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XVIII.—*On some Fossils of Wenlock Age from Mulde, near Klinteberg, Gotland.* By FREDERICK CHAPMAN, A.L.S., F.R.M.S.; *with Notes by* Prof. T. RUPERT JONES *and* Dr. F. A. BATHER.

[Plate III.]

SOME few years ago Mr. F. A. Bather, D.Sc., F.G.S., favoured me with a sample of richly fossiliferous clay collected at Mulde brick-works in the island of Gotland; and since it yielded a large number of Ostracoda and other minute fossils, some of them new, the following notes have been written on them. The sample did not happen to contain any of the larger species (Brachiopods, Trilobites, &c.) well known from this locality.

Prof. Gustaf Lindström has already described a large number of fossils from Gotland, and has published a complete list of them (1050 spp.) so far as then known *.

The Ostracoda of Gotland have been specially dealt with

* 'A List of the Fossils of the Upper Silurian Formation of Gotland,' Stockholm, 1885.

by L. Kolmodin *, Prof. T. Rupert Jones †, and J. Kiesow ‡, whilst A. Krause has described many forms from a similar fauna in the Silurian Drift of N. Germany §.

Nevertheless the material we possess appears to come from an unworked locality, and the Ostracoda and some other groups of fossils afford many special points of interest.

The clay obtained from Mulde is on the horizon of bed *c* of Lindström ‖, and the fauna agrees with that author's area no. 3, "das centrale Gebiet" ¶. It agrees with Lindström's statement that it is comparable in age with the Wenlock Shale of this country; it is also partly homotaxial with the Niagara group of North America.

The most abundant fossils are the Ostracoda, Polyzoa, Brachiopoda, and Pteropoda (*Tentaculites*). Besides these there are specimens representing two genera of Foraminifera, some tubicolar Annelids, and a few fragments of Crinoids and Trilobites. The matrix is a soft pale bluish clay, which is as easily washed down as a Tertiary clay, and the fossils contained in it are excellently preserved.

PROTOZOA.

Class RHIZOPODA.

Order FORAMINIFERA.

Family **Astrorhizidæ**.

Subfamily *Rhabdammininæ*.

Hyperammina, Brady [1878].

Hyperammina ramosissima, sp. n. (Pl. III. fig. 1.)

Test adherent, white, finely arenaceous; consisting of a flattened tube, with widely divergent branches, obscurely

* 'Bidrag till kännedomen om Sverges Siluriska Ostracoder' (Upsala, 1869); also, 'Översigt Kongl. Vetensk.-Ak. Förhandlingar,' 1879, no. 9, pp. 133–139, pl. xix.

† 'Notes on some Silurian Ostracoda from Gothland' (Stockholm, 1887); also "On some Silurian Ostracoda from Gothland," Ann. & Mag. Nat. Hist. ser. 6, vol. i. 1888, pp. 395–411, pls. xxi., xxii.

‡ "Ueber Gotländische Beyrichien," Zeitschr. deutsch. geol. Gesellsch. vol. xl. (1888) pp. 1–16, pls. i., ii.

§ Zeitschr. deutsch. geol. Gesellsch. vol. xliii. (1891) pp. 488–521, vol. xliv. (1892) pp. 383–399.

‖ "Ueber die Schichtenfolge des Silur auf der Insel Gotland," Neues Jahrb. 1888, vol. i. pp. 147–164.

¶ *Op. cit.* pp. 154–156.

segmented in a few places. Apertures at the terminations of the branches. Greatest length 2·66 millim.; average width of tube ·23 millim.

This species is somewhat like *Sagenina frondescens* (Brady) in habit of growth, but it has a smoother tube and is without the smoothly finished apertures at the ends of the branches; the latter also are more outspread.

Silurian; Mulde, Gotland. Attached to the interior of a Brachiopod shell.

Family **Lituolidæ**.

Subfamily *Endothyrinæ*.

Stacheia, Brady [1876].

Stacheia amplexa (Vine).

Psammosiphon amplexus, Vine, 1882, Quart. Journ. Geol. Soc. vol. xxxviii. p. 391, pl. xv. fig. 8.
Stacheia amplexa (Vine), Chapman, 1895, Ann. & Mag. Nat. Hist. ser. 6, vol. xvi. p. 323, pl. xii. figs. 6, 7.

Reference has already been made to the discovery of *S. amplexa* in the Silurian clay of Gotland in my paper on the Rhætic Foraminifera of Wedmore*. The Gotland specimens are of a pale grey colour, but in all other respects are like the Carboniferous and Rhætic specimens.

Silurian; Mulde, Gotland. Common.

Stacheia stomatifera, sp. n. (Pl. III. fig. 2.)

Test calcareo-arenaceous; normally attached or resting on one surface, somewhat depressed and lobulated. Apertures slit-like and salient, on the superior face only. Longest diameter of specimen found 5 millim.

Silurian; Mulde, Gotland.

CŒLENTERATA.

Class ACTINOZOA.

Order ZOANTHARIA.

Syringopora, Goldfuss [1829].

Syringopora serpens (Linné). [Young specimens.] (Pl. III. fig. 3.)

Tubipora serpens, Linné, 1767, Syst. Nat. 12th ed. p. 1271.
Syringopora serpens (L.), Edwards & Haime, 1854, Mon. Brit. Foss. Corals, pt. v., Pal. Soc. p. 275, pl. lxv. figs. 2, 2*a*.

* Ann. & Mag. Nat. Hist. vol. xvi. (1895) p. 324.

