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ORIGINAL ARTICLES.

I.— ON SOME FOSSIL ENTOMOSTRACA FROM SOUTH AMERICA.

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(PLATES X AND XI.)

PART II.

(Concluded from the June Number, p. 265.)

§ VIII. (4) *ESTHERIA CHILENSIS*, Philippi.

PLATE X, Figs. 4, 5.

*Estheria Chilensis*, Philippi, "Tert. u. Quat. Verst. Chiles," etc., 1887, p. 223, pl. I, fig. 11.

Valves subcircular, approaching subquadrate, like some small Lamellibranchs. Umbo at the antero-dorsal corner, and at an angle of  $40^{\circ}$  to the extreme curvature of the concentric ridgelets. Hinge-line straight, behind the umbo, about half the length of the longest diameter of the valve. The other edges rounded; the anterior nearly semicircular; the ventral obliquely curving up to meet the steeper and narrower posterior curve.

Size.—Length, 6.4 mm.; breadth, 5.6 mm.

In the dark-coloured hard shale collected by David Forbes at Arica, Southern Peru.

This differs from the associated suborbicular *Estheria* in the Arica shale, both by its rounder shape and especially by the terminal position of the umbo. Also by its more symmetrically regular and more delicate lines of growth.

Lebu, on the coast of Chili, is given, with doubt, as the locality of Professor Philippi's *E. Chilensis*, Fig. 5.

This shape is not unusual among young forms; for instance, the young *E. Forbesii*, "Monogr. Foss. *Esth.*," pl. iv, fig. 9; but the marginal contour differs all round, and the Arica specimen has more numerous ridgelets. The adult form of *E. Forbesii* differs still more distinctly.

The figure of *Estheria* associated with *E. elliptica* in the "Monogr. Foss. *Esth.*," pl. iv, fig. 3, already referred to as an analogue of *Cyclestheria*, may be again quoted, as having a form somewhat like our Fig. 4, though more subquadrate and oblique.

Although there is evidently a close alliance, as far as outward form is concerned, between *Estheria Chilensis* and *Cyclestheria*, Fig. 6,

it would be impossible, without more knowledge of the internal structure, to recognize a generic identity.

An approach to this rare form (*Cyclestheria*) among *Estheria* is seen on pl. iv, fig. 3, "Monogr. Foss. *Estheria*," a right-hand valve of a small form (possibly a variety) of *E. elliptica*, from the Purbeck of Hanover, and already referred to.

Both Forbes's specimens and Philippi's outline are matched to some extent by Krotow's *Estheria subconcentrica*, Fig. 7, from the "Lower Permian" formation of the Urals;<sup>1</sup> but this apparent alliance is not sufficient to give a geological horizon to the Arica shales. The doubt, moreover, of the locality and geological horizon whence *E. Chilensis* really came, further obscures the possible relationship of these *Estheria*.

#### § IX. SZAJNOCHA, 1888.

In the "Verhandl. k. k. Geol. Reichsanstalt Wien," 1888, pp. 146, 147, Dr. L. Szajnocha refers to specimens collected by Dr. Rudolf Zuber in South Argentina and Patagonia, especially plant-remains, such as characterize Triassic or Rhætic strata in Australia, South Africa, Germany, Portugal, and Scania. He notices that at Cacheuta shales with plant-remains and phyllopoda occur, and that the latter were described by Geinitz as *Estheria Mangaliensis*, Jones, in his Memoir (1876) on these and other Rhætic plants and animals.

#### § X. SUMMARY OF THE FOREGOING NOTES.

These result in the determination of four species of *Estheria* found fossil in Peru and Chili, namely—

1. *Estheria Mangaliensis*, Jones, Mangali in Central India, and Mendoza in South America.
2. *E. Forbesii*, Jones, Mendoza, South America.
3. *E. Aricensis*, sp. nov., Arica, South Peru.
4. *E. Chilensis*, Philippi, Lebu (?), Chili; Arica, South Peru.

#### § XI. ESTHERIA MAWSONI, sp. nov., and var.

There is also another South-American *Estheria* preserved in the British Museum (Nat. Hist.), and forming part of Mr. J. Mawson's Collection from Brazil, namely (5) *Estheria Mawsoni*, sp. nov., and (5\*) variety.

#### (5) ESTHERIA MAWSONI, sp. nov.

PLATE XI, Figs. 3a-g.

Carapace obliquely subovate, moderately gibbose. Umbones at the anterior third of the valve. Hinge-line straight from the umbo to the posterior end, and equal to about two-thirds of the length of the valve. Hinder moiety of the carapace smaller than the front part, the posterior curve being more contracted than the antero-ventral curve. Hence the carapace has a triangular subovate side-view.

Concentric ridgelets or lines of growth, numerous: more than thirty, although those on the umbonal area are obsolete or obliterate. These ridges on the upper part, just below the umbones, are strong,

<sup>1</sup> Mém. Com. Géol. (St. Petersburg), vol. vi, 1888, pp. 469 and 556, pl. ii, fig. 26. See also Brit. Assoc. Report for 1889, p. 66.

with rounded and smooth edges, Fig. 3*d*; thinner and smaller lower down on the valve.

