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XXI

THE GASTROPODA AND LAMELLIBRANCHIA OF THE GREEN AMMONITE BEDS OF DORSET

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Read March 25th, 1936

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I. INTRODUCTION

MOST of the mollusca here described have been collected during the past 30 years by Dr. W. D. Lang. Older material in the British Museum collection shows that the Green Ammonite Beds had also occupied the attention of such collectors as the Rev. P. B. Brodie, R. F. Tomes, and (especially) T. J. Slatter, but the exact horizons of their specimens are unrecorded. Of previous published records of non-cephalopod mollusca from these beds, reference need only be made to R. Tate's description (1870A, p. 404) of four small gastropod species, *Straparolus wrightianus*, *S. bellulus*, *S. aratus*, and *Littorina biornata*, obtained by H. B. Brady in washing material collected by T. Wright for foraminifera,[1] and to a short list

[1] Tate states that these forms came from the Jamesoni Zone of Charmouth, but there is no doubt that they came from an horizon in the Green Ammonite Beds a few feet above the Belemnite Stone.

published by E. C. H. Day (1863, p. 291), which includes the two forms *Chemnitzia carrucensis* [*sic*] d'Orbigny and *Pterocera liasina* d'Orbigny. The first of Day's records (*Chemnitzia carusensis* d'Orbigny) may or may not be correct; the species is not in the material examined by me. His record of *P. liasina* is meaningless, as this form has been ignored by French authors since its original, and totally inadequate, description in d'Orbigny's *Prodrome*, and the type is no longer extant.[1]

The most notable feature of the non-cephalopod molluscan fauna of these beds is the abundance of small gastropods, particularly a few feet above the Belemnite Stone, and of Taxodont lamellibranchs belonging to the genera *Nucula*, *Nuculana*, and *Parallelodon*.

Most of the lamellibranchs and some of the gastropods are long-ranging forms. A few of the gastropods probably have a more restricted range, but the reappearance in bed 126a of *Buvignieria biornata* (Tate), so abundant in bed 123, shows that little reliance can be placed on species of this class for purposes of exact correlation. The most characteristic gastropods are two small discoidal species belonging to the genus *Cœlodiscus*; these range throughout the Green Ammonite Beds, but are most abundant a few feet from the base. It is noteworthy that a related species, *C. minutus* (Schübler MS., Zieten), occurs in similar abundance in the Upper Lias of Yorkshire, Germany, and elsewhere.

Except for *Inoceramus*, which is not uncommon towards the base of the Green Ammonite Beds, lamellibranchs of families other than those already mentioned and the Pectinidæ are rare. The Pectinidæ are mostly small forms and are frequently indeterminate owing to incrustation. The species *Oxytoma inequivalve* (J. Sowerby), so abundant at lower horizons of the Dorset Lias, occurs but rarely, and *Ostrea* and *Gryphæa* appear to be completely absent. The most interesting lamellibranch species collected by Dr. Lang is referable to a new genus, *Anningia*, as yet, unfortunately, incompletely known. The facies differs appreciably from that of contemporaneous beds at various localities in Gloucestershire, Northamptonshire, and Lincolnshire, where the lamellibranch fauna consists mainly of larger forms.[2] It may be suggested that the Dorset beds were deposited under deeper-water conditions.

Several species in addition to those described below are represented in the material studied, but the specimens are too imperfect for description or definite determination. A few

[1] See A. Thevenin, *Annales de Paléontologie*, iii, 1908, p. 38.

[2] For example, *Modiolus scalprum* (J. Sowerby), *Chlamys* (*Æquipecten*) *acuticosta* (Lamarck), *Pholadomya ambigua* (J. Sowerby), *Pleuromya costata* (Young and Bird), *Goniomya hybrida* (Münster), *Mactromya cardioides* (Phillips), and *Hippopodium ponderosum* J. Sowerby.

such forms are included, under provisional determinations, in the lists accompanying Dr. Lang's paper. I must acknowledge the kind assistance of Mr. C. P. Chatwin in giving me facilities to examine Tate's types and other Liassic mollusca in the Geological Survey Museum, and am also indebted to Mr. L. Richardson for information regarding the Cheltenham Lias.

II. GASTROPODA

Family Pleurotomariidæ

Genus **Ptychomphalus** J. L. R. Agassiz, 1839

Ptychomphalus expansus (J. Sowerby)

Ptychomphalus expansus (J. Sowerby), Cox, 1928, p. 236.

Material.—One specimen.
Horizon and Locality.—126, Stonebarrow.

Family Euomphalidæ

Genus **Cœlodiscus** Brösamlen, 1909

Cœlodiscus wrightianus (Tate)

Straparolus wrightianus Tate, 1870A, p. 404, pl. xxvi, figs. 23 *a–c*.
Straparolus bellulus Tate, 1870A, p. 404, pl. xxvi, figs. 22 *a–c*.

