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ORIGINAL ARTICLES.

I.—ON SOME FOSSIL OSTRACODA FROM S.-W. WYOMING, AND FROM
UTAH, U.S.A.

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(PLATE XV.)

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§ 1. Introduction.

In 1885 Dr. C. A. White, F.C.G.S., Palæontologist to the U.S. Geological Survey, supplied me with some of the siliceous residue of a limestone belonging to the freshwater Jurassic *Atlantosaurus*-beds in Colorado, from which several casts of small Ostracoda were figured and described in the GEOLOGICAL MAGAZINE,¹ Dec. III. Vol. III. April, 1886, pp. 145–8, Pl. IV. Since that time Dr. White has kindly sent me somewhat similar material, obtained in like manner, by dissolving in dilute acid pieces of an impure limestone, which lies at the base of the Upper Cretaceous Series, from Cokeville, a hamlet in South-Western Wyoming, and belongs to the Bear-River Formation. The Ostracoda selected are figured in Plate XV. Figs. 1–9, 11–13, and 15. These casts represent the whole carapace in many if not all instances.

All the known fossils from the deposit yielding these specimens, Dr. White tells me, are either fresh-water or brackish-water forms (none marine). Of these under notice, however, Figs. 11 and 12 belong to a marine genus. The *Chara*, occurring abundantly with these fossils from S.-W. Wyoming, has been published by

¹ Also noticed in the "Bulletin U.S. Geol. Survey," No. 29, May, 1889.

Mr. F. H. Knowlton (in the "Botanical Gazette," vol. xviii. p. 141, figs. 1-3), as *Chara Stantonii*. It has much of the appearance of some of the *Charæ* found in the Oligocene beds of the Isle of Wight. Various species of *Pyrgulifera*, *Corbula*, *Unio*, *Limnæa*, and *Neritina*, are found as siliceous casts with the *Chara*.

Dr. White has also sent to me a piece of shale containing Ostracoda with their tests preserved, but very fragile; this specimen was from the Montana Formation, near the top of the Upper Cretaceous Series, at Coalville, Utah, about 40 miles from Salt-Lake City. Some examples are illustrated by Figs. 10, 14, and 16, belonging to brackish- or, more probably, fresh-water genera.

UPPER CRETACEOUS SERIES.	Laramie Formation.	
		←Place of the shale from Utah.
	Montana Formation.	
	Colorado Formation.	
	Bear-River Formation.	(Place of the specimens obtained by dissolving the impure limestone from S.-W. Wyoming.
	Dakota Formation.	

Some of the specimens from S.-W. Wyoming, now figured, remind us of those from Colorado, above-mentioned; others are different; but nearly all appear to represent either freshwater or estuarine forms; and are thus in accord with the other known fossils of the Upper Cretaceous beds from which they have come.

The selected specimens are described in their natural order according to the classification of the Ostracoda.

§ 2. Description of the Species.

I. CYPRIS, Müller, 1785.

1. CYPRIS PURBECKENSIS, E. Forbes. Pl. XV. Figs. 15a, 15b.

Quart. Journ. Geol. Soc. vol. xli. 1885, pp. 347-8, pl. 9, figs. 1-6.

Length .5, height .3, thickness .15 mm.

Fig. 15a is referable to *Cypris Purbeckensis*, being like figs. 3-5 of those figured and described in 1885 (*op. cit.*); it is, therefore, evidently equivalent to figs. 5a, b, c, Pl. IV. GEOL. MAG. 1886, p. 147, illustrating the same form from Colorado.

From the Bear-River Formation; Cokeville, S.-W. Wyoming.

II. CYPRIDEA, Bosquet, 1852.

Quart. Journ. Geol. Soc. vol. xli. 1885, p. 336.

2. CYPRIDEA TUBERCULATA (Sowerby, *op. cit.* p. 342), var.

WYOMINGENSIS, nov. Pl. XV. Figs. 5a, b; 6a, b.

Fig. 5. Length .95, height .6, thickness .35 mm.

Fig. 6. ——— 1.05, ——— .6, ——— .4 mm.