The interstitial spaces are broad on the upper or dorsal moiety of the valves, more and more closely set below, as in other adult *Estheria*. The ornament in the broad interspaces consists of small vertical bars, or barrolets, slightly sinuous (Figs. 3*d*, *e*), and occasionally branching and anastomosing to some extent. Towards the free margin, in the narrower intervals, the barrolets become shortened, and merge into a wavy and crenulate pattern (Figs. 3*f*, *g*).

Two carapaces, "L. 304." 1. Long, 7.0 mm.; high, 4.0 mm.; thick, 2.6 mm. 2. Long, 5.7 mm.; high, 3.6 mm.; thick, 3.0 mm. Ovate-oblong, anteriorly short. From shale in a cutting on the Bahia and San Francisco Railroad, 12–13 kilometres from Bahia, on the sea-side, between Periperi and Olaria; together with some small Molluscs—*Anodonta Hartii*, White, *A. Mawsoni*, White, *A.*, sp., and *Arca*, sp. There are also other specimens, more or less flattened and decomposed, in sandy shales and clay from cuttings at Pitanga, Pojuca, and elsewhere.

With regard to the ornamentation of this species, two recent forms, *Estheria donaciformis*, Baird,<sup>1</sup> and *E. similis*, Baird,<sup>2</sup> have a bar-ornament in the interstices, of much the same character as that in Figs. 3*d*–*g*, though not so regularly parallel. The valves, however, do not correspond with ours in shape.

Among fossil forms *E. elliptica*, Dunker, and *E. subquadrata*, Sowerby, are characterized by the ornament of vertical bars between the concentric ridges, much like those of *E. Mawsoni*. The shape, however, of the valves in these Purbeckian forms<sup>3</sup> differs from that of the Brazilian species under notice. There is evidence of a similar ornament in some fragments of *Estheria* from the Triassic or Rhætic coal-shales of Dan River, North Carolina.<sup>4</sup> An analogous pattern is present on the shells of some bivalved Mollusca, as *Corbis*, etc.

(5\*) *ESTHERIA MAWSONI*, sp. nov., variety or female form.

PLATE XI, Figs. 4–6.

Ovate-oblong, umbo near the anterior end, in the front fourth of the dorsal edge; postero-dorsal angle more or less distinct; hinge-line straight between these two points, and equal to more than half the length of the valve. The front and hind margins have a steep curve, and are more equal than in *E. Mawsoni*, Fig. 3*a*. But the posterior moiety of the carapace is rather smaller than the anterior; its edge having a somewhat smaller curve than the broad, almost semicircular, curvature of the front end.

This form differs from *E. Mawsoni* (described above) in being nearly oblong in side-view; the front edge curving steeply below the umbo; and the posterior not being contracted. The difference

<sup>1</sup> Proc. Zool. Soc., Annulosa, 1849, p. 89, pl. xi, fig. 6.

<sup>2</sup> Ibid., 1849, p. 90, pl. xi, fig. 7; and 1860, p. 188.

<sup>3</sup> "Monogr. Foss. *Esth.*," 1862, p. 103, etc., pl. iii, figs. 18–29; and GEOLOGICAL MAGAZINE, 1890, p. 389, Pl. XII, Figs. 1, 2.

<sup>4</sup> "Monogr. Foss. *Esth.*," 1862, p. 189, etc., pl. ii, fig. 37; and GEOLOGICAL MAGAZINE, 1890, p. 387.

of shape may possibly be due to sexual condition, since the ornamentation is quite the same on the two forms.

Approximately similar valves are found in the varieties of *E. minuta* and its allies. This form is somewhat like the carapace of the female *E. Packardii*, as figured by Sars.

Flattened casts of the valves occur in brownish shales and in pink clay in the Pitanga and Pojuca cuttings. A carapace from the cutting between Periperi and Olaria measures: Long 5.0 mm., high 3.5 mm., thick 2.5 mm.

*Estheria Mawsoni* or its variety occurs

At 12-13 kilometres. The cutting between Periperi and Olaria.

At 73-74 kilometres. The Pitanga cutting, between Matta and Pitanga Stations.

At 82 kilometres. At Pojuca Station.

At 84.5 kilometres. At San Thiago (São Jago), about six kilometres from the Pojuca Station.

Fig. 5 shows an internal cast with delicate radiating marks, due to the decomposition of the test and its outer layer.

There seems to be a still more truly oblong variety of this species, Fig. 7.

## § XII. OSTRACODA.

A number of small valves occur in the same soft brownish shale in a cutting at 83 kiloms. between the Station of Pojuca and San Thiago, on the railroad from Bahia, that yields *Estheria Mawsoni*, *Estherina expansa*, and *E. astartoides*. They lie crowded on some of the bed-planes, and are much obscured by the matrix and imbedment.