The specimens from Gotland are small detached corallites of the early stages of *Syringopora*. They are remarkably like *Aulopora* and *Cladochonus* in general appearance; and this bears out Messrs. Edwards and Haime's statement that "young specimens of this coral equally resemble *Aulopora*." It has previously been recorded from Dudley and Benthall Edge in Britain and from Gotland.

Silurian; Mulde, Gotland. Common.

ECHINODERMATA.

Sub-branch PELMATOZOA.

Class CRINOIDEA.

[Some fragments of Crinoids were found in the washings of the Mulde clay, and Mr. Bather has been good enough to write the following note upon them.]

Entrochus, gen. et sp. indet.

A Crinoid stem-fragment of five columnals (Pl. III. fig. 5), total length 5·5 millim., width 1·5 millim.; each with slightly concave sides, marked, however, with faint pustules, tending to concresce into a ridge at half the height of each columnal. Lumen small and apparently circular. Facet (fig. 6) with about twenty-eight radiating ridges, not very marked or regular and not reaching the margin, so that the suture is not crenulate.

Trochitæ, gen. et sp. indet.

A series of six columnals of delicate and beautiful appearance. The body of each is pentagonal in section, about ·8 millim. wide, with small pentagonal lumen, the angles of which alternate with those of the columnal. The facet (fig. 9) shows five marked grooves (or the ridges that engage in those grooves, as the case may be, fig. 8) which pass from the angles of the lumen to the sides of the facet, which they bisect, and to a slight extent render the periphery quinquelobate, reminding one of a Tudor rose. The body of the columnal bears at half its height a thin flange, circular or slightly angular in outline, the angles in the latter case corresponding to those of the body of the columnal; total width 1·75 millim.; breadth of flange ·5 millim. A similar flange is seen in certain Devonian columnals usually assigned to *Rhodocrinus*, but on what evidence I know not.

Trochitæ, gen. et sp. indet.

Four columnals rather higher, apparently with circular body, circular flange, and pentagonal lumen. The facet is in one specimen (fig. 7) divided into a depressed central area and an elevated outer area, the latter divided into about twelve rounded portions (knobs almost) by grooves radiating from the central area. In this, and in all the rest to a less extent, the flange is seen to be composed of concresced tubercles. Total width of this is about 1·2 millim.

Compare flanges of *Gissocrinus verrucosus*, Bather (Crin. Gotland, Svenska Vet.-Akad. Handl. vol. xxv. no. 2, pl. x. figs. 371, 372, 375); but the facet is not similar.

[F. A. B.]

ANNULOSA.

Class ANNELIDA.

Order POLYCHÆTA (Tubicola).

Cornulites, Schlotheim [1820].

Cornulites scalariformis, Vine.

Cornulites scalariformis, Vine, 1882, Quart. Journ. Geol. Soc. vol. xxxviii. p. 379, pl. xv. figs. 1, 9, & 10.

Our specimens are characteristic in general form, but dwarfed, being only half the size of the specimens found in the Wenlock Shales by Vine.

Silurian; Mulde, Gotland. Rare.

Conchicolites, Nicholson [1872].

Conchicolites Nicholsonii, Vine.

Conchicolites Nicholsonii, Vine, 1882, Quart. Journ. Geol. Soc. vol. xxxviii. p. 381, pl. xv. fig. 2.

This species was originally described from the Wenlock Shales of this country, and Vine also found it in material from Gotland.

Our specimen is probably a young tube, since it measures only $\frac{1}{8}$ inch (3·125 millim.) in length.

Silurian; Mulde, Gotland.

Conchicolites tuberculifera, sp. n. (Pl. III. fig. 4.)

Tube calcareous, tapering, slightly curved; averaging 3 millim. in length, diameter of mouth about 1 millim.

Annulations numerous, about six to 1 millim.; they are somewhat irregular and have their edges broken up into numerous closely-set tubercles.

Silurian; Mulde, Gotland.

Ortonia, Nicholson [1872].

Ortonia pseudopunctata, Vine.

Ortonia conica, Nicholson, var. *pseudopunctata*, Vine, 1882, Quart. Journ. Geol. Soc. vol. xxxviii. p. 383, pl. xv. fig. 3.

Tube regularly conical, attenuate, flexuose, adherent by one side; with numerous annulations. The Gotland specimens measure 2 millim. in length. The present species seems to have intermediate characters between *Ortonia minor*, Nicholson, and *Ortonia conica*, Nicholson.

The specimens are adherent to Brachiopod shells. One example has a calcareous layer extending round the distal end of the tube.

Silurian; Mulde, Gotland. Rare.

ARTHROPODA.

Class ENTOMOSTRACA.

Order OSTRACODA.

The natural relationships of many of the genera of Palæozoic Ostracoda are more or less obscure. The following table of the grouping, which has been kindly drawn up by our best authority on the subject, Prof. T. Rupert Jones, F.R.S., to whom I am indebted for many helpful suggestions in writing this section of the paper, will be of the greatest use to students of the fossil forms of Ostracoda.

The genera *Thlipsura* and *Æchmina* and also *Primitiopsis* are placed apart and after the family of the Cytheridæ and before the Cyprididæ. Regarding the two former genera, Prof. Jones remarks:—"Their alliance is not yet clear, and they are in many respects peculiar." He also says regarding *Primitiopsis*:—"Related to the Cytheridæ through the fossil *Cytheridea*, and to the Cyprididæ through the recent *Chlamydotheca*."

OSTRACODA
[limited to genera mentioned in this paper].

Section PODOCOPA.

Family **Leperditiidæ**, Jones.