This comes very near to *Cypridea tuberculata* (Sow.), var. *adjuncta*, Jones (*op. cit.* p. 342, Pl. VIII. Figs. 22-24), but its antero-dorsal angle (anterior hinge) is stronger, giving a more pronounced slope to the dorsal border; its notch and hood are stronger; its tubercles are not so strong; the valves are not so convex, hence the edge-

view is narrower. Some few individuals (figs. 6a, b, for instance) have a strong dorsal depression just behind the front hinge, and a deformation of the antero-ventral border. This furrow is irregular; but the largest example is figured here. Sometimes the depression consists of two narrow sub-triangular hollows. It is difficult to determine if this be a varietal character, or the result of accident or disease.

The original *Cypridea tuberculata* (Sowerby) is sub-quadrate and relatively shorter and thicker than either var. *adjuncta* or the form under notice. The latter is sufficiently distinct to have a varietal name—*Wyomingensis*

From the Bear-River Formation; Cokeville, S.-W. Wyoming.

III. POTAMOCYPRIS, Brady, 1870.

3. POTAMOCYPRIS AFFINIS, sp. nov. Pl. XV. Figs. 8a, b.

Length .7, height .4, thickness .22 mm.

This is not far distant in shape from *Cytherideis* [?] *Marshii*,¹ Jones; but it is more oblong, being less attenuate posteriorly, and has not so great a lateral convexity.

Some of the fossil Ostracoda formerly referred to *Cytherideis* probably belong to *Potamocypris*; and I think that *C. Marshii* and the specimens now under notice should be regarded as belonging to this genus. I propose to name the present form as *P. affinis*. The species of this genus live in fresh and brackish waters.

From the Bear-River Formation; Cokeville, S.-W. Wyoming.

4. POTAMOCYPRIS UNISULCATA, Jones. Pl. XV. Figs. 10a, b.

Length 1.05, height .65, thickness .45 mm.

The "*Cytherideis*" *unisulcata*, Jones, Monogr. Tert. Entom., Pal. Soc. 1856, p. 48, pl. iv. fig. 10, and Suppl. Monogr. 1889, p. 46, was regarded as a doubtful species; but (its proposed genus, *Cytherideis*, having been revised and limited by G. S. Brady and A. M. Norman, 1889) its right place is in *Potamocypris*. To this *P. unisulcata* the present species aptly coincides. Its transverse furrow is at first sight a differential characteristic; but we find so many genera having species impressed with a more or less distinct transverse furrow² that we cannot remove this form from *Potamocypris* on account of that feature.

P. unisulcata occurs in the green shale of the Osborn Series, Cliff End,³ Isle of Wight, with *Candona Forbesii*, Jones, also *Paludina*, *Melanopsis*, *Melania*, *Lepidosteus* and remains of Alligator.

Fig. 10 is from the Montana Formation; Coalville, Utah.

¹ GEOL. MAG. 1886, p. 147, Pl. IV. Figs. 6a, b, c.

² A more or less perfect furrow marks the valves in some species of *Cypris*, *Limnocythere*, *Cytheridea*, *Cythere*, *Cytheropteron*, *Bythocythere*, *Cytherella*, *Cypridina*. In the foregoing the sulcus is often rare and always irregular; but it holds good, however, more definitely as a generic character in the Palæozoic *Entomis* and *Entomidella*, although partially shown in some contemporary genera, especially *Primitia*.

³ Mem. Geol. Surv., Isle of Wight, 2nd edit., by Reid and Strahan, 1889, p. 150.

IV. CANDONA, Baird, 1845.

5. CANDONA SUBRENIFORMIS, sp. nov. Pl. XV. Fig. 14 a, b.

Length, 1·2, height ·6, thickness ·5 mm.

This approaches the female form of *Candona Kingsleii*, Brady and Robertson (see Trans. R. Dublin Soc. ser. 2, vol. iv. 1889, p. 102, pl. ix. figs. 19, 20), in shape; but it is relatively fuller in the posterior third.

From the Montana Formation; Coalville, Utah.

6. CANDONA SUBOVATA, sp. nov. Pl. XV. Figs. 16a, b.

Length 1·2, height ·65, thickness ·65 mm.

