in the Japanese species figured with it (Fig. 1); but the style of ornamentation has varied but little in this genus since Jurassic times.

In reference to the genus *Pleurotomaria*, Mr. W. H. Dall has the

TABLE OF DISTRIBUTION OF THE *PLEUROTOMARIIDÆ*.

		No. of species.		
RECENT	West Indies	...	2	4 Living of RECENT.
	Moluccas	...	1	
	Japan	...	1	
—				
PLEISTOCENE	West Indies	...	2	2 Pleistocene or Quaternary.
	—			
PLIOCENE	...	...	0	0 PLIOCENE.
	—			
MIOCENE	Germany	...	1	2 MIOCENE.
	Australia	...	1	
—				
EOCENE	France	...	3	7 EOCENE.
	Switzerland	...	1	
	Russia	...	1	
	Asia Minor	...	1	
	India	...	1	
—				
CRETACEOUS	Switzerland	...	136	208 CRETACEOUS.
	France	...	37	
	India	...	2	
	America	...	2	
	England	...	31	
—				
JURASSIC	Germany	...	45	367 JURASSIC.
	France	...	198	
	Russia	...	3	
	England	...	121	
—				
PERMIAN	Germany	...	8	12 PERMIAN.
	Russia	...	1	
	England	...	3	
—				
CARBONIFEROUS	America	...	65	258 CARBONIFEROUS.
	Belgium	...	130	
	Russia	...	10	
	England	...	53	
—				
DEVONIAN	America	...	31	123 DEVONIAN.
	Rhenish Prussia	...	72	
	Russia	...	8	
	France	...	3	
	England	...	9	
—				
SILURIAN	America	...	113	177 SILURIAN.
	Gotland	...	41	
	Russia	...	9	
	Bohemia	...	3	
	Australia, etc.	...	2	
England	...	9		
—				
Summary—				
Living species	...	4	1160.	
Tertiary	...	11		
Secondary	...	575		
Palæozoic	...	570		
—				
1160.				{ British fossil species
				{ of <i>Pleurotomariæ</i> ... 226.

following remark (Bulletin of Museum of Comparative Zoology, Cambridge, Mass., 1881, vol. ix. p. 78): "It seems to have been overlooked until now, that we are indebted to Sowerby for its characterization, and that he is entitled to be cited as authority for the genus." But on referring to James de Carle Sowerby's description of the genus *Pleurotomaria*,<sup>1</sup> Min. Conch. vol. vii. p. 69, pl. 640 (published November, 1844), he cites DeFrance as his authority.

It is true that in DeFrance's "Tableau des Corps Organisés Fossiles" (8vo. Paris, 1824), he merely gives the name (p. 114); but in the "Dictionnaire des Sciences Naturelles" (vol. xli. 1826, p. 381), De Blainville adopts DeFrance's name, and credits him with most of the new species described. It is also perfectly true that Sowerby defined the genus, but to assume that he founded it would be unjust to DeFrance, especially since both De Blainville and Sowerby have given DeFrance credit for the genus. If such a rule, as is thus proposed by Mr. W. H. Dall, were generally adopted by naturalists, endless confusion would arise and great injustice would be done to all the older naturalists whose work laid the foundation for the researches of the generation of younger men who have followed after.

#### EXPLANATION OF PLATE XI.

FIG. 1a. *Pleurotomaria Beyrichii*, Hilgendorf. Recent. Enoshima, Japan. (Nat. size.)

„ 1b. Portion of the slit-band (enlarged).

„ 2 *Pleurotomaria reticulata*, Sby. (nat. size). Kimmeridge Clay, Wotton-Basset.

The nacreous inner layer of the shell is well preserved.

Fig. 1 is from the cabinet of Mr. R. Damon, F.G.S., of Weymouth.

Fig. 2 is preserved in the British Museum (Natural History).

Note.—Mr. Robert Damon has kindly given me permission to retain his specimen of *Pleurotomaria Beyrichii* on exhibition for two months in the table-case with the fossil *Pleurotomariæ* in Gallery B, Department of Geology.—H. W.

## II.—ON BASTITE-SERPENTINE AND TROKTOLITE IN ABERDEENSHIRE, WITH A NOTE ON THE ROCK OF THE BLACK DOG.

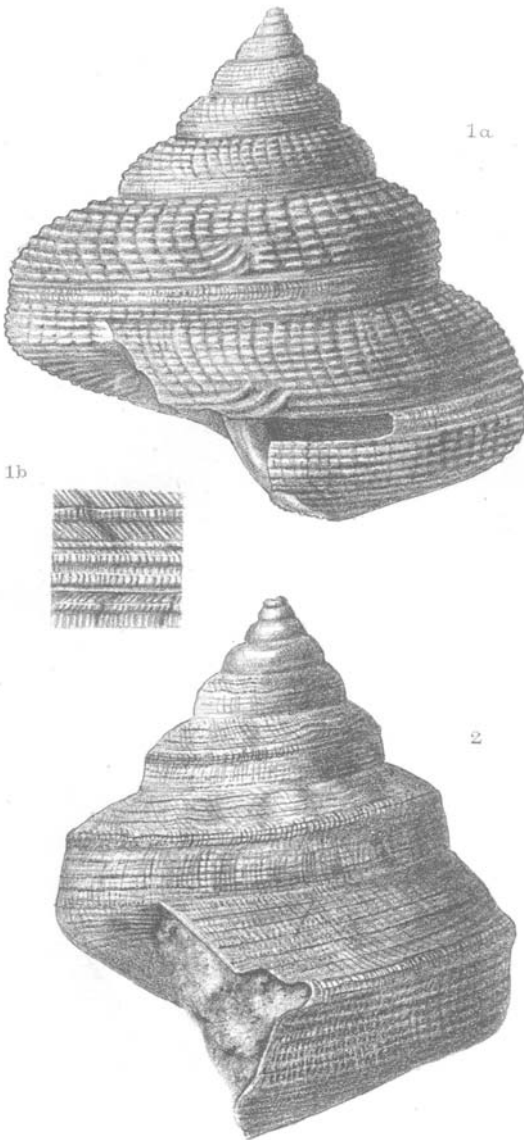
By Prof. T. G. BONNEY, D.Sc., LL.D., F.R.S., Pres. G.S.

IN a paper entitled "On Minerals new to Britain,"<sup>2</sup> published in the Mineralogical Magazine, vol. v. p. 1, Professor Heddle mentions the occurrence of a bastite-serpentine at two localities in Aberdeenshire; one in the parish of Belhelvie, the other on the shore close to a curious rock named the Black Dog. A visit to the localities has enabled me to add to his account some particulars, and to offer one or two corrections which seem to me not unimportant.

Professor Heddle states that he found the rock in the former case "in two quarries which are cut into a hill-side near the farms of Craige and White-Cairns, on the west side of the Belhelvie hills."

<sup>1</sup> Sowerby's description is as follows:—"PLEUROTOMARIA, DeFrance. Gen. char. A trochiform spiral shell, with an angular sinus near the middle of the outer lip, from which a band marked with lines of growth that indicate the sinus is carried round the whorls; no beak or sinus at the base of the aperture; a columella with or without an umbilicus."—(Sowerby, Min. Conch.)

<sup>2</sup> In this paper the term mineral is used in a very wide sense, as it includes *tachylite*, *Lydian-stone*, *chert*, *lignite*, *spherulite*, and *pitchstone*. If all of these are minerals, what are left to us as rocks?



E. C. Woodward del. et lith

West, Newman & Co. lit

Recent & Fossil Pleurotomariæ.