In Plate XI the most recognizable forms are depicted (Figs. 8-14); but it is difficult to define their characteristics. Figs. 8 and 9 may belong to an oblong form of *Cythere*; so also Fig. 14, but this is small and nearly oval. Figs. 10 and 11 may be subtrigonal *Cythere* or *Cytherideæ*, with the anterior hinge sufficiently strong to influence the outline of the valve. So also Fig. 13, but this valve has on its surface local depressions, which may possibly be indicative of the undulated or constricted valve of a *Metacypris*: see GEOL. MAG. 1886, pp. 145-8, Pl. IV, Figs. 1-3; and *ibid.*, 1893, pp. 385-91, Pl. XV, Figs. 1-3. Fig. 12 may be a *Candona* or a *Cypris*.

The general aspect of the Ostracoda is that of a group of probably brackish-water forms, agreeing therein with the associated Estherian phyllopods. Compare the analogous Brazilian specimens treated of in the Quart. Journ. Geol. Soc., vol. xvi (1860), pp. 266-7, pl. xvi, figs. 13-17.

## § XIII. CONCLUSION.

It is difficult to determine if the groups of fossil Entomostraca above described, represent the brackish-water conditions that obtained in the late Triassic (Rhætic) or the Jurassic and early Cretaceous (Wealden) times. The plant-remains of Mendoza appear to be of Rhætic age. The railway-cuttings in Brazil have not yielded any definite plant-remains; and their fossil shells have

been referred to the Cretaceous system. *Estheriina* is certainly characteristic of the Brazilian shales in Hartt's "Bahian" series; some of its analogues are far back in the Carboniferous system. *Estheria Forbesii* and *E. Mangaliensis* are such as lived in a late Secondary age;<sup>1</sup> *E. Mawsoni* has the ornament characteristic of some species of early Secondary, or rather earlier date.

#### EXPLANATION OF PLATE X.

- FIG. 1.—*Estheria Aricensis*, sp. nov. Left valve, magn. 3 diam.  
 FIG. 2.—The same. Left valve, magn. 3 diam.  
 FIG. 3.—The same. A large specimen, drawn from a hollow mould of a left valve, magn. 3 diam.  
 FIG. 4.—*Estheria Chilensis*, Philippi. Right valve, magn. 3 diam.  
 Figs. 1-4, from Arica, Peru, collected by David Forbes, are in the British Museum.  
 FIG. 5.—*E. Chilensis*, after Philippi. Nat. size.  
 FIG. 6.—*Cyclestheria Hislopi*, after Sars. Magn. 3 diam.  
 FIG. 7.—*Estheria subconcentrica*, after Krotow. Nat. size.

#### EXPLANATION OF PLATE XI.

- FIG. 1.—*Estheria Forbesii*, Jones. *a*, left valve, magn. 3 diam.; *b*, part of the superficial ornament, magn. 75 diam. From Cacheuta, Argentine; collected by D. Forbes, and in the British Museum.  
 FIG. 2.—A group of the same species, after Philippi. Nat. size.  
 FIG. 3.—*Estheria Mawsoni*, sp. nov. *a*, carapace, showing the left valve; *b*, end view; *c*, edge view. *a*, *b*, *c*, magn. 6 diam. *d*, *e*, *f*, *g*, parts of surface, magn. 75 diam.  
 FIG. 4.—The same, variety or ♀. *a*, left valve imperfect, magn. 6 diam.; *b*, part of surface, magn. 75 diam.  
 FIG. 5.—The same, variety or ♀. An internal cast of a left valve, showing radiating lines caused by the decomposition of the test and its minute interstitial barrolets; magn. 6 diam.  
 FIG. 6.—The same, variety or ♀. *a*, carapace showing left valve; *b*, edge view; *c*, end view: all magn. 6 diam.  
 FIG. 7.—The left valve of a variety of *E. Mawsoni*. Shorter and squarer than the other examples, magn. 6 diam.

Figs. 3-7 from the Bahia and San Francisco Railroad, at 12-13, 73-74, 82, and 84.5 kilom. from Bahia.

Figs. 8-14.—Small Ostracoda (possibly *Cythere*, *Cytheridea*, *Cypris*, *Candona*, and *Metacypris*); magn. 40 diam.

## II.—ON A NEW SPECIMEN OF THE STEGOCEPHALAN *CERATERPETON GALVANI*, HUXLEY, FROM THE COAL-MEASURES OF CASTLECOMER, KILKENNY, IRELAND.

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(PLATE XII.)

SINCE the original description of *Ceraterpeton* by Huxley thirty years ago,<sup>2</sup> several specimens have been referred<sup>3</sup> to this interesting Stegocephalan genus, one even to the typical species.

<sup>1</sup> See "Monogr. Foss. *Esth.*," Pal. Soc. 1862, Table, p. 114.

<sup>2</sup> Huxley and Wright, "On a Collection of Fossil Vertebrata from the Jarro Colliery, County of Kilkenny, Ireland": Trans. Roy. Irish Acad., vol. xxiv (1867), p. 354, pl. xix.

<sup>3</sup> E. D. Cope, "Synopsis of the Extinct Batrachia from the Coal-measures [of Ohio]," Rep. Geol. Surv. Ohio, Paleont., vol. ii, pt. 2 (1875), p. 372, pl. xli, fig. 4; pl. xlii, fig. 2. A. Fritsch, "Fauna der Gaskohle," vol. i (1880), pp. 136-46, pls. xxvii-xxx.