Although subovate, almost subreniform, and with a low front, its lateral aspect is too long and narrow in proportion, and its edge view too thick for *Cypris incongruens*, Ramdohr,¹ nor has it the slight, flattened margin of that form.

So also it is not unlike *Cypris? Cambrica* (female), Brady and Robertson (Ann. Mag. N.H. ser. 4, vol. ix. 1872, p. 55, pl. ii, figs. 3, 4), except that it is fuller at the middle and posterior thirds, and more convex at the sides, so that in the broadly-lanceolate edge view the anterior extremity is not so sharp, and the posterior is quite blunt.

Among the figures of *Candona candida*, male and female, and its varieties, shown in the Trans. R. Dublin Soc. 1889, pl. x. figs. 14–23, figs. 18 and 19 (female) are somewhat like our fig. 16, but rather less plump, not so convex on the back, and too sharp at the ends in the edge view. Figs. 20 and 21, except that they project too much at the postero-ventral region, have a closer resemblance to fig. 16 than the foregoing; and I think it most probable that both fig. 14 and fig. 16 are referable to the same genus (*Candona*), but they differ specifically from any that I know.

From the Montana Formation; Coalville, Utah.

7. METACYPRIS SUBCORDATA, sp. nov. Pl. XV. Figs. 2a, b, c.

Length ·6, height ·35, thickness ·5 mm.

This *Metacypris* approaches the well-known recent *M. cordata*, Brady and Robertson,² especially the female form; but the transverse constriction more strongly impresses the lateral convexity, the dorsal region in each valve is more depressed and sloping, and the ventral region is more deeply excavated. The surface is marked with a shallow, irregular pitting, almost a reticulation.

The specific name, *M. subcordata*, is applicable, in allusion to its recent ally.

From the Bear-River Formation; Cokeville, S.-W. Wyoming.

8. METACYPRIS CONSOBRINA, sp. nov. Pl. XV. Figs. 1a, b, c.

Length ·45, height ·25, thickness ·4 mm.

This is evidently a *Metacypris*, and nearly allied to both *M. Forbesii*,

¹ Magaz. Ges. nat. Freunde zu Berlin, II. Quartal, 1808, p. 86, pl. iii. figs. 19, 20; also Brady, Trans. Linn. Soc. 1868, p. 362, pl. xxiii. figs. 16–22.

² See Trans. R. Dubl. Soc. n.s. vol. iv. 1889, p. 123, pl. xiv. figs. 3–12, for latest notice, by Brady and Norman.

Jones, and *M. Bradyi*, Jones (GEOL. MAG. 1886, Pl. IV. Fig. 1 and Fig. 2); it is, however, smaller, relatively shorter, plumper, and less strongly constricted across the middle than *M. Bradyi*; and smaller, longer (relatively), and more oblong than *M. Forbesii*; its transverse sulcus, also, is quite medial, and not at the anterior third as in the latter. Being thus quite distinct, although related, it may have the new specific name of *M. consobrina*. The surface has a shallow, irregular pitting.

From the Bear-River Formation; Cokeville, S.-W. Wyoming.

9. *METACYPRIS CUNEIFORMIS*, sp. nov. Pl. XV. Figs. 3*a*, *b*, *c*.

Length .65, height .35, thickness .3 mm.

Oblong; compressed anteriorly, convex behind; almost straight on the parallel dorsal and ventral borders, the former compressed and sharp, the latter deeply sunken, giving a sagittate outline to the end view (Fig. 3*c*.) of the carapace, whilst the dorsal view (Fig. 3*b*.) is lanceolata. The ends are rather obliquely, and unequally rounded.

Having much of the appearance of an oblong wedge, this species may be conveniently termed *M. cuneiformis*. The surface does not show any marking.

From the Bear-River Formation; Cokeville, S.-W. Wyoming.

10. *METACYPRIS SIMPLEX*, sp. nov. Pl. XV. Figs. 9*a*, *b*, *c*.

Length .4, height .2, thickness .2 mm.

Suboblong, but broader (higher) at the anterior third than behind, both ends truncate; the front slightly oblique, and the hinder end gently rounded. The valves are convex; edge view, acute oval; end view, broadly cordate (reversed).