Subfamily APARCHITINÆ, nov.

1. *Primitia*, Jones & Holl, 1865.

Subfamily BEYRICHIINÆ, nov.

2. *Klædenia*, Jones & Holl, 1886.
3. *Bollia*, Jones & Holl, 1886.
4. *Beyrichia*, M'Coy, 1846.

Family **Cytheridæ**.

5. *Cythere*, Müller, 1785.

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6. *Thlipsura*, Jones & Holl, 1869.
7. *Æchmina*, Jones & Holl, 1869.

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8. *Primitiopsis*, Jones, 1887.

CYPRIDIDA.

Family **Cyprididæ**.

9. *Pontocypris*, G. O. Sars, 1865.

Family **Bairdiidæ**.

10. *Macrocypris*, G. S. Brady, 1867.
11. *Bythocypris*, G. S. Brady, 1880.

Section PLATYCOPA.

Family **Cytherellidæ**.

12. *Cytherella*, Jones & Bosquet, 1848.

T. RUPERT JONES,
Oct. 13th, 1900.

Family **Leperditiidæ**.

Subfamily *APARCHITINÆ*, nov.

PRIMITIA, Jones & Holl [1865].

Primitia valida, Jones & Holl.

Primitia valida, Jones & Holl, 1886, Ann. & Mag. Nat. Hist. ser. 5, vol. xvii. p. 409, pl. xiv. figs. 7 *a–c*; Jones, 1888, Ann. & Mag. Nat. Hist. ser. 6, vol. i. p. 405.

The surface reticulation is well preserved in the Gotland specimens; this feature was also noticed by Prof. Jones in

the examples from Fröjel, and he also records it from Woolhope and Ironbridge.

Silurian; Mulde, Gotland.

Primitia valida, var. *breviata*, Jones & Holl.

Primitia valida, var. *breviata*, Jones & Holl, 1886, Ann. & Mag. Nat. Hist. ser. 5, vol. xvii. p. 410, pl. xiv. figs. 8 *a*, *b*.

Formerly described from the Wenlock Shales.

Silurian; Mulde, Gotland.

Primitia valida, var. *angustata*, Jones & Holl.

Primitia valida, var. *angustata*, Jones & Holl, 1886, Ann. & Mag. Nat. Hist. ser. 5, vol. xvii. p. 410, pl. xiv. figs. 4 *a*, *b*.

This variety was also found in the Wenlock Shales.

Silurian; Mulde, Gotland. Very rare.

Primitia fabulina, Jones & Holl.

Primitia fabulina, Jones & Holl, 1886, Ann. & Mag. Nat. Hist. ser. 5, vol. xvii. p. 408, pl. xiv. figs. 2 *a*, *b*.

Two specimens, rather more elongate than the type figure, were found in the Gotland series. Originally described from the Wenlock series of Dudley Tunnel.

Silurian; Mulde, Gotland.

Primitia elongata, Krause.

Primitia elongata, Krause, 1891, Zeitschr. deutsch. geol. Gesellsch. vol. xliii. p. 494, pl. xxx. figs. 4 *a*, *b*; Krause, 1892, ibid. vol. xliv. p. 386, pl. xxii. fig. 2.

This species has been described from the Silurian Drift-gravel of Mark Brandenburg.

Silurian; Mulde, Gotland. Very rare.

Primitia punctata, Jones.

Primitia punctata, Jones, 1887, Ann. & Mag. Nat. Hist. ser. 5, vol. xix. p. 193, pl. vii. figs. 9 *a*, *b*.

Has been previously recorded from the Wenlock Shales of this country.

Silurian; Mulde, Gotland. Very rare.

Primitia humilis, Jones & Holl.

Primitia humilis, Jones & Holl, 1886, Ann. & Mag. Nat. Hist. ser. 5, vol. xvii. p. 409, pl. xiv. figs. 6 *a*, *b*, 9 *a–c*.

The British specimens were from Woolhope and the shales of the Lower and Upper Wenlock series.
Silurian; Mulde, Gotland. Very rare.

Primitia ornata, Jones & Holl.

Primitia ornata, Jones & Holl, 1886, Ann. & Mag. Nat. Hist. ser. 5, vol. xvii. p. 411, pl. xiv. fig. 5.

This species was described from the Upper Wenlock and Woolhope series. It is a small but striking form, on account of the beautifully reticulated surface.
Silurian; Mulde, Gotland. Common.

Primitia reticristata, Jones.

Primitia reticristata, Jones, 1887, Silur. Ostrac. Gothland, p. 5; id. 1888, Ann. & Mag. Nat. Hist. ser. 6, vol. i. p. 406, pl. xxii. figs. 15 *a–c*.

A common form in the Gotland series and already recorded from Fröjel, in Gotland; also from the Silurian Drift of Mark Brandenburg.
Silurian; Mulde, Gotland. Very common.

Primitia mundula, Jones.

Beyrichia mundula, Jones, 1855, Ann. & Mag. Nat. Hist. ser. 2, vol. xvi. p. 90, pl. v. fig. 23.
Primitia mundula, Jones & Holl, 1865, Ann. & Mag. Nat. Hist. ser. 3, vol. xvi. p. 419; Jones, Krause, 1891, Zeitschr. deutsch. geol. Gesellsch. vol. xliii. p. 495, pl. xxx. figs. 5 *a–c*, 6, 7 *a*, *b*.

This well-known Silurian species is represented in our collection by a fine series of well-preserved specimens.
Silurian; Mulde, Gotland. Common.

Subfamily *Beyrichiinæ*, nov.