Material.—Numerous specimens.
Horizons and Localities.—122, 122g–123m, Black Ven; 123r, Broom Cliff; 125b, Broom Cliff; 128i, 129c, Stonebarrow.
Remarks.—It is doubtful if this form is specifically distinct from *C. minutus* (Schübler MS., Zieten), of the Upper Lias of Germany and Yorkshire, and I have retained Tate's name mainly because of the difference in horizon. *Cœlodiscus minutus*, as interpreted by German authors (compare Brösamlen, 1909, p. 203, pl. xvii, figs. 9–11), is highly variable in shape, some specimens being naticoid, with an exserted spire, while others, including the original type figured by Zieten (1832, p. 45, pl. xxxiii, fig. 6),[1] are discoidal, with a concave upper surface. In *C. wrightianus*, however, the upper surface is more depressed, on the average, than in the Upper Liassic form, and I have seen no specimens with an exserted spire. Tate's statement that the Dorset species has fewer whorls than *C. minutus* cannot be accepted, the number being approximately the same at the same stage of growth; the largest specimens of *C. wrightianus* are about 5 mm. in diameter and have six or seven whorls. In both forms, moreover, the axis of the

[1] A specimen in the British Museum of Natural History, registered no. 62852, purchased from Dr. Bruckmann and labelled by him "from Zieten's Collection", may be Zieten's actual type (compare G. C. Crick, *Geol. Mag.* 1900, p. 561).

nuclear whorl is considerably deviated with respect to the axis of the rest of the shell. The presence of faint spiral threads in the form described as *Straparolus bellulus* does not justify its specific separation from *C. wrightianus*. Both in *C. minutus* and *C. aratus* (described below) such threads are present in some specimens and absent in others.

Tate (1876, p. 341) records *S. bellulus* from the Margaritatus Zone of Yorkshire; Beesley (1872, p. 14) records *S. wrightianus* from the Capricornus Zone of Banbury.

Cœlodiscus aratus (Tate). Pl. XXXIV, figs. 1a, b, 2a, b

Straparolus aratus Tate, 1870A, p. 404, pl. xxvi, figs. 21 *a–c*.
Discohelix aratus Tate, 1876, p. 340, pl. ix, figs. 5, 5*a*.
Cœlodiscus aratus Brösamlen, 1909, p. 203, pl. xvii, figs. 7*a–d*, 8*a–c*.
Cœlodiscus aratus Cossmann, 1916B, p. 149, fig. 33.

Material.—Numerous specimens.
Horizons and Localities.—*c.* 122, Whitchurch School; 122f, Golden Cap; 122g–123m, Black Ven; 123r, Broom Cliff; 125b, Broom Cliff, Golden Cap; 126, Westhay Water; 129b, 129c, Stonebarrow; 131a, Golden Cap; 132c, Stonebarrow.
Remarks.—The upper surface of the shell is impressed in the majority of specimens, but is occasionally almost flat; the spire is never exserted, as in a German specimen figured by Brösamlen. There is some variation in the proportionate height of the shell and in the rate of increase in whorl-diameter. The earliest whorls are smooth, axial ribbing appearing on about the third whorl. The ribs are much finer and more numerous in some specimens than in others, while there is also considerable variation in their obliqueness and curvature. I find it impossible, however, to refer the specimens to more than one species, the coarseness of the ribbing often changing on successive whorls of the same specimen. The specimen originally figured by Tate was immature, full-grown ones attaining a diameter of 6 or 7 mm.
Beesley (1872, p. 14) records this species from the Capricornus Zone of Banbury; Tate (1876, loc. cit.) from the Margaritatus Zone of Yorkshire; and Brösamlen (loc. cit.) from the Lias δ (Middle Lias) of Germany.

Family Rissoinidæ

Genus **Buvignieria** Cossmann, 1921

Buvignieria carixensis sp.nov. Pl. XXXIV, figs. 3a, b, 4

Diagnosis.—Shell minute, high-turbinate, consisting of a small papilliform protoconch of two whorls succeeded by three or four strongly convex whorls, the last of which occupies slightly less than two-thirds of the total height. The first two or three post-nuclear whorls bear two spiral carinæ which

produce well-marked angulations in the profile, but on the last whorl, or in some specimens rather earlier, these carinæ fade away and are replaced by narrow, straight, or slightly flexuous axial costæ, numbering about six to the half-whorl; the costæ usually extend on to the base of the shell and are crossed, just below the periphery, by two spiral threads. Aperture ovate, sub-angular posteriorly; inner lip sub-vertical, meeting the anterior margin of the aperture, which projects prominently, in a somewhat ill-defined, slightly obtuse angle; labrum sinuous, retrocurrent in its general direction, possibly thickened externally; parietal callus thin or absent, but, if present, definitely margined.

Dimensions.—The height of the shell is about 1·5 mm.

Material.—The holotype (G 26515, figs. 3a, b) and numerous paratypes.

Horizon and Locality.—123a–m, Black Ven.

Remarks.—This minute shell might, from its general appearance, belong either to the Rissoidæ or to the Rissoinidæ. Cossmann (1921, pp. 3, 63) points out than an essential difference between these families lies in the inclination of the labrum, which is "antecurrent" in the former family and retrocurrent in the latter. Its labral characters would thus associate the species now described with the Rissoinidæ. All the Jurassic Rissoinidæ mentioned by Cossmann (1921, pp. 64–6) are referred by him to his genus *Buvignieria*, the main apertural character of which is that the vertical, untwisted columellar lip has no notch at its base, but makes a more or less definite angle with the anterior margin of the aperture. This is a feature of the aperture of the species now described, which may therefore be tentatively referred to *Buvignieria*. The labrum is not preserved intact in any of the specimens examined, but was probably somewhat thickened externally in the adult shell, corresponding to the flexuous axial costæ of the last whorl. The thickening, as well as the parietal callosity, appears, however, to have been less developed than in the typical species of *Buvignieria*.

Buvignieria biornata (Tate)

Littorina biornata Tate, 1870A, p. 404, pl. xxvi, fig. 17.

Material.—Numerous specimens.

Horizons and Localities.—123a–m, Black Ven; 126a, Stonebarrow.

Remarks.—Specimens from the lower horizon are usually partly coated with encrusting matter, while the aperture is seldom preserved intact. Those from bed 126a occur on the surface of a limestone block and are better preserved, but only a few are full-grown. This species resembles the species last described in the replacement of the purely spiral ornamentation

of its early whorls by axial costæ on the later ones, as described by Tate. Its apertural characters conform more or less to those of Cossmann's genus *Buvignieria*. The columella is vertical and joins the anterior margin of the aperture, which projects strongly, in a fairly well-defined angle. The labrum, which is thickened externally, is retrocurrent in its general direction, although near the suture it may curve round so as to be perpendicular or slightly procurrent ("antecurrent"). The parietal wall has a thick and distinctly margined callosity.

It should be remarked that specimens which I refer to this species were examined by Miss A. I. McDonald and Professor A. E. Trueman (1921, p. 329) and were regarded by them as belonging to a species of *Zygopleura* closely related to their *Z. capricornu*.[1]

Family Procerithiidæ

Genus **Procerithium** Cossmann, 1902

Procerithium langi sp.nov. Pl. XXXIV, figs. 5a, b

Diagnosis.—Shell small, short and stout, slightly pupoidal. Protoconch papilliform, consisting of about two smooth whorls; later whorls five or six, feebly convex, with well-impressed sutures, and ornamented with three rows of small tubercles which have also a slightly procurrent axial alinement. A fourth row of tubercles appears on the last whorl beyond the aperture, and the base bears four or five strong concentric ribs. Aperture sub-orbicular, but with a small, beak-like anterior canal; columellar lip vertical, with a reflected margin; parietal callus thick, distinctly margined, and partly detached from the penultimate whorl.

Dimensions.—Holotype: height 3·9 mm., diameter 2·3 mm.

Material.—The holotype (G28437, figs. 5a, b) and three paratypes in the Slatter collection. Numerous paratypes in Dr. Lang's collection.

Horizons and Localities.—122g, Black Ven; unrecorded, Golden Cap (Slatter collection).

Remarks.—Its stout and somewhat pupoidal form distinguishes this species from any *Procerithium* hitherto described from the Lias. An undescribed species, comparable in shape but with the axial element of its ornamentation stronger than the spiral element, occurs in the Middle Lias of Gretton Hill, Gloucestershire.

Procerithium westhayensis sp.nov. Pl. XXXIV, fig. 7

Diagnosis.—Large for the genus and moderately acute, with a spire angle of approximately 17°. Whorls very obtusely

[1] By a misprint, the horizon of the specimens referred to by them was stated to be 78 feet above the Belemnite Stone at Black Ven. This should read 7–8 feet.

angular at about the anterior third of their height, the angulation coinciding with a nodose spiral cord, anterior to which is a somewhat weaker nodose cord, while a third, still less prominent, borders the posterior suture, and a yet weaker one, not nodose, the anterior suture. About three spiral threads of unequal strength occur between the posterior sutural cord and the one which coincides with the carina, and another just anterior to the latter. Backward-arched growth-threads are pronounced at fairly regular intervals, and form a reticulate pattern with the spiral threads, especially marked on the posterior slope of the whorls. Sutures narrow and deep, gently inclined. Base ornamented with about three strong concentric cords. Apertural details unknown.

Dimensions.—Original height (estimated) 35–40 mm., diameter 11 mm.

Material.—The holotype only (G57752, fig. 7), consisting of the last $3\frac{1}{2}$ whorls of the shell.

Horizon and Locality.—126, foreshore at Ridge fault, Westhay.

Remarks.—This species is much larger than any *Procerithium* hitherto recorded from the Lias of this country and is further distinguished by the predominance of the spiral element of its ornamentation over the axial element.

Sub-genus **Rhabdocolpus** Cossmann, 1906

Procerithium (Rhabdocolpus) auricipitis sp.nov.

Pl. XXXIV, fig. 8.

Diagnosis.—Fairly small and of moderate stoutness, with a spire angle of about 32°. Whorls about seven, strongly convex, and ornamented with rather narrow axial ribs cancellated by slightly weaker spirals. The ribs are sometimes continuous from one whorl to the next, but usually their number increases on the later whorls, reaching 10 or more on the last whorl; they are straight and sub-vertical on the spire whorls, but tend to become arched backwards near the aperture. The spirals number four on the spire whorls, the uppermost being slightly more prominent than the others, with the space between it and the suture slightly wider than the other interspaces. The base is ornamented with spiral threads which alternate in strength. Aperture sub-orbicular, with no indication of an anterior canal.

Dimensions.—Holotype: height 6·5 mm., diameter 3·0 mm.

Material.—The holotype (G57789, fig. 8) and seven paratypes.

Horizons and Localities.—123r, Broom Cliff; 125, Golden Cap; 125b (type horizon), Broom Cliff.

Remarks.—The specimens consist mainly of pyritized casts with decayed remains of the shell adherent to them, and do not retain the finer details of their ornamentation. The species is, nevertheless, sufficiently well characterized to name.

Family ZYGOPLEURIDÆ

Genus **Zygopleura** Koken, 1892

Sub-genus **Anoptychia** Koken, 1892

Zygopleura (Anoptychia) westhayensis sp.nov.

Pl. XXXIV, fig. 6

Diagnosis.—Fairly small, slender, with a spire angle of 15°. Whorls evenly convex, rather low-embracing, the early ones, apart from a protoconch of two smooth whorls, ornamented with slightly backward-arched and retrocurrent axial costæ, which first number about 14 to the whorl, but subsequently decrease to about eight and become increasingly fainter; half-way along the shell, after about the eleventh whorl, the costæ completely disappear and are replaced by about 12 obscure spiral striæ. Growth-lines well marked at intervals, with a pronounced sigmoidal curve. Aperture unknown.

Dimensions.—Holotype: height 15 mm., diameter 3·4 mm.

Material.—The holotype (G36860, fig. 6) and four paratypes in the Slatter collection. Also a pyritized cast possibly referable to this species in Dr. Lang's collection.

Horizons and Localities.—129, Stonebarrow (doubtful cast); unrecorded, Westhay (Slatter collection).

Remarks.—*Zygopleura* (*Anoptychia*) *similis* (Moore) (1867, p. 212, pl. iv, fig. 13, *sub Turritella*) is a closely related but larger form from the Middle Lias of Ilminster; Sherborn's *Index Animalium* shows its specific name to be a homonym.

III. LAMELLIBRANCHIA

Family NUCULIDÆ

Genus **Nucula** Lamarck, 1799

Nucula ungulella Tate. Pl. XXXIV, figs. 13, 14

Nucula cordata Goldfuss, 1837, p. 155, pl. cxxv, figs. 6*a–c* (*non* Roemer, 1836—Lower Cretaceous species).
Nucula variabilis Oppel, 1853, p. 123, pl. iv, figs. 26*a*, *b* (*non* J. de C. Sowerby, 1824—Bathonian species).
Nucula variabilis Quenstedt, 1856, p. 188, pl. xxiii, fig. 28 (? *non* p. 110, pl. xiii, fig. 43).
Nucula ungulella Tate, 1870A, p. 407, pl. xxvi, fig. 11.
Nucula cordata Brauns, 1871, p. 369.
Nucula cordata Tate, 1876, p. 382.
Nucula cordata Richardson, 1918, pl. i, figs. 2, 4.
Nucula ungulella Richardson, 1918, pl. i, fig. 3.

Material.—Numerous specimens.

Horizons and Localities.—123a–m, Black Ven; 123r, Broom Cliff; 124, Broom Cliff; 125b, Stonebarrow, Broom Cliff, and Golden Cap; 126 (best preserved specimens), Stonebarrow; 127,

Broom Cliff; 128a, east of St. Gabriel's Water; 129, 129–130, Stonebarrow; 131a, Golden Cap; 132c, Stonebarrow.

Remarks.—Although he attributed the specific name to Goldfuss, Roemer's (1836, p. 101) description of a *Nucula cordata* appeared in the year preceding Goldfuss's, and as his specimens came from the "Hilsthon" the name cannot continue to be used for a Liassic shell. The shape of Tate's figured type of *N. ungulella* (Geol. Surv. Mus. 7890) has been modified posteriorly by some accident in growth, producing a shell with a terminal, opisthogyrous umbo. After comparing it with several other specimens from the type locality, Cheltenham, I am convinced that it is not separable specifically from those referable to *N. cordata* Goldfuss, a highly variable species for which *N. ungulella* thus appears to be the earliest valid name.

Family NUCULANIDÆ

Genus **Nuculana** Link, 1807

Sub-genus **Rollieria** Cossmann, 1920

Nuculana (Rollieria) bronni (Andler)

Nucula subovalis Goldfuss, 1837, p. 154, pl. cxxv, figs. 4*a*, *b* (*non* Roemer, 1836—Inferior Oolite species).
Nucula palmæ Oppel, 1853, p. 123, pl. iv, figs. 22*a*, *b* (*non* J. de C. Sowerby, 1824—Carboniferous Limestone species).
Nucula palmæ Quenstedt, 1856, p. 187, pl. xxiii, figs. 16, 17.
Leda bronni Andler, 1858, p. 644.
Leda palmæ Dumortier, 1869, p. 120, pl. xix, figs. 3, 4, p. 261.
Leda bronni Tate, 1870B, p. 19, pl. i, fig. 1.
Leda subovalis Brauns, 1871, p. 376.
Leda subovalis Tate, 1876, p. 382.
Leda (*Nuculopsis ?*) *subovalis* Cossmann, 1916, p. 147, pl. v, figs. 11, 12.
Leda subovalis Richardson, 1918, pl. i, fig. 15.
Leda subovalis Kuhn, 1936, p. 258, pl. x, fig. 10.

Material.—Two specimens.

Horizons and Localities.—127, Golden Cap; 129–132, Stonebarrow.

Remarks.—As in the case of the last species, Goldfuss's specific name is invalidated by its prior publication by Roemer (1836, p. 101) for a species from a different horizon. Tate (1876, p. 382) suggests that *Corbis uniformis* Phillips (1835, p. 133, pl. xii, fig. 3) may have been this species. Phillips's type, said to come from the Upper Lias, appears, however, to be no longer extant, and its generic affinities are not obvious from the figure. The earliest valid name for the species now recorded thus appears to be *N. bronni* Andler, assuming Tate's interpretation of that form to be correct. Described by Andler from the Angulatus Zone, this form ranges without appreciable change up to the Middle Lias.

Nuculana (? Rollieria) galatea (d'Orbigny, Dumortier)

Pl. XXXIV, figs. 11, 12

Nucula striata Roemer, 1836, p. 99, pl. vi, fig. 11 (*non* Lamarck, 1805—Eocene species).
Leda galatea d'Orbigny, 1850, p. 234.
Nucula inflexa Oppel, 1853, p. 123, pl. iv, figs. 21*a*, *b* (*non* Roemer, 1836—Purbeck *Corbula*, *fide* Brauns).
Nucula inflexa Quenstedt, 1856, p. 187, pl. xxiii, fig. 15 (? p. 110, pl. xiii, fig. 41).
Leda galatea Dumortier, 1869, p. 120, pl. xix, figs. 5, 6.
Leda quenstedti Tate, 1870B, p. 19, pl. i, fig. 4.
Leda galathea Brauns, 1871, p. 374.
Leda galathea Tate, 1876, p. 383 (*partim*, *non* pl. xi, fig. 5).
Leda trapezoidalis Monke, 1888, p. 216, pl. ii/iii, fig. 8.
Leda (*? Nuculopsis*) *galatea* Cossmann, 1916, p. 147, pl. viii, figs. 1, 2.
Leda galatea Richardson, 1918, pl. i, fig. 5.

Material.—Numerous specimens.

Horizons and Localities.—122g, 123a–m, Black Ven; 124, Broom Cliff; 125b, west of St. Gabriel's Water, and Broom Cliff; 127, Broom Cliff, and Golden Cap; 128i, 129, 130, Stonebarrow; 130a, 131a, Golden Cap.

Remarks.—D'Orbigny's type of *L. galatea* is said to be broken and so has not been figured in the *Annales de Paléontologie*.[1] We must, therefore, follow Dumortier in our interpretation of this species, since he was the first author to describe it adequately and to figure it. The shell depicted by him is only 6 mm. in length and is elliptical in shape, with a symmetrically convex posterior end.[2] A French specimen figured by Cossmann (loc. cit.) is of the same size and shape as Dumortier's. In the Dorset Lias—as elsewhere in this country—specimens attain at least twice this length and are mostly characterized by their greatly produced postero-dorsal margin; this forms an acute angle with the flattened posterior margin, which truncates the shell obliquely (Pl. XXXIV, fig. 12). Shells of this shape, which is reminiscent of that of some species of the Recent genus *Yoldia*, were described by Tate as *Leda quenstedti* and by Monke as *L. trapezoidalis*. They are, however, associated in Dorset and other British localities with occasional specimens (Pl. XXXIV,

[1] See A. M. Davies, *Q.J.G.S.* lxix, 1913, p. 329, footnote. Tate (*Geol. & Nat. Hist. Repertory*, i, 1867, p. 396) records having examined this specimen in 1867, presumably before it was broken, and identifies it with the species *Nucula elliptica* Roemer [*non* Phillips]. Brauns (loc. cit.), whose interpretation of *L. galatea* agrees with that here adopted, includes *N. elliptica* Roemer in its synonymy.

An application was made in 1929 to the International Commission on Zoological Nomenclature by Dr. W. J. Arkell and myself that d'Orbigny's *Prodrome* names should be treated as virtual *nomina nuda*. No decision has, however, yet been reached.

[2] By the courtesy of M. Gaillard, the Director, I examined Dumortier's collection in the Municipal Museum at Lyons this spring, but unfortunately was unable to find the figured, or any other, specimen of this species.

fig. 11) in which the postero-dorsal prolongation is less pronounced and which therefore agree better with the figures of *N. galatea* given by the French authors cited. It thus seems advisable to continue to identify the commoner, more trapezoidal, British variety with *N. galatea*.

The Yorkshire Middle Lias specimen (Geol. Surv. Mus. 7883) figured by Tate (1876, pl. xi, fig. 5) as belonging to this species does not appear to me to belong even to the genus *Nuculana*; it may be a *Thracia*.

Sub-genus **Ryderia** Wilton, 1830

Nuculana (Ryderia) doris (d'Orbigny)

Pl. XXXIV, fig. 16

Nucula complanata Goldfuss, 1837, p. 156, pl. cxxv, figs. 11*a–c* (*non* Phillips, 1829—?cast of *Nuculana ovum* J. de C. Sowerby sp.).
Nucula doris d'Orbigny, 1850, p. 253 (nom.nov. for *N. complanata* Goldfuss).
Nucula complanata Oppel, 1853, p. 122, pl. iv, fig. 20.
Nucula complanata Quenstedt, 1856, p. 110, pl. xiii, fig. 40; p. 186, pl. xxiii, figs. 9, 10.
Leda romani Oppel, 1856, p. 95.
Leda complanata Brauns, 1871, p. 372.
Leda complanata Tate, 1876, p. 385.
Leda romani Monke, 1888, p. 216, pl. ii/iii, fig. 5.
Leda complanata Richardson, 1918, pl. i, fig. 8.
Leda banzensis Kuhn, 1936, p. 258, pl. x, fig. 5.

Material.—Seven specimens.

Horizons and Localities.—*c.* 122, Peace E., "about half-way to far hedge"; 127, Golden Cap; 129, Stonebarrow; 130c, Golden Cap.

Remarks.—It is probable that the name *Leda doris* has hitherto been ignored by authors as it was erroneously listed by d'Orbigny as a Toarcian species. The species was, however, founded on Goldfuss's figures, cited above, and not on any specimens in d'Orbigny's collection. Oppel gave no reasons for separating *L. romani* from *L. complanata* auctt., with which Brauns later placed it in synonymy. Monke states that in *L. romani* the shell is more inflated and the umbo more prominent, but specimens of the species now described in the British Museum show considerable variation in these characters, and I doubt the validity of Monke's distinction. In proposing a new species, *L. banzensis*, for Goldfuss's *N. complanata*, Kuhn has obviously overlooked d'Orbigny's name.

Oppel, Brauns, Monke, and Tate all agree in distinguishing a closely comparable form from the Angulatus and Bucklandi zones under the name *L. renevieri* Oppel. The main distinction is said to be that the escutcheon is impressed in *L. renevieri* and elevated in roof-like fashion in *L. complanata* auctt. E. T. Newton (1901, p. 234) considered the form identified by Tate

(1870B, p. 19, pl. i, fig. 3) as *L. renevieri* to be distinct from Oppel's species, and gave to it the name *Nuculana tatei*. Several British specimens from the lower horizon have been examined by me, and I very much doubt if they are specifically distinct from the form now recorded.

The generic name *Ryderia* was proposed by Wilton (1830, p. 72) for a figured but specifically unnamed shell, which may be identified as *Nuculana renevieri* (alias *tatei*), from the Lower Lias of Awre, on the shore of the Severn. This name must be accepted as valid, since it was accompanied by a short description, and has priority over *Dacryomya* Agassiz (1842, p. 500), proposed for the same group of *Nuculana*.

Family Parallelodontidæ

Genus **Parallelodon** Meek and Worthen, 1866

Parallelodon trapezium Cox. Pl. XXXIV, fig. 15

Parallelodon trapezium Cox, 1928, p. 240, pl. xviii, figs. 5*a*, *b*.

Material.—Numerous specimens.

Horizons and Localities.—122c, 122g, Broom Cliff; 122g, 123a–m, Black Ven; ?123a, Westhay Water; 123r, Broom Cliff; 122–124, right bank of R. Char, south-west of Whitchurch bridge; 125b, Broom Cliff and Golden Cap; 126, Stonebarrow and foreshore at Ridge fault; 127, Broom Cliff and Golden Cap; 128a, Broom Cliff; 128i, Golden Cap; 129, 129–132, Stonebarrow; 130a, 131a, Golden Cap; 132c, Stonebarrow.

Family Pteriidæ

Genus **Oxytoma** Meek, 1864

Oxytoma inequivalve (J. Sowerby)

Avicula inequivalvis J. Sowerby, 1819, p. 78, pl. ccxliv, figs. 2, 3.

Material.—One specimen.

Horizon and Locality.—128i, Golden Cap.

Family Isognomonidæ

Genus **Inoceramus** (J. Sowerby MS.) W. Smith, 1816

Inoceramus ventricosus (J. de C. Sowerby)

Inoceramus ventricosus (J. de C. Sowerby), Cox, 1928, p. 241.

Material.—Several specimens.

Horizons and Localities.—122a–b, 122c, 122d, Golden Cap; 122a–c, Westhay Water; 126, foreshore at Ridge fault.

Family MYALINIDÆ ?

Genus **Anningia** nov.

(Named after Miss Mary Anning, the famous collector of Lyme Regis fossils.)

Diagnosis.—Right valve pyriform, oblique, strongly convex, concentrically ornamented, with a small projecting anterior auricle separated by a narrow groove from the body of the shell, but with no posterior auricle. Hinge edentulous. Left valve unknown.

Anningia carixensis sp.nov. Pl. XXXIV, figs. 9, 10

Diagnosis.—As for genus.

Description.—The height of the shell, measured perpendicularly to the hinge-margin, is considerably in excess of the length; the hinge-margin is short and meets the strongly convex posterior margin in an even curve; the anterior margin is slightly concave, its general direction making approximately a right angle with the hinge-margin. The shell thus has the shape of a pendent pear which curves ventrally towards the anterior side. The dorsal margin of the anterior auricle is in alinement with the hinge-margin; its anterior margin has a sigmoidal curve and meets the anterior margin of the body of the shell tangentially. The surface of the shell is ornamented with fine, concentric, nearly equidistant, imbricating lamellæ.

In the holotype there is a pronounced angularity in the profile of the valve at about the middle of its height, the shell having been flat in early stages of growth. The paratype, a smaller specimen, is more evenly convex. The paratype reveals the interior of the shell, but it is impossible to locate the muscle scar. The structure of the shell is prismatic.

Dimensions.—Holotype: length (restored) 19 mm., height 27 mm.

Material.—The holotype (L64148, Pl. XXXIV, fig. 9) and one paratype.

Horizon and Locality.—Fallen nodule, most probably from 123, but possibly from 129a; Westhay Water.

Remarks.—The presence of the prominent anterior auricle serves to distinguish the species now described from typical species of *Inoceramus*. Such an auricle is present in the peculiar form from the Black Marl of Charmouth to which Oppel gave the name *I. faberi* (see Cox, 1926, p. 181, text-fig. 4), but the species now described is readily distinguished from this species by its pyriform shape. Its affinities are probably with *Buchia* [*Aucella*] and related genera rather than with *Inoceramus*. *Pergamidia* Bittner (1891, p. 103, pl. iii), from the Trias, is comparable, but its anterior auricle is less prominent.

Family PECTINIDÆ

Genus **Chlamys** Bolten, 1798

Chlamys milvus Cox

Chlamys milvus Cox, 1928, p. 243, pl. xviii, figs. 8, 9.

Material.—Four specimens.

Horizons and Localities.—122e, Golden Cap; 123a–m, Black Ven; 127, Broom Cliff, Golden Cap.

Sub-genus **Æquipecten** P. Fischer, 1886

Chlamys (Æquipecten) prisca (Schlotheim)

Æquipecten priscus (Schlotheim), Staesche, 1926, p. 48 (with synonymy).

Material.—Four specimens.

Horizons and Localities.—125b, 127, Broom Cliff; 128i, 132a, Golden Cap.

Family LUCINIDÆ

Genus **Luciniola** Skeat and Madsen, 1898

Luciniola pumila (Münster *in* Goldfuss)

Venus pumila Münster, Goldfuss, 1837, p. 243, pl. cl, figs. 7*a*, *b*.
Venus pumila Oppel, 1853, p. 125, pl. iv, figs. 25*a*, *b*.
Venus pumila Quenstedt, 1856, p. 111, pl. xiii, fig. 44; p. 189, pl. xxiii, fig. 24.
Lucina pumila Brauns, 1871, p. 332.
Lucina pumila Tate, 1876, p. 396.
Luciniola pumila Skeat and Madsen, 1898, p. 86, pl. i, figs. 1–5.

Material.—Two specimens.

Horizons and Localities.—125b, Broom Cliff; 127, Golden Cap.

IV. LIST OF WORKS TO WHICH REFERENCE IS MADE

AGASSIZ, L. 1839–42. *Annotations in* James Sowerby's Mineral-Conchologie Grossbrittaniens, deutsch bearbeitet von E. Desor. Solothurn.

ANDLER, —. 1858. Über die Angulaten-Schichten in der Württembergischen Jura-Formation. *N.J. f. Min.* 1858, p. 641.

BEESLEY, T. 1872. A Sketch of the Geology of the Neighbourhood of Banbury. *Proc. Warwick Nat. & Arch. F.-C.* 1872, p. 11.

BITTNER, A. 1891. Triaspetrefakten von Balia in Kleinasien. *Jahrb. k.k. geol. Reichsanst.* xli, p. 97.

BRAUNS, D. 1871. Der untere Jura im nordwestlichen Deutschland. Braunschweig.

BRÖSAMLEN, R. 1909. Beitrag zur Kenntnis der Gastropoden des schwäbischen Jura. *Palaeontographica*, lvi, p. 177.

COSSMANN, M. 1916A. Étude complémentaire sur le Charmouthien de la Vendée. *Bull. Soc. géol. Normandie*, xxxiii, p. 113.

——. 1916B, 1921. Essais de Paléoconchologie comparée. Vols. X, XII. Paris.

Cox, L. R. 1926. Notes on the Lamellibranchia from the Black Marl of Black Ven and Stonebarrow. *Q.J.G.S.* lxxxii, p. 180.
——. 1928. The Gastropod and Lamellibranch Molluscs from the Belemnite Marls. *Q.J.G.S.* lxxxiv, p. 233.
Day, E. C. H. 1863. On the Middle and Upper Lias of the Dorset Coast. *Q.J.G.S.* xix, p. 278.
Dumortier, E. 1869. Études paléontologiques sur les dépots jurassiques du bassin du Rhône. Troisième Partie : Lias-Moyen. Paris.
Goldfuss, A. 1833–40. Petrefacta Germaniae. Vol. II. Düsseldorf.
Kuhn, O. 1936. Die Fauna des Amaltheentons (Lias δ) in Franken. *N.J. f. Min.* Beil.-Bd. lxxv, Abt. B, p. 231.
McDonald, A. I., & A. E. Trueman. 1921. The Evolution of certain Liassic Gastropods, with special reference to their Use in Stratigraphy. *Q.J.G.S.* lxxvii, p. 297.
Monke, H. 1888. Die Liasmulde von Herford in Westfalen. *Verh. naturhist. Ver. preuss. Rheinl.* xlv, p. 125.
Moore, C. 1867. On the Middle and Upper Lias of the South West of England. *Proc. Somerset Arch. Nat. Hist. Soc.* xiii, p. 119.
Newton, E. T. 1901. Palæontological Notes *in* B. N. Peach and W. Gunn, On a Remarkable Volcanic Vent of Tertiary Age in the Island of Arran, enclosing Mesozoic Fossiliferous Rocks. *Q.J.G.S.* lvii, p. 229.
Oppel, A. 1853. Der mittlere Lias Schwäbens. *Württemb. naturw. Jahreshefte*, x, p. 39.
——. 1856–8. Die Juraformation. Stuttgart.
Orbigny, A. d'. 1850. Prodrome de paléontologie stratigraphique universelle des animaux mollusques et rayonnés. Vol. I. Paris.
Phillips, J. 1835. Illustrations of the Geology of Yorkshire. Part I : The Yorkshire Coast. 2nd edition. London.
Quenstedt, F. A. 1856–8. Der Jura. Tübingen.
Richardson, L. 1918. The Geology (Lias and Superficial Deposits) of the Cheltenham–Stratford-on-Avon Railway (G.W.R.). *Trans. Woolhope Nat. F.-C.* 1914–17, p. 137.
Roemer, F. A. 1835–9. Die Versteinerungen des norddeutschen Oolithen-Gebirges. Hanover.
Skeat, E. G., & V. Madsen. 1898. On Jurassic, Neocomian and Gault Boulders found in Denmark. *Danmarks geol. Undersök.* ser. 2, no. 8.
Sowerby, J. 1818–21. The Mineral Conchology of Great Britain. Vol. III. London.
Staesche, K. 1926. Die Pectiniden des schwäbischen Jura. *Pal. Abh.* n.s. xv, Heft 1.
Tate, R. 1870a. On the Palæontology of the Junction Beds of the Lower and Middle Lias in Gloucestershire. *Q.J.G.S.* xxvi, p. 394.
——. 1870b. A List of the Irish Liassic Fossils, with Notes on the New and Critical Species. *Seventh Ann. Rep. Belfast Nat. F.-C.* App. I.
——. 1876. Palæontology. Classes Gasteropoda and Lamellibranchiata. *In* R. Tate and J. F. Blake, The Yorkshire Lias. London.
Wilton, C. P. N. 1830. Memoir on the Geology of the Shore of the Severn, in the parish of Awre, Gloucestershire. *Q.J. Sci. Lit. & Art*, Jan.–June 1830, p. 64.
Zieten, C. H. v. 1830–3. Die Versteinerungen Württembergs. Stuttgart.

EXPLANATION OF PLATE XXXIV

Figs. 1a, b. *Cœlodiscus aratus* (Tate), × 3. Brit. Mus. G26245. Horizon 123a–m, Black Ven. P. 459.

2a, b. *Cœlodiscus aratus* (Tate), × 3. More depressed specimen, with closer ribbing. Brit. Mus. G26248. Horizon 123a–m, Black Ven.

3a, b. *Buvignieria carixensis* sp.nov., × 12. Holotype, Brit. Mus. G26515. Horizon 123a–m, Black Ven. P. 459.

Fig. 4. *Buvignieria carixensis* sp.nov., × 10. Paratype, Brit. Mus. G26516. Horizon 123a–m, Black Ven.

Figs. 5a, b. *Procerithium langi* sp.nov., × 5. Holotype, Brit. Mus. G28437. Horizon unrecorded, probably 122–123, Golden Cap. P. 461.

Fig. 6. *Zygopleura* (*Anoptychia*) *westhayensis* sp.nov., × 2. Holotype, Brit. Mus. G10796. Horizon unrecorded, Westhay. P. 463.

7. *Procerithium westhayensis* sp.nov., nat. size. Holotype, Brit. Mus. G57752. Horizon 126, foreshore at Ridge fault, Westhay. P. 461.

8. *Procerithium* (*Rhabdocolpus*) *auricipitis* sp.nov., × 2·5. Holotype, Brit. Mus. G57789. Horizon 125b, Broom Cliff. P. 462.

9. *Anningia carixensis* gen. et sp.nov., nat. size. Holotype, Brit. Mus. L64148. Fallen nodule (? from bed 123), Westhay Water. P. 468.

10. *Anningia carixensis* gen. et sp.nov., × 2. Paratype, interior of right valve, Brit. Mus. L64149. Fallen nodule (? from bed 123), Westhay Water.

11. *Nuculana* (*Rollieria*) *galatea* (d'Orbigny, Dumortier), × 1·5. Ovate specimen, Brit. Mus. L64069. Horizon 127, Golden Cap. P. 465.

12. *Nuculana* (*Rollieria*) *galatea* (d'Orbigny, Dumortier), nat. size. Specimen with produced postero-dorsal margin, Brit. Mus. L64055. Horizon 127, Broom Cliff.

13. *Nucula ungulella* Tate, × 1·5. Subtrigonal specimen, Brit. Mus. L64109. Horizon 126, Stonebarrow. P. 463.

14. *Nucula ungulella* Tate, × 2. Ovate specimen approaching Tate's holotype in shape, Brit. Mus. L64009. Horizon 123r, Broom Cliff.

15. *Parallelodon trapezium* Cox, × 1·5. Brit. Mus. L64127. Horizon 128a, Broom Cliff. P. 467.

16. *Nuculana* (*Ryderia*) *doris* (d'Orbigny), nat. size. The rostrate posterior end is probably broken away distally. Brit. Mus. L64091. Horizon 130c, Golden Cap. P. 466.

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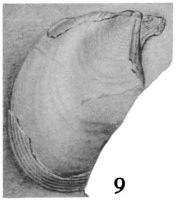

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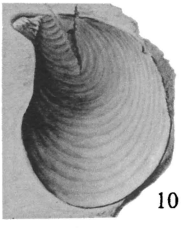

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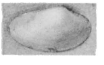

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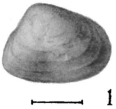

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E. T. Talbot, del.

Zinco-Collotype Co., Edinburgh.

MOLLUSCA from the GREEN AMMONITE BEDS OF CHARMOUTH