This is smaller, less truly oblong, and more uniformly convex than *M. cuneiformis*, and has to be regarded as a distinct species. The surface is faintly reticulate.

From the Bear-River Formation; Cokeville, S.-W. Wyoming.

The known species of *Metacypris* are:—

M. glutea (Egger). Neues Jahrb. etc. 1858, p. 408, pl. i. fig. 6.

M. strangulata,¹ Jones, Q. J. G. S. vol. xvi. 1866, p. 187, fig. 73.

M. cordata, Brady and Robertson, Ann. Mag. Nat. Hist. ser. 4, vol. vi. 1870, p. 20, pl. vi. figs. 1—9; and Trans. R. Dublin Soc. n.s. vol. iv. 1889, p. 123, pl. xiv. figs. 3—12.

M. Forbesii, Jones, and var. *verrucosa*, Jones, Q. J. G. S. vol. xli. 1885, p. 345, pl. viii. figs. 11—13.

M. Bradyi, Jones, GEOL. MAG. 1886, p. 146, Pl. IV. Fig. 2.

M. Whitei, Jones, loc. cit. Fig. 3.

M. Fittoni (Mantell), Jones in Prestwich's "Geology," vol. ii. 1888, p. 263, fig. 137*a*; and GEOL. MAG. 1888, p. 539.

VI. *CY THERE*, Müller, 1785.

11. *CY THERE MONTICULA*, sp. nov. Pl. XV. Figs. 13*a*, *b*.

Length .6, height .35, thickness .6 mm.

Looking for published species showing definite alliance in form to this specimen, *Limnocythere*, a brackish genus presents itself; but there is no real ground for regarding relationship to exist. *Cythere*

¹ *Cypris conculeata*, Jones, Q. J. G. S., vol. xvi. 1866, p. 266, fig. 3, is not a *Metacypris* for certain.

Cluthæ, Brady, Crosskey, and Robertson,¹ which presents variable aspects, with its irregular mammillated surface and subquadrate carapace, is decidedly a nearer ally.

In our specimen the valves are broad (high) in front, narrow and subtruncate behind, the dorsal and ventral borders sloping backwards, and the ventral region bears a definitely sharp ridge (not broad and rounded as in *C. Cluthæ*) for two-thirds of its length. There is also a central tubercle on the valve, with a swelling in front and behind it.

Differing in marked features from the other species, this may be designated *Cytheræ monticula*.

From the Bear-River Formation; Cokeville, S.-W. Wyoming.

VII. CYTHERIDEA, Bosquet.

12. CYTHERIDEA TRUNCATA, sp. nov. Pl. XV. Figs. 4a, b.

Length .7, height .5, thickness .3 mm.

There is no evidence of the Cypridean hook in this form, though it has some resemblance to a possibly truncate form of *Cypridea punctata*² (Forbes); but I prefer to associate it with *Cytheridea*. Its subtriangular shape, with truncate front, and oblique posterior end, are characteristics. Its edge view is narrow-oval.

On the surface is visible a shallow pitting, looking almost like a reticulation.

From the Bear-River Formation; Cokeville, S.-W. Wyoming.

13. CYTHERIDEA TENUIS, sp. nov. Pl. XV. Figs. 7a, b.

Length .6, height .25, thickness .2 mm.

This is another form probably belonging to *Cytheridea*. The cast (like Fig. 4) has not retained (if it ever had) any evidence of the Cypridean beak-like process and its accompanying notch. It has a long subtriangularly ovate shape, like that of many different kinds of Ostracodes. The front is well rounded; the posterior rounded, but narrow; the ventral border is straight; the dorsal elliptical, and most convex at the anterior hinge, as in many of the *Cytheridæ*. The surface shows some slight tuberculation.

From the Bear-River Formation; Cokeville, S.-W. Wyoming.

VIII. CYTHERIDEIS, Jones, 1857; and Brady and Norman, 1889.

14. CYTHERIDEIS ÆQUALIS, sp. nov. Pl. XV. Figs. 11a, b.

Length .6, height .25, thickness .4 mm.