Klœdenia, Jones & Holl [1886].

Klœdenia apiculata, Jones.

Klœdenia apiculata, Jones, 1888, Ann. & Mag. Nat. Hist. ser. 6, vol. i. p. 398, pl. xxi. figs. 1–5.

A few typical specimens occur in our washings. The original types came from Slite, in Gotland.
Silurian; Mulde, Gotland.

Klœdenia gotlandica, sp. n. (Pl. III. figs. 12 *a*, *b*.)

Valve seen from the side suboval, elongate; ventral margin elliptically convex; dorsal margin straight, but intruded on

by the middle lobe; posterior angle full and evenly rounded, anterior rounded and narrowed off. Middle of valve with a short, low, transverse, clavate ridge or swelling, which projects a little beyond the dorsal margin. Towards the ends of the valves the sides are swollen, especially near the posterior extremity, and represent incipient lobes. Surface of valves delicately pitted. Edge view of carapace elongate-oval, with rounded ends. Length ·44 millim.; height ·266 millim.

This species is nearly allied to *Beyrichia* (? *Klædenia*) *plagosa*, Jones *, which was obtained from strata of Wenlock age at Beechey Island, Canada. It differs, however, in the position and shape of the central lobe, which in our specimen is more pronounced and projects beyond the margin; and, further, the surface ornamentation in *K. gotlandica* is an even and delicate pitting.

Bollia, Jones & Holl [1886].

Bollia auricularis, Jones.

Bollia auricularis, Jones, 1887, Ann. & Mag. Nat. Hist. ser. 5, vol. xix. p. 408, pl. xiii. figs. 10 *a–c*.

This species is not uncommon in the Gotland washings, and the measurements of the valves agree very closely with those of the originally described specimens from Ironbridge, Severn.

Silurian; Mulde, Gotland.

Beyrichia, M'Coy [1846].

Beyrichia concinna, Jones & Holl.

Beyrichia concinna, Jones & Holl, 1886, Ann. & Mag. Nat. Hist. ser. 5, vol. xvii. p. 356, pl. xii. figs. 22 *a*, *b*.

The Gotland specimens measure about one third more than the specimen figured by Jones and Holl from the Silurian of Dormington, but otherwise they possess the same characteristics.

Silurian; Mulde, Gotland. Common.

Beyrichia muldensis, sp. n. (Pl. III. fig. 10.)

Valve oblong, ventral margin slightly convex, ends nearly equally rounded, and with a marginal raised rim round the ends and the elliptically curved ventral border. Surface of

* Ann. & Mag. Nat. Hist. ser. 3, vol. i. 1858, p. 243, pl. ix. fig. 2.

valve excavated and granulate. The central area is occupied by three transverse narrow lobes or ridges, which are all slightly salient at the dorsal border; the posterior and central lobes are slightly clavate; the anterior is a thin ridge and joining the raised border of the valve at the antero-dorsal angle. Length of carapace ·8 millim.; height ·4 millim.

This is a very neat form, and apparently has not been previously noticed in any of the washings made from the Silurian either of this country or of Gotland. The nearly symmetrical W-like group of the three thin central lobes, scarcely reaching the ventral region and joining on with the anterior marginal rim, is not matched in any published figures. A somewhat near approach to these features, however, is seen in *B. admixta*, Jones & Holl *, from Woolhope, but that form is more stoutly built and its four transverse lobes are thicker and shorter in proportion; their general arrangement is also different.

Silurian; Mulde, Gotland. Frequent.

Beyrichia Jonesii, Boll.

Beyrichia Jonesii, E. Boll, 1856, Zeitschr. deutsch. geol. Gesellsch. vol. viii. p. 322, figs. 1, 2; 1862, Archiv Ver. Fr. Nat. Mecklenburg, 16 Jahr. p. 134, fig. 8; Jones & Holl, 1886, Ann. & Mag. Nat. Hist. ser. 5, vol. xvii. p. 359.

This has already been recorded from the Wenlock Limestone of Eastnor Park. A few typical specimens with faintly granulate surfaces occur in this collection.

Silurian; Mulde, Gotland.

Beyrichia Klædeni, M'Coy, var. *tuberculata*, Salter.

Beyrichia Klædeni, var. *tuberculata*, Salter, 1881, Geol. Mag. dec. ii. vol. viii. pp. 345, 346; Jones & Holl, 1886, Ann. & Mag. Nat. Hist. ser. 5, vol. xvii. pp. 354, 355, pl. xii. figs. 8 *a*, *b*, 9 *a*, *b*.

Most of our specimens can be compared with the subvariety *clausa*, by which Jones and Holl have designated certain small elongated examples from the Wenlock Shales in Vine's collection, and these are possibly young individuals. There is, however, one example of the typical variety in our series.

Silurian; Mulde, Gotland. Rare.

Beyrichia tuberculata (Klœden), var. *lineato-tuberculata*, nov. (Pl. III. fig. 11.)

This is one of the many modifications of *B. tuberculata*

* Ann. & Mag. Nat. Hist. 1886, ser. 5, vol. xvii. p. 359, pl. xii. fig. 5.

(Klœden). Six of such varieties are figured on pl. xxi. Ann. & Mag. Nat. Hist. ser. 6, vol. i. (1888) p. 402, figs. 12–17, from the Silurian of Slite, Gotland. In the present instance the lobes are more distinctly marked with three obliquely transverse furrows; the ventral edge more neatly tubercled, and the two bold curved ventral fringes far more symmetrically arranged. Length 2·5 millim.; height 1·4 millim.

Silurian; Mulde, Gotland. Frequent.

Beyrichia Bolliana umbonata, Reuter.

Beyrichia Bolliana umbonata, Reuter, 1885, Zeitschr. deutsch. geol. Gesellsch. vol. xxxvii. p. 646, pl. xxvi. fig. 21; Jones, 1888, Ann. & Mag. Nat. Hist. ser. 6, vol. i. p. 401, pl. xxi. figs. 10, 11.

This species has been recorded from Fröjel. Two specimens were found at Mulde and are variable in size; their lengths measure 1·3 millim. and 2·3 millim. respectively.

Silurian; Mulde, Gotland.

Beyrichia clavata, Kolmodin.

Beyrichia clavata, Kolmodin, 1869, Bidrag till Kännedomen om Sverges Siluriska Ostracoden, p. 18, fig. 10; Jones, 1887, Silur. Ostrac. Gothland, p. 2; Jones, 1888, Ann. & Mag. Nat. Hist. ser. 6, vol. i. p. 399, pl. xxi. figs. 6–9.

The washings from Mulde have yielded a very large number of this species, a fair proportion of them having the hypertrophied lobe common to this type of *Beyrichia*. Prof. Jones records *B. clavata* from Eksta and Fröjel in Gotland.

Silurian; Mulde, Gotland. Very abundant.

Family **Cytheridæ**.

Cythere, Müller [1785].

? *Cythere Vinei*, Jones.

? *Cythere Vinei*, Jones, 1887, Ann. & Mag. Nat. Hist. ser. 5, vol. xix. p. 191, pl. vii. figs. 1 *a*, *b*, & 5 *a*, *b*.

A specimen similar in every respect to those found in the Wenlock Shales of Shropshire was met with in the Gotland series. The generic relationship of this and the following is very doubtful.

Silurian; Mulde, Gotland.

? *Cythere subquadrata*, Jones.

? *Cythere subquadrata*, Jones, 1887, Ann. & Mag. Nat. Hist. ser. 5, vol. xix. p. 191, pl. vii. figs. 6 *a*, *b*, & 14 *a*, *b*.

This species is represented from Gotland only by a single valve. It has been recorded from the Wenlock Series of Shropshire.

Silurian; Mulde, Gotland.

THLIPSURA, Jones & Holl [1869].

Thlipsura plicata, var. *unipunctata*, Jones.

Thlipsura plicata, var. *unipunctata*, Jones, 1887, Ann. & Mag. Nat. Hist. ser. 5, vol. xix. p. 403, pl. xii. figs. 11 & 12.

A single example of this variety was found at Mulde.

Silurian; Mulde, Gotland.

Thlipsura v-scripta, Jones & Holl, var. *discreta*, Jones.

Thlipsura v-scripta, J. & H., var. *discreta*, Jones, 1887, Silur. Ostrac. Gothland, p. 6; Jones, 1888, Ann. & Mag. Nat. Hist. ser. 6, vol. i. p. 404, pl. xxii. figs. 9 *a–c*, 10.

Good typical specimens occur in our washings from Mulde.

Silurian; Mulde, Gotland. Very common.

ÆCHMINA, Jones & Holl [1869].

Æchmina bovina, Jones.

Æchmina bovina, Jones, 1887, Ann. & Mag. Nat. Hist. ser. 5, vol. xix. p. 412, pl. xiii. fig. 6; Jones, 1888, Ann. & Mag. Nat. Hist. ser. 6, vol. i. p. 409, pl. xxii. fig. 8.

Five very perfect specimens, showing the delicate toothed margin, were found in our material. It has occurred before in the Wenlock Shales of this country and also at Fröjel in Gotland.

Silurian; Mulde, Gotland.

Æchmina bovina, Jones, var. *punctata*, Krause.

Æchmina bovina, Jones, var. *punctata*, Krause, 1892, Zeitschr. deutsch. geol. Gesellsch. vol. xliv. p. 397, pl. xxii. fig. 18.

An example of this beautiful little variety occurred at Mulde. The spike in our specimen is rather longer than that shown in Krause's figure. Krause records this variety from the "Graptolithen-Gestein" in the Silurian Drift of Mark Brandenburg in N. Germany.

Silurian; Mulde, Gotland.

PRIMITIOPSIS, Jones [1887].

Primitiopsis planifrons, Jones.

Primitiopsis planifrons, Jones, 1887, Silur. Ostrac. Gothland, p. 5, woodcuts; Jones, 1888, Ann. & Mag. Nat. Hist. ser. 6, vol. i. p. 406, pl. xxii. figs. 1 *a–d*.

Somewhat like a long *Primitia* with the reticulate ornament of *P. ornata*. The anterior border, however, is more pronounced, and the front part of the interior is partitioned off by a thin cross-wall.

Silurian; Mulde, Gotland. Frequent.

CYPRIDIDA.

Family **Cyprididæ**.

PONTOCYPRIS, G. O. Sars [1865].

Pontocypris Mawii, Jones.

Pontocypris Mawii, Jones, 1887, Ann. & Mag. Nat. Hist. ser. 5, vol. xix. p. 182, pl. iv. figs. 4 & 7; Krause, 1891, Zeitschr. deutsch. geol. Gesellsch. p. 512, pl. xxxiii. figs. 8 *a*, *b*.

Our specimens are exactly comparable with those figured by Prof. Rupert Jones from Fröjel in Gotland.

Silurian; Mulde, Gotland. Rare.

Pontocypris Mawii, var. *proxima*, Jones.

Pontocypris Mawii, var. *proxima*, Jones, 1889, Ann. & Mag. Nat. Hist. ser. 6, vol. iv. p. 269, pl. xv. figs. 5 *a*, *b*.

A specimen occurs in our series which closely resembles the variety *proxima*. Prof. Jones records it from Wisby in Gotland.

Silurian; Mulde, Gotland.

Family **Bairdiidæ**.

MACROCYPRIS, G. S. Brady [1867].

Macrocypris siliquoides, Jones.

Macrocypris siliquoides, Jones, 1887, Ann. & Mag. Nat. Hist. ser. 5, vol. xix. p. 181, pl. v. figs. 9 *a–c*.

This species is rare at Mulde. It has been recorded from the Wenlock Shales.

Silurian; Mulde, Gotland.

Bythocypris, G. S. Brady [1880].

Bythocypris symmetrica, Jones.

Bythocypris symmetrica, Jones, 1887, Ann. & Mag. Nat. Hist. ser. 5, vol. xix. p. 186, pl. vii. figs. 3, 4, 7.

The Gotland specimens are rather variable in size, but in outline they are quite characteristic.

This species is already known from the Wenlock Series of Shropshire and from bed *c*, Fröjel, Gotland.

Silurian; Mulde, Gotland. Common.

Bythocypris symmetrica, var. *obesa*, Jones.

Bythocypris symmetrica, var. *obesa*, Jones, 1889, Ann. & Mag. Nat. Hist. ser. 6, vol. iv. p. 270, pl. xv. figs. 7 *a–c*.

This variety was originally obtained from the red clay, bed *a*, of Northern Gotland (of Llandovery age).

Silurian; Mulde, Gotland. Very common.

Bythocypris phaseolus, Jones.

Bythocypris phaseolus, Jones, 1887, Ann. & Mag. Nat. Hist. ser. 5, vol. xix. p. 189, pl. vii. figs. 11 & 12.

This species is new to the Gotland fauna. It was described from a specimen out of the Wenlock Shales of Buildwas, Shropshire.

Silurian; Mulde, Gotland. Very rare.

Bythocypris Hollii, Jones.

Bythocypris Hollii, Jones, 1887, Ann. & Mag. Nat. Hist. ser. 5, vol. xix. p. 184, pl. v. figs. 1 *a*, *b*, pl. vi. figs. 3 *a*, *b*, & 4 *a*, *b*.

This is a common and very striking form in the Gotland series. Prof. Jones records it from Fröjel and also from the Wenlock Shales of Shropshire.

Silurian; Mulde, Gotland.

Bythocypris Hollii, var. *oblonga*, Jones.

Bythocypris Hollii, var. *oblonga*, Jones, 1889, Ann. & Mag. Nat. Hist. ser. 6, vol. iv. p. 270, pl. xv. figs. 1 *a–c*.

This variety differs from the type in its greater proportionate length. It was formerly known from the red clay, bed *a*, of Northern Gotland.

Silurian; Mulde, Gotland. Frequent.

Family **Cytherellidæ**.

CYTHERELLA, Jones & Bosquet [1849].

Cytherella Smithii, Jones.

Cytherella Smithii, Jones, 1887, Ann. & Mag. Nat. Hist. ser. 5, vol. xix. p. 192, pl. vii. figs. 15 *a*, *b*, & 16 *a*, *b*.

This neat little species is common at Mulde, and they appear to be favourably grown as regards size. It was originally described from Woolhope.

Silurian ; Mulde, Gotland.

Order TRILOBITA.

Phacops (*Dalmanites*) *limulurus*, Hall.

Several specimens of young individuals of the above species, but more or less fragmentary, were found in the Mulde clay washings. Fragments of the pygidium with the spine attached were occasionally found.

MOLLUSCOIDEA.

Class BRYOZOA.

Order GYMNOLÆMATA.

Suborder CYCLOSTOMATA.

? *Spiropora intermedia*, Vine. Rare.

Fistulipora, sp. Rare.

Suborder TREPOSTOMATA.

Callopora florida, Hall. Rare.

Trematopora solida, Hall. Very rare.

Cladopora repens (Linné). Very common.

—— *sparsa* (Hall). Very rare.

Suborder CRYPTOSTOMATA.

Ptilodictya lanceolata (Goldfuss). Rare.

Rhombopora lineinodis, Ulrich. Common.

Class BRACHIOPODA.

Order INARTICULATA.

Pholidops implicata (Sowerby). Very abundant.

Order ARTICULATA.

Spirifer elevatus, Dalman. Very rare.
Dayia navicula (Sow.). Common.
Retzia Salteri, var. *Bouchardi*, Davidson. Very rare.
Atrypa imbricata, Sow. Rare.
Rhynchotreta cuneata (Dalman). Frequent.
Orthis (*Dalmanella*) *canaliculata*, Lindström. Common.

MOLLUSCA.

Class GASTROPODA.

Order PTEROPODA (THECOSOMATA).

Tentaculites elongatus, Hall. Frequent.
—— *tenuis*, Sowerby. Rare.
—— *wenlockianus*, Vine. Very common.
—— *ornatus*, Sow. Common.
—— *multiannulatus*, Vine. Frequent.

Comparative Table of Species occurring at Mulde.

	Previously recorded from Gotland by Lindström, Jones, &c.	England (Wenlock Group).	America (Niagara Group).	Silurian (Drift), N. Germany.	Notes.
FORAMINIFERA.					
1. Hyperammina ramosissima, sp. n.					
2. Stacheia amplexa (*Vine*)	..	*	..	..	Occurs also in the Rhætic of Somerset.
3. —— stomatifera, sp. n.					

	Previously recorded from Gotland by Lindström, Jones, &c.	England (Wenlock Group).	America (Niagara Group).	Silurian (Drift), N. Germany.	Notes.
ZOANTHARIA.					
4. Syringopora serpens (*Linné*)	*	*			
Crinoid fragments indet.					
POLYCHÆTA.					
5. Cornulites scalariformis, *Vine*	..	*			
6. Conchicolites Nicholsoni, *Vine*	*	*			
7. —— tuberculifera, sp. n.					
8. Ortonia pseudopunctata, *Vine*	..	*			
OSTRACODA.					
9. Primitia valida, *Jones & Holl*	*	*	..	*	
10. —— ——, var. breviata, *J. & H.* ..	..	*			
11. —— ——, var. angustata, *J. & H.* ..	..	*			
12. —— fabulina, *J. & H.*	..	*			
13. —— elongata, *Krause*	..	..	..	*	
14. —— punctata, *Jones*.....	..	*			
15. —— humilis, *J. & H.*	..	*			
16. —— ornata, *J. & H.*	..	*			
17. —— reticristata, *Jones*	*	..	..	*	
18. —— mundula, *Jones*	..	*	..	*	Small specimens in the Wenlock series near Malvern. Also from Scandinavia.—T. R. J.
19. Klœdenia apiculata, *Jones*	*				
20. —— gotlandica, sp. n.					
21. Bollia auricularis, *Jones*	..	*			
22. Beyrichia concinna, *J. & H.*	..	*			
23. —— muldensis, sp. n.					
24. —— Jonesii, *Boll*.....	*	*	..	*	
25. —— Klœdeni, *M'Coy*, var. tuberculata, *Salter*.....	*	*			
26. —— tuberculata (*Klœden*), var. lineato-tuberculata, nov.					
27. —— Bolliana umbonata, *Reuter* ..	*	..	..	*	
28. —— clavata, *Kolmodin*.....	*	*	..	*	
29. ? Cythere Vinei, *Jones*	..	*			
30. ? —— subquadrata, *Jones*.....	..	*			
31. Thlipsura plicata, var. unipunctata, *Jones*	..	*			
32. —— v-scripta, *J. & H.*, var. discreta, *Jones*	*	..	..	*	

	Previously recorded from Gotland by Lindström, Jones, &c.	England (Wenlock Group).	America (Niagara Group).	Silurian (Drift), N. Germany.	Notes.
33. Æchmina bovina, *Jones*	*	*			
34. —— ——, *J.*, var. punctata, *Krause*	..	..	..	*	
35. Primitiopsis planifrons, *Jones*	*				
36. Pontocypris Mawii, *Jones*	*	*	..	*	
37. —— ——, var. proxima, *Jones*	*	..	..	*	
38. Macrocypris siliquoides, *Jones*	..	*			
39. Bythocypris symmetrica, *Jones*	*	*	..	*	
40. —— ——, var. obesa, *Jones*	*				
41. —— phaseolus, *Jones*	..	*			
42. —— Hollii, *Jones*	*	*	..	*	
43. —— ——, var. oblonga, *Jones*	*				
44. Cytherella Smithii, *Jones*	..	*			
TRILOBITA.					
45. Phacops (Dalmanites) limulurus, *Hall*	..	..	*		
BRYOZOA.					
46. ? Spiropora intermedia, *Vine*	..	*			
47. Fistulipora, sp.					
48. Callopora florida, *Hall*	..	..	*		
49. Trematopora solida, *Hall*	*	..	*		
50. Cladopora repens (*Linné*)	*	*			
51. —— sparsa (*Hall*)	*	..	*		
52. Ptilodictya lanceolata (*Goldf.*)	*	*			
53. Rhombopora lineinodis, *Ulrich*	..	..	..	..	Upper Helderberg Series, Ohio Falls.
BRACHIOPODA.					
54. Pholidops implicata (*Sow.*)	*	*			
55. Spirifer elevatus, *Dalman*	*	*			
56. Dayia navicula (*Sow.*)	*	*			
57. Retzia Salteri, var. Bouchardi, *Davidson*	*	*			
58. Atrypa imbricata, *Sow.*	*	*			
59. Rhynchotreta cuneata (*Dalman*)	*	*	*		
60. Orthis (Dalmanella) canaliculata, *Lindström*	*	..	..	..	Also occurs in the Aymestry Limestone near Wolverhampton.
PTEROPODA.					
61. Tentaculites elongatus, *Hall*	..	..	..	..	Occurs in the L. Helderberg Group of N. Amer.
62. —— tenuis, *Sow.*	..	*			
63. —— wenlockianus, *Vine*	..	*			
64. —— ornatus, *Sow.*	..	*			
65. —— multiannulatus, *Vine*	..	*			

The type specimens have been placed in the British Museum (Natural History).

EXPLANATION OF PLATE III.

Fig. 1. *Hyperammina ramosissima*, sp. n. × 15 diam.
Fig. 2. *Stacheia stomatifera*, sp. n. × 10 diam.
Fig. 3. *Syringopora serpens* (Linné). Young specimen. × 15 diam.
Fig. 4. *Conchicolites tuberculifera*, sp. n. × 12 diam.
Fig. 5. *Entrochus*, gen. et sp. indet.; from side. × 8 diam.
Fig. 6. The same form, upper end, showing joint-surface. × 8 diam.
Fig. 7. *Trochita*, gen. et sp. indet.; joint-surface. × 20 diam.
Figs. 8, 9. *Trochitæ*, gen. et sp. indet.; another form. Articular surfaces, with ridges on fig. 8, and grooves on fig. 9. × 20 diam.
Fig. 10. *Beyrichia muldensis*, sp. n. × 45 diam.
Fig. 11. *Beyrichia tuberculata* (Klœden), var. *lineato-tuberculata*, var. nov. × 30 diam.
Fig. 12. *Klœdenia gotlandica*, sp. n. *a*, right valve, side view; *b*, edge view.

XIX.—*On the Squirrels of the* Sciurus erythræus *Group.*

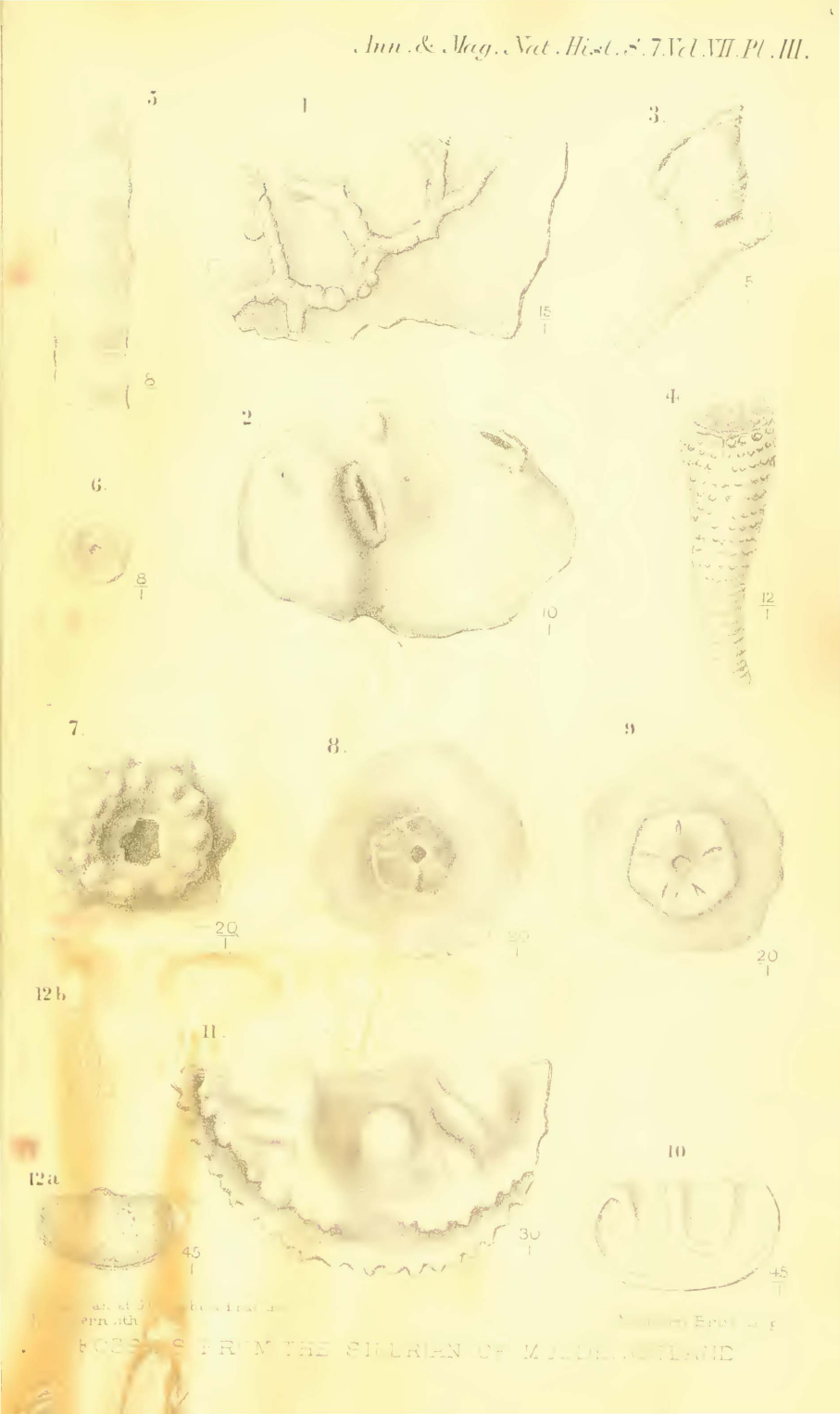
By J. L. Bonhote.

The squirrels of this group, though showing a considerable amount of variation and forming races which closely resemble each other, fall naturally into distinct groups, each group being restricted to its own locality.

The following remarks are based on the study of a very fair series at the National Museum, but several other species have been included, which are not there represented, to show what seems to be their proper relation to the group as a whole. I have been unable to make much mention of the skulls, chiefly because the series of Indian skulls is rather deficient, and, as the skulls of these allied forms differ so slightly from each other, it is impossible to draw any deductions without a large series.

Five distinct species may be distinguished in this group, as well as several geographical races :—

(i.) *Sciurus erythræus*, Pallas, from Assam, spreading through Bhutan, the Cachar Hills, and Manipur to Burma.
(ii.) *Sciurus castaneoventris*, Gray, from China, its range being from Ningpo to Burma, and possibly Assam.
(iii.) *Sciurus Styani*, Thos., between Ningpo and Shanghai.
(iv.) *Sciurus thaiwanensis*, sp. n., from Formosa.
(v.) *Sciurus melanogaster*, Thos., from Si-oban, Sipora.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