It is difficult (if not impossible) to place this form among fresh-water and brackish Ostracoda. The *Cypridopsis villosa* (Jurine), as defined by Brady, has a narrow and curved carapace, but more arched on the back and thicker in the middle than Fig. 11. The genus *Cytherideis*, of which only marine forms are known, offers a more convenient asylum for this narrow, curved carapace with the ends equally rounded, but with an anterior compression of the valves

¹ Monogr. Post-Tert. Entom., Pal. Soc., and more lately treated of by Brady and Norman in Trans. R. Dublin Soc., n.s., vol. iv. 1889, p. 145, pl. xiv. figs. 25-27; and pl. xviii. figs. 25 and 26.

² Quart Journ. Geol. Soc. vol. xli. 1885, p. 357, pl. viii. figs. 1-8.

(Fig. 11a.), giving a sharp-lanceolate edge view (Fig. 11b.). In this case *Cytherideis gracilis* (Reuss) and *C. botellina* (Jones) are among its nearest allies; but neither of them matches it exactly. I propose to name it *C. æqualis*.

From the Bear-River Formation; Cokeville, S.-W. Wyoming.

15. *CYTHERIDEIS IMPRESSA*, sp. nov. Pl. XV. Figs. 12a, b.
Length .6, height .25, thickness .17 mm.

A narrow and curved carapace of nearly equal thickness throughout except where constricted with a broad and shallow impression in the middle of the ventral region.

From the Bear-River Formation; Cokeville, S.-W. Wyoming.

EXPLANATION OF PLATE XV.

All the figures magnified 20 diameters.

- FIG. 1. *Metacypris consobrina*, sp. nov.; a, carapace, left valve shown; b, edge view; c, end view.
 ,, 2. ——— *subcordata*, sp. nov.; a, left valve shown; b, edge view; c, end view.
 ,, 3. ——— *cuneiformis*, sp. nov.; a, right valve shown; b, edge view; c, end view.
 ,, 4. *Cytheridea truncata*, sp. nov.; a, left valve shown; b, ventral edge.
 ,, 5. *Cypridea tuberculata* (Sow.), var. *Wyomingensis*, nov.; a, right valve shown; b, ventral edge.
 ,, 6. The same; a, left valve shown; b, ventral edge.
 ,, 7. *Cytheridea tenuis*, sp. nov.; a, left valve shown; b, edge view.
 ,, 8. *Potamocypris affinis*, sp. nov.; a, right valve shown; b, ventral edge.
 ,, 9. *Metacypris simplex*, sp. nov.; a, right valve shown; b, edge view; c, end view.
 ,, 10. *Potamocypris unisulcata*, Jones; a, left valve; b, edge view.
 ,, 11. *Cytherideis æqualis*, sp. nov.; a, carapace, left valve shown; b, edge view.
 ,, 12. ——— *impressa*, sp. nov.; a, right valve shown; b, edge view.
 ,, 13. *Cythere monticula*, sp. nov.; a, left valve shown; b, ventral view.
 ,, 14. *Candona subreniformis*, sp. nov.; a, right valve; b, edge view.
 ,, 15. *Cypris Purbeckensis*, E. Forbes; a, carapace, right valve shown; b, edge view.
 ,, 16. *Candona subovata*, sp. nov.; a, right valve shown; b, edge view.

II.—THE EVOLUTION OF THE AMERICAN TAPIR.

By CHARLES EARLE, B.Sc.,
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THE genus *Tapirus* of all the recent Ungulata, is the most continuous in its distribution over the Earth's surface. Wallace, in his great work on the "Geographical distribution of Animals," in referring to extinct Tapirs, remarks: "the singular distribution of the living species is thus explained, since we see that they are an old world group, which only entered the American continent at a comparatively recent epoch." He reaches this conclusion by the fact that at the time his work was written (1876) the only known remains of the Tapiridæ in America were from the Post-Pliocene deposits.

Our knowledge has been greatly increased as regards fossil tapirs in America within the past few years, and the discovery of the genus *Protapirus* of Filhol, by the expedition sent out by the American Museum of Natural History in the Lower Miocene of Western Dakota, has added another very important link in the phylogeny of

E.C. Knight del.

West, Newman imp.

Fossil Ostracoda from S.W. Wyoming